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Behavioral and Pharmacotherapy Weight Loss Interventions to Prevent Obesity-Related Morbidity and Mortality in Adults: An Updated Systematic Review for the U.S. Preventive Services Task Force

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Structured Abstract

Objective: We conducted this systematic review to support the U.S. Preventive Services Task Force (USPSTF) in updating their 2012 recommendation on screening for and treatment of adult obesity. Our review addressed three key questions: 1) Do primary care–relevant behavioral and/or pharmacotherapy weight loss and weight loss maintenance interventions lead to improved health outcomes among adults who are overweight or have obesity and are a candidate for weight loss interventions? 2) Do primary care–relevant behavioral and/or pharmacotherapy weight loss and weight loss maintenance interventions lead to weight loss, weight loss maintenance, or a reduction in the incidence or prevalence of obesity-related conditions among adults who are overweight or have obesity and are a candidate for weight loss interventions? 3) What are the adverse effects of primary care–relevant behavioral and/or pharmacotherapy weight loss and weight loss maintenance interventions in adults who are overweight or have obesity and are a candidate for weight loss interventions?

Data Sources: We performed a search of MEDLINE, PubMed Publisher-Supplied, PsycINFO, and the Cochrane Collaboration Registry of Controlled Trials for studies published through June 6, 2017. Studies included in the 2011 USPSTF review were re-evaluated for potential inclusion. We supplemented searches by examining reference lists from related articles and expert recommendations and searched federal and international trial registries for ongoing trials.

Study Selection: Two researchers reviewed 15484 titles and abstracts and 571full-text articles against prespecified inclusion criteria. Eligible studies were those that focused on weight loss in adults who are overweight or have obesity, or maintenance of previous weight loss. Trials among populations selected based on the presence of a chronic disease in which weight loss or maintenance is part of disease management (e.g., known cardiovascular disease, type 2 diabetes) were excluded. Studies included for health and intermediate outcomes (including weight loss) were randomized or clinically controlled trials that report data at least 12 months following the start of the intervention. In addition, for studies of potential harms of interventions we included large cohort, case-control, or event monitoring studies in addition to trials with fewer than 12 months of followup. Included interventions were those conducted in or recruited from primary care or a health care system or were judged to be feasible for implementation or referral from primary care and included behavior-based interventions as well as five U.S. Food and Drug Administration-approved medications for long-term chronic weight management (liraglutide, lorcaserin, naltrexone and bupropion, orlistat, and phentermine-topiramate). Studies of surgical and nonsurgical weight loss devices and procedures were excluded. We conducted dual, independent critical appraisal of all provisionally included studies and abstracted all important study details and results from all studies rated fair or good quality. Data were abstracted by one reviewer and confirmed by another.

Data Analysis: We synthesized data for behavior- and medication-based weight loss and weight loss maintenance interventions separately. Health outcomes and harms were sparsely reported and the specific outcomes measured differed across trials precluding meta-analysis, so we summarized those data in tables and narratively. For weight loss outcomes related to behavior-based weight loss interventions, we ran random effects meta-analyses using the DerSimonian and Laird method to calculate the pooled differences in mean changes (for continuous data) and

pooled risk ratio (for binary data). We examined statistical heterogeneity among the pooled studies using standard χ^2 tests and estimated the proportion of total variability in point estimates using the I^2 statistic. Meta-regression was used to explore potential effect modification by various study, population, and intervention characteristics. We generated funnel plots and conducted tests for small-study effects for all pooled analyses. Meta-analysis of the medication trials was not performed due to the small number of included trials and inconsistency in outcome reporting; therefore, results from these trials were summarized narratively and in illustrative forest plots. Using established methods, we assessed the strength of evidence for each question.

Results: We included 124 studies that were reported in 238 publications. We carried forward 41 studies from our previous review and 83 new studies were added. Of the 124 included studies, 89 trials focused on behavior-based weight loss (80 trials) or weight loss maintenance (9 trials) interventions. Thirty-five studies addressed medications for weight loss (32 studies) or weight loss maintenance (3 trials). The majority of trials took place in the United States. Over half (73 trials) represented a general, unselected population of adults who were eligible for participation based on being overweight or having obesity; the remaining trials specifically enrolled participants who were also at elevated clinical or subclinical risk of cardiovascular disease or cancer. The mean baseline BMI ranged from 25 to 42 kg/m^2 and mean age ranged from 22 to 66 years. Eleven trials focused on specific racial or ethnic groups (African American, Asians and South Asians, American Indian, or those of Hispanic ethnicity). In the remaining trials, race and/or ethnicity and socioeconomic status were not well reported and when described, the majority of participants were white with medium to high socioeconomic status.

The behavior-based interventions were highly variable across the included trials in terms of the modes of delivery, number of sessions and contacts, and interventionists. Across the 120 intervention arms the primary mode of intervention delivery was: group based (42 arms), individual-based (37 arms), technology-based (24 arms), or "mixed" (17 arms). Twenty-three interventions included interaction with a primary care provider. The 41 medication based studies addressed: liraglutide (4 trials), lorcaserin (4 trials), naltrexone and bupropion (3 trials), orlistat (19 trials, 2 observational studies), and phentermine-topiramate (3 trials).

Health outcomes. Health outcomes were minimally reported in the behavior-based weight loss and maintenance trials (k=20; n=9910). In four weight loss trials (n=4442) reporting mortality there were no significant differences between groups over two to sixteen years. Two weight loss trials (n=2666), reported on cardiovascular events, with neither finding differences between groups over 3 and 10 years, respectively. Health-related quality of life (QOL) was evaluated in 17 weight loss and maintenance trials (n=7120), with almost all showing no differences between groups. Trials of medication-based weight loss interventions examined few health outcomes beyond QOL (k=10; n=13145). Although most studies showed evidence of a greater improvement in obesity-specific QOL among those on medication compared with placebo, the differences were small and of unclear clinical significance. In addition, interpretation of these finding was limited given high study dropout rates (≥ 35% in half the included trials). Two medication-based trials (n= 6210) examined cardiovascular events finding few events in any group. None of the medication-based maintenance trials reported the effects of the interventions on health outcomes.

Weight outcomes. Pooled results of 67 behavior-based weight loss trials indicated greater weight loss from interventions compared to control conditions at 12-18 months (mean difference in weight change [MD], −2.39 kg [−5.3 lb] [95% CI, −2.86 to −1.93]; k=67; n=22065; I^2=90.0%). Mean absolute changes in weight ranged from −0.5 kg (−1.1 lb) to −9.3 kg (−20.5 lb) among intervention participants and from 1.4 kg (3.0 lb) to −5.6 (−12.3 lb) among control participants. Weight change at followup beyond 12 to 18 months was not as well reported but effects were consistent with short-term weight loss, although generally attenuated, over time. A meta-analysis of 38 trials found that intervention participants had a 1.94 times greater probability of losing 5 percent of their initial weight compared with control groups over 12 to 18 months (risk ratio [RR], 1.94 [95% CI, 1.70 to 2.22], k=38; n=12231, I^2=67.2%) which translated into a number needed to treat of 8. Among the majority of trials of behavior-based weight loss maintenance interventions both intervention and control participants regained weight over 12 to 18 months of maintenance; however, the intervention participants experienced less weight regain (pooled MD, −1.59 kg [−3.5 lb] [95% CI, −2.38 to −0.79]; k=8; n=1408; I^2=26.8%).

Among 32 medication-based weight loss trials, those randomized to medications experienced greater weight loss compared to those in placebo at 12 to 18 months (mean/least squares mean [LSM] difference in weight change [MD] ranged from −1.0 kg [−2.2 lb] to −5.8 kg [−12.8 lb]; no meta-analysis conducted). Absolute changes in weight ranged from mean/LSM of −3.3 kg (−7.3 lb) to −10.5 kg (−23.4 lb) among medication participants compared to −0.9 kg (−2.0 lb) to −7.6 kg (−16.8 lb) among placebo participants over 12 to 18 months. Medication participants had a 1.2 to 3.9 times greater probability of losing 5 percent of their initial weight compared with placebo participants over 12 to 18 months. Three medication-based trials indicate greater weight maintenance in medication than placebo participants over 12 to 36 months (MD ranged from −0.6 to −3.5; no meta-analysis conducted).

Intermediate outcomes. Thirteen trials (n=4095) examined incident diabetes among those in behavior-based interventions compared to control conditions. Absolute cumulative incidence of diabetes at up to 3 years followup ranged from 0 to 15 percent in the intervention group and 0 to 29 percent in controls. The DPP and Finnish DPS trials found statistically significant lower incidences of developing diabetes at three to nine years; no other trial found differences between groups, however, these trials generally had smaller sample sizes and shorter followup. The pooled relative risk of developing incident diabetes was 0.67 (95% CI, 0.51 to 0.89; k=9; n= 3140; I^2=49.2%) Four trials of weight loss medications (three weight loss and one maintenance trial) examined incident diabetes. Absolute cumulative incidence of diabetes at up to 4 years of followup ranged from 0 to 6 percent in medication arms and 1 to 11 percent in placebo arms, between group differences were statistically different in most medication trials. Prevalence of hypertension, metabolic syndrome, use of CVD medications, and estimated 10-year risk of CVD were sparsely reported. There was limited evidence from larger trials that those in behavior-based weight loss arms had reduced prevalence of hypertension and use of CVD medications compared to control conditions; data were limited and mixed for metabolic syndrome and 10-year CVD risk. Four medication trials reported on use of lipid-lowering and antihypertensive medications, prevalence of metabolic syndrome, and 10-year CVD risk score with mixed results.

Adverse events. There were no serious harms related to the behavior-based interventions and most trials noted no differences between groups in the rates of adverse events, including

cardiovascular events. In the three behavior-based trials large enough to examine musculoskeletal issues between groups, results were mixed. Although serious adverse events were relatively uncommon in medication trials and generally similar between groups, adverse event rates were high in both groups by 12 months, with 80 to 96 percent experiencing an adverse event in the medication arms compared with 63 to 94 percent in the placebo arms. The higher rates of adverse events in the medication arms resulted in higher dropout rates than in the placebo arms.

Conclusion: We found that behavior-based weight-loss interventions with or without weight loss medications resulted in more weight loss than usual care conditions. The degree of weight loss we observed with the behavior-based weight loss interventions in the current review is slightly smaller but consistent in magnitude with our 2011 review on this topic. As in the previous review, we noted that weight loss interventions resulted in a decreased risk of developing diabetes, particularly among those with prediabetes, although the prevalence of other intermediate health outcomes were less well reported. Limited evidence exists regarding health outcomes associated with weight loss interventions. Weight loss medications, but not behavior-based interventions, were associated with higher rates of harms compared with control arms. Heterogeneity within each individual intervention arm confounded with differences in the populations, settings, and trial quality, make it difficult to disentangle which variables may be driving larger effects. Long-term weight and health outcomes data, as well as data on important subgroups (e.g. those who are older, or non-white, or overweight) were lacking and should be a high priority for future study.

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Chapter 1. Introduction

Condition Background

The most widely used and practical way to evaluate degree of overweight is by body mass index (BMI), calculated as weight in kilograms divided by height in meters squared (kg/m^2). Adults with BMIs from 25 to 29.9 kg/m^2 are generally considered to be overweight and those with BMIs equal to or greater than 30 kg/m^2 are considered to have obesity.[1-3] The category of "obese" is further divided into subcategories of Class I obesity (BMI 30.0 to 34.9 kg/m^2), Class II obesity (BMI 35.0 to 39.9 kg/m^2), and Class III obesity (BMI $\geq$ 40 kg/m^2).[2]

The relationship between percent body fat and BMI differs among ethnic groups.[4, 5] Such differences have raised concerns about the appropriateness of current BMI cut-offs for all ethnic groups. However, BMI thresholds have generally been based on morbidity and mortality outcomes and not the BMI-adiposity relationship.[4] All ethnic and racial groups have increased mortality, cardiovascular disease risk, and type 2 diabetes risk with increasing BMI, but there may be group-specific differences in absolute risk, the level of BMI at which increased risk occurs, and the strength of the relationship (**Appendix A**).[6-20] In Asians, the BMI associated with increased diabetes risk[14, 21-23] and mortality[24-27] is lower than in Caucasians, consistent with their higher body fat at a given BMI level; therefore, the World Health Organization (WHO) suggested that countries consider setting lower potential BMI action points for Asians (along the BMI continuum from 23.0 to 27.5 kg/m^2).[18] The evidence regarding whether current BMI cut-offs are appropriate for non-Hispanic blacks and Hispanics is mixed.[6, 20, 28-31] Given the complexity of the relationship between BMI and ethnicity, and the limited, conflicting data, neither of the two groups that have reviewed this topic, the National Institute of Health and Care Excellence (NICE) in the United Kingdom or the American Heart Association/American College of Cardiology/Obesity Society (AHA/ACC/TOS) workgroup, has recommended changing the BMI thresholds for blacks, Hispanics, or other ethnic groups.[3,23] The AHA/ACC/TOS panel noted a "critical" lack of studies on racial-ethnic differences in Western countries to determine whether different cut-points for racial and ethnic subgroups might be appropriate.

Prevalence of Overweight and Obesity

In 2013–2014, 35 percent of U.S. men and 40 percent of U.S. women were categorized as having obesity.[32] About one in 13 Americans has a BMI of more than 40 kg/m^2 (Class III obesity).[33] From 2005 through 2014 there has been a significant increase in the rate of women with obesity but not men. [3234, 35] When expanded to include overweight and obesity (BMI ≥35 kg/m^2) the age-adjusted prevalence in 2011–2014 was 67.0 percent of U.S. men and 72.8 percent of U.S. women.[36]

Using the standard definitions of BMI across ethnic groups, non-white adults have a higher prevalence of overweight and obesity than white adults. Among women, for example, the age-adjusted prevalence of obesity (BMI greater than or equal to 30 kg/m^2) is higher among non-Hispanic black (57.2%) and Hispanic women (46.9%) than among non-Hispanic white women

(38.2%). The difference in obesity prevalence is less marked among men (38.0% in non-Hispanic black men, 37.9 percent in Hispanic men, and 34.7 percent in non-Hispanic white men).[35] Rates of obesity among Asian-Americans are lower than other groups (12.4% in women, and 12.6% in men);[35] however, when using the adjusted cut-off of >25 kg/m^2 is higher (43% for U.S.-born Asians) than that of non-Hispanic whites (36%).[37]

Burden of Disease

Overweight and obesity have been associated with an increased risk of coronary heart disease (CHD), type 2 diabetes, and cancer, even after adjustment for established risk factors (**Appendix A**).[38-46 47] Other diseases that have been associated with obesity include ischemic stroke,[11, 48, 49] heart failure,[41] atrial fibrillation/flutter,[50, 51] venous thrombosis,[52] gallstones,[53-55] gastroesophageal reflux disease,[56] renal disease,[57, 58] and sleep apnea.[59] Midlife obesity has been associated with later-in-life dementia.[60, 61] Obesity also increases the risk of developing osteoarthritis[62, 63] and is associated with functional disability.[64] Some observational studies suggest that individuals with obesity, even those without comorbid diseases, may have a decreased quality of life compared with individuals who are not overweight or obese.[65-67] As a result of the increased morbidity, there is increased use of health care services and costs among individuals with obesity.[68, 69]

BMI has been associated with risk of death. The shape of the association appears to be J shaped with higher and lower BMIs being associated with increased mortality. However, the nadir of the curve is controversial. Obesity (BMI ≥ 30 kg/m^2) has been associated with an increased risk of death, especially in women and adults under the age of 65 years.[70, 71] Obesity has been estimated to advance death in the United States by 1.6 years for those with BMIs between 30 and 34.9 and by 3.7 years for those with BMIs of 35 kg/m^2 and above.[71] Ischemic heart disease, diabetes, cancer (especially liver, kidney, breast, gallbladder, pancreas, endometrial, prostate, and colon cancers), and renal, hepatic, and respiratory diseases are leading causes of death in those who have obesity.[72, 73]

Whether being overweight (BMI 25 to 29.9 kg/m^2) is associated with increased mortality risk has been the subject of considerable public health debate.[74] Some,[73, 75-80] but not all,[29, 70, 81, 82] studies have found an increased risk of death in those who are overweight (**Appendix A**). The difficulty in conducting these studies is that conditions leading to death may cause lower BMI rather than lower BMI causing death (reverse causation bias).[83, 84] A recent analysis of the Nurses' Health Study (NHS) I and II and the Health Professionals Follow-Up Study (HPFS) attempted to avoid this problem by looking at maximum BMI over 16 years of prospective weight history. Maximum BMI in overweight, Class I obesity, and Class II obesity categories were all associated with a statistically significant increased risk for all-cause death (increased risk of 6%, 24%, and 73%, respectively). The nadir for risk for all-cause death was 22.5 to 24.9 kg/m^2 among all participants.[80] In addition, those who were overweight at baseline and remained so during followup did not have an increased risk of death compared with those who were normal weight during the entire observation period. In contrast, those who were obese throughout the study (at baseline and during followup) had an increased risk of death compared with those who were not overweight or obese at all time points.[80]

The relationship between BMI and mortality is weaker and less reliable in older adults[80] likely due to the central fat redistribution, decreased muscle mass, and decreased stature that occurs with aging (**Appendix A**).[85-88] While the curve still appears to be J shaped with higher and lower BMIs being associated with increased mortality, the nadir of the curve may be shifted upward, close to or even into the overweight category.[70, 79, 80, 85, 86, 89] While the evidence is mixed regarding whether older persons with Class 1 obesity (BMI 30 to 35 kg/m^2) have an increased mortality risk,[70, 85, 89] most evidence suggests that those with Class 2 and 3 obesity (BMI ≥35 kg/m^2) do have increased mortality risk.[31, 70, 85, 89] Obesity has been associated with higher rates of physical and functional disability and functional decline in older populations,[31, 90-92] but whether overweight is associated with physical decline is less clear.[31, 90] The 2013 AHA/ACC/TOS report on the Management of Overweight and Obesity in Adults (published before some of these data were reported) concluded there was insufficient evidence to address the adequacy of existing BMI cut-points in adults above the age of 65.[3]

The association between overweight and mortality risk may also be influenced by environmental and person-specific factors such as disease history, diet, and physical activity. Individuals with overweight but without cardiovascular risk factors, often termed "metabolically healthy," especially those who are physically active, may not have an increased risk of mortality compared with normal-weight individuals.[93-97]

There are also potential psychosocial burdens associated with having overweight or obesity and with the implementation of weight loss interventions, including weight stigma[98] and eating disorders.[99-101]

Etiology and Natural History

Many factors contribute to the development of overweight and obesity. [102, 103]Nutritional factors contributing to the growing obesity epidemic include the availability of more processed and affordable foods that are high in fat and sugar,[104, 105] including potato chips, sugar-sweetened beverages, and processed meats.[106] Other factors that play an important role in this epidemic include increasingly sedentary lifestyle,[107] more screen time,[108] increased fast-food consumption,[109] and sleep deprivation.[110] It is increasingly recognized that regulation of energy homeostasis and body weight is a complex process involving the central and sympathetic nervous systems, the melanocortin system, nutrient intake, gut hormones, the gut microbiome, and adipose tissue itself. [111-114] Genetic factors play a permissive role and interact with environmental factors to produce obesity.[102, 103, 115] In terms of the natural history of obesity, weight gain in adults is a steady progression, with significant increases at points like pregnancy, development of depression/ psychosocial stressors, changes in functional status due to pain/injury, or with the addition of obesogenic medications in the treatment of other conditions until about the sixth decade of life, when weight appears to stabilize and then decline with age.[2, 116, 117]

Risk Factors

Environmental and nutritional exposures in early development may influence the risk of developing obesity later in life.[118] Animal and human data suggest that maternal BMI and macronutrient/energy intake during gestation influence offspring appetite, metabolism, adiposity, and risk of overweight/obesity in childhood and into adulthood.[119, 120] Maternal smoking,[121] maternal gestational diabetes,[122] and short or no exposure to breastfeeding are also associated with an increased risk of childhood obesity.[123] Childhood obesity increases the risk of adult obesity[124, 125] and having an elevated BMI in early adulthood (ages 20 to 22 years) appears to increase the risk of developing obesity within 15 years. For example, in a study of the natural history of the development of obesity in young U.S. adults, 41 percent of white, 47 percent of Hispanic, and 66 percent of black women who had BMIs of 24 to 25 kg/m^2 at ages 20 to 22 became obese by ages 35 to 37 years.[126]

Screening

Measurements that can be used to estimate body fat and quantify health risks include BMI, waist circumference, waist to hip ratio, bioimpedance, and Dual Energy X-ray Absorptiometry (DXA).[127] Measuring height and weight to calculate BMI in a clinical setting is a low-cost, relatively quick, and reasonably reliable way to screen for obesity. Reference charts and BMI calculators are available to allow clinicians to determine a patient's BMI using his/her height and weight without having to perform a manual calculation. A 2003 evidence report for the United States Preventive Services Task Force (USPSTF) found good-quality evidence supporting the use of BMI to identify adults with increased risk of future morbidity and mortality.[128]

Patients with abdominal obesity (also called central adiposity, visceral, android, or male-type obesity) are at increased risk for heart disease, cancer, diabetes, and death.[129-134] Multiple ways of measuring central adiposity have been proposed including waist circumference, waist to hip ratio,[135] waist to height ratio,[136, 137] the body shape index (ABSI[138-140], derived from weight, height and waist circumference), and anthropometric risk index (ARI,[141] derived from height, BMI, and ABSI). Waist circumference, which can be measured in clinical settings with a flexible tape placed on a horizontal plane at the level of the iliac crest as seen from the anterior view, is used most frequently by clinicians and is recommended for inclusion as part of the routine obesity evaluation by several organizations.[3, 142-144]

Elevated waist circumference has been associated with increased mortality, CVD, and diabetes risk independent of BMI, and combining waist circumference with BMI may more accurately assess obesity-related mortality and morbidity risk.[3, 134, 145, 146] The waist circumference cut-points in current use were recommended by the 1998 NHLBI obesity education initiative expert panel, which recommended that waist circumference be considered elevated when greater or equal to 40 inches (102 cm) for men and 35 inches (88 cm) for women.[147] A 2008 WHO Expert Consultation concluded that these levels were associated with substantially increased risk and recommended using lower cut-points (>94 cm in men, >80 cm in women) to identify increased risk.[148] The International Diabetes Federation suggested different cut-points for South Asians, Chinese, and Japanese individuals (>90 cm in men, >80 cm in women).[149, 150] A 2013

AHA/ACC/TOS panel was unable to formulate an evidence statement on specific waist circumference cut-points and recommended continuing with current cut-points until further evidence became available.[3]

Waist circumference measurements may be particularly useful among certain subgroups (**Appendix A**). For example, because of fat redistribution with aging, waist circumference may be more closely associated with morbidity and mortality in elderly populations.[85] In a pooled analysis of over 58,000 persons ages 65 to 74, the relative risk of mortality in older persons with a healthy weight and a large waist circumference was generally higher than for those with overweight and a small waist circumference.[151] Evidence about whether waist circumference can improve the predictive ability of obesity screening for health outcomes in non-white groups is mixed. [15, 28, 131, 152-155]

Treatment

Clinical interventions to achieve and maintain weight reduction include behavior-based interventions to induce lifestyle change (i.e., dietary restriction, increased physical activity, and decreasing sedentary lifestyle), pharmacotherapy, and surgery. Behavior-based clinical interventions optimally will combine information on safe physical activity and healthy eating for weight loss with cognitive and behavior-based management techniques to help participants make and maintain lifestyle changes.[156] Interventions often include behavior change techniques such as facilitating goal setting, prompting self-monitoring, weighing pros and cons, drawing the health benefit link, and encouraging social support and can be provided through individual counseling sessions (in-person or remotely), group counseling sessions, technology-based modalities such as computer-based modules, computer- and smartphone-based applications, and text messages, print materials or combinations of these formats.

Several medications are currently approved in the United States for the management of obesity, including weight loss and maintenance of weight loss, in conjunction with a reduced calorie diet. The Food and Drug Administration (FDA) considers a drug is be effective for the treatment of obesity if either of the following two criteria are satisfied: 1) mean weight loss is at least 5 percent greater than control groups, or 2) proportion of subjects who lose at least 5 percent of baseline body weight is at least 35 percent and approximately double the proportion of the control group.[157] Even if these conditions are met, however, a drug might not be approved because the potential risks or harms of the drug outweigh its benefits or efficacy. Weight loss medications are recommended for patients with obesity with an initial BMI greater than or equal to 30 kg/m^2 or greater than or equal to 27 kg/m^2 in the presence of other risk factors (e.g., diabetes, dyslipidemia, controlled hypertension). An Endocrine Society clinical practice guideline states that medication should be discontinued if weight loss is less than 5 percent of body weight within the first 3 months.[158]

Orlistat has been approved by the FDA as a chronic weight loss medication since 1999.[159] It blocks absorption of 25 to 30 percent of fat calories by inhibiting pancreatic lipases. Ingested fat is not completely hydrolyzed, resulting in increased fecal fat excretion.[160, 161] The recommended prescription dose is one 120 mg capsule three times a day (TID) with each main meal containing

fat. A lower dose of 60 mg TID is available as an over-the-counter medication.[162] The predominant side effects are gastrointestinal, and there may be decreased absorption of some vitamins. Severe liver injury and oxalate-induced kidney injury have been reported rarely in Orlistat users.[160, 161]

Other weight loss medications target appetite mechanisms, primarily working in the arcuate nucleus to stimulate the pro-opiomelanocortin neurons, thereby promoting satiety.[158] One such class of drugs, sympathomimetic drugs (e.g., phentermine, diethylproprion), has been approved since the 1960s for short-term use (up to 12 weeks). They block the reuptake of norepinephrine and serotonin into nerve terminals, thereby leading to early satiety and reduced food intake. Because they are only indicated for short-term use, use of these drugs alone in obesity treatment is not included as part of this systematic evidence review. [158]

One of these short-acting sympathomimetic drugs, phentermine, was combined with topiramate. and this drug, phentermine-topiramate extended release (phentermine-topiramate, hereafter), was approved in 2012 for chronic weight management.[163, 164] Topiramate, a GABA receptor modulator, used to treat epilepsy and migraines, was noted to be associated with weight loss in clinical trials, prompting its evaluation as an anti-obesity agent.[165-167 168] The main side effects of this combination drug include insomnia, dry mouth, constipation, paresthesias, dizziness, distortion of taste, elevation of heart rate, psychiatric events (e.g., depression, anxiety), and cognitive changes (e.g., disturbed memory and attention).[158, 169] The FDA required a postmarketing prospective cohort and drug use study evaluating oral cleft risks, an RCT evaluating renal function in adults with obesity, and an RCT to examine effects on the incidence of major adverse CVD events in subjects with CVD.[164]

Another drug, lorcaserin hydrochloride (lorcaserin, hereafter), a selective serotonin type 2c receptor agonist, was also approved by the FDA in 2012 for chronic weight management.[163, 170] Serotonin reduces food intake and thereby body weight.[171-173] Adverse effects of lorcaserin include headache, nausea, dry mouth, constipation, dizziness, fatigue, cough, and nasopharyngitis.[158, 169, 174] The FDA required a postmarketing randomized, double-blind, placebo-controlled trial to evaluate the effect of long-term treatment on the incidence of major adverse cardiovascular events (including serial echocardiographic assessments) in those with CVD (final submission to FDA due 12/2018). The FDA also required postmarketing reports of cardiac valve disorders, serotonin syndrome, neuroleptic malignant syndrome, mood and cognitive disorders, and benign and malignant neoplasms.[170]

The combination of naltrexone HCL and buproprion HCL (naltrexone and buproprion, hereafter) was approved for chronic weight management by the FDA in 2014.[170] Bupropion is a dopamine and norepinephrine reuptake inhibitor approved for the treatment of depression and prevention of weight gain during smoking discontinuation. [175, 176] Naltrexone is an opioid receptor antagonist. Side effects include nausea, constipation, headache, vomiting, and dizziness.[158] The FDA required a postmarketing cardiovascular outcomes trial designed to rule out a significant increase in CVD risk. In addition to the unknown CVD risks, the following were also noted during the FDA approval process: seizures (known risk with buproprion), cognitive effects (mostly attention), renal function (creatinine increase), and liver harms (known risk with naltrexone).[170]

Liraglutide was approved as a chronic weight management drug in 2014.[177] Liraglutide is a long-acting glucagon-like polypeptide-1 (GLP-1) analog also used for treating diabetes. GLP-1 is a gastrointestinal peptide that stimulates glucose-dependent insulin secretion and inhibits glucagon release and gastric emptying. GLP-1 agonists also affect the POMC neurons and cause satiety.[178] For weight management, it is given a dose of 3 mg daily, which is higher than the dose used for treating diabetes (1.8 mg daily). Side effects include nausea, vomiting, and pancreatitis. A Risk Evaluation and Mitigation Strategies (REMS) requirement was made for physician education regarding the risk of medullary thyroid carcinoma (black box warning) and acute pancreatitis. There was also the requirement of a medullary thyroid cancer registry (15 years) and re-analysis of CVD outcomes trials to examine breast cancer risk. There is also an ongoing postmarketing study of diabetes level dosage and the risk of CVD, MTC, pancreatitis, renal safety, hypoglycemia, immunological reactions, gallbladder disease, and neoplasms in T2DM.[177]

Bariatric surgery, the most effective weight loss treatment,[179] is one of the fastest growing operative procedures performed worldwide (estimated >340,000 operations in 2011).[180] Bariatric surgical procedures result in weight loss through two mechanisms. Some procedures cause malabsorption by shortening the length of the functional small intestine, either through bypass of the absorptive surface area or diversion of the biliopancreatic secretions that facilitate absorption (e.g., biliopancreatic diversion with duodenal switch). Other procedures cause restriction and limit caloric intake by reducing the stomach's reservoir capacity via resection, bypass, or creation of a proximal gastric outlet (e.g., laparoscopic adjustable gastric band, sleeve gastrectomy). Some procedures have both a restrictive and malabsorptive component (e.g., Roux-en-Y gastric bypass). There is growing evidence that bariatric surgical procedures also result in weight loss through neurohormonal effects on the regulation of energy balance.[181]

Current Clinical Practice

Expert organizations generally agree that all adults should be screened for overweight and obesity using at least BMI (**Table 1**).[143, 144, 156, 182] Measuring weight at periodic health exams is now part of standard clinical practice in most medical settings. Despite these guidelines and the ease of determining BMI, surveys have indicated that fewer than one-half of patients with BMIs greater than 30 are documented as having obesity in the medical record,[183, 184] and less than one-quarter of providers state that they consistently and systematically track patients over time with regard to their weight.[185]

Because central adiposity is emerging as a useful risk factor, several organizations also recommend measuring waist circumference as part of screening (**Table 1**).[142-144, 156] For waist circumference, the NHLBI (in collaboration with the AHA, ACC, and TOS) and WHO have defined cut-points for abdominal obesity as greater than 88 cm for women and greater than 102 cm for men.[156] In Asians, the WHO has suggested that countries consider lower cut-points: greater than 80 cm in women and greater than 90 cm in men.[1, 186]

Experts recommend that persons with obesity be given advice about diet, exercise, and lifestyle management.[3, 142, 144, 158, 182] In 2011, Medicare began reimbursing for behavior-based weight loss treatment for beneficiaries with obesity (body mass index of 30 or higher). The new payment

allows up to 20 weight loss-related visits with primary care physicians, nurse practitioners, physician assistants, or clinical nurse specialists. In a serial cross-sectional analysis of fee-for-service Medicare claims, a very small proportion of persons with obesity (0.35% and 0.60% in 2012 and 2013) were using the Medicare Obesity Benefit with only a mean of about 2 claims per user.[115] Under the Affordable Care Act, there is no exact definition of what obesity counseling must include, and coverage varies from plan to plan.[187] But most health insurance plans, including all plans purchased through the Marketplace, offer coverage for obesity screening and counseling. However, primary care-delivered, weight-related counseling rates remain low. In one recent analysis, only 30 percent of patients with obesity received weight counseling in 2007–8 (compared with 40 percent in 1995–6.).[188] These data are consistent with other surveys, which show that 35 to 60 percent of providers provide specific guidance on diet, physical activity, or weight control to their patients who have obesity.[183, 189-192] In a recent survey, almost all (97%) physicians felt responsible for promoting weight-related care. However, there was little familiarity with select obesity guidelines.[185] In addition, more than half of the physicians had concerns about the effectiveness of weight loss interventions, and nearly two-thirds felt they lacked effective strategies to help patients.[184] In contrast, nutrition professionals self-identify as being the most qualified group to help patients lose weight, and those who report receiving high-quality training in weight loss counseling report high degrees of confidence and success in helping patients with obesity to lose weight.[193]

Several organizations and expert panels recommend weight loss medications for those with BMIs of 30 or over (or 27 with comorbidities) who are unsuccessful with lifestyle changes.[143, 144, 156, 158] However, in a recent survey, there was little consensus among physicians about when to initiate weight loss medications, and physicians expected more weight loss with medications than is realistic.[185] Many adults that are prescribed weight loss medications may not meet approved indications and/or may have contraindications.[194] An analysis of pharmacy claims data from 2012 to 2015 found that the adoption of new anti-obesity medications has remained level while the adoption of new anti-diabetes medications (subtype 2 sodium-glucose transport protein inhibitors) has increased nearly exponentially.[195]

Previous USPSTF Recommendation

In 2012, the USPSTF recommended screening all adults for obesity and referral of patients with BMIs of 30 kg/m^2 or higher to intensive, multicomponent behavioral interventions (B Recommendation).[196]

Chapter 2. Methods

Review Scope

The current review is an update of the 2011 LeBlanc et al. review.[197] Unlike the previous review, populations selected based on the presence of a chronic disease in which weight loss or weight loss maintenance is part of disease management (e.g., arthritis, known cardiovascular disease, type 2 diabetes) have been excluded. Pharmacological interventions included in this review are limited to those that are approved by the U.S. Food and Drug Administration for long-term chronic weight management; therefore, although metformin was reviewed in the 2011 evidence review, it was not included in the current review. We included four new weight loss medications that have been approved since the last review: liraglutuide, lorcaserin, naltrexone and bupropion, and phentermine-topiramate and one medication included in the previous review (Orlistat).

Analytic Framework and Key Questions

We developed an Analytic Framework (**Figure 1**) and three Key Questions (KQs) to guide the literature search, data abstraction, and data synthesis.

Key Questions

1. Do primary care-relevant behavioral and/or pharmacotherapy weight loss and weight loss maintenance interventions lead to improved health outcomes among adults who are overweight or have obesity and are a candidate for weight loss interventions?
2. Do primary care-relevant behavioral and/or pharmacotherapy weight loss and weight loss maintenance interventions lead to weight loss, weight loss maintenance, or a reduction in the incidence or prevalence of obesity-related conditions among adults who are overweight or have obesity and are a candidate for weight loss interventions?
3. What are the adverse effects of primary care-relevant behavioral and/or pharmacotherapy weight loss and weight loss maintenance interventions in adults who are overweight or have obesity and are a candidate for weight loss interventions?

Data Sources and Searches

In addition to considering all studies from the previous review on this topic[197] for inclusion in the current review, we performed a comprehensive search of MEDLINE, PubMed Publisher-Supplied Records, PsychINFO, and the Cochrane Collaboration Registry of Controlled Trials. We searched between January 1, 2010, and June 6, 2017, building upon the most recent full search for this topic. We worked with a research librarian to develop our search strategy, which was peer-reviewed by a second research librarian (**Appendix B**). All searches were limited to articles published in English.

In addition to these database searches, we searched ClinicalTrials.gov and the World Health Organization International Clinical Trials Registry Platform (www.who.int/ictrp) for ongoing trials through August 2017. We also examined the reference lists of previously published reviews, meta-analyses, and primary studies to identify any potential studies for inclusion. We examined the FDA review documents for each included medication to identify any additional studies not published in the primary literature. We supplemented our searches with suggestions from experts and articles identified through news and table-of-content alerts such as those produced by the USPSTF Scientific Resource Center LitWatch activity.[198] We managed literature search results using version X7 of Endnote® (Thomson Reuters, New York, NY), a bibliographic management software database.

Study Selection

Two reviewers independently reviewed the title and abstract of all identified articles using DistillerSR (Evidence Partners, Ottawa, Canada) to determine if the study met our *a priori* inclusion and exclusion criteria for design, population, intervention, and outcomes (**Appendix B Table 1**). Two reviewers then independently evaluated the full-text article(s) of all potentially relevant studies against the complete inclusion and exclusion criteria. Disagreements in the abstract and/or full-text review were resolved by discussion.

For all KQs we included randomized controlled trials (RCTs) including cluster randomized trials and controlled clinical trials (CCTs) focused on weight loss in individuals who are overweight or have obesity, or maintenance of previous weight loss. In addition, for KQ3 (potential harms of weight loss/maintenance interventions) we included systematic reviews and large cohort, case-control, or event monitoring studies. We excluded studies with a primary aim of the prevention of overweight or obesity. Studies included for KQ1 and KQ2 had to report weight/adiposity change at least 12 months following the start of the intervention to be included. No minimum followup for KQ3 was required.

We included studies among adults 18 years or older who were candidates for weight loss/maintenance interventions and selected based on an above normal BMI (e.g., ≥25 kg/m^2) or other weight-related measure (e.g., waist circumference). In cases where lower BMI thresholds were used for eligibility (e.g., ≥23) or where participants were selected based on other cardiovascular risk factors (e.g., hypertension, impaired fasting glucose) *without* weight-related eligibility criteria and the focus of the intervention was clearly weight loss, we examined the distribution of the mean BMI at baseline to evaluate potential inclusion. We allowed in studies where 100 percent of the sample had a BMI above 23 kg/m^2, 95 percent of the sample had a BMI above 24 kg/m^2, or 90 percent of the sample had a BMI above 25 kg/m^2. These individuals may have additional risk cardiovascular risk factors (e.g., hypertension); however, we excluded studies in adults with a chronic disease for which weight loss/maintenance is part of disease management (e.g., known cardiovascular disease, diabetes mellitus). In addition, we excluded studies in adults with known chronic diseases not generalizable to the primary care population (e.g., eating disorders, chronic kidney disease). Studies in adults with secondary causes of obesity, pregnant women, and institutionalized adults were excluded. The evidence related to weight loss in children and adolescents is addressed in a separate review.[199]

We included interventions that were conducted in or recruited from primary care or a health care system or that we judged could feasibly be implemented in or referred from primary care. We included studies of commercial weight loss programs that are widely available in the community at a national level. We excluded studies that took place exclusively in or in conjunction with worksites, churches, or other settings that are not generalizable to primary care given pre-existing social ties that are not easily reproducible in primary care.

We included interventions focused on weight loss or maintenance of previous weight loss including: behavioral counseling (either alone or part of a multicomponent intervention), training of health care providers, pharmacologic interventions approved by the U.S. Food and Drug Administration as first-line long-term weight loss/management medications, and combinations of these interventions. Interventions could be delivered via face-to-face contact, telephone, print materials, or technology (e.g., computer-based, text messages), and by numerous potential interventionists, including but not limited to: physicians, nurses, exercise specialists, dietitians, nutritionists, and behavioral health specialists. Included behavior-based interventions had to focus on healthful diet and nutrition, physical activity, sedentary behavior, or a combination thereof and include behavior change techniques such as: assessment with feedback, advice, collaborative goal-setting, assistance, exercise prescriptions (referral to exercise facility or program), or arranging further contacts. We excluded studies of surgical and nonsurgical devices and procedures, medications not approved by the U.S. Food and Drug Administration for long-term weight loss or weight loss maintenance, complementary and alternative treatments, and dietary supplements.

Given the elevated level of lifestyle counseling that now occurs as part of standard care, we allowed more intensive control groups than in the previous review. For studies of behavior-based interventions, we included only studies that had the following controls: no intervention (e.g., wait list, usual care, assessment-only), minimal intervention (e.g., usual care limited to quarterly counseling sessions or generic brochures), or attention controls (e.g., similar format and intensity but different content). We excluded studies that evaluated the comparative effectiveness of two active interventions without the addition of a true control group. For studies of pharmacologic interventions, we included only placebo-controlled studies in which participants all received the same behavior-based interventions. For the greatest applicability to U.S. primary care practice, we included only studies conducted in economically developed countries, defined as member countries of the Organisation for Economic Co-Operation and Development.[200] Finally, due to resource constraints, we included only studies for which results were published in English.

Health outcomes included mortality, morbidity, depression, health-related quality of life, and disability. Intermediate outcomes included weight measurements, measures of total and central adiposity, incidence or prevalence of obesity-related conditions, and proportion of individuals taking medication for obesity-related conditions. Unlike the 2011 review, the effects of weight loss interventions on intermediate cardiometabolic measures (i.e., continuous measures of blood pressure, cholesterol levels, and glucose levels) was not included; rather, we focused on the incidence or prevalence of specific diseases/risk factors (e.g., diabetes, hypertension). Adverse events included treatment-related harms and discontinuation of medication due to adverse effects at any time point during intervention. We did not include studies that evaluated potential harms of weight loss itself (i.e., harms had to be related to a weight loss or maintenance intervention

that met our inclusion criteria, including having an adequate comparison group).

Two reviewers independently assessed the methodological quality of each study using predefined study-design specific criteria developed by the USPSTF.[198] Disagreements in quality were resolved by discussion. Each study was given a final quality rating of good, fair, or poor. Good-quality studies were those that met nearly all of the specified quality criteria (e.g., comparable groups were assembled initially and maintained throughout the study, followup was approximately 85 percent or higher, conservative data substitution methods were used in cases of missing data, no evidence of selective outcome or analysis reporting), whereas fair-quality studies did not meet these criteria but did not have serious threats to their internal validity related to the design or execution of the study. Studies we rated as poor-quality had several important limitations, including at least one of the following risks of bias: very high attrition (generally >40%), differential attrition between intervention arms (generally >20%); lack of baseline comparability between groups without adjustment; methods for ascertainment of weight outcomes were unclear or differed between groups (e.g., self-report or objective measurement and not reported by group), or issues in trial conduct, analysis, or reporting of results (e.g., possible selective reporting, inappropriate exclusion of participants from analyses, and questionable validity of randomization and allocation concealment procedures). Studies rated as poor quality were excluded from the review. In studies of pharmacologic interventions most drop out is due to adverse events or lack of effectiveness and not loss to followup. We allowed studies with more than 40 percent attrition to be rated as fair-quality if they used adequate data substitution methods with sensitivity analyses using different methods (e.g., modified intention-to-treat [mITT],[157] baseline observation carried forward, multiple imputation using a mixed effects model).[201] Because this review was an update of our own work, we did not repeat critical appraisal of the original studies through full dual-quality rating; rather, we confirmed the quality rating during data abstraction. In two cases a study included in the previous report was excluded for poor quality upon re-review due to several methodological issues including high attrition with lack of adequate data substitution methods, lack of analysis description, and allocation concealment issues.[202, 203]

For all of the included studies, one reviewer extracted key elements into standardized abstraction forms in Microsoft Access® 2010 (Microsoft, Redmond, WA). A second reviewer checked the data for accuracy. For each study, we abstracted general characteristics of the study (e.g., author, year, study design), clinical and demographic characteristics of the sample and setting (e.g., age, race/ethnicity, baseline clinical characteristics, setting, country), analytic methods, and results. For intervention characteristics, we abstracted detailed information about specific components: duration, number, and length of sessions; group or individual delivery of counseling; mode of delivery (i.e., in-person, telephone, electronic, or print); providers and provider training; setting; and adherence to the intervention. We abstracted the number of sessions and length of sessions according to what was planned (and not necessarily what was implemented). In order to summarize and compare interventions' intensity, we abstracted the total number of sessions conducted and the total number of contacts made in the first 12 months for each intervention arm. For this, sessions included any group or individual counseling session, conducted face to face or by telephone or any web- or computer-based module or session, whereas contacts included all sessions *plus* contacts made through mobile phone text messages, e-mails, or interactions with other web-based or social media platforms. In this case, the number of contacts

was always greater than the number of sessions. As described below, both variables were considered when exploring effect modification by intervention intensity.

We categorized each study according to the selection of participants into the study based on their cardiovascular or cancer risk. The four categories of risk were: 1) increased cardiovascular risk (e.g., selection was based on having one or more cardiovascular risk factor such as hypertension, dyslipidemia, metabolic syndrome), 2) subclinical increased cardiovascular risk (e.g., selection was based on having prediabetes, prehypertension, or other clinical risk factor for diabetes such as gestational diabetes), 3) elevated cancer risk (e.g., studies in which participants were cancer survivors or who had a premalignant condition), and 4) low cardiovascular risk or unselected (i.e., studies that did not select participants on the basis of their cardiovascular or cancer risk). Studies categorized as low risk or unselected generally enrolled participants based on overweight and/or obese status, age, and other demographic characteristics.

Data Synthesis and Analysis

We synthesized data separately for each KQ and according to the focus of the intervention (i.e., behavior-based weight loss interventions, behavior-based weight loss maintenance interventions, medication-based weight loss interventions and medication-based weight loss maintenance interventions). Results for each medication were analyzed and reported separately. The data on health outcomes (KQ1), intermediate outcomes such as incident cases of diabetes or metabolic syndrome (KQ2), and adverse events (KQ3) did not allow for quantitative pooling due to the limited number of contributing studies and the variability in outcomes measured, so we summarized those data in tables and narratively. For the results of medications on weight loss outcomes, there were too few trials (2-3) for each drug to be pooled. For orlistat, where there were 11 trials reporting weight loss outcomes, there was inconsistency in the measurements reported for within- and between-group effects (e.g., means, least squares means) and a lack of reporting of variance precluded meta-analyses of continuous outcomes. We chose not to meta-analyze the nine orlistat trials that reported the proportion of participants losing at least 5 or 10 percent of their initial body weight given concerns regarding several of the trials' high and differential attrition. Instead, we presented a forest plot (without pooling) to illustrate each trial's results.

For behavior-based interventions, we ran random-effects meta-analyses using the method of DerSimonian and Laird to calculate the pooled differences in mean changes (for continuous data) and a pooled risk ratio (for binary data) for weight outcomes (KQ2).[204] Details of our data analysis methods are included in **Appendix B**. Briefly, we used the between-group differences for each outcome as reported by each respective study and favored adjusted over unadjusted effect estimates. If a between-group effect estimate and variance were not provided, we calculated a crude effect estimate. Within the pooled analyses, we grouped 12- to 18-month followup data together and 24-month data separately. If a trial reported both 12- and 18-month data, we chose 12-month data to pool. If a trial had more than one active intervention arm, we plotted the most intensive arm or the arm that was the most similar with other interventions included in the analysis. Of note, we did not include the DPP treatment arm randomized to metformin[205] or the POWER-UP enhanced brief lifestyle counseling arm which included the

participants' choice of meal replacements or weight-loss medications (orlistat or sibutramine)[206] given our review inclusion criteria. We presented the results of other time points and other intervention arms in tabular format.

We examined statistical heterogeneity among the pooled studies using standard χ^2 tests and estimated the proportion of total variability in point estimates using the I^2 statistic.[207] We applied the Cochrane's rules of thumb for interpreting heterogeneity: less than 40 percent likely represents unimportant heterogeneity, 30 to 65 percent, moderate heterogeneity; 50 to 90 percent, substantial heterogeneity; and more than 75 percent, considerable heterogeneity.[208] We generated funnel plots to evaluate small-study effects (a possible indication of publication bias) and ran the Egger's[209] or Peters'[210] test to assess the statistical significance of imbalance in study size as well as findings that suggested a pattern.

We used visual displays and tables grouped and sorted by potentially important characteristics and a series of meta-regressions to investigate whether variability among the results was associated with any prespecified study, population, or intervention characteristics. Specifically, we examined study quality (good versus fair), percent of participants retained at 12 to 18 months, link to primary care (conducted in or recruited from primary care or not), whether the trial was set in the United States, risk status of the sample (increased CV, subclinical, or cancer risk versus low risk or unselected), participant selection approach (self-selected versus directly recruited), and a number of intervention characteristics (number of sessions and contacts in the first year, intervention duration, the main mode of intervention delivery, the presence of any group, individual, or technology-based components, and the use of self-monitoring).

We used Stata version 13.1 (Stata Corp LP, College Station, TX) for all quantitative analyses. All significance testing was two-sided, and results were considered statistically significant if the p-value was 0.05 or less.

Grading the Strength of Evidence

We graded the strength of the overall body of evidence for each key question. We adapted the Evidence-based Practice Center approach[211] which is based on a system developed by the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group.[212] Our method explicitly addresses four of the five Evidence-based Practice Center-required domains: consistency (similarity of effect direction and size), precision (degree of certainty around an estimate), reporting bias (potential for bias related to publication, selective outcome reporting, or selective analysis reporting), and study quality (i.e., study limitations). We did not address the fifth required domain—directness—as it is implied in the structure of the key questions (i.e., pertains to whether the evidence links the interventions directly to a health outcome).

Consistency was rated as reasonably consistent, inconsistent, or not applicable (e.g., single study). Precision was rated as reasonably precise, imprecise, or not applicable (e.g., no evidence). Reporting bias was rated as suspected, undetected, or not applicable (e.g., when there is insufficient evidence for a particular outcome). Study quality reflects the quality ratings of the

individual trials and indicates the degree to which the included studies for a given outcome have a high likelihood of adequate protection against bias. Limitations highlights important restrictions in answering the overall key question (e.g., lack of replication of interventions, nonreporting of outcomes important to patients).

We graded the overall strength of evidence as high, moderate, or low. "High" indicates high confidence that the evidence reflects the true effect and that further research is very unlikely to change our confidence in the estimate of effects. "Moderate" suggests moderate confidence that the evidence reflects the true effect and that further research may change our confidence in the estimate of effect and may change the estimate. "Low" indicates low confidence that the evidence reflects the true effect and that further research is likely to change our confidence in the estimate of effect and is likely to change the estimate. A grade of "insufficient" indicates that evidence is either unavailable or does not permit estimate of an effect. Two independent reviewers rated each key question according to consistency, precision, reporting bias, and overall strength of evidence grade. We resolved discrepancies through consensus discussion involving more reviewers.

Expert Review and Public Comment

The draft Research Plan was posted for public comment on the USPSTF Web site from December 10, 2015, to January 13, 2016. Several comments suggested including studies of women during the postpartum period; the USPSTF changed the Research Plan to include postpartum women. A final research plan was posted on the USPSTF's Web site on March 31, 2016.

USPSTF Involvement

We worked with six USPSTF members at key points throughout this review, particularly when determining the scope and methods for this review and developing the Analytic Framework and KQs. After revisions reflecting the public comment period, the USPSTF members approved the final analytic framework, KQs, and inclusion and exclusion criteria. AHRQ funded this review under a contract to support the work of the USPSTF. An AHRQ Medical Officer provided project oversight, reviewed the draft report, and assisted in the external review of the report.

Chapter 3. Results

Included Studies

Our literature search resulted in 15484 unique citations. For these, we provisionally accepted 571 articles for full-text review based on titles and abstracts (**Appendix C**). Following review of full-text articles and critical appraisal, we included 124 trials of weight loss or weight loss maintenance interventions[160, 161, 168, 172, 173, 205, 206, 213-330] reported in 238 publications (**Appendix D**). Of the included trials, 80 trials examined the effectiveness of behavior-based weight loss interventions,[205, 206, 214, 215, 217, 219, 221, 224, 225, 228-232, 234, 235, 237, 240, 242, 243, 245, 249-258, 261, 262, 264-267, 269-272, 274-281, 283, 286, 288-291, 293, 295, 300-302, 305, 306, 308, 310, 314-316, 318-330] and 32 examined the effectiveness and/or harms of medication for weight loss[160, 161, 168, 172, 173, 213, 216, 218, 220, 222, 226, 227, 236, 238, 239, 241, 244, 246, 248, 259, 260, 263, 268, 273, 285, 292, 297-299, 304, 307, 311] (**Table 2**). An additional 12 trials (9 behavior-based[223, 233, 282, 284, 294, 296, 303, 309, 313, 317] and 3 medication-based[247, 287, 312]) evaluated the effectiveness of a weight loss maintenance intervention. We carried forward 41 studies from our prior review and added 83 new studies (**Table 2**).

Of the 571 articles that were reviewed, the most common reasons for exclusion were: a lack of relevant outcomes (k=50), less than 12-month followup (for effectiveness studies) (k=59), and a lack of an appropriate comparator (comparative effectiveness, controls told specifically not to lose weight) (k=92). **Appendix E** contains a list of all excluded studies and their reasons for exclusion.

Given the diversity of interventions included in this review, we organized the results by: 1) behavior-based weight loss interventions (k=80), 2) behavior-based weight loss maintenance interventions (k=9), 3) medication-based weight loss interventions (k=32), and 4) medication-based weight loss maintenance interventions (k=3). Weight loss maintenance trials are those in which participant randomization occurred after weight loss (either as part of or outside of the study).

Study and Population Characteristics

Behavior-Based Weight Loss Interventions

Of the 80 behavior-based weight loss trials, 20 were carried forward from previous review and 60 new studies were added (**Table 2**). All of the included studies were RCTs; 11 were cluster RCTs with randomization of health centers or primary care practices, physicians, or families.[214, 225, 231, 232, 235, 269, 271, 318, 320, 329, 330] Sample sizes ranged from 30 to 2161, and the median sample size was 240. Followup at 12 months ranged from 57.0 percent to 100 percent. The majority of the trials (k=47) took place in the United States, and the remaining trials were conducted in Europe (k=15), the United Kingdom (k=11), Japan (k=3), Australia (k=2), and Canada (k=2). Recruitment varied, with at least some self-selected into the trial based on broad-based recruitment methods (35 trials), or direct recruiting through methods such as targeted mailings or

appointments with their primary care providers (40 trials). The remaining trials applied mixed recruitment methods.

Half of the behavior-based weight loss trials represented a general, unselected population of adults who were eligible for participation based on their BMI alone (k=40) (with or without other demographic limitations [e.g., age, race/ethnicity]) (**Table 3**). Five additional trials specifically enrolled adults at elevated cancer risk (i.e., cancer survivors, those with colorectal adenomas).[217, 229, 235, 288, 310] The remaining 35 trials selected participants based on increased subclinical (k=19, e.g., prediabetes, family history of diabetes, high-normal blood pressure) or clinical (k=16, e.g., hypertension, dyslipidemia) cardiovascular risk. Across all 80 trials, regardless of participant selection into the trials, cardiovascular risk status of the participants was underreported and variable among those that did report baseline prevalence. Among those that reported risk status the proportion of affected participants varied broadly: prediabetes (8.5 to 100 percent; k=16), diabetes (0 to 43 percent; k=49), hypertension (0 to 100 percent; k=24), and dyslipidemia (0 to 67.7 percent; k=12).

The majority of trials (k=71) included adults who were overweight or obese, with eight trials limited to adults with obesity (i.e., BMI ≥30 kg/m^2) and one trial limited to adults who were overweight (BMI 25-29.9 kg/m^2).[251] Very few trials placed an upper bound for eligible BMIs; in those that did, the upper bound ranged from 29.9 kg/m^2 (in the only trial limited to adults who were overweight) to 60 kg/m^2. The mean baseline BMI ranged from 25.2 kg/m^2 (among a sample of Japanese adults aged 50-69 years) to 39.2 kg/m^2 (among a sample of African American women aged 30-65 years) with a median of 33.4 kg/m^2. The standard deviations were large, indicating that there was a wide range of baseline BMI's and that baseline BMI's overlapped even among trials with different BMI inclusion criteria (**Figure 2**). Only five trials[225, 265, 270, 286, 291] included eligibility criteria based on central adiposity (i.e., waist circumference).

The mean age of included participants ranged from 22.4 to 66.0 years (median, 50.3 years). While none of the trials restricted participation to older adults, the mean age was above 60 years in six trials.[217, 229, 235, 243, 270, 326] One trial focused on college students aged 18-35 years.[242] Four trials were limited to men,[249, 272, 281, 286] and 14 were limited to women.[229, 234, 235, 240, 250, 261, 269, 277, 288, 289, 295, 310, 321, 330] Of the trials restricted to women, some were further restricted to specific subgroups of women, including: women with a history of breast[229, 235, 288] or endometrial cancer,[310] postpartum women,[250, 277, 321, 330] and African American women.[240, 269] Eleven trials focused on specific racial or ethnic groups including African Americans,[240, 269] Asians[257, 270, 274, 316] and South Asians,[225] American Indian,[276] or those of Hispanic ethnicity.[278, 290, 321] There was no consistent reporting of socioeconomic status of the participants; however, based on the variables that were reported, most of the sample represented adults with medium to high socioeconomic status based on education, income, and employment.

Behavior-Based Weight Maintenance Interventions

Of the nine behavior-based weight loss maintenance trials, three were carried forward from previous review (**Table 2**). The nine studies included eight RCTs and one cluster RCT (randomized based on assignment to a previous weight loss intervention).[233] Sample sizes ranged from 92 to 1032 (median, 201), with a followup of 74 to 95 percent at 12 to 18 months. The

majority of the trials (k=6) took place in the United States, and the remaining trials were conducted in UK, Finland, and Australia. Recruitment procedures varied across trials, but at least some of the participants self-selected into the trials as a result of broad-based recruitment methods such as advertising with the community, health insurance, or PCP.

All but one behavior-based weight loss maintenance trial represented a general, unselected population of adults who were eligible for participation based on BMI alone (k=8), with one trial specifically enrolling adults with cardiovascular risk (i.e., hypertension and/or dyslipidemia) (**Table 3**).[303] Six trials[233, 282, 284, 303, 309, 317] conducted weight loss interventions prior to randomizing participants into the maintenance interventions, with three trials randomizing only those with at least 4 kg of weight loss.[233, 282, 284] The mean BMI at enrollment in these trials was 34.2 kg/m^2. The remaining three trials selected patients based on achieving a weight loss of 5 to 10 percent in the 1 to 2 years before randomization and did not include weight loss as part of the trial (mean BMI, 33.1 kg/m^2).[294, 296, 313]

The mean age of included participants across studies ranged from 46.4 to 61.8 years (median, 49.2). One study examined only women,[233] and one was limited to men.[317] The majority of studies did not report information regarding participant race/ethnicity or socioeconomic status. Based on the limited information available, the study populations appeared to be majority white (percent of non-white participants ranged from 5.4 to 41.9%) with medium to high socioeconomic status based on limited data on education, income, and/or employment.

Medication-Based Weight Loss Interventions

Of the 32 medication-based weight loss studies, 16 were carried forward from previous review (all related to orlistat) and 16 new studies were added (**Table 2**). Among the 32 studies, 20 RCTs were included in the review of the benefits of weight loss medications (KQ1 and KQ2), and all of the studies (30 RCTs, 1 retrospective cohort, and 1 event monitoring study) were included in the review of potential harms of medications (KQ3). Sample sizes ranged from 48 to 3,731 in the RCTs (median, 542). About one-half of the trials (k=15) took place in solely in the United States. The remaining trials were conducted in Europe (k=14), Australia/New Zealand (k=1), and multiple countries/regions (k=2). Fourteen studies had run-in periods to assess compliance with taking the medication. The trials that examined health outcomes (KQ1 and KQ2) lasted 12 to 48 months, with six trials contributing outcome data at 24 months or longer.[160, 161, 172, 220, 241, 246, 285, 292, 297] Of the trials included for the effectiveness of weight loss, followup at 12 to 18 months ranged from 50 to 96 percent. The body of evidence regarding harms (KQ3) also included trials with shorter followup (1 to 6 months). The retrospective cohort and event monitoring study examined harms over a median of 150 days to 3 years.[213, 248]

The majority of studies recruiting from academic, research, or specialty care settings; recruitment procedures were not well described. Five trials specifically reported conducting at least some communitywide recruitment (via local advertising).[161, 220, 239, 259, 297] One trial recruited participants from a primary health care setting,[246] and two studies were conducted in a primary care setting.[246, 263]

Almost two-thirds of the weight loss medication trials (21 of 30 trials) were conducted in

generally unselected populations based on their BMI alone. Thirteen of these trials in unselected populations required BMI to be greater than or equal to 30 kg/m^2 but allowed those with BMIs ≥27 kg/m^2 if cardiovascular risk factors were present.[160, 161, 168, 172, 173, 216, 218, 220, 239, 244, 246, 285, 311] One trial selected participants based on the presence of prediabetes,[259] and eight trials selected those with one or more cardiovascular risk factors (e.g., hypertension, dyslipidemia).[222, 226, 227, 236, 241, 263, 273, 304] Across all 30 trials, cardiovascular risk status of the participants was underreported. In those reporting risk status, 1 to 68 percent had prediabetes (k=8), 0 to 27 percent had type 2 diabetes (k=21), 0 to 100% had hypertension (k=11), and 21 to 100 percent had dyslipidemia (k=13). Overall, approximately two-thirds of the trials (k=19) included adults who were overweight or obese, with eleven trials limited to adults with obesity (BMI ≥ 30 kg/m^2). The mean baseline BMI ranged from 31 to 42 kg/m^2 (median, 36.1 kg/m^2). The large standard deviations indicate a wide range of baseline BMI's that overlapped among trials with different BMI inclusion criteria (**Figure 3**). No trial had eligibility criteria based on central adiposity (i.e., waist circumference).

The mean age of included participants ranged from 41 to 58 years (median, 45 years). All studies comprised both men and women (25 to 90% female), with all but one study[299] including more females than males. Of the 18 trials that reported race and/or ethnicity of the sample, the percent of non-white participants ranged from 5 to 37 percent. No trials focused on specific racial or ethnic groups and there was no reporting of socioeconomic status. Baseline characteristics were similar in the two non-RCT studies.[213, 248]

Medication-Based Weight Maintenance Interventions

Two medication-based weight loss maintenance trials were carried forward from the previous review,[247, 287] and one new trial was added (**Table 2**).[312]All were RCTs conducted in research clinics and were set in the United States, Canada, and Scandinavia. Sample sizes ranged from 309 to 542 with a followup of 65 to 74 percent at 12 to 36 months. All three trials began with an active weight loss phase, which lasted for 4 to 24 weeks, during which all participants were prescribed hypocaloric diets and exercise with no pharmacologic intervention. Participants were required to lose 5 to 8 percent of their baseline weight prior to randomization to the maintenance intervention. One trial was limited to adults with at least one cardiovascular risk factor. The mean baseline BMI at enrollment into the maintenance phase ranged from 32.8 to 37.5 kg/m^2.[287] The mean age of included participants was 46 to 47 years with the majority of the participants being female (51 to 84%) and white (12 to 16% non-white). There was no reporting of socioeconomic status.

Intervention Characteristics

Behavior-Based Weight Loss Interventions

Within the 80 weight loss trials, 105 unique weight loss interventions were evaluated against control conditions (**Table 4**). The interventions were highly variable across the included trials in terms of the modes of delivery, number of sessions and contacts, and interventionists. However, specific weight loss messages and behavior change techniques were consistent across the trials

(**Table 5; Appendix F Table 1**). Duration of interventions ranged from 3 months (in six trials) to 5 years (in one trial), with the majority taking place for a minimum of 1 year. One-third of interventions provided a "core" intervention period (described as "core," "active," or "intense" phases) generally for 3 months to 1 year and then followed up with a support phase (also described as "maintenance" in some trials), generally for 9 to 12 months. The remaining interventions did not distinguish between "core" and "support" phases.

To better summarize the interventions, we categorized each intervention arm according to the main mode of intervention delivery into the following groups: 1) group, 2) individual, 3) mixed, 4) technology-based, and 5) print-based (**Table 4**). Across the 105 intervention arms, just over one-third (36 arms in 26 trials) were primarily group-based counseling interventions.[214, 215, 221, 230, 243, 249, 253-255, 261, 262, 266, 267, 270, 276, 280, 295, 300, 301, 314, 316, 321, 323, 327, 329] Group-based interventions ranged from 8 group sessions over 2.5 months to 52 weekly group sessions over 1 year (median, 23 total sessions in the first year). Twelve interventions (in 7 trials[254, 261, 300, 301, 314, 327, 329]) provided group sessions beyond 1 year (1.5 to 3 years total intervention time). Groups typically consisted of classroom-style sessions with 8 to 12 participants per group, and each session lasted 1 to 2 hours. Within the group-based interventions, five trials (9 arms) provided referral and free access to commercially available group-based weight loss programs including Weight Watchers,[253, 255, 267, 323] Slimming World[221, 255] and the Size Down program[255] (both provided by the UK National Health Service [NHS]), and Rosemary Conley (UK-based weight loss program).[255] Six of the group-based interventions offered minimal supplemental support, with one brief individual counseling session.[214, 221, 300, 301, 327, 329]

In 30 trials (with 33 arms), the main mode of intervention delivery was individual-based support.[205, 206, 217, 219, 224, 225, 229, 232, 234, 237, 250, 252, 255, 257, 265, 269, 271, 275, 283, 286, 289, 291, 305, 306, 308, 318, 320, 324, 325, 328] In most of these (24 arms), counseling was provided through face-to-face intervention sessions with or without ongoing telephone support. The remaining nine individual-based interventions were provided remotely through telephone counseling calls (average 15 to 30 minutes) and Web-based self-monitoring and support. One trial evaluated three individual-based strategies that included telephone support only, a mailed food basket only, and telephone support plus the mailed food basket.[320] In general, the individual-based counseling interventions had fewer sessions or contacts than the group-based interventions; the median number of sessions in the first year for individual-based interventions was 12 compared with 23 in group-based interventions. DPP was the most intense individual-based intervention, offering participants weekly and then bimonthly individual counseling sessions with case managers over 3 years.[205] Another example of an intense individual intervention was one that offered free access to weekly individual counseling sessions through Jenny Craig.[289]

We categorized 16 interventions (within 14 trials[219, 240, 251, 256, 258, 274, 278, 288, 290, 302, 310, 315, 326, 330]) as "mixed" interventions as they included relatively equal numbers of group- and individual-based counseling sessions with or without other forms of support (telephone, print, Web-based). All but four of these interventions took place for more than 1 year, and most had more than 12 sessions in the first year (median number of sessions [23] was same as median for group-based interventions).

In another 20 interventions (17 trials), the main component of the intervention was technology-

based, including computer- or Web-based intervention modules,[231, 264, 272, 277, 279, 281, 308, 315] Web-based self-monitoring, mobile phone-based text messages, smartphone applications, or social networking platforms,[242, 245, 265, 293, 302, 320, 322] or DVD learning.[266] In all but two of these interventions,[231, 264] there was no face-to-face interaction with an interventionist. There was only one trial (2 arms) that delivered its intervention entirely through print-based tailored materials.[235]

Across all intervention types, 19 interventions included interaction with a primary care provider (PCP) although the level of interaction with the provider was variable across the interventions.[206, 219, 221, 224, 231, 232, 237, 255, 257, 269, 271, 305, 310, 318, 324, 327, 328] In three of these interventions, PCP involvement was limited to encouragement to take part in and/or referral to interventions conducted by other providers (i.e., group-based interventions conducted by lifestyle coaches or registered dietitians) or in other settings (i.e., commercial weight loss program).[219, 221, 224] In seven trials, PCPs reinforced intervention messages through brief counseling sessions.[206, 231, 237, 310, 324, 327, 328] A PCP was the primary interventionist in only six interventions, providing 3 to 12 months of individual counseling.[232, 255, 257, 269, 305, 318] The intervention providers were highly diverse in the remaining trials not involving PCPs and included behavioral therapists, psychologists, registered dietitians, exercise physiologists, lifestyle coaches, and other study-hired medical or public health staff. Most trials included interventionist training prior to the start of the intervention; in those that gave specific details (k=43), training was fairly intense, ranging from 2 hours to 4 days as well as regular check-ins or supervised sessions to ensure fidelity to the intervention protocol. In one trial,[271] the focus of the intervention was to educate primary care providers on the benefits of weight loss and effective treatment options through small group meetings. Each practice was then asked to devise an individual weight management protocol for their patients who had obesity to help them achieve 10 percent loss of their body weight.

The trials had very similar messages in terms of specific weight loss and behavioral goals. Most of the interventions were designed to help participants achieve a 5 percent or greater weight loss through a combination of dietary changes (including specific caloric goals) and a gradual increase in physical activity (generally promoting at least 150 minutes of moderate-intensity activity per week). A few trials mentioned promoting specific dietary approaches including the DASH diet (Dietary Approaches to Stop Hypertension),[228, 302, 320] a Mediterranean food pattern,[291] or the Magedeburg Dual Diet (500 kcal/day reduction and consumption of low glycemic index foods).[265] Only one trial[314] encouraged a very low-calorie diet (800 to 1000 kcal/day). In two trials,[254, 289] prepackaged meals were provided directly to participants. In one trial,[256] the intervention was exclusively focused on dietary changes and participants were specifically told not to exercise.

In addition to group, individual, and technology-based education and counseling, most interventions provided additional tools to assist with weight loss (e.g., pedometers, food scales, exercise videos). One intervention provided monetary incentives for weight loss.[254] Most of the trials targeted individual participants, but a few encouraged participants to invite family members to join intervention activities[228, 243, 300, 301, 306, 316, 320] and two specifically targeted family pairs or units (i.e., mother-daughter pairs[235]or adult relatives[225]).

Twelve trials (14 intervention arms) provided interventions modeled closely after the DPP lifestyle intervention for application in the community[214, 215, 230, 258, 277, 278, 290, 316, 319, 321] or

primary care.[266, 328] A number of these trials tailored the DPP intervention for a specific population (e.g., Latinos, postpartum women with recent gestational diabetes) and included additional intervention components such as individual counseling sessions with community health workers. All but one[328] of these trials were among adults at increased diabetes (9 trials) or cardiovascular risk (2 trials). Three of the trials adapted the DPP core curriculum to be provided strictly by DVD,[266] text messages,[319] or a Web site.[277] Three additional trials described using or adapting DPP materials as part of their interventions but did not closely follow the DPP framework and were conducted among unselected adults or those at low cardiovascular and diabetes risk.[237, 261, 305]

In general, rates of participation or participant adherence were relatively high (**Appendix F Table 1**). Most of the studies reported that more than two-thirds of the intervention participants completed the full intervention, or alternatively, that all participants completed more than two-thirds of the intervention. However, participation rates appeared to decline over time, especially as intervention intensity lessened. This pattern held true even among interventions that were primarily technology-based.

The majority of trials employed a minimal weight loss intervention (k=42) or usual care (k=24) arm for the control group (**Appendix F Table 1**). Most of the minimal intervention and usual care groups consisted of generic self-help print or Web-based materials focused on weight loss, diet, and physical activity changes, and diabetes prevention (e.g., the National Heart, Lung, and Blood Institute's "Aim for a Healthy Weight" brochure). A handful, however, were more intense and included 30 minutes to 2 hours of nontailored group weight-loss counseling sessions, brief (2 to 3 minutes) quarterly counseling sessions with a PCP, or more intense individualized counseling two to four times per year.[205, 225, 237, 265, 267, 272, 288, 289, 305, 306, 324, 326, 328, 329]

Behavior-Based Weight Maintenance Interventions

Within the 9 behavior-based maintenance trials,[233, 282, 284, 294, 296, 303, 309, 313, 317] there were 15 unique weight loss interventions evaluated against control conditions; 4 trials had more than 1 active intervention arm compared with a control condition (**Table 6; Appendix F Table 2**). The maintenance interventions included group interventions (6 arms),[282, 284, 313] technology-based (4 arms),[233, 303, 313, 317] individual counseling sessions conducted in person or by phone (4 arms),[294, 296, 303] or a combination of individual and group counseling (1 arm)[309] (**Table 7**). Duration of the maintenance interventions ranged from 6 months to 5 years, with the majority taking place for 12 to 18 months. The number of sessions within the first year ranged from 0 (Web-based self-monitoring only) to 26 with majority of the interventions having greater than 12 sessions in the first year. Only one study, which included four intervention arms, specifically reported that the intervention included interaction with a PCP (physician or nurse) paired with a clinical psychologist.[284]

The interventions were designed to help participants maintain weight loss by continuing dietary changes and physical activity. There was a focus on reviewing nutrition, exercise, and behavioral topics as well as self-monitoring, identifying barriers, problem-solving, peer support, and relapse prevention. Programs also provided participants with tools to assist in weight loss maintenance (e.g., food diaries, pedometers) and one intervention included monetary incentives for program

adherence.[284]

In most trials, the majority of the sessions were attended or contacts completed during the first 6 to 12 months (**Appendix F Table 2**). However, similar to the trials of behavior-based weight loss interventions, participation began to drop off, especially beyond 12 months.

Following an administered weight loss intervention[233, 282, 284, 303, 309, 317] or after study enrollment,[294, 296, 313] the control groups received either no intervention (k=4),[233, 282, 284, 317] minimal intervention (e.g., generic self-help print or Web-based materials or minimal phone contact) (k=3),[294, 303, 313] or usual care (e.g., care offered as part of health plan enrollment) (k=2).[296, 309]

Medication-Based Weight Loss Interventions

All of the medication-based weight loss studies examined FDA-approved dosages of medications (**Table 8**): liraglutide at 1.8 mg QD or 3.0 mg QD, lorcaserin at 20 mg (10 mg BID), naltrexone and bupropion at 32/360 mg (16/180 mg TID), orlistat at the prescription strength dosage of 360 mg daily (120 mg TID) and over-the-counter dosage of 180 mg (60 mg TID), and phentermine-topiramate at 15/92 mg and 7.5/46 mg. We did not abstract data on nonapproved dosages.

Within all trials, both groups received identical behavioral interventions. Participants were told to follow energy-restricted diets (generally with a 500- to 800-kcal/day deficit) and increase physical activity in addition to taking the medication. The extent of the behavior-based component of the intervention varied widely among studies—from a single visit with a study physician[246] to weekly, 90-minute group sessions.[311] The most common behavior-based intervention was to require participants to complete food records that were discussed with nutritionists at study visits (which ranged from monthly to quarterly).

Medication adherence was rarely reported; however, almost all trials reported the percentage of participants who completed the trial on the drug/placebo. Completion rates ranged from 10 to 93 percent, with most studies having completion rates between 50 and 70 percent. Of note, completion rates tended to be higher among the intervention groups than control groups.

Medication-Based Weight Maintenance Interventions

Three trials examined the effect of medication on weight loss maintenance following a weight loss intervention. Two medication-based weight loss maintenance studies examined orlistat, one at the prescription strength dosage of 360 mg daily (120 mg TID)[287] and one at both prescription and over-the-counter strengths (180 mg [60 mg TID]),[247] and one study examined liraglutide 3.0 mg QD (**Table 8**).[312] During the maintenance phase, participants were prescribed energy intakes to either maintain weight or result in a 500- to 600-kcal/day energy restriction, were encouraged to exercise regularly, and met with dieticians or behavioral counselors. While no trials reported on pill compliance, the percentage of participants who completed the trial on the drug/placebo ranged from 70 to 77 percent in the two trials that reported these data.

Study Quality

Within the 89 included behavior-based weight loss and weight loss maintenance trials, we rated 26 as good quality and the remaining 63 as fair quality (**Table 2**). In general, the 26 good-quality trials were characterized by valid randomization procedures, comparable groups at baseline (or adequate adjustment for known baseline differences in the analysis), high sample retention (i.e., 85% or greater retention at 12 months), the use of reliable and valid measurement instruments applied equally across arms, evidence of fidelity to the intervention protocol, no evidence of selective outcome or analysis reporting, and appropriate analyses, including intention-to-treat principles using multiple imputation or other conservative data imputation procedures for missing data (e.g., baseline observation carried forward). Most of the trials rated as good quality included published design papers or protocols with extensive details on their randomization methods, procedures for maintaining fidelity to the intervention, and data analysis plans. Additionally, several of the good-quality trials were multisite trials with data coordinating centers, including the three POWER trials,[206, 219, 224, 331] TOHP phases I and II,[300, 301] the TONE trial,[326] and DPP.[205] Some common limitations of the fair-quality studies included lack of reporting details about allocation concealment, relatively higher (i.e., >20%) and differential attrition between groups, and no attempt (or lack of reporting) to account for missing data or only completers-only analyses. The main risks of bias for the 12 behavior-based intervention studies we rated as poor quality included differential attrition between intervention arms (approximately 10 to 30% differential attrition) with completers-only analyses or unclear methods for handling missing data coupled with other issues in trial conduct, analysis, or reporting of results (e.g., intervention fidelity, possible selective reporting, inappropriate exclusion of participants from analyses, questionable validity of randomization and allocation concealment procedures). In addition, three of the studies excluded for poor quality used different procedures for measuring participants' weight at baseline and followup. In these trials, baseline weight was objectively measured using standard protocols, whereas weight at followup was self-reported by participants for the full or partial sample and the percent of self-reported weights was not reported by treatment group.

All 35 of the medication trials were rated as fair quality; none were rated as good quality (**Table 2**). One study included in KQ3 (harms) had intermediate health outcome data, but these data were not evaluated as the study was rated poor quality for KQ1 and KQ2 because of greater than 20 percent differential attrition early on in the study with limited data substitution methods.[222] In addition, one study only eligible for inclusion for KQ3 (harms) was excluded for poor quality due to incomplete description of the collection and reporting of adverse events.[332] The biggest threat to internal validity within this body of evidence is high rates of attrition and missing data, which is a substantial and frequent issue in weight loss medication trials.[201] Because most dropouts are due to adverse events or lack of effectiveness of the intervention and not study design flaws, we rated studies with high attrition as fair quality if they used adequate data substitution methods with sensitivity analyses evaluating various substitution methodologies. A study evaluating data substitution methods in obesity medication trials concluded that data substitution methods were generally adequate for protecting against false positive and false negative results in the majority of medication weight loss trials.[201]

KQ1. Do Primary Care-Relevant Behavioral and/or Pharmacotherapy Weight Loss and Weight Loss Maintenance Interventions Lead to Improved Health Outcomes Among Adults Who Are Overweight or Have Obesity and Are a Candidate for Weight Loss Interventions?

Summary of Results

Health outcomes were minimally reported in the behavior-based weight loss and maintenance trials (k=20; n=9,910). In four weight loss trials (n=4,442) reporting mortality, there were no significant differences between groups over 2 to 16 years. Two weight loss trials (n=2666), reported on cardiovascular events, with neither finding differences between groups over 3 and 10 years. Health-related quality of life (QOL) was evaluated in 17 weight loss and maintenance trials (n=7120), with almost all showing no differences between groups.

Trials of medications for weight loss examined few health outcomes beyond QOL (k=10; n=13145). Although there was evidence of greater improvement on an obesity-specific QOL scale in those randomized to medications for weight loss compared with placebo within most of the trials, the differences were small and of unclear clinical significance, especially given high dropout rates in medication trials. None of the medication-based maintenance trials reported the effects of the interventions on health outcomes.

Detailed Results

Behavior-Based Weight Loss Interventions

Eighteen trials reported the effects of behavior-based weight-loss interventions on at least one health outcome (n=9543);[205, 206, 219, 234, 235, 243, 249, 252, 262, 275, 278, 288, 301, 306, 310, 315, 323, 326] we rated half of these trials as good quality. Thirteen of the 18 trials were newly identified as part of our update; the remaining 5 trials–which included the DPP, the Finnish DPS, PREDIAS, TOHP Phase II, and TONE–were included in our previous review.

All-Cause Mortality

Four good-quality trials (n=4442), all included in our previous review, reported the effect of the intervention on all-cause mortality.[205, 301, 306, 326, 333-335] Overall, few deaths occurred in the three trials of adults (aged 25 to 65). One trial in older hypertensive adults (age 60 to 80) found higher overall rates of death in both arms; however, none of the four trials found significant between-group differences in mortality over 2 to 16 years of followup. After approximately 4.5 years of followup, DPP (n=2161) found that the placebo group had a nonsignificant higher mortality rate per 100 person-years compared with the lifestyle intervention group (0.2 vs. 0.1).[205] In Phase II of TOHP, a hypertension prevention trial (n=1191), five versus two participants in the intervention and control groups died, respectively, over 2 years.[301, 333] The Finnish DPS (n=505) found no significant difference in all-cause mortality after 10.2 years of followup with 6 versus

10 deaths in the intervention versus control groups (HR, 0.57 [95% CI, 0.21 to 1.58]).[306, 334] Finally, TONE (n=585), a study in hypertensive adults aged 60 to 80, found no significant difference in the all-cause mortality after 16 years of follow up (HR, 0.82 [95% CI, 0.55 to 1.22]).[335]

Cardiovascular Disease

The DPP[205, 336] and the Finnish DPS[306, 334] trials (n=2666) reported on the incidence of cardiovascular (CV) events over the course of the study, including stroke or myocardial infarction. There was no statistically significant difference between groups on the number of participants in the intervention groups of DPP and DPS who experienced CV events compared with control participants after 3 and 10 years of followup, respectively.[205, 306] Within DPP, nonfatal CV events occurred in 2.2 percent of lifestyle intervention participants (9.7 events/1000 patient-years) (n=1079) compared with 1.7 percent of placebo participants (7.3 events/1000 patient-years) (n=1082), which was not statistically different.[336] CV-related deaths occurred in only two and four participants in the lifestyle and placebo groups, respectively.[336] In the Finnish DPS trial, after 10.2 years, there were 57 new CV events (22.9 per 1,000 person-years) in the intervention group and 54 events (22.0 per 1,000 person-years) in the control group (HR, 1.04 [95% CI, 0.72 to 1.51]).[334]

Health-Related Quality of Life and Depression

Fifteen trials (n=6893 examined health-related quality-of-life (QOL) outcomes (**Table 9**).[205, 206, 219, 234, 235, 243, 249, 252, 262, 275, 278, 288, 310, 315, 323] The data were limited in that only six trials presented absolute changes in QOL scores; the remaining just reported whether or not there were significant differences between groups in QOL outcomes. Three of 14 trials found statistically significantly greater improvement on the physical component summary score (but not the mental component summary score) after 1 to 3 years of followup among intervention participants versus control participants (absolute between-group differences ranging from 1.5 to 2.5 points on a 100-point scale).[205, 215, 249] There were no other significant differences between groups on other measures of QOL.

None of the included trials reported the effect of the intervention on the incidence or prevalence of depression over the course of the study. Two trials (DPP and the Finnish DPS) reported the prevalence of participants on antidepressant medications after 3 to 4 years of followup and found no significant differences across treatment arms.[337, 338]

Behavior-Based Weight Loss Maintenance Interventions

The only health outcome reported in behavior-based weight loss maintenance interventions was QOL which was evaluated in two trials; both found no significant effects after 1 to 2 years of followup (**Table 9**).[282, 296]

Medication-Based Weight Loss Interventions

Ten of 32 medication-based weight loss trials reported the effects of the intervention on health

outcomes, including QOL (10 trials) and CV events (2 trials).[172, 173, 218, 220, 241, 244, 285, 292, 304, 311] In general, findings related to health outcomes were limited by reduced long-term followup, with many trials reporting rates of 35 to 55 percent loss to followup by 12 to 24 months (**Table 2, Table 8**).

Cardiovascular Disease

Liraglutide. Within one trial (n=3723) there were three CV events in both the liraglutide and placebo arms (0.12 and 0.24 percent, respectively) after 13 months (statistical testing not reported).[285] Participants with prediabetes at baseline (n=2201) were followed for an additional 23 months (total of 36 months), with an additional two CV events in those randomized to liraglutide and none in the placebo arm (statistical testing not reported).[339]

Phentermine and topiramate. One trial of phentermine and topiramate (n=2487) reported similarly low rates of CV events in the intervention and placebo arms (0.4, 0.6, and 0.7 percent in the 15/92 mg, 7.5/46 mg, and placebo arms, respectively) across 13 months followup (statistical testing not reported).[241]

Quality of Life

Liraglutide. Two liraglutide trials examined changes in QOL (**Table 10**).[220, 285] The smaller trial (n=196) reported QOL improvement in both arms during the first 12 months, without between-group statistical testing.[220] The larger trial (n=3662) found significant improvements in QOL in those randomized to liraglutide versus placebo at 13 months (absolute between-group differences ranging from 0.9 to 3.1 points on a 100-point scale).[285] Among a subset of participants with prediabetes, there were mixed results in QOL changes at 36 months.[339] [285, 339]

Lorcaserin. Two trials of lorcaserin (n=6139) examined changes in QOL at 12 months, both finding [172, 173]that greater improvements in QOL were seen in those randomized to lorcaserin compared with those in the placebo arm (absolute between-group differences not reported, p<.001) (**Table 10**).[172, 173]

Naltrexone and bupropion. Three trials (n=2815) of naltrexone and bupropion examined QOL after 12 to 13 months (**Table 10**). [218, 244, 311] All trials reported that QOL improved more in those who received naltrexone and bupropion compared with those who received placebo (absolute between-group differences not reported, p<.001).

Orlistat. Changes in QOL were evaluated in two orlistat trials (**Table 10**).[292, 304] One (n=333) noted a statistically significant higher score on one QOL subscale in those on orlistat compared with placebo after 12 months; however, there were no other significant differences.[304] Another trial (n=481) found those randomized to orlistat for 24 months had statistically significant greater satisfaction with their medication and overall therapy, and less overweight distress.[292]

Phentermine and topiramate. One trial (n=2487) identified significantly greater improvements in QOL with 15/92 mg phentermine and topiramate compared with placebo (data not reported) (**Table 10**).[241]

Medication-Based Weight Loss Maintenance Interventions

None of the three trials examining the effect of medications for weight loss maintenance reported the effects of the intervention on health outcomes.

KQ2. Do Primary Care-Relevant Behavioral and/or Pharmacotherapy Weight Loss and Weight Loss Maintenance Interventions Lead to Weight Loss, Weight Loss Maintenance, or a Reduction in the Incidence or Prevalence of Obesity-Related Conditions Among Adults Who Are Overweight or Have Obesity and Are a Candidate for Weight Loss Interventions?

Summary of Results

Participants who received behavior-based weight loss interventions generally lost more weight and had greater reductions in waist circumference than those in control conditions at up to 24 months followup. Intervention participants had a pooled −2.4 kg (95% CI, −2.85 to −1.92) greater weight loss at 12 to 18 months. Mean absolute changes in weight ranged from −0.5 kg (−1.1 lb) to −9.3 kg (−20.5 lb) among intervention participants and from 1.4 kg (3.0 lb) to −5.6 (−12.3 lb) among control participants. In addition, intervention participants had a 1.94 (95% CI, 1.70 to 2.22) times greater chance of losing 5 percent weight, which translated into a NNT of 8. Although weight outcomes were less well-reported beyond 12 months, weight loss remained significantly greater in intervention compared with control conditions in interventions lasting up to 36 months. Participants who received behavior-based weight loss maintenance interventions generally maintained more of their weight loss compared with those in control conditions. The heterogeneity in each individual intervention arm and differences in the populations, settings, and trial quality made it difficult to disentangle what variables might be driving larger effects.

In the two largest and longest good-quality trials (n=1818), participants randomized to behavior-based weight loss interventions had a decreased probability of developing type 2 diabetes compared with control conditions over 3 to 9 years. Although 11 smaller and generally shorter-duration weight loss trials did not find significant differences between groups, when pooled with the larger trials, there was a significant 33% reduction in risk of developing diabetes over 1 to 9 years (pooled RR, 0.67 [95% CI, 0.51 to 0.89]; k=9; n=3140; I^2=49.2%). Three large trials (n=2844) noted benefits of behavior-based weight loss on hypertension and hyperlipidemia diagnosis and/or medication use; however, effects were not found in five smaller trials. Effects on metabolic syndrome and CVD risk score were mixed.

Participants randomized to weight loss medications had more weight loss and a greater decrease in waist circumference than those on placebo. Participants who received medications to assist with weight loss maintenance generally maintained more of their weight loss and waist circumference decrease compared with those in control conditions. However, the results were

limited by high dropout rates and relatively short followup duration in some trials. The most common intermediate outcome reported (k=4; n=9763) was incident diabetes, and there was a decreased risk of developing diabetes over 1 to 4 years in those given medications; however, these trials were similarly limited by high dropout rates. Other intermediate outcomes were sparsely reported with mixed results.

Detailed Results

Behavior-Based Weight Loss Interventions

Weight Loss

All of the included trials reported treatment effects on at least one measure related to weight change (i.e., weight change in kilograms [kg] or pounds [lb], percent weight loss, BMI, waist circumference, or the proportion of participants losing 5, 7, 10, or 15 percent of their weight from baseline). All weight-related outcomes for all time points and all arms for all trials are reported in **Appendix G Table 1** for continuous outcomes and **Appendix G Table 2** for dichotomous outcomes. **Table 11** summarizes the results for all pooled analyses.

A meta-analysis combining the 67 behavior-based weight loss trials that reported kilograms or pounds lost at 12 to 18 months found a pooled mean difference of −2.4 kg (−5.3 lb) more lost in the intervention versus control groups (mean difference [MD], −2.39 kg [95% CI, −2.86 to −1.93]; k=67; n=22065; I^2=90.0%) (**Figure 4**). Although not all trials found statistically significant results, in all but two cases, intervention participants showed greater reductions in weight than control participants. Absolute changes in weight ranged from −0.5 kg (−1.1 lb) to −9.3 kg (−20.5 lb) among intervention participants and from 1.4 kg (3.1 lb) to −5.6 (−12.3 lb) among control participants at 12 to 18 months. Across the trials, however, a wide range of effects was seen within all arms (intervention and control) as demonstrated by large standard deviations (SDs) relative to the average change. In other words, some adults showed fairly large reductions in weight, some showed no or modest changes, and some gained weight. All but nine[221, 231, 243, 255, 264, 269, 272, 275, 318] of the trials that reported weight change at 12 to 18 months had interventions that spanned at least 12 months. Within the eight trials that had interventions less than 12 months long (i.e., 3 to 9 months), only one reported a statistically significant difference in weight loss at 12 months.[221]

Weight change at followup beyond 12 to 18 months was not as well reported. The pooled MD in weight change at 24 months was −1.45 kg (−3.2 lb) in favor of the intervention versus control groups [95% CI, −2.03 to −0.87]; k=21; n= 7268; I^2=67.9%) (**Figure 5**). Absolute changes in weight ranged from a 1.0 kg (2.2 lb) to −5.6 kg (−12.3 lb) among intervention participants and from 0.3 kg (0.7 lb) to −4.0 kg (−8.8 lb) among control participants. Absolute differences between groups ranged from 0.75 kg in favor of the control group to −4.78 kg in favor of the intervention group. Only eight trials reported weight change at greater than 24 months, with most reporting outcomes at 2.5 to 4 years;[225, 234, 254, 256, 261, 301, 306, 326] one reported effects of the intervention at both 2.5 and 6.6 years, over 4 years after the intervention ended.[234]).

Twenty-eight trials reported effects of the interventions on weight change over time.[206, 219, 224, 225,

[234, 237, 242, 251, 254, 256, 258, 261, 266, 269, 271, 286, 288, 290, 291, 301, 302, 306, 314, 318, 323-326] Ten trials showed consistent although attenuated, statistically significant benefit of the interventions over time (from 12 to 48 months followup),[219, 224, 258, 261, 266, 288, 301, 306, 323, 325] whereas ten trials showed consistent null effects over time.[206, 237, 251, 254, 256, 269, 271, 290, 318] Six trials reported initial statistically significant benefit of the interventions at 12 to 18 months, with attenuation of effects over time such that effects were no longer statistically significant at 18 to 80 months.[234, 242, 286, 291, 314, 324] One trial[326] reported a consistent (not attenuated) benefit from a 28-month intervention at 12, 18, and 30 months. One trial[225] reported no benefit from the 3-year intervention at 12 and 24 months but found a statistically significant greater weight loss at 3 years. A forest plot showing all of the trials that reported weight change over time (i.e., more than one time point), without pooling, is included to visualize the change in effects over time within each trial (**Figure 6**). Within the ten trials with a lag time between intervention end and final followup (lag of 2 to 50 months),[234, 254, 261, 266, 269, 271, 286, 318, 323, 326] four reported statistically significant differences in weight loss at the final time point.[261, 266, 323, 326]

Nine trials that reported a weight outcome could not be included in the meta-analyses for weight change at 12 to 18 months or 24 months because of limitations in data reporting (e.g., no measure of dispersion) (**Appendix G Table 1**).[214, 230, 254, 256, 257, 276, 278, 280, 295] Most of these were relatively small trials with sample sizes ranging from 50 to 280. Within all of these trials, intervention group participants experienced greater mean or median weight loss than control group participants, but only three trials reported these differences as statistically significant at 12 to 18 months.[278, 280, 295]

Separate meta-analyses for between-group mean differences in percent weight change and BMI at 12 to 18 months followup also showed statistically significant associations with weight loss interventions (**Table 11**).

There was no evidence of small-study effects for weight loss based on the Egger's test.

Weight Loss of 5 Percent or Greater

Forty-five of the 79 trials reported the proportion of participants losing at least 5 percent of their baseline weight at 12 months or more followup (**Appendix G Table 2)**. A meta-analysis of 38 trials reported that intervention participants had a 1.94 times greater probability of losing 5 percent of their initial weight compared with control groups over 12 to 18 months (risk ratio [RR], 1.94 [95% CI, 1.70 to 2.22], k=38; n=12231, I^2=67.2%) (**Figure 7**). Based on an assumed control risk of 14 percent, the number needed to treat (NNT) to achieve one more adult losing at least 5 percent of their body weight over 12 to 18 months is 8 (NNT, 7.6). At 24 months, the pooled risk ratio was attenuated but still suggested an association between behavior-based weight loss interventions and the proportion of participants losing at least 5 percent of their baseline weight (pooled RR, 1.51 [95% CI, 1.25 to 1.81], k=13; n=4824, I^2=63.0%) (**Figure 8**). There was no evidence of small-study effects for the proportion losing at least 5 percent of their body weight based on the Peters' test.

Fewer trials reported the percent of participants losing 10 percent or more of their body weight. Meta-analyses found that intervention participants were 3.1 times more likely to lose 10 percent

of their weight compared with controls at 12 to 18 months (RR of 3.06 [95% CI, 2.41 to 3.88]; k=16; n=6975; I^2=49.0% (**Figure 9**). In the nine trials reporting this effect at 24 months or greater, the effects were attenuated over time; however, six trials still had statistically significant greater probability of 10 percent weight loss in intervention compared with controls, with risk ratios ranging from 1.6 to 3.8 (**Appendix G Table 2**).

Waist Circumference

A meta-analysis of 41 trials reported a mean greater reduction of approximately 2.51 cm (1.0 inches) in waist circumference among those in behavior-based weight loss interventions compared with control conditions at 12 to 18 months followup (95% CI, −3.15 to −1.87; k=41; n=12180; I^2=94.6%) (**Table 11**). Absolute changes in waist circumference ranged from a 0.1 cm to −11.3 cm among intervention participants and from 1.5 cm to -7.4 cm among control participants Fewer trials reported the effects of the intervention on other adiposity outcomes such as waist-to-hip ratio and percent body fat; results related to these outcomes are presented in **Appendix G Table 1**.

Incident Type 2 Diabetes

Thirteen trials (n=4095) reported incident type 2 diabetes associated with behavior-based weight loss interventions (**Table 12**).[205, 215, 225, 258, 265, 266, 277, 280, 283, 288, 306, 314, 321] Twelve of the 13 trials were limited to adults with prediabetes or those who were otherwise at risk for diabetes (family history, history of gestational diabetes, metabolic syndrome); the one remaining trial was conducted among breast cancer survivors.[288] Most of the trials reported cases of diabetes over 1 year of followup; only five trials reported type 2 diabetes incidence at 2 or more years. In DPP (n=1295) the estimated cumulative incidence of diabetes at 3 years was 14.4 percent versus 28.9 percent in the lifestyle-intervention versus placebo groups, respectively (between-group crude incidence difference of -58% [95% CI, 48 to 66]; study-reported number needed to treat of 6.8).[205] Similarly, the good-quality Finnish DPS (n=523), a 4-year behavior-based weight loss intervention trial,[306, 340] found that after 9 years, intervention group participants were significantly less likely to develop type 2 diabetes compared with the control group (40.0% vs. 54.5%, respectively; HR, 0.4 [95% CI, 0.3 to 0.7]).[306, 340] The European Diabetes Prevention Study (EDIPS) (n=102) applied the DPS intervention in the UK and found a large but nonsignificant reduction in the incidence of diabetes in the intervention group compared with the control group after 5 years (9.8% vs. 21.6%, respectively; RR, 0.45 [95% CI, 0.2 to 1.2]).[283] In the remaining ten trials, progression to diabetes was observed less frequently with absolute cumulative incidence of diabetes at up to 3 years followup ranging from 0 to 15.0 percent in intervention participants and 0 to 28.9 percent among control participants. Although the differences between intervention and control groups were not statistically significant, the studies were generally of shorter duration and smaller than DPP and FDPS.[215, 225, 258, 265, 266, 277, 280, 288, 314, 321] When the 2 larger and 7 of the smaller trials that reported rates of incident diabetes were pooled, there was a significant 33% reduction in risk of developing diabetes over 1 to 9 years (pooled RR 0.67 [95% CI, 0.51 to 0.89]; k=9; n=3140; I^2=49.2%) (**Figure 10**).

Other Intermediate Outcomes

Other intermediate outcomes, including the prevalence of hypertension, use of CVD medications, prevalence of metabolic syndrome, and estimated 10-year risk of CVD were sparsely reported within the trials. Rates of hypertension at 18 months to 3 years followup were reported for the TOHP Phase I (n=564) and Phase II (n=1191) trials as well as the DPP trial (n=2161) and a smaller study by Nilsen et al. (n=213).[301, 327, 333, 336] TOHP I and II reported 34 and 22 percent reduced risk of incident hypertension at 18 months among those in the weight loss condition (which also included sodium reduction) compared with the control condition, respectively.[333, 336] By 3 years in TOHP II, fewer participants in the intervention group (32%) met criteria for hypertension compared with the control group (39%) (absolute risk difference [RD], 7.3 [NNT=14]). In DPP (n=2161), the prevalence of hypertension remained stable among intervention participants (approximately 30%) but increased among control participants (from approximately 30% to 40%) over 3 years ($p<0.001$).[336] Similarly, use of anti-hypertensive medications rose from 17 to 23 percent among DPP intervention participants and from 17 to 31 percent among control participants over 3 years ($p<0.001$). Likewise, fewer weight loss participants (12%) required drug therapy for either elevated triglyceride or LDL cholesterol levels compared with control participants (16%) ($p<0.001$).[205, 336] A smaller study by Nilsen et al. (n=213) found no significant difference between groups in the percent of individuals with hypertension by the end of the study; however, there was a high baseline prevalence of hypertension (74%),[327] Four smaller trials examining medication changes (n from 30 to 772) did not find significant differences in anti-hypertensive or lipid-lowering medication use between intervention and control arms.[232, 253, 288, 291] Five trials (n=3,356) reported on incidence of metabolic syndrome in intervention and control arms at 1 to 3 years followup with mixed results.[205, 243, 265, 286, 291] Similarly, two trials (n=165) reported mixed findings on the effects of weight loss interventions on estimated 10-year CVD risk at 1 year based on the UK Prospective Diabetes Study risk engine or QRISK2.[214, 243]

Subpopulations

Subpopulation analyses were infrequently reported among included studies and often not prespecified. Even when prespecified analyses were performed, they often lacked interaction testing, limiting the allowable interpretation of treatment effect by subpopulation.

The differential effects of weight loss interventions for individuals with varying baseline BMIs was examined in five trials,[234, 266, 288, 301, 302] only two of which[266, 301] prespecified such subgroup analyses. No trial found that baseline weight was associated with weight change following interaction testing.

Prespecified analyses of the effect of age were reported in two studies with mixed results. In the CITY trial among young adults (mean age=29.4 years), a cell-phone based intervention, the oldest tertile of participants (mean age not reported) lost less weight than the youngest tertile of participants (mean age not reported).[302] However, in DPP there was a suggestion of a stronger effect of the lifestyle intervention in older individuals (aged 60 to 85 years); however, there was no interaction testing, limiting interpretation of this finding.[341]

Whether sex influenced the effectiveness of weight loss interventions was reported in eight trials, with six prespecifying interaction testing analyses. Men were generally observed to lose a greater percentage of their baseline weight than women; however, only two[301, 342] of six studies found the sex differences to be significant in interaction testing.[254, 266, 300, 302] Two exploratory analyses[255, 279] also had mixed results, with one trial reporting greater weight loss in men following interaction testing.[279]

The effect of race on the effectiveness of weight loss interventions was examined in seven trials, six of these analyses were prespecified.[215, 300-302, 326, 342] There was a trend toward greater weight loss among white participants than black or Hispanic participants. However, this finding became nonsignificant in three[215, 300, 302]of the five trials following interaction testing. The two trials that found a significant racial difference were TOHP II and DPP. In TOPH II, white participants lost a net 1.8 kg more than African American participants at 18 months.[301] Within DPP, black women exhibited significantly smaller (approximately half) weight losses ($p<0.01$) with the lifestyle intervention than other race-sex groups.[342] One additional trial (TONE) found significantly greater weight loss in white participants than black participants; however, no interaction testing was performed.[326, 343] One exploratory analysis among a predominantly non-Hispanic white female population found no difference by race/ethnicity.[288]

Subgroup analyses for all other outcomes were limited by sparse reporting and limited interaction testing.

Effect Modification

We conducted subgroup analyses and a series of meta-regressions to explore potential effect modification by prespecified study, population, and intervention characteristics (see **Appendix B Detailed Data Analysis Methods** for the full list of variables). We limited these analyses to the main outcome of change in weight at 12 to 18 months followup, and all meta-regressions controlled for risk status of the population.

In terms of intervention characteristics, subgroup analyses according to the number of intervention sessions in the first year (>26 sessions, 12-26 sessions, and <12 sessions) showed slightly higher effect estimates among interventions with more sessions; however, the confidence intervals among all three of the subgroups overlapped (**Figure 11**). When examined as a continuous measure, a higher number of intervention sessions in the first 12 months was associated with significantly more weight loss (coefficient, −0.03; p=0.023); however, total number of contacts (including text messages, e-mails, and print materials) was not (coefficient, 0.001; p=0.488). Likewise, the number of sessions in the first 12 months was not associated with greater weight loss after controlling for the presence of any group sessions (coefficient, -0.015; p=0.212). In addition, there was no pattern of effects according to the main mode of intervention delivery (i.e., group vs. individual vs. technology-based vs. mixed) (**Figure 11**). However, there was evidence of a greater effect among interventions that included any group sessions versus those that did not (coefficient, −1.19; p=0.004). This held true after controlling for the total number of sessions within the first year and the risk status of the population (coefficient, −0.97; p=0.029). Among the subset of trials that included any group sessions (whether or not it was the main mode of delivery) the pooled difference in weight change was −3.03 kg (95% CI, −3.65 to

−2.42; k=35; n=15132; I^2=91.3%). Those without any group sessions resulted in a smaller pooled effect estimate (although still statistically significant) and reduced statistical heterogeneity (MD, −1.46 kg [95%CI, −1.84 to −1.09]; k=32; n=6933; I^2=49.8%). None of the other intervention characteristics we looked at modified the effect of the intervention, including duration of the intervention, whether there was in-person support, whether individual in-person or telephone sessions were offered, whether the intervention was technology-based, whether self-monitoring of weight or behaviors was encouraged, or whether the intervention was based on the DPP. Descriptions of each intervention, including specific intervention components, are fully described in **Table 4, Table 5,** and **Appendix F Table 1**.

In terms of population characteristics, larger differences in weight change were seen among trials that specifically enrolled adults with increased CV risk, subclinical risk, and elevated cancer risk versus those who were unselected or generally at low risk (coefficient, −1.15; p=0.004). A meta-analysis of the subset of 33 trials among participants at elevated risk found a pooled MD in change of −2.98 kg (95% CI, −3.58 to −2.39; k=33; n=10554; I^2=87.7%) at 12 to 18 months (**Figure 11**). A statistically significant association was also found for the subset of trials among low risk or unselected participants but with a significantly smaller effect estimate than that seen for those at risk (MD, −1.82 kg (95% CI, −2.35 to −1.30; k=34; n=11511; I^2=82.8%). Those who self-selected or volunteered to take part in the interventions were also more likely to experience greater weight loss (MD, −2.97 kg (95% CI, −3.87 to −2.07; k=28; n=9626; I^2=94.0%) than participants who were recruited directly into the trial (MD, −2.02 kg (95% CI, −2.47 to −1.56; k=39; n=12439; I^2=79.7%) (coefficient, −1.14; p=0.004), after controlling for risk status. Baseline BMI and baseline weight category (i.e., overweight, Class I obesity, and Class II obesity) were not associated with differences in the effects of the intervention on weight change, percent weight change, or the proportion of participants losing at least 5 percent of their baseline weight.

There was no evidence of effect modification by study quality or U.S.- versus non-U.S.-based studies. Sample retention at 12 months was associated with the pooled effect size in that trials with higher retention rates experiencing greater weight loss (coefficient, −0.05; p=0.011).

In summary, a few factors were identified in the subgroup analyses and meta-regressions as potential effect modifiers. However, the heterogeneity in each individual intervention arm, confounded with differences in the populations, settings, and trial quality, make it nearly impossible to disentangle what variables may be driving larger effects. The consistency—yet wide range in effects—seen across specific interventions and across various adult subgroups emphasizes a broad range of benefit that is likely dependent on other individual, social, and environmental factors influencing an individual's weight loss.

Behavior-Based Weight Loss Maintenance Interventions

Maintenance of Previous Weight Loss

All weight-related outcomes for all time points for the nine behavior-based weight loss maintenance trials are reported in **Appendix G Table 3** for continuous outcomes and **Appendix G Table 4** for dichotomous outcomes.

Six trials included an initial weight loss intervention (mean weight loss of 5 to 15 kg [11 to 33.1 lb]) for all study participants (**Appendix F Table 2**).[233, 282, 284, 303, 309, 317] Three additional trials did not include a weight loss portion but required that participants have recently lost 5[296] or 10[294, 313] percent of their body weight. In eight trials, both the intervention and control arms regained weight over a 12- to 18-month followup; however, the intervention arm experienced less weight regain (gain of 0.1 kg [0.2 lb] to 7.5 kg [16.5 lb] in intervention arms and 0.6 kg [1.3 lb] to 8.8 kg [19.4 lb] in control arms), although all participants maintained some of their previous weight loss.[233, 282, 284, 294, 303, 309, 313, 317] Only four of the eight trials had statistically significant results. In the ninth trial both the intervention and control arms continued to lose weight (loss of 2.4 kg [5.3 lb] in intervention and 0.6 [1.3 lb] in controls); however these within-group changes were not statistically significant.[296] A meta-analysis combining the eight behavior-based weight loss trials that reported kilograms or pounds lost at 12 to 18 months found a pooled mean difference of −1.6 kg (−3.5 lb) in the intervention versus control groups (MD, −1.59 kg [95% CI, −2.38 to −0.79]; k=8; n=1408; I^2=26.8%) (**Figure 12**). The one trial that could not be included in the meta-analysis had similar results.[303] Three studies included participant followup beyond 18 months with mixed findings.[294, 303, 317]

Maintenance of 5 Percent or Greater Weight Loss

Only three of the maintenance trials (n=1320) examined maintenance of 5 percent weight loss over 12 to 36 months, finding mixed results. In two small trials (n's of 92 and 200), those randomized to a maintenance intervention were not more likely to have maintained 5 percent weight loss by 12 to 36 months.[282, 317] However, in the larger trial (n=1029), those in the maintenance group were slightly more likely to have maintained 5 percent of their weight loss at 30 months (42% vs. 34%; RR, 1.24 [95% CI, 1.02 to 1.51]) and 60 months (37% vs. 27%; RR, 1.37 [95% CI, 1.03 to 1.82]) compared with the minimal intervention arm.[303]

Waist Circumference

Three small trials (n=453) reported change in waist circumference after behavior-based maintenance interventions.[296, 309, 317] Changes in waist circumference were not significantly different between intervention and control groups at 12 months. Extension of one trial for 36 months did not reveal any significant differences in waist circumference over the longer-term followup.[317]

Incident Diabetes and Other Intermediate Outcomes

No study reported these outcomes.

Medication-Based Weight Loss Interventions

All weight-related outcomes for all time points for all medication-based weight loss trials are reported in **Appendix G Table 5** for continuous outcomes and **Appendix G Table 6** for dichotomous outcomes. Findings were often limited by reduced long-term followup, with the majority of trials reporting 30 percent or greater loss to followup or greater by 12-13 months (Figure 13), and limited data reporting (often not reporting statistical significance of findings and

lack of description of variance) (**Table 2**). The study-specific results below and in tables reflect analyses using a modified ITT (mITT) analysis (i.e., participants' last observation post-baseline while still on study drug) as that was the primary analysis reported by studies (mITT is required by the FDA). Results from sensitivity analyses within trials using other data substitution methods (baseline observation carried forward, multiple imputation using mixed effects models, etc.) were generally consistent with the mITT results.

Weight Loss

Liraglutide. Two trials reported on degree of weight loss in liraglutide versus placebo arms (n=3853).[220, 285] Those in the liraglutide groups lost statistically more weight (−7.8 to −8.4 kg [−17.2 to −18.5 lb]) than those in placebo group (−2.0 to −2.8 kg [−4.4 to −6.2 lb]) over 12 to 13 months, a statistically significant difference (p<.001) (**Table 13**). One trial extended followup in those with prediabetes to 36 months; mean weight loss was less by 36 months in both groups, but the mean difference in weight loss between arms was still statistically different (liraglutide arm lost 4.6 kg more than placebo at 36 months; p<.0001).[339]

Lorcaserin. Two trials reported on degree of weight loss in lorcaserin versus placebo arms using mean or least square mean (LSM) (n=6139) (**Table 13**).[172, 173] Those randomized to lorcaserin lost a mean or LSM of 5.8 kg (12.8 lb), while those in placebo lost 2.2 to 2.9 kg (4.9 to 6.4 lb) over 12 months, which was statistically significantly different in both trials (p<.001).

Naltrexone and bupropion. Three trials reported on degree of weight loss in naltrexone and bupropion compared with placebo arms (**Table 13**).[218, 244, 311] Those randomized to naltrexone and bupropion lost more weight over 13 months compared with those randomized to placebo (LSM: −6.1 to −6.2 kg [−13.4 to −13.7 lb] and −1.3 to −1.4 kg [−2.9 to −3.1 lb] in the intervention and placebo groups, respectively; p<.001).[218, 244] One trial reported only the percent change in weight with those in naltrexone and bupropion arm showing greater percent weight loss than the placebo arm (LSM: −9.1% vs. −5.1%, respectively; p<0.001) (**Appendix G Table 5**).[311]

Orlistat. Eleven trials reported on degree of weight loss in orlistat versus placebo arms.[160, 161, 227, 236, 239, 246, 260, 263, 292, 297, 304] In every trial, those randomized to orlistat lost statistically significantly more weight loss (mean of 1.0 to 4.4 kg [2.2 to 9.7 lb] more) than those on placebo over 12 months. (**Table 13**).[161, 260, 297] In the two trials that compared the 60 mg TID dosage to 120 mg TID, weight loss was about 0.8 to 0.9 kg less with 60 mg TID compared with 120 mg TID over 12 months.[246, 292] Two studies examined weight loss at later time points (18 to 48 months). Mean weight loss was less in both arms at the later time points (1.2 to 2 kg had been regained); however, those in the orlistat arm had still lost more weight since randomization compared with the placebo arm (mean difference −3.1 to −3.37 kg in 120 mg TID of orlistat and −2.3 to −2.81 kg in 60 mg TID of orlistat vs. placebo arms, respectively; p<.01).[246, 292] Following four years of treatment, participants had regained approximately half of their weight loss since randomization; however, the 120 mg orlistat arm still had lost significantly more weight than the placebo arm (p<0.001).[161]

Phentermine and topiramate. Two trials reported on degree of weight loss for those

randomized to phentermine and topiramate versus placebo arms.[216, 241] In one trial, participants randomized to phentermine and topiramate lost statistically significantly more weight than those on placebo (LSM: −8.1 kg [−17.8 lb] with 15/92 mg, −10.2 kg [−22.5 lb] with 7.5/46 mg, and −1.4 kg [−3.1 lb] with placebo; p<.0001) (**Table 13**).[241] The second trial only reported the percentage of weight loss in the two arms. Those randomized to phentermine and topiramate lost a greater percentage of weight compared with the placebo arm at 12 months (LSM: 10.9% vs. 1.5%, respectively; p<.0001) (**Appendix G Table 5**).[216]

Weight Loss of 5 Percent or Greater

Liraglutide. At 12 to 13 months, participants randomized to liraglutide were 2.8 to 4.8 times more likely to lose 5 percent of their body weight compared with those in the placebo arm (63 to 79% compared with 27 to 29%, respectively) and 3.9 to 4.3 times more likely to lose 10 percent of their weight (33 to 40% compared with 10 to 11%, respectively) (p<.001) (**Figure 13**, **Figure 14**).[220, 285] In additional followup of a subgroup with prediabetes at baseline, those randomized to orlistat were over 3 times more likely to have achieved 5 and 10% weight loss after 36 months compared with those on placebo (p's<.001), although absolute percentages who reached this milestone was smaller in both arms.[339]

Lorcaserin. Compared with placebo, those randomized to lorcaserin were 1.9 to 2.3 times more likely to lose 5 percent of their body weight (47% vs. 20-25% in lorcaserin and placebo arms respectively, p<.001) (**Figure 13**) and 2.3 to 2.9 times more likely to lose 10 percent of their weight by 12 months (23% vs. 8 to 10% in in lorcaserin and placebo arms, respectively, p<.001) (**Figure 14**).

Naltrexone and bupropion. Those randomized to naltrexone and bupropion were 1.6 to 3.0 times more likely to lose 5 percent of their weight (48 to 66% in naltrexone and bupropion arm vs. 16 to 42% in placebo arm; p<.01) [218, 244, 311] (**Figure 13**) and 2.0 to 5.0 times more likely to lose 10 percent of their weight (25 to 42% in naltrexone and bupropion arm compared with 6 to 20% in placebo arm; p<.001) (**Figure 14**).

Orlistat. Ten trials reported the percentage of participants who lost at least 5 and 10 percent of their baseline weight.[160, 161, 227, 239, 246, 260, 263, 287, 292, 297] Participants randomized to orlistat were 1.3 to 2.3 times more likely to lose 5 percent of their weight at 12 months compared with those given placebo (35 to 73% vs. 21 to 49%, respectively; p<0.05) (**Figure 13**).[160, 161, 227, 239, 246, 260, 263, 287, 292, 297] In the two trials that examined both orlistat dosages (60 TID and 120 TID), there was little evidence of a dosage effect.[246, 292] In the four trials that extended followup beyond 12 months,[161, 246, 260, 292] those on either dose of orlistat were still significantly more likely to be 5 percent below their starting weight at 24 to 48 months (RR of 1.41-1.74; p<.05). Nine of these 10 trials also reported 10 percent weight loss;[161, 227, 239, 246, 260, 263, 287, 292, 297] the results were similar with those on either dosage of orlistat being more likely to have 10 percent weight loss at 12 to 48 months (RR,1.31-2.95; p<.05 in all but one study[263] **Figure 14**); however, the absolute percentage of participants who reached this milestone was smaller in both arms with rates decreasing as followup time increased.[161, 227, 239, 246, 260, 263, 292, 297]

Phentermine and topiramate. Those randomized to 15/92 mg or 7.5/46 mg phentermine and

topiramate were 3.0 to 3.9 times more likely to lose 5 percent of their weight, respectively, by 12 to 13 months (67 to 70% of 15/92 mg, 62% of 7.5/46 mg, and 17 to 21% of placebo; p<.0001) (**Figure 13**). They were 5.1 to 6.4 times more likely to lose 10 percent of their body weight (47 to 48% of 15/92 mg, 37% of 7.5/46 mg, and 7% of placebo); p<.0001) (**Figure 14**).[216, 241]

Waist Circumference

Liraglutide. Participants randomized to liraglutide had significantly greater mean waist circumference decreases than placebo (means: 7.8 to 8.2 cm over 12 to 13 months compared with 3.0 to 3.9 cm in the placebo arm; p<0.001) (**Table 14**). Among participants with prediabetes at baseline, the change was slightly attenuated by 36 months; however, those randomized to liraglutide still had a statistically significant greater 3.5 cm decrease in waist circumference.[339]

Lorcaserin. Waist circumference decreased more in those randomized to lorcaserin compared with those randomized to placebo by 12 months (LSM/means: −6.3 to −6.8 cm vs. −3.9 to −4.1 cm, respectively; p<.001) (**Table 14**).[172, 173]

Naltrexone and bupropion. Waist circumference decreased more in those randomized to naltrexone and bupropion compared with those in placebo over 12 months (LSM/means: −6.2 to −10.2 cm vs. −2.1 to −7.0, respectively; p<.001) (**Table 14**).[218, 244, 311]

Orlistat. There was a greater decrease in waist circumference in the orlistat arms over 12 to 18 months compared with placebo (LSM/means: −3 to −9.6 cm vs. −1.9 to −7.0 cm) (**Table 14**).[161, 227, 236, 260, 263, 292, 304] Statistical significance was reported in only six of the seven trials, with four showing a statistically significance difference between arms. In the one study that examined both 60 mg TID and 120 TID dosages, there was no evidence of a dosage effect.[292] By 24 and 48 months, there was regain in waist circumference in both arms, but the statistically significant differences remained except for one 60 mg TID arm.[161, 292]

Phentermine and topiramate. Over 12 to 13 months, waist circumference decreased significantly more for participants randomized to phentermine-topiramate 15/92 mg compared with placebo (LSM: −9.2 to -10.9 vs. −2.4 to −3.1 cm, respectively; p<0.0001). This effect was also significant in participants randomized to 7.5/46 mg (LSM: −7.6 vs. −2.4 cm, respectively; p<0.0001) (**Table 14**).[216, 241]

Incident Diabetes

Liraglutide. In the single liraglutide trial examining incident diabetes (n=3662), fewer participants randomized to liraglutide (n=4, 0.2%) developed diabetes over 13 months compared with those given placebo (N=14, 1.1%) (odds ratio [OR], 8.1 [95% CI, 2.6 to 25.3]; p<0.001) (**Table 15**).[285] The trial continued past 13 months among 2210 participants with prediabetes at baseline; prediabetics randomized to liraglutide were less likely to develop type 2 diabetes by 36 months compared with placebo (1.8 vs. 6.2% of participants) with a mean time from randomization to diagnosis of 99 (SD 47) versus 87 (SD 47) weeks, respectively (HR, 0.21 [95% CI, 0.13 to 0.34; p<0.0001]). However, these findings are limited by the large number of participants who discontinued medication during the 36-month followup (53% of those on

liraglutide and 45% of those on placebo completed the study on medication).[339]

Lorcaserin. No study reported this outcome.

Naltrexone and bupropion. No study reported this outcome.

Orlistat. A trial of over 3300 persons (21% with prediabetes) found that 6 percent of those randomized to 120 mg TID of orlistat developed type 2 diabetes over 48 months compared with 9 percent of those in the placebo arm (HR, 0.63 [95% CI, 0.46 to 0.87]; p=0.005). However, applicability of these findings is limited by the high discontinuation rate (only 52% and 35% of intervention and placebo participants, respectively, completed a 48-month followup on study medication).[161]

Phentermine and topiramate. One trial of over 2400 participants with elevated CV risk (68% with prediabetes) reported that 14 (1.7%) and 12 (2.8%) of those randomized to 15/92 mg and 7.5/46 mg of phentermine and topiramate, respectively, developed type 2 diabetes compared with 30 (3.6%) of those on placebo (RRs, 0.47 [95% CI, 0.25, 0.88] and 0.78 [95% CI, 0.40, 1.50] for 15/92 mg and 7.5/46 mg arms, respectively) (**Table 15**).[241]

Other Intermediate Outcomes

Liraglutide. Compared with placebo at 13 months, those randomized to liraglutide in one trial (n=3662) were less likely to increase use of lipid-lowering medication (2.1% vs. 3.7%) and antihypertensive medication (3.7% vs. 5.7%) and were more likely to decrease use of antihypertensives (6.0% vs. 3.8%), but statistical significance was not reported.[285]

A second, smaller trial (n=191) in which there was a high prevalence of metabolic syndrome at baseline (42% and 51% in liraglutide and placebo arms, respectively), reported that those randomized to liraglutide had a statistically significant lower prevalence of metabolic syndrome compared with placebo at 12 months of followup (17% vs. 43%; p=0.005).[220]

Lorcaserin. In one 12-month trial (n=3102),[173] 4.0 and 5.0 percent of those randomized to lorcaserin and placebo arms, respectively, increased use of lipid lowering medications and 2.6 and 1.4 percent decreased use. Use of antihypertensive medications decreased in 4.0 and 3.1 percent of participants randomized to lorcaserin and placebo, respectively. However, the number taking these classes of medications at baseline was not given, and statistical significance was not reported.

Naltrexone and bupropion. No study reported other intermediate outcomes.

Orlistat. One trial reported that over 12 months there was no significant difference between change in 10-year CVD risk score and usage of CV medications in those randomized to 120 mg TID of orlistat compared with placebo.[304]

Phentermine and topiramate. No study reported other outcomes.

Medication-Based Weight Loss Maintenance Interventions

All weight-related outcomes for all time points for all medication-based weight loss trials are reported in **Appendix G Table 7** for continuous outcomes and **Appendix G Table 8** for dichotomous outcomes.

Maintenance of Previous Weight Loss

Liraglutide. One trial (n=413) examined weight loss maintenance with liraglutide after a run in weight loss period in which qualifying participants were required to lose 5 percent of their body weight (mean weight loss: 6.3 kg [13.9 lb]) though a hypocaloric diet.[312] During the 13-month maintenance phase, those in the placebo arm lost an additional 0.1 kg (0.2 lb), while those randomized to liraglutide lost an additional 6.0 kg (13.3 lb) (p<.0001).

Orlistat. In the two trials[247, 287] examining the use of orlistat for weight loss maintenance, participants had lost an average of 9.9 to 12.0 kg (21.8 to 26.5 lb) through hypocaloric diets prior to being randomized into the weight loss maintenance phase. Those randomized to 120 mg TID of orlistat gained 1.8 to 1.9 kg (4.0 to 4.2 lb) less than those given placebo over 12 to 18 months (2.6 to 2.8 kg vs. 4.4 to 4.7 kg, respectively, a statistically significant difference in the one study reporting statistical results[247]). In the one trial with both 120 mg TID and 60 mg TID arms, the 60 mg TID arm did not have significantly less weight gain than those in the placebo group over 12 months (3.8 kg vs. 4.4 kg gain, respectively).[247] During longer-term followup in one trial of 120 mg TID, those randomized to orlistat continued to have less weight gain by 36 months compared with placebo (5.1 kg vs. 7.1 kg; p=0.028).[287]

Maintenance of Weight Loss of 5 Percent or Greater

Liraglutide. In the one maintenance trial,[312] all participants had experienced at least 5 percent weight loss on entry. Compared with placebo participants, those on liraglutide were 2.3 times more likely to have maintained 5 percent weight loss (RR, 2.32 [95% CI, 1.74 to 3.11]) and 4.1 times more likely to have achieved 10 percent weight loss (RR, 4.13 [95% CI, 2.33 to 7.34]) at the end of the 12-month weight loss maintenance period (p<.0001) (**Figure 13**).

Orlistat. In the one maintenance trial reporting percent weight loss, all participants had lost at least 5 percent of their weight at study entry (**Figure 13, Figure 14**).[287] After 12 months of maintenance treatment, those randomized to orlistat 120 mg TID were 1.2 times more likely to have maintained their 5 percent weight loss (RR, 1.18 [95% CI,1.05 to 1.33]; p<0.001), and this difference remained by 36 months (RR, 1.20 [95% CI,1.00 to 1.43]; p<0.05). However, the percentage with 10 percent weight loss at 36 months was not statistically different between arms (RR, 1.18 [95% CI, 0.85 to 1.64]; p=NS).

Maintenance of Waist Circumference Decrease

Liraglutide. While both arms had continued decreases in waist circumference during the 13-month maintenance trial, the decrease was greater among those randomized to liraglutide (−4.7 vs. −1.2 cm; p<.0001).[312]

Orlistat. In the one trial reporting waist circumference, those randomized to 120 TID of orlistat had no increase in waist circumference at 18 months, while the placebo group experienced an average 3 cm increase (p=NR).[287] By 36 months, those randomized to orlistat had an average 4.3 cm increase in waist circumference, which was less than the 6.6 cm gain reported in the placebo arm (p=.032).

Incident Diabetes

Liraglutide. No study reported this outcome.

Orlistat. One trial of 309 participants with at least one CV risk factor (27% with prediabetes) reported that compared with those randomized to 120 mg of orlistat, almost twice as many persons on placebo developed type 2 diabetes over the 36-month weight loss maintenance intervention (5.2% vs. 10.9%; p=.041) (**Table 15**).[287]

Other Intermediate Outcomes

No study reported other intermediate outcomes.

KQ3. What Are the Adverse Effects of Primary Care-Relevant Behavioral and/or Pharmacotherapy Weight Loss and Weight Loss Maintenance Interventions in Adults Who Are Overweight or Have Obesity and Are a Candidate for Weight Loss Interventions?

Summary of Results

Rates of adverse events were sparsely reported in the behavior-based weight loss and weight loss maintenance trials (30 trials, n=12824). In general, there were no serious harms related to the interventions and most trials noted no differences between groups in the rates of adverse events, including cardiovascular events. In the three trials large enough to examine musculoskeletal issues between groups, results were mixed.

Almost all medication trials reported AEs. Weight loss medications were associated with more adverse events than placebo, which resulted in higher dropout rates for AEs in the medication than placebo arms. However, SAEs were not generally more common in those randomized to medications. There are multiple potential harms required by FDA to be listed on weight loss medication labels, but these harms have not been well evaluated in the trials included in this review.

Detailed Results

Behavior-Based Weight Loss Interventions

Twenty-seven trials reported harms (or lack of harms) associated with a behavior-based weight loss intervention (n=12235).[205, 206, 215, 217, 219, 224, 225, 235, 237, 242, 249, 251, 253, 258, 264, 266, 278, 289-291, 305, 320, 321, 323, 325, 328, 330] We rated 15 of these trials as good quality and 12 as fair quality. Only two of these trials (DPP[205] and SLIM[325]) were included in the previous review; the remaining 25 are new as part of this update. Very few of the trials reported their methods for capturing adverse events or provided definitions for adverse events or for serious adverse events.

Within the 27 trials, eight stated that no harms or serious adverse events were reported[217, 251, 253, 264, 278, 321, 325, 328] and three simply stated that none of the adverse events that were reported were related to the study.[290, 305, 323] Within the remaining 16 trials that reported actual data, the rates of any adverse events (AE) and serious adverse events (SAE) were relatively low (ranging from 0.6 to 25% of participants experiencing any AE) and often not reported by group. In all but two trials,[205, 291] rates of any AE, SAEs, and specific AEs did not differ between the intervention versus control participants based on statistical testing or in comparing event rates. Those that did show differences between intervention and control groups are discussed below. [330]Four trials specifically reported that no deaths occurred during the trial period.[205, 206, 219, 290]

Among four trials reporting specifically on cardiovascular-related adverse events or symptoms (e.g., chest pain, difficulty breathing, and fainting and dizziness),[206, 215, 224, 291] three of the four reported low rates of self-reported CV events (less than 1 percent)[215, 224] and cardiac disorders (10 cases of angina pectoris, atrial fibrillation, atrial flutter or syncope among the intervention group and 6 cases of angina pectoris, atrial fibrillation, congestive heart failure, and myocardial infarction among the control group)[206]and no differences between groups.[215, 224] In the remaining trial among sedentary adults (categorized as low risk as no data given on baseline comorbidities) (n=490), cardiovascular symptoms (including chest pain, difficult breathing, and dizziness or loss of consciousness) were less common in the intervention group (115 events among 249 participants, 46.2%) compared with the usual care group (137 events among 241 participants, 56.8%) as were cardiovascular symptoms resulting in physician visits (30.5% vs. 34.4%) or hospitalizations (3.6% vs. 7.5%).[291]

The adverse events most commonly rated as being related to the intervention were musculoskeletal issues, which varied in severity from soreness to sprains to ruptured tendons.[205, 206, 215, 224, 235, 237, 291, 330] Rates of musculoskeletal issues ranged from one musculoskeletal injury (0.006 event rate) to nearly 50 percent of participants experiencing muscle or joint aches. Within the seven trials specifically reporting event rates by group, only three had enough events to make comparisons between groups.[205, 215, 291] In the DPP trial (n=2161) a statistically significant higher rate of musculoskeletal symptoms (myalgia, arthritis, arthralgia) was seen among those in the lifestyle intervention group (24.1 events per 100 person-years) compared with those in the control group (21.1 events per 100 person-years) ($p<0.0167$) over 4 years followup.[205] In the PROACTIVE trial (n=490), rates of musculoskeletal events during or after exercise (pain or cramping in leg, knee, or foot; strained muscle, tendon, or ligament; and broken bone) were slightly higher in the usual care group (311 events among 241 participants, 129.0%) compared

with the intervention group (300 events among 249 participants, 120.5%) over the course of the 2-year intervention; but musculoskeletal events requiring a physician visit were slightly higher in the intervention (70.3%) versus control (66.4%) participants.[291] However, in DEPLOY (n=509),[215] intervention participants did not experience more muscle or joint aches (48.6% vs. 50.5%, p-value not reported) or joint sprains or strains (22.6% vs. 22.9%; p-value not reported) compared with controls.

Six trials (n=2767) reported on incidence of gallbladder disease, which is more common among those who are overweight and have obesity and is associated with rapid weight loss.[206, 224, 242, 249, 289, 320] Across these trials, six intervention versus two control participants experienced either gallstones or cholecystectomy over 1 to 2 years of followup.

One trial of postpartum women showed higher (38 to 42 percent) rates of reduced breast milk supply; however, these differences were not significant.[330]

Behavior-Based Weight Loss Maintenance Interventions

Three of the nine behavior-based weight loss maintenance interventions reported harms (n=589).[282, 296, 309] In one trial (n=201), a similar number of participants (31%) in the intervention and control group were treated for adverse events over 24 months.[282] In a second trial (n=222), there was one (0.1%) death in the control group and four (3.6%) adverse events (knee pain, low blood pressure, bradycardia, and anxiety) in the intervention group over 56 weeks; of note, the intervention group had more contacts at which to report AEs compared with controls.[309] The third trial (n=166) reported one serious adverse event (group not given) that was felt to be related to a pre-existing condition and not to the intervention.[296]

Medication-Based Weight Loss Interventions

Liraglutide

Three trials reported harms (or lack of harms) related to liraglutide (n=3990).[220, 259, 285] Compared with placebo, those randomized to liraglutide had a higher prevalence of experiencing at least one AE (**Table 16**) (80-96% vs. 63-89%) and slightly more serious AEs (**Table 17**) (6-15% vs. 3-13%) over 12 to 36 months, although statistical testing was not reported.[220, 285] As a result, more participants withdrew from the liraglutide (8 to 33%) compared with the placebo arm (0 to 6%) because of AEs;[220, 259, 285] statistical testing was only presented in one study which noted a statistical difference between groups (p=0.009). One trial reported on total mortality with one to two deaths per arm.[285] Compared with placebo, there was no evidence that more participants on liraglutide developed depression (1 to 17% vs. 0 to 18%)[220, 285], suicidal behavior and/or ideation (0.5% vs. 0.9%)[285] or anxiety (2% vs. 1%)[220] at 12 to 18 months (p=NR). The most common AEs were gastrointestinal,[285] and 77 to 79 percent of those randomized to liraglutide experienced at least one gastrointestinal event compared with 31 to 46 percent of those on placebo (p=NR).[220, 259] Of those on liraglutide, 4 to 8 percent withdrew from the trial because of gastrointestinal AE compared with 1 to 2 percent of placebo participants (p=NR).[220, 285]

Other potential harms that are listed in the "warnings and precautions" section of the liraglutide

label include malignant thyroid c-cell carcinomas (black box warning), pancreatitis, gallbladder disease, renal impairment, increased heart rate, hypersensitivity/anaphylaxis, hypoglycemia, and cancer. [220, 259, 285]One large trial of prediabetic patients[339] reported ten cases of confirmed pancreatitis during 3 years among 1505 individuals randomized to liraglutide treatment (0.7%; 0.3 events per 100 person-years) compared with two cases in 747 placebo-group individuals (0.3%; 0.1 events per 100 person-years) with most events (8/12) occurring within the first year of treatment.[339] Data on other outcomes were generally sparse among the trials. [220, 259, 285]

Lorcaserin

Four trials reported harms (or lack of harms) related to lorcaserin (n=6490).[172, 173, 238, 268] More participants in the lorcaserin arms experienced at least one AE (12% at 1 month, 83% at 1 year) compared with those in placebo (4% at 1 month, 75% at 1 year), although statistical testing was not conducted (**Table 16**).[173, 238] Compared with placebo, the AE most commonly associated with lorcaserin was dizziness, with 8 to 10% of those randomized to lorcaserin experiencing dizziness compared with 4% of controls (p=NR).[172, 173, 268] Rates of serious AEs were low in both groups (0 to 3% in lorcaserin and 0 to 2% in placebo; p=NR) (**Table 17**). [172, 173, 238] In one trial, six SAEs were deemed to be potentially related to lorcaserin; three occurred in the placebo group (syncope, ventricular tachycardia, and anaphylactic reaction), and three occurred in the lorcaserin group (syncope, moderate depression, and acute anxiety attack).[173] Withdrawals due to AEs were less than 10 percent in both arms (7% in lorcaserin arm and 5 to 7% in placebo arm; statistical testing was not conducted).[172, 173] There were only two deaths, both in control groups.[172, 173] There was no evidence of increased risk of developing depression or suicidal ideation among those randomized to lorcaserin (2 to 3% and 1%, respectively) compared with placebo (2% and 1%) (ps=NR).[172, 173]

Other potential harms that are listed in the "warnings and precautions" section of the lorcaserin label include serotonin syndrome, valvular heart disease, cognitive impairment, and priapism. There were no reports of serotonin syndrome and two studies that conducted echocardiograms during the trial did not report any increased incidence of valvular heart disease in those given lorcaserin.[172, 173] There were scarce to no data on cognitive impairment, psychiatric disorders beyond depression, or priapism.

Naltrexone and Bupropion

Three trials reported harms (or lack of harms) related to naltrexone and bupropion (n=3453).[218, 244, 311] More participants randomized to naltrexone and bupropion experienced at least one AE (83 to 86%) compared with those on placebo (69 to 75%) over 12 to 13 months, although statistical testing was not reported (**Table 16**).[218, 244] The most frequent treatment-related adverse events during the primary treatment period were nausea, constipation, headache, dry mouth, and dizziness.[218, 244, 311] SAEs were rare and low in both the naltrexone and bupropion (0.3 to 2%) and placebo arms (0 to 1%) (**Table 17)**. More participants withdrew from the naltrexone and bupropion group for AEs (20 to 25%) compared with placebo (10 to 14%), although statistical testing was not reported.[218, 244, 311] Of the two trials reporting deaths (n=1948), one death occurred in the naltrexone and bupropion group.[244, 311] There was no statistically significant association with depression or anxiety; 0 to 5% in naltrexone and bupropion arm developed

depression and/or anxiety compared with 1 to 4% of the placebo arm.[218, 244, 311]

In the "warnings and precautions" sections of the naltrexone and bupropion label, additional potential harms include seizures, neuropsychiatric events, increased blood pressure/heart rate, cognitive effects, renal dysfunction (increases in creatinine), liver dysfunction, and glaucoma. Many of these warnings come from trials of naltrexone or bupropion alone. Two of the three trials noted that naltrexone and bupropion may attenuate the positive effects of weight loss on blood pressure as the naltrexone and bupropion arm did not have as much of a decrease in blood pressure ($p<.05$)[244, 311]) and an average 1 bpm greater increase in heart rate ($ps<.05$)[218, 244] compared with controls. The other harms were not well reported; however, those with certain conditions such as history of psychiatric illness and seizures were excluded from participating in the trials.

Orlistat

Seventeen trials[160, 161, 222, 226, 227, 236, 239, 246, 260, 263, 273, 292, 297-299, 304, 307] (n=10,392) and two observational studies[213, 248](n=209,993) reported harms (or lack of harms) related to orlistat. Sixteen are from the previous review, and three are new as part of this update.[248, 298, 299] More participants in the orlistat groups (80 to 96%) experienced at least one adverse event compared with those in the placebo group (67 to 94%) (k=8) over 6 to 18 months; statistical testing was only reported in three studies and between-group differences were significant (**Table 16**) ($p<.05$). The number who withdrew for adverse events was also higher in the orlistat groups (2 to 16%) compared with placebo (0 to 7%), although statistical testing was not presented (k=14). However, the number of participants with serious adverse events was low in both groups and not consistently higher in those randomized to orlistat (0 to 15%) compared with placebo (2 to 26%) (**Table 17**) (p=NR; k=13). Six trials reported on deaths, but only 0 to 1 deaths were reported in each trial and none was felt to be related to orlistat. One prescription event monitoring study of 16021 orlistat users reported 33 deaths (0.21%) in orlistat users over 12 months, but none was felt to be related to orlistat.[213]

The most commonly reported AEs were gastrointestinal.[213] Sixty-three to 91 percent of participants randomized to orlistat experienced at least one gastrointestinal AE (e.g., intestinal borborygmi and cramps, flatus, fecal incontinence, oily spotting, and flatus with discharge) in the first 12 to 24 months of the trials compared with 39 to 65 percent of placebo participants (k=16);[160, 161, 213, 222, 226, 227, 239, 246, 260, 263, 273, 297-299, 304, 307] only three trials reported statistical testing and all found statistically significant differences ($p<.05$).[222, 246, 304] Similarly, compared with placebo participants, more of those randomized to orlistat dropped out because of gastrointestinal AEs (1 to 10% vs. 0 to 4%; p=NR; k=12).[213, 222, 226, 227, 236, 239, 246, 263, 292, 297, 299, 307] The number of serious gastrointestinal AEs was much lower in both groups, ranging from 2 to 10 percent in the orlistat group and from 1 to 3 percent in the placebo group (k=3; p=NR).[161, 248, 307] There was no clear association with dosage (i.e., 120 mg TID was not associated with more AEs or gastrointestinal AEs than 60 mg TID). Gastrointestinal symptoms were described as being of relatively short duration and decreased over time with continued usage. Orlistat was not related to risk of colorectal cancer in a retrospective cohort (n=193972) designed to examine this association.[248]

One trial (n=551) found an increased incidence of musculoskeletal problems/injuries in those randomized to orlistat (23%) compared with placebo (16%) (p<=.05).[222] In six trials, more of those randomized to orlistat had episodes of beta carotene or vitamins A, D, or E deficiency (low levels or need for supplementation) compared those given placebo (0 to 12% vs. 0 to 8%)[161, 239, 246, 292, 297, 307]; however, statistical testing was only reported in one trial, which noted differences were significant for beta carotene and vitamin E (ps<.01).[246]

On the orlistat label, there are warnings for specific conditions including cholelithiasis, liver injury, and impaired renal function. Four trials (n=1230) reported cholelithiasis or cholecystectomy events, with most trials having only one or two cases.[226, 239, 292, 298] One trial (n=222) conducted gallbladder ultrasounds at baseline and at treatment end, reporting that 7 percent of those randomized to orlistat and 11 percent of those on placebo developed gallbladder abnormalities (mostly asymptomatic stones detected by ultrasound; p=NR) over 12 months.[239] In the prescription event monitoring study of 1602 orlistat users, there were 12 reported cases of abnormal liver tests[213]; 1 subject (arm not identified) withdrew in a different trial because of a liver disorder.[260] One trial that conducted kidney ultrasounds at baseline and end of treatment noted that renal abnormalities (mainly stones and cysts) developed in 3 percent of those on orlistat and 2 percent of those in placebo over 12 months[239]; in a 2nd trial, there was one person in the orlistat arms with a kidney stone exacerbation on orlistat.[298]

Phentermine and Topiramate

Three trials reported harms (or lack of harms) related to Phentermine and topiramate (n=3837).[168, 216, 241] In the only trial reporting this outcome, 85 percent of those on 15/92 mg phentermine and topiramate and 73 percent of those on placebo experienced at least one AE (p=NR) (**Table 16**).[216] SAE's were rare in all three trials (with 2 to 5%, 1 to 3%, 0 to 4%, of those randomized to phentermaine and topiramate 15/92 mg, 7.5/46 mg, and placebo, respectively); statistical testing was only reported in one study with no between-group differences noted (**Table 17**).[241] More participants withdrew from phentermine and topiramate (16 to 21% in 15/92 mg and 12 to 15% on 7.5/46 mg) compared with placebo (7 to 9%) over 6 to 12 months (p=NR).[168, 216, 241] In the two trials reporting mortality, only one cardiovascular-related death was reported in the placebo arm of one trial).[168, 241] Those randomized to 15/92 mg of phentermine and topiramate had more anxiety (4%) than those in control arm (1 to 2%) (p≤.01); the 7.5/46 mg dosage was not associated with increased anxiety compared with control.[216, 241] Results on the effects on depression were mixed, with one trial finding a significantly increased incidence of depression in those randomized to 15/92 mg of phentermine and topiramate (5%) compared with placebo (1%) (p=.0007)[216]; however, a second trial did not find a significant difference between groups (4% of those on 15/92 mg, 3% of those on 7.5/46 mg, and 3% of those in placebo had incident depression; p=0.90).[241] There were no suicide attempts or ideation in either study.

The "warnings and precautions" section of the phentermine and topiramate label list additional potential harms including fetal toxicity, myopia, mood disorders (irritability), cognitive dysfunction (attention), elevated heart rate, metabolic acidosis, and elevated creatinine. Fetal toxicity risk is based on registries and epidemiologic studies of topiramate alone (with an FDA Risk Evaluation and Mitigation Strategy in place). There was a slightly higher incidence of

blurred vision in those on 15/92 mg phentermine and topiramate (5 to 6%) compared with placebo (3 to 5%), but between-group differences were only significant in one of two studies reporting statistical significance; the 7.5/46 mg dose was not associated with an increased risk.[168, 216, 241] Irritability and insomnia were higher in the phentermine and topiramate arms (2 to 5% and 6 to 12%, respectively) compared with placebo (<1 to 2% and 5 to 6%; p<=.05).[168, 216, 241] Those in phentermine and topiramate arms reported more disturbance in attention (3 to 7%) compared with placebo (<1%)(p<.001).[168, 216, 241] The trials monitored heart rate with conflicting findings.[168, 216, 241] Mild decreases in bicarbonate were seen more frequently in those on phentermine and topiramate (p<.05) but less than 2 percent of all arms experienced substantial reductions.[216, 241]

Medication-Based Weight Loss Maintenance Interventions

All three medication-based weight loss maintenance trials reported adverse events.[247, 287, 312] The AEs during weight loss maintenance interventions were similar to those seen during weight loss trials.

Orlistat

Two trials reported harms (or lack of harms) during weight loss maintenance with orlistat. [247, 287] AEs, especially gastrointestinal related AEs, were higher in those on orlistat (88 to 95% with gastrointestinal related AEs) than placebo (63 to 68% with gastrointestinal related AEs) (p≤.01 and p=NR). The number who withdrew for adverse events, especially gastrointestinal related AEs, was also generally higher in the orlistat groups (5 to 15% and 7 to 12% for any and gastrointestinal related AEs, respectively) compared with placebo (3 to 5% and 0.5%), although statistical testing was not presented. However, the number of participants with serious adverse events was not statistically different in those randomized to orlistat (12%) compared with placebo (18%) in the one study reporting this outcome (**Table 16**).[287] Few participants (<4%) in one orlistat trial required additional vitamin supplementation, and the results are not described by study arm.[247]

Liraglutide

One trial reported harms (or lack of harms) during weight loss maintenance with liraglutide.[312] Persons given liraglutide did not experience more AEs overall (92%) compared with those on placebo (89%), although statistical testing was not presented (**Table 16**). However, more participants experienced gastrointestinal AEs (74% vs. 45% for liraglutide vs. placebo, respectively; p=NR). More participants randomized to liraglutide experienced at least one serious AE (4%) than those on placebo (2%), although statistical testing was not conducted (**Table 17**). Although overall withdrawals for AEs were similar in the two arms (9%), more participants in the liraglutide arm withdrew for gastrointestinal AEs (5% vs. 0%; p=NR).[312]

Chapter 4. Discussion

Summary of Evidence

We conducted this systematic review to assist the USPSTF in updating its 2012 recommendation on screening for and management of adult obesity.[196] The current review focused specifically on the effectiveness and harms of primary care-relevant weight loss and weight loss maintenance interventions. We included 124 unique trials, two-thirds of which (k=83) were published after the 2011 USPSTF review. More studies were included for each Key Question, and the included trials are of longer duration. The effect estimate found for weight loss in our updated systematic review is slightly smaller in magnitude compared with the 2011 review on this topic, and the evidence on health outcomes and intermediate outcomes remains sparse.[197]

Table 18 summarizes the findings and our assessment of the strength of evidence for this review. We found that **behavior-based weight loss interventions** were associated with more weight loss and that **behavior-based weight loss maintenance interventions** were associated with less weight regain than control conditions over 12 to 18 months. Although addressed in fewer trials, weight loss or weight loss maintenance interventions lasting up to 36 months reported significantly greater weight loss or weight loss maintenance in the intervention participants compared with control participants. Given the consistency in the effect estimates and precision in those estimates over time, we are moderately confident that our pooled estimates for weight loss and weight loss maintenance from behavior-based interventions lie close to the true effects. However, pooled analyses resulted in considerable statistical heterogeneity, reflecting the clinical heterogeneity across studies. The heterogeneity in each individual intervention arm and differences in the populations, settings, and trial quality made it difficult to disentangle what variables might be driving larger effects. The trials used various modes of intervention delivery (group, individual, mixed, technology-based, and print-based) but were generally designed to help participants achieve or maintain a 5 percent or greater weight loss through a combination of dietary changes (including specific caloric goals) and increased physical activity (generally promoting at least 150 minutes of moderate-intensity activity per week). In addition, most interventions encouraged self-monitoring of weight and provided additional tools to assist with weight loss or maintenance (e.g., pedometers, food scales, exercise videos).

We have moderate confidence that behavior-based weight loss interventions are associated with a decreased risk of progressing from prediabetes to type 2 diabetes at up to 36 months followup. The association between weight loss interventions and other intermediate health outcomes (e.g., CVD risk factors) was sparsely reported and considered to have low strength of evidence. Weight loss maintenance interventions did not report on any intermediate outcomes.

We have limited confidence in the evidence regarding the effects of behavior-based weight loss interventions on longer-term health outcomes, including all-cause mortality, CVD events, and quality of life (QOL). Although some of the studies reporting these outcomes were generally large and of good quality, most were still underpowered to detect differences during followup. Therefore, although behavior-based weight loss interventions consistently showed no difference in all-cause mortality and CVD events, we rated the strength of evidence as low. Studies of

behavior-based weight loss and maintenance reported inconsistent effects on QOL.

Overall, a limited number of trials reported on adverse events (AEs) of behavior-based weight loss and weight loss maintenance interventions but none reported serious harms related to the interventions. Most trials noted no differences between arms in the rates of AEs, including cardiovascular events. Results were mixed in the three trials large enough to examine musculoskeletal issues between arms. Given the small body of evidence related to harms and inconsistent reporting, we have low confidence that our body of evidence represents the actual incidence of harms related to behavior-based weight interventions.

We found that **weight loss medications** were associated with more weight loss and weight loss maintenance over 12 to 18 months compared with those randomized to placebo. While fewer trials addressed longer-term interventions, weight loss or weight loss maintenance interventions lasting up to 48 months reported significantly greater effects in the medication arms compared with placebo. Although the effects are consistent, we were unable to pool data due to the small number of trials for each medication, methodological variability, missing data regarding dispersion, and poor followup (often less than 65%). Because of these issues, we rated the strength of evidence as low. The medication trials have limited applicability given that most participants had to meet narrowly defined inclusion criteria. In addition, many studies required participants to show compliance with taking pills and/or meet weight loss goals before study entry.

Weight loss medications in populations with a 20 to 70 percent prevalence of prediabetes at study enrollment were associated with a decreased incidence of progression to type 2 diabetes compared with placebo at up to 48 months of followup. Although the effect estimates were consistent, they were imprecise and limited by a high degree of withdrawals. We therefore rated the strength of evidence as low. Pooled data from over 3,000 overweight and obese participants in three randomized controlled trials of phentermine/topiramate extended release (CONQUER, EQUIP, and SEQUEL) were not included in this review due to recruitment of an excluded population in one trial; however, pooled findings were consistent with those of this review--a decrease in risk of developing diabetes, especially in those at highest risk, in those randomized to the weight loss medication.[344] The association between weight loss medications and other intermediate health outcomes (CVD risk factors) was sparsely reported with mixed findings.

In terms of longer-term health outcomes with medications, the evidence related to CVD outcomes was sparse, precluding any definite conclusions. Studies of weight loss medications reported improvements on obesity-specific QOL measures; however, actual QOL scores were often missing, and when available, differences were small and of unclear significance. We rated the strength of evidence as low given these issues and the high dropout rates in studies.

All of the medication trials included for weight loss or weight loss maintenance outcomes also reported on potential harms; in addition, we examined additional trials for potential harms (often excluded from weight-based outcome evidence due to short duration of followup and/or quality issues). Serious adverse events were relatively uncommon and rates were generally similar between groups. However, those randomized to medications consistently experienced more adverse events in general resulting in higher withdrawal rates in the medication arms than in the

placebo arms. Although the absolute incidence of events was imprecise, ranging from 63 to 96 percent. Few trials conducted statistical testing of differences between groups, those that did usually noted a statistically greater number of AEs in those on medications. In addition, many of the trials selected participants at low risk of harms (due to restrictive inclusion criteria), potentially underestimating the rate of harms that will occur among the general population. Despite the lack of statistical testing, we feel moderately confident that there are more harms associated with weight loss medications than with placebo.

Comparison With Findings From Other Systematic Reviews

The findings of our review are consistent with findings of other similarly scoped, recent systematic reviews. A systematic review conducted for the Canadian Task Force on Preventive Health Care (CTFPHC) found similar results for the effects of behavior-based interventions on weight loss. An overall pooled effect of 3.02 kg greater weight loss was found among intervention participants, with greater rates of losing at least 5 percent of baseline body weight (RR: 1.77 [95% CI, 1.58 to 1.99]) with a number needed to treat (NNT) of 5 (95% CI, 4 to 7). This review also concluded that for individuals who are at risk of type 2 diabetes, weight-loss interventions could delay the onset of type 2 diabetes. Results on the effect of behavior-based weight loss maintenance interventions (pooled MD, −1.56 kg [95% CI: −3.10 to −0.02]) and orlistat for weight loss (pooled MD, −3.05 kg [95% CI, −3.75 to −2.35]) were also consistent with our findings.[345, 346]

Compared with other recent reviews of the effectiveness of new weight loss medications, similar rates of weight loss were cited along with high rates of adverse events in participants.[169, 347, 348]

Observational Evidence on the Association Between Intentional Weight Loss and Health Outcomes

Due to sparse direct trial evidence on the effect of weight loss interventions on health outcomes (KQ1), we present observational evidence to contextualize our results (**Appendix A**). There is little evidence to suggest that intentional weight loss among those who are overweight, especially those with BMIs less than 28 kg/m^2, is associated with decreased mortality.[349-353] Intentional weight loss among those who are obese may lead to a small decrease in mortality risk, although the literature is conflicting, especially for men and individuals without obesity-related comorbidities.[354-356] The literature is scant and limited on the effects of intentional weight loss on other outcomes such as CVD and cancer.[357, 358]

In people who undergo bariatric surgery, there are significant improvements in diabetes,[359, 360] sleep apnea,[360, 361] QOL,[362] depression,[363] and pain and physical function.[364] Data on long-term health outcomes, such as mortality, cardiovascular disease, and cancer, are still lacking. However, the amount of weight loss that occurs with weight loss surgery is much greater than what can usually be achieved with behavior-based weight loss interventions, and only people with severe obesity or obesity with comorbidities are candidates for bariatric surgery. In addition, there are metabolic changes that occur after surgery, independent of weight loss, that

could contribute to improvements in health outcomes among those who undergo surgery.[365]

Considerations for Applicability of Findings

Recruitment in the majority of behavior-based trials had some degree of self-selection, so participants were likely to have been more motivated to change their behaviors than individuals not represented in these trials, making the findings most applicable to those who are motivated to change their body size. We saw generally high rates of retention (>80% at 12 months) and adherence in the behavior-based intervention trials—rates which may not be seen in real-world scenarios.

The vast majority of trials were conducted in the United States. The trials included adults who were a range of ages and BMI's. The risk status of the populations varied broadly, with one-half of the trials requiring participants to have increased or subclinical CV risk or cancer risk and the other half selecting participants only on weight status (comorbidities of participants were variably reported). Race and ethnicity were inconsistently reported and only a small proportion of trials focused specifically on underrepresented racial or ethnic groups. Most trials did not stratify results by any of these important factors (BMI, age, race/ethnicity, health status). Although we were limited in examining effects by subgroup due to population heterogeneity, we noted through meta-regression that those who had increased CV risk (e.g., hypertension, prediabetes, metabolic syndrome) had greater weight loss than those who were unselected. However, this finding is limited by the variability between intervention components and other population characteristics (e.g., age) among the trials. Despite the limitations related to examination of specific population subgroups, we have found no evidence to suggest the findings of the behavior-based weight loss and maintenance interventions review would not be applicable to the U.S. primary care population; however, the magnitude of the effects may be slightly lower when applied to general practice.

It is nearly impossible to determine to what extent specific population and intervention characteristics were driving intervention effects given the within- and between-study heterogeneity in population, intervention, and broader study characteristics. Few interventions included interaction with a primary care provider (PCP), and among those that did, the level of PCP interaction was variable. In addition, no two studies had exactly the same intervention messaging, schedule, or mode delivery, although many built off of learnings from earlier trials (for example, the DPP[205]). We applied *a priori* subgroup analyses and meta-regression in an effort to identify whether any particular intervention modes or characteristics were driving larger effects. We did not find that the main intervention mode (group vs. individual vs. technology vs. mixed), the involvement of a PCP, or the duration of the intervention significantly affected the direction or magnitude of the benefit. In contrast to our previous review, we did not find that a greater number of sessions in the first year were associated with greater weight loss. However, most of the interventions had at least 12 sessions within the first year of the intervention. In addition, there were many more trials in this update that focused on technology-based interventions, with few (if any) actual counseling sessions; rather, such studies used multiple contacts with participants via e-mails, text messages, or social networking applications. Given the inclusion of more interventions with few formal sessions but a high number of contacts (a

more inclusive measure than our previous counting of formal "session"), we also examined the effect of the number of participant contacts. This analysis was also not associated with effect size. The one intervention component that was related to greater weight loss was the inclusion of any use of group sessions in the intervention (whether that was the main mode of delivery or an additional component). While it is possible that including some group interaction creates a social bond that leads to greater weight loss, there were also many other differences among studies (i.e., age of participants, health status of participants, other delivery components), which precludes any firm conclusions about this finding. To fully address whether certain intervention components are more effective would require examination of comparative effectiveness studies (which were specifically excluded in this review). The ideal counseling intervention for any given individual likely depends on consideration of his or her specific clinical characteristics and preferences.

Most weight loss medication trials included self-selected volunteers who had to meet multiple, highly selective inclusion and exclusion criteria, with many trials requiring specific levels of medication compliance and/or ability to reach weight loss goals prior to randomization. The large number of exclusions (e.g., history of serious medical conditions, CVD events, psychiatric illness) likely resulted in a highly motivated, relatively healthy population. The mean age of the studies was relatively narrow, from 41 to 58, and race/ethnicity was reported in just over half the studies, with the majority of participants (over 60%) reported as non-Hispanic white. Therefore, it is unclear whether the findings of the review on weight loss medications are generally applicable to the general U.S. primary care population.

Limitations of Our Approach

The current review excluded studies specifically focused on persons with conditions for which weight loss is considered as part of disease management (e.g., diabetes, polycystic ovarian syndrome). Literature specific to these populations is considered tertiary prevention and therefore not within the scope of the current review. Aspects of the care in these populations generally fall within the domain of other condition specific reviews within the USPSTF portfolio. We also excluded trials focused on weight gain prevention, including general health promotion, as this evidence is including in separate reviews on counseling for healthful diet and physical activity. Trials of weight management during pregnancy were also excluded. In addition, we did not systematically examine the effectiveness of screening or the best screening approach to identify adults who may be candidates for weight loss interventions (but did examine this body of research contextually) (**Appendix A**).

Our review was limited to interventions that were conducted in primary care or those that are feasible for referral from primary care. Surgical weight loss interventions or nonsurgical weight loss devices were considered to be outside the scope of primary care-referable interventions. Additionally, we included only trials conducted in developed countries so as to identify the evidence with the highest applicability to current U.S. practice.

We also excluded studies without a true control group and thus did not address the comparative effectiveness of different types of behavior-based interventions. Our requirement was that the

behavior-based intervention trials have control groups with no more than quarterly contact via counseling sessions or generic brochures to be reflective of the current standard of care within the United States. This criterion led to the exclusion of 81 comparative effectiveness trials, which likely have key data for determining whether certain intervention modes or components are more effective. We did examine this issue by describing and synthesizing intervention characteristics; however, doing so for such complex interventions is difficult. The included interventions varied considerably in terms of the mode of delivery, delivery schedule, and providers. However, in many cases, detailed reporting of the number, length, and content of sessions and contacts was lacking, so we had to make several assumptions.

We did not include continuous intermediate outcomes (e.g., continuous measures of blood pressure, cholesterol levels, glucose levels, and cardiorespiratory fitness). Instead, we examined the effects of weight management interventions on the incidence and prevalence of obesity-related conditions such as diabetes, hypertension, dyslipidemia, and sleep apnea. In our previous adult obesity review and cardiovascular prevention reviews for the USPSTF, diet and physical activity counseling interventions were associated with decreased in LDL cholesterol (approximately 2.6 to 4.9 milligrams per deciliter [mg/dL]), total cholesterol (approximately 2.8 to 5.8 mg/dL), SBP (1.3 to 2.5 millimeters of mercury [mm Hg]) and DBP (0.5 to 2 mm Hg).[366, 367] Although we did not formally abstract or analyze these data in this update, the newly included evidence that did report results on these continuous cardiometabolic outcomes are generally of the same magnitude seen previously. In addition, we discuss the association between intentional weight loss and health outcomes in epidemiological studies in order to contextualize the long-term clinical significance of intentional weight loss. Additionally, we did not collect or evaluate any data on costs or cost-effectiveness of the interventions.

Finally, we pooled across a body of literature that was heterogeneous with respect to clinical and demographic characteristics, interventions, and settings. The statistical heterogeneity was considerable (I^2 >85%), indicating the pooled averages should be interpreted with caution and confidence interval estimates should be primarily used to understand the magnitude of effects. In addition, across the trials, there were large standard deviations (SDs) relative to the average change suggesting that some adults showed fairly large reductions in weight, some showed no or modest changes, and some gained weight. In light of the considerable amount of participant withdrawals and missing data, we chose not to present the pooled effects for the weight loss medication trials.

Limitations of the Studies and Future Research Needs

Although the evidence in the current review indicates that weight loss interventions (both behavior-based and medication-based) result in short-term weight loss, there remains a paucity of data on what happens to weight long term. Only a limited number of trials reported followup beyond 24 months, and in most of those, ongoing weight loss or maintenance sessions occurred throughout followup. Therefore, relatively little is known about what happens to weight after an active weight or maintenance program intervention ends. Survey data suggest that a minority of individuals are successful at long-term weight loss.[368, 369]

There was also a paucity of data on long-term health outcomes. While it appears that weight loss interventions can reduce diabetes incidence, additional larger trials with longer-term followup are required to understand the full benefits of these interventions on health outcomes and whether those effects are long-lasting. Additionally, there was little data on patient-centered outcomes such as QOL and psychological outcomes such as weight stigmatization from both the general public and within the health care system,[98] eating disorders,[99-101] and weight fluctuation ("yo-yo" dieting).[370-372] Future trials should include psychosocial, QOL, and patient-centered outcomes. In addition, future trials should examine whether interventions that focus not only on weight loss, but also on how to best support people living with obesity regardless of weight loss success, improve these patient-centered outcomes.

In general, the included behavior-based interventions all included similar messages related to energy balance (i.e., gradual increases in moderate-to-vigorous intensity physical activity and healthful dietary patterns following national guidelines) and similar behavior change technique (e.g., goal setting, weighing pros and cons, increasing self-efficacy). In contrast, the specific modes of delivery, including the number and length of sessions and total duration of the interventions, and interventionists varied greatly. More data from well-designed pragmatic trials and better reporting of intervention characteristics to facilitate evaluation and dissemination of evidence-based practices is warranted. As outlined by Krist and colleagues,[373] research on behavioral counseling interventions such as the type synthesized here would benefit from application of checklists and frameworks such as the Template for Intervention Description and Replication (TIDierR), Research, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM), and the Pragmatic-Explanatory Continuum Indicator Summary (PRECIS) to assess the feasibility and applicability of interventions as well as to improve replication and dissemination.

Many of the trials, especially those examining weight loss medications, may have been biased by high attrition. We chose to include studies with high attrition because we believed that early discontinuation was likely due to the interventions (medication side effects, lack of weight loss, time commitments) and not necessarily due to a design flaw. Although we required that trials examine multiple methods of imputing data, imputing such large amounts of data might have led to biased comparisons in unknown directions.

Almost all of the studies relied on BMI to identify their populations for weight loss or maintenance interventions. While long-term health risks increase with increasing BMI, the precise BMI at which increased risk occurs and the strength of the relationship appears to vary by race, age, and personal/lifestyle factors. [6-20, 29, 70, 73-82] BMI may not be the best predictor of future disease and mortality especially in particular subgroups and future trials should consider employing more recently developed classification systems which include assessment of physical, mental, and functional health to characterize obesity severity.[374, 375] In the meantime, an important consideration for primary care providers is whether to recommend weight loss for participants with BMIs in the overweight range, especially if they are older, of certain racial/ethnic groups, or "metabolically healthy." Participants in the weight loss trials generally fell into the overweight and obese categories, and results were not reliably stratified by BMI. We were therefore unable to make conclusions about whether the health effects of weight loss interventions vary according to baseline BMI category, age, or race. Future research should focus on these important subgroups to determine if weight loss has lasting benefits in these lower risk

populations. In addition, future research should focus on interventions that include identification and treatment of factors that may prevent adults from losing weight during behavioral interventions such as the microbiome, genetics, or other unmanaged medical or psychological conditions.

We identified nine trials, including four being conducted in the United States, currently underway that may contribute to this evidence base (**Appendix H**). One of particular interest that may address several of these future research needs is the 5A trial. This trial will examine an intervention that supports the 5As of Obesity Management™ - ASK, ASSESS, ADVISE, AGREE, ASSIST, for use in clinical care. ASK permission to discuss weight, and how to conduct a proper ASSESSMENT.[376] There are also a number of comparative effectiveness trials underway that we did not list here.

Conclusion

We found that behavior-based weight loss interventions with or without weight loss medications resulted in more weight loss than usual care. The degree of weight loss we observed in the current review is slightly smaller but consistent in magnitude with our 2011 review on this topic. As in the previous review, we noted that weight loss interventions resulted in a decreased risk of developing diabetes, particularly among those with prediabetes, although the prevalence of other intermediate health outcomes were less well reported. Limited evidence exists regarding health outcomes associated with weight loss interventions. Weight loss medications, but not behavior-based interventions, were associated with more harms compared with control arms. Long-term weight and health outcomes data as well as data on important subgroups (e.g., those who are older, or non-white, or overweight) were lacking and should be a high priority for future study.

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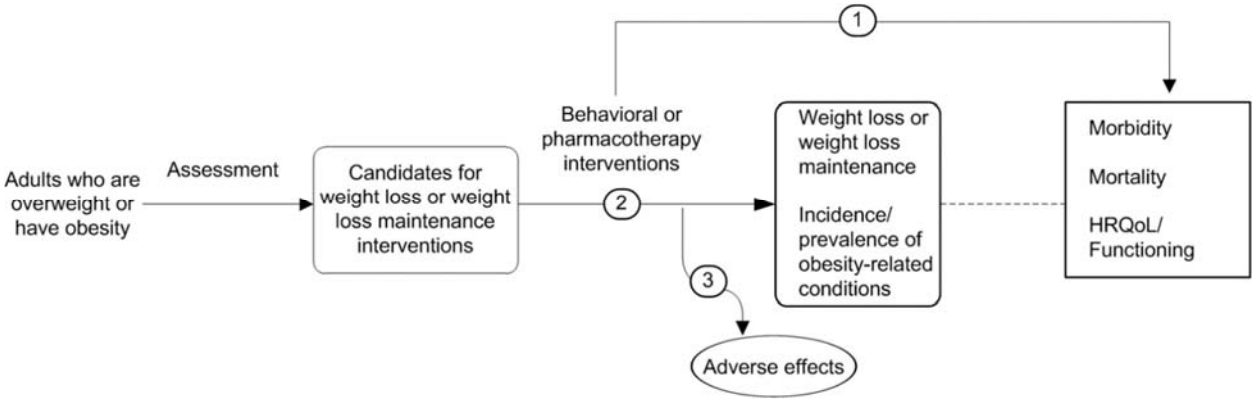
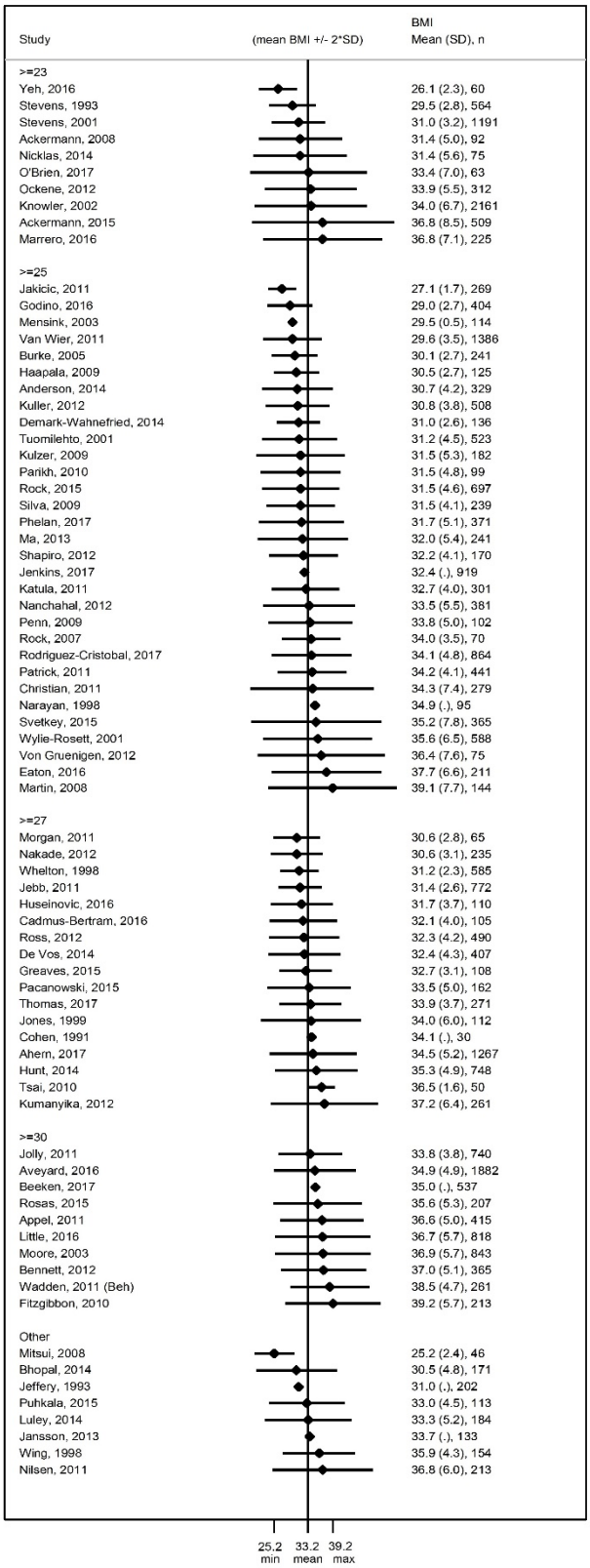
Figure 1. Analytic Framework



Abbreviations: HRQoL = health-related quality of life

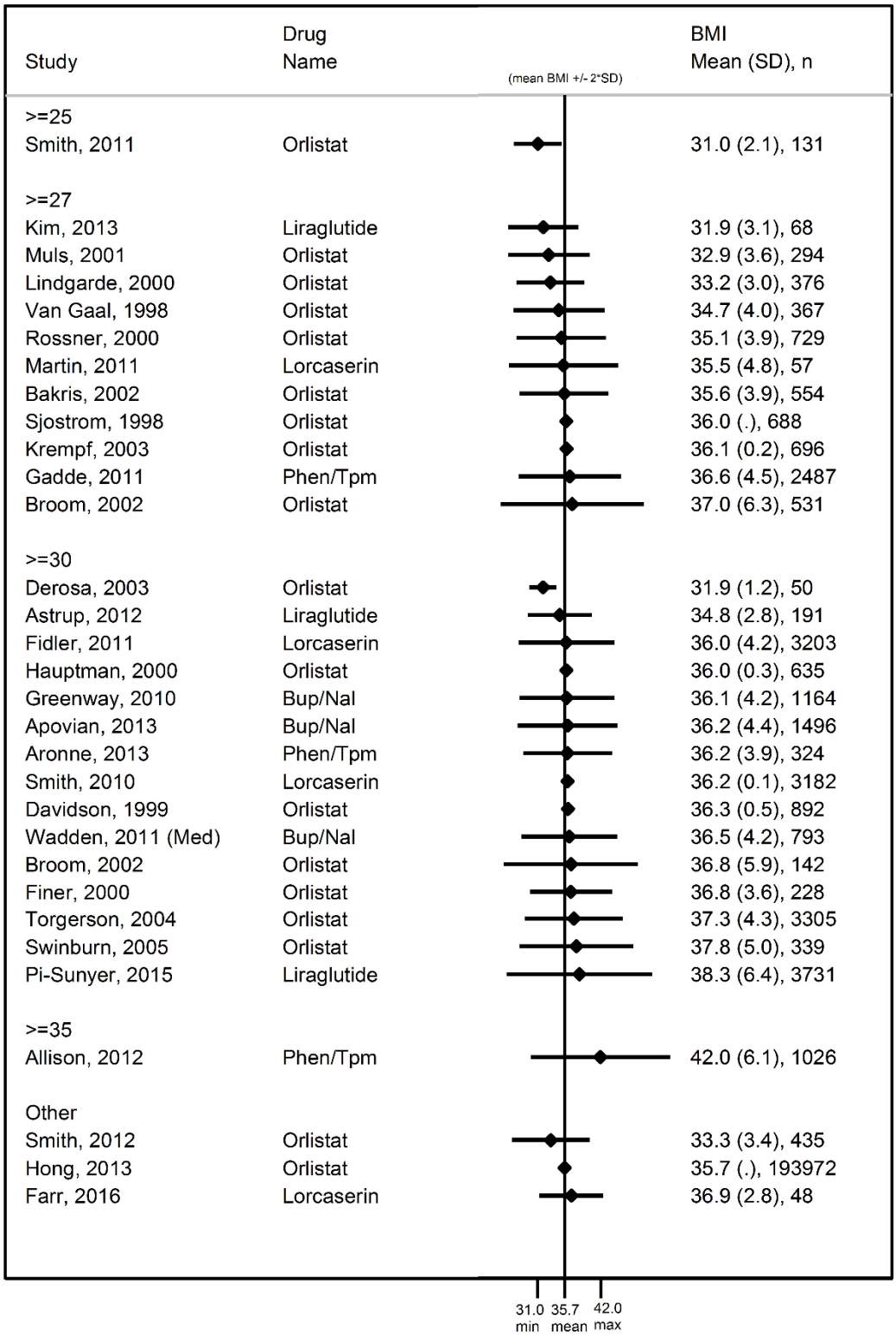
Figure 2. Distribution of Baseline BMI in Behavior-Based Weight Loss Trials, by BMI Inclusion Criteria*



*Four trials not included because baseline mean BMI was not reported.

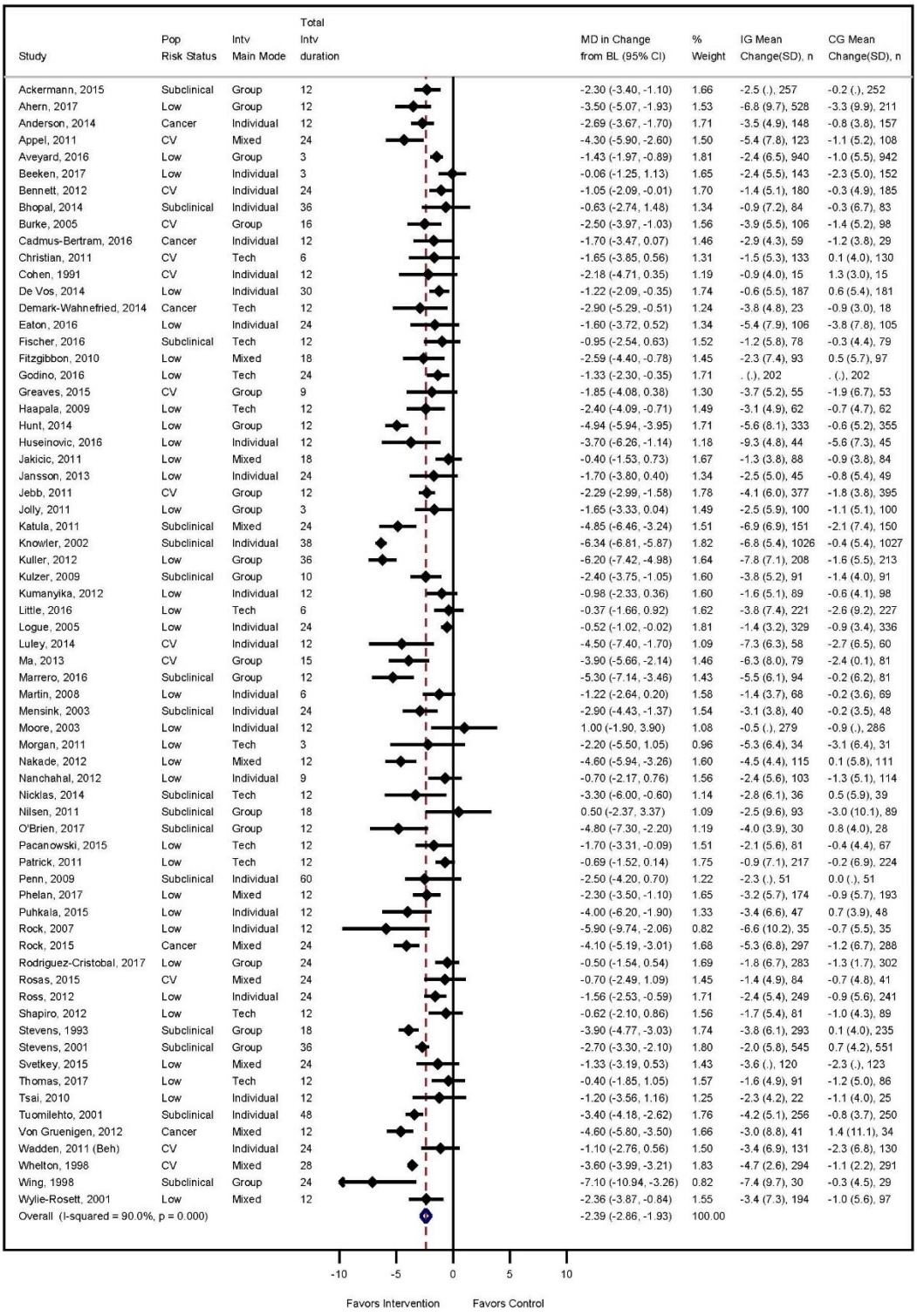
Abbreviations: BMI = baseline; SD = standard deviation

Figure 3. Distribution of Baseline BMI in Medication-Based Weight Loss Trials, by BMI Inclusion Criteria



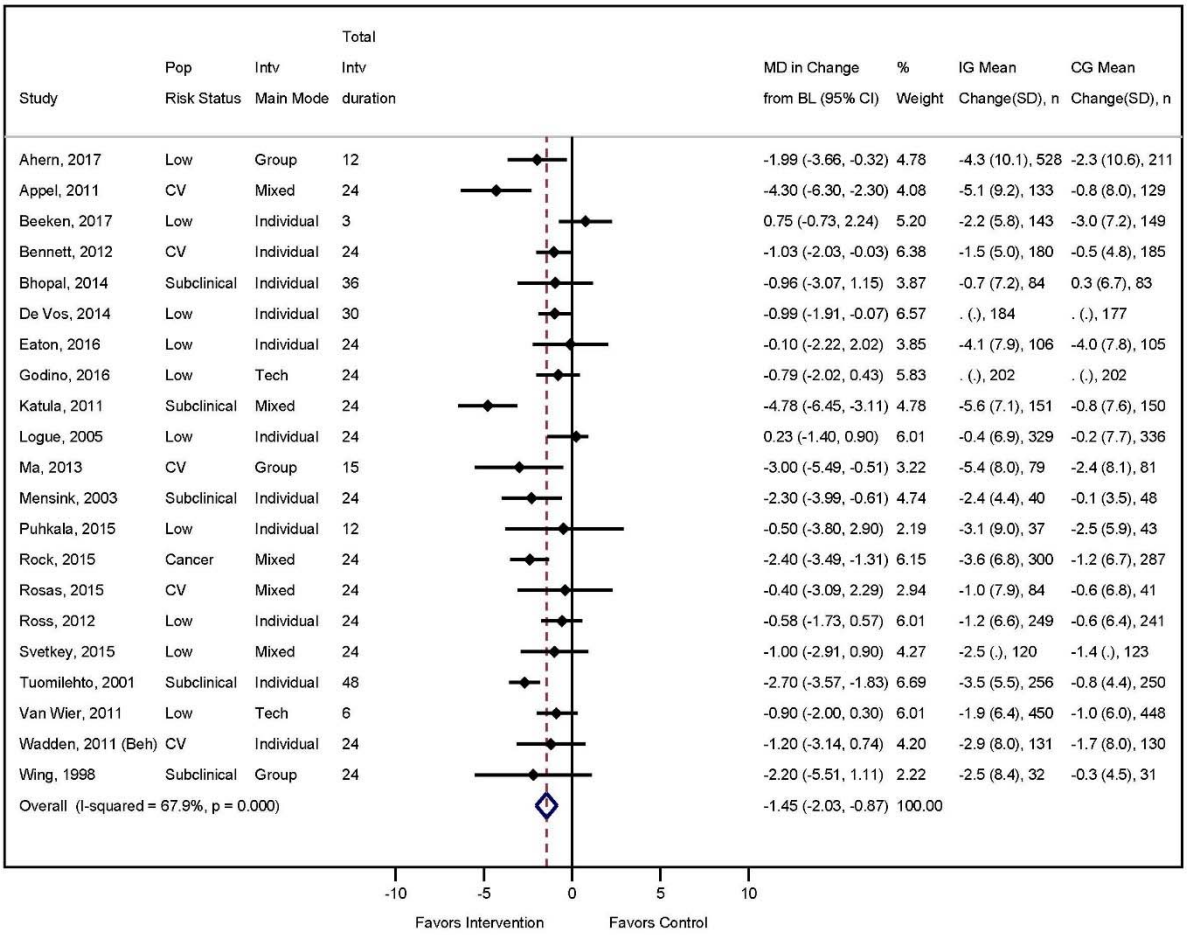
Abbreviations: BMI = baseline; Nal/Bup = Naltrexone HCL and bupropion HCL; Phen/Top = Phentermine-topiramate extended release; SD = standard deviation

Figure 4. Pooled Analysis of Change in Weight at 12 to 18 Months in Behavior-Based Weight Loss Interventions Compared With Controls



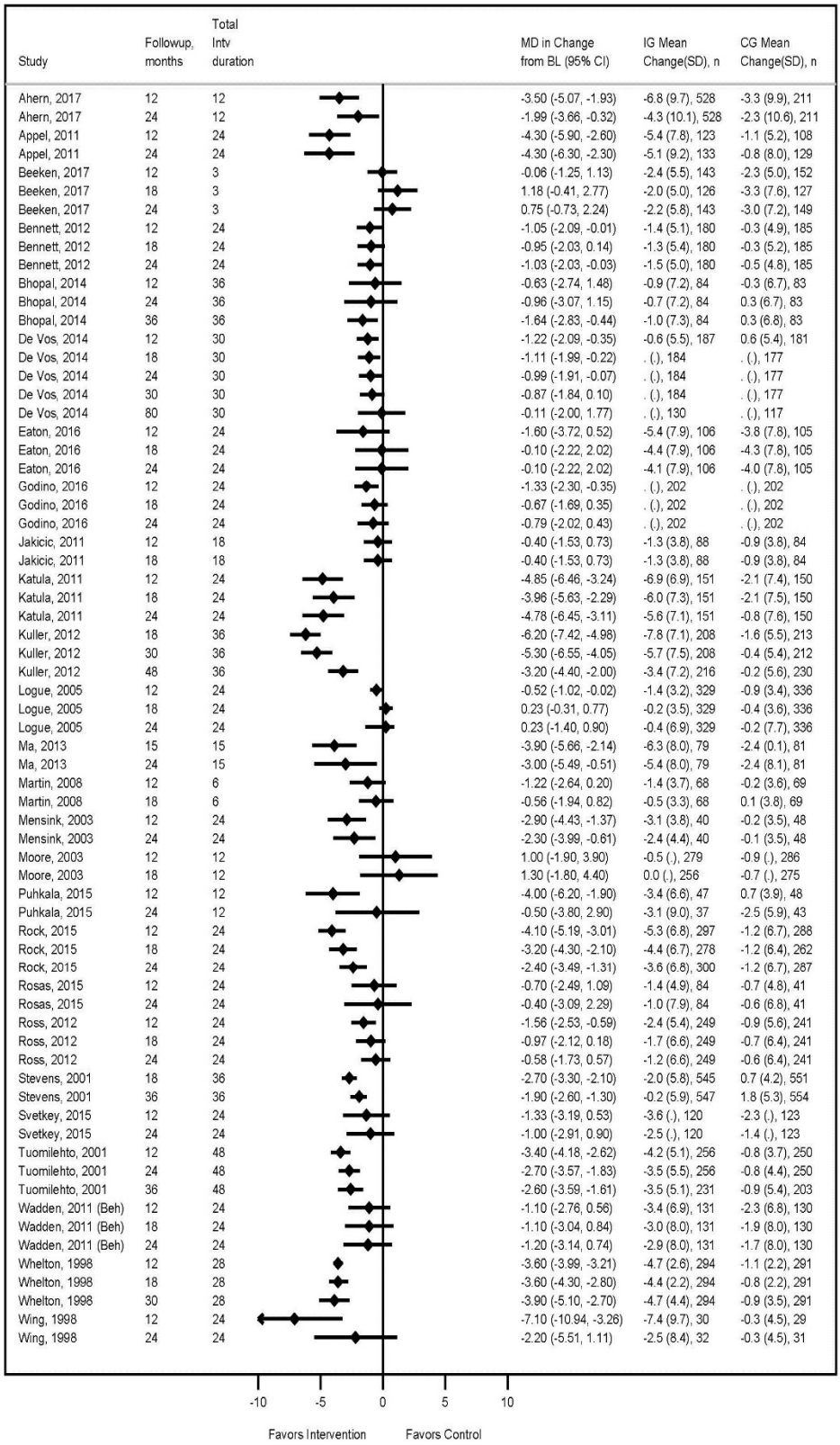
Abbreviations: BL = baseline; Cancer = elevated cancer risk; CG = control group; CI = confidence interval; CV = increased cardiovascular risk; IG = intervention group; Intv = intervention; Low = low cardiovascular risk or unselected; MD = mean difference; Pop = population; SD = standard deviation; Subclinical = increased subclinical cardiovascular risk

Figure 5. Pooled Analysis of Change in Weight at 24 Months in Behavior-Based Weight Loss Interventions Compared With Controls



Abbreviations: BL = baseline; Cancer = elevated cancer risk; CG = control group; CI = confidence interval; CV = increased cardiovascular risk; IG = intervention group; Intv = intervention; Low = low cardiovascular risk or unselected; MD = mean difference; Pop = population; SD = standard deviation; Subclinical = increased subclinical cardiovascular risk

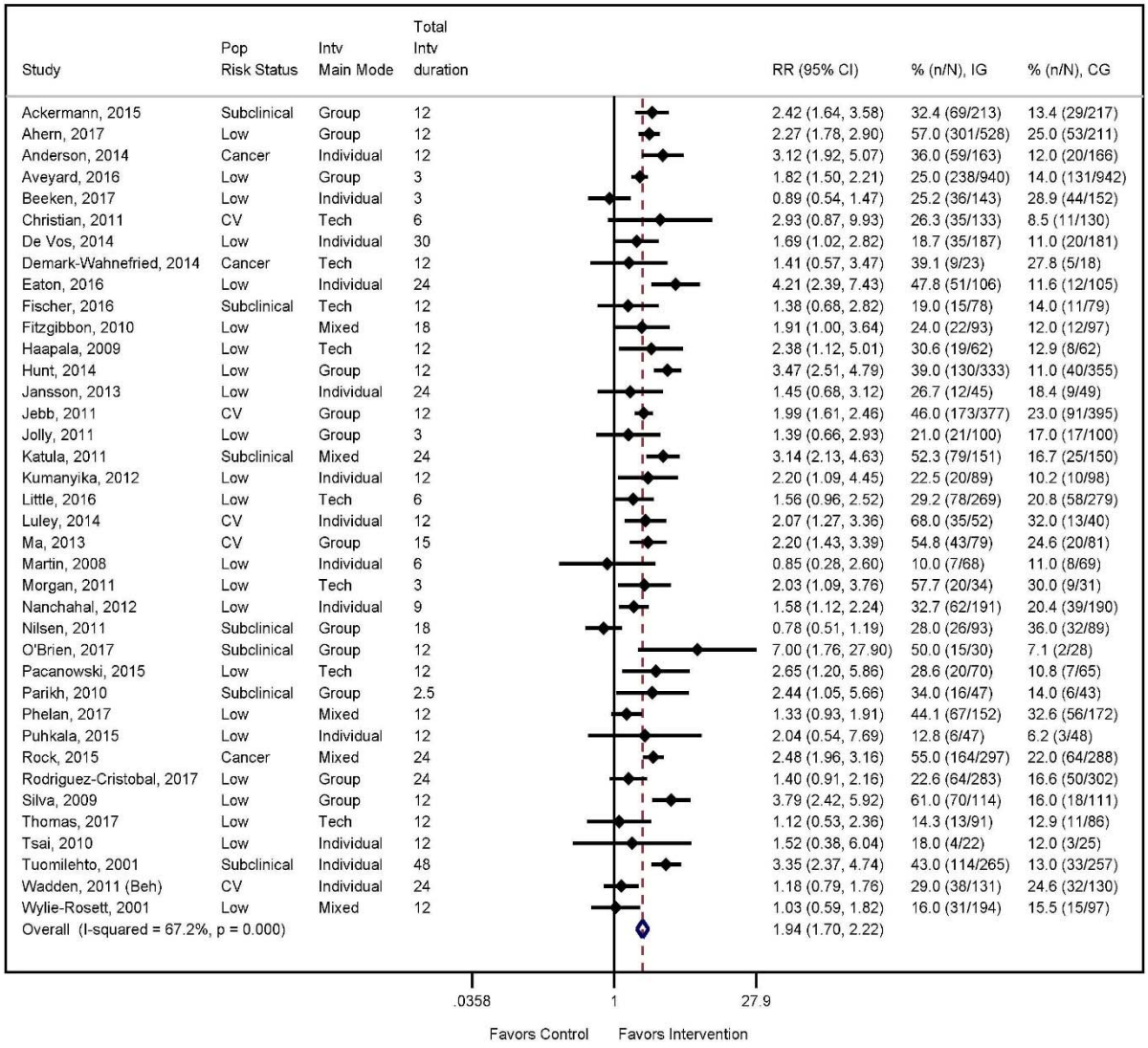
Figure 6. Change in Weight in Behavior-Based Weight Loss Intervention Among Trials With Multiple Followup Timepoints



Study	Followup, months	Total Intv duration	MD in Change from BL (95% CI)	IG Mean Change(SD), n	CG Mean Change(SD), n
Ahern, 2017	12	12	-3.50 (-5.07, -1.93)	-6.8 (9.7), 528	-3.3 (9.9), 211
Ahern, 2017	24	12	-1.99 (-3.66, -0.32)	-4.3 (10.1), 528	-2.3 (10.6), 211
Appel, 2011	12	24	-4.30 (-5.90, -2.60)	-5.4 (7.8), 123	-1.1 (5.2), 108
Appel, 2011	24	24	-4.30 (-6.30, -2.30)	-5.1 (9.2), 133	-0.8 (8.0), 129
Beeken, 2017	12	3	-0.06 (-1.25, 1.13)	-2.4 (5.5), 143	-2.3 (5.0), 152
Beeken, 2017	18	3	1.18 (-0.41, 2.77)	-2.0 (5.0), 126	-3.3 (7.6), 127
Beeken, 2017	24	3	0.75 (-0.73, 2.24)	-2.2 (5.8), 143	-3.0 (7.2), 149
Bennett, 2012	12	24	-1.05 (-2.09, -0.01)	-1.4 (5.1), 180	-0.3 (4.9), 185
Bennett, 2012	18	24	-0.95 (-2.03, 0.14)	-1.3 (5.4), 180	-0.3 (5.2), 185
Bennett, 2012	24	24	-1.03 (-2.03, -0.03)	-1.5 (5.0), 180	-0.5 (4.8), 185
Bhopal, 2014	12	36	-0.63 (-2.74, 1.48)	-0.9 (7.2), 84	-0.3 (6.7), 83
Bhopal, 2014	24	36	-0.96 (-3.07, 1.15)	-0.7 (7.2), 84	0.3 (6.7), 83
Bhopal, 2014	36	36	-1.64 (-2.83, -0.44)	-1.0 (7.3), 84	0.3 (6.8), 83
De Vos, 2014	12	30	-1.22 (-2.09, -0.35)	-0.6 (5.5), 187	0.6 (5.4), 181
De Vos, 2014	18	30	-1.11 (-1.99, -0.22)	. (.), 184	. (.), 177
De Vos, 2014	24	30	-0.99 (-1.91, -0.07)	. (.), 184	. (.), 177
De Vos, 2014	30	30	-0.87 (-1.84, 0.10)	. (.), 184	. (.), 177
De Vos, 2014	80	30	-0.11 (-2.00, 1.77)	. (.), 130	. (.), 117
Eaton, 2016	12	24	-1.60 (-3.72, 0.52)	-5.4 (7.9), 106	-3.8 (7.8), 105
Eaton, 2016	18	24	-0.10 (-2.22, 2.02)	-4.4 (7.9), 106	-4.3 (7.8), 105
Eaton, 2016	24	24	-0.10 (-2.22, 2.02)	-4.1 (7.9), 106	-4.0 (7.8), 105
Godino, 2016	12	24	-1.33 (-2.30, -0.35)	. (.), 202	. (.), 202
Godino, 2016	18	24	-0.67 (-1.69, 0.35)	. (.), 202	. (.), 202
Godino, 2016	24	24	-0.79 (-2.02, 0.43)	. (.), 202	. (.), 202
Jakicic, 2011	12	18	-0.40 (-1.53, 0.73)	-1.3 (3.8), 88	-0.9 (3.8), 84
Jakicic, 2011	18	18	-0.40 (-1.53, 0.73)	-1.3 (3.8), 88	-0.9 (3.8), 84
Katula, 2011	12	24	-4.85 (-6.46, -3.24)	-6.9 (6.9), 151	-2.1 (7.4), 150
Katula, 2011	18	24	-3.96 (-5.63, -2.29)	-6.0 (7.3), 151	-2.1 (7.5), 150
Katula, 2011	24	24	-4.78 (-6.45, -3.11)	-5.6 (7.1), 151	-0.8 (7.6), 150
Kuller, 2012	18	36	-6.20 (-7.42, -4.98)	-7.8 (7.1), 208	-1.6 (5.5), 213
Kuller, 2012	30	36	-5.30 (-6.55, -4.05)	-5.7 (7.5), 208	-0.4 (5.4), 212
Kuller, 2012	48	36	-3.20 (-4.40, -2.00)	-3.4 (7.2), 216	-0.2 (5.6), 230
Logue, 2005	12	24	-0.52 (-1.02, -0.02)	-1.4 (3.2), 329	-0.9 (3.4), 336
Logue, 2005	18	24	0.23 (-0.31, 0.77)	-0.2 (3.5), 329	-0.4 (3.6), 336
Logue, 2005	24	24	0.23 (-1.40, 0.90)	-0.4 (6.9), 329	-0.2 (7.7), 336
Ma, 2013	15	15	-3.90 (-5.66, -2.14)	-6.3 (8.0), 79	-2.4 (0.1), 81
Ma, 2013	24	15	-3.00 (-5.49, -0.51)	-5.4 (8.0), 79	-2.4 (8.1), 81
Martin, 2008	12	6	-1.22 (-2.64, 0.20)	-1.4 (3.7), 68	-0.2 (3.6), 69
Martin, 2008	18	6	-0.56 (-1.94, 0.82)	-0.5 (3.3), 68	0.1 (3.8), 69
Mensink, 2003	12	24	-2.90 (-4.43, -1.37)	-3.1 (3.8), 40	-0.2 (3.5), 48
Mensink, 2003	24	24	-2.30 (-3.99, -0.61)	-2.4 (4.4), 40	-0.1 (3.5), 48
Moore, 2003	12	12	1.00 (-1.90, 3.90)	-0.5 (.), 279	-0.9 (.), 286
Moore, 2003	18	12	1.30 (-1.80, 4.40)	0.0 (.), 256	-0.7 (.), 275
Puhkala, 2015	12	12	-4.00 (-6.20, -1.90)	-3.4 (6.6), 47	0.7 (3.9), 48
Puhkala, 2015	24	12	-0.50 (-3.80, 2.90)	-3.1 (9.0), 37	-2.5 (5.9), 43
Rock, 2015	12	24	-4.10 (-5.19, -3.01)	-5.3 (6.8), 297	-1.2 (6.7), 288
Rock, 2015	18	24	-3.20 (-4.30, -2.10)	-4.4 (6.7), 278	-1.2 (6.4), 262
Rock, 2015	24	24	-2.40 (-3.49, -1.31)	-3.6 (6.8), 300	-1.2 (6.7), 287
Rosas, 2015	12	24	-0.70 (-2.49, 1.09)	-1.4 (4.9), 84	-0.7 (4.8), 41
Rosas, 2015	24	24	-0.40 (-3.09, 2.29)	-1.0 (7.9), 84	-0.6 (6.8), 41
Ross, 2012	12	24	-1.56 (-2.53, -0.59)	-2.4 (5.4), 249	-0.9 (5.6), 241
Ross, 2012	18	24	-0.97 (-2.12, 0.18)	-1.7 (6.6), 249	-0.7 (6.4), 241
Ross, 2012	24	24	-0.58 (-1.73, 0.57)	-1.2 (6.6), 249	-0.6 (6.4), 241
Stevens, 2001	18	36	-2.70 (-3.30, -2.10)	-2.0 (5.8), 545	0.7 (4.2), 551
Stevens, 2001	36	36	-1.90 (-2.60, -1.30)	-0.2 (5.9), 547	1.8 (5.3), 554
Svetkey, 2015	12	24	-1.33 (-3.19, 0.53)	-3.6 (.), 120	-2.3 (.), 123
Svetkey, 2015	24	24	-1.00 (-2.91, 0.90)	-2.5 (.), 120	-1.4 (.), 123
Tuomilehto, 2001	12	48	-3.40 (-4.18, -2.62)	-4.2 (5.1), 256	-0.8 (3.7), 250
Tuomilehto, 2001	24	48	-2.70 (-3.57, -1.83)	-3.5 (5.5), 256	-0.8 (4.4), 250
Tuomilehto, 2001	36	48	-2.60 (-3.59, -1.61)	-3.5 (5.1), 231	-0.9 (5.4), 203
Wadden, 2011 (Beh)	12	24	-1.10 (-2.76, 0.56)	-3.4 (6.9), 131	-2.3 (6.8), 130
Wadden, 2011 (Beh)	18	24	-1.10 (-3.04, 0.84)	-3.0 (8.0), 131	-1.9 (8.0), 130
Wadden, 2011 (Beh)	24	24	-1.20 (-3.14, 0.74)	-2.9 (8.0), 131	-1.7 (8.0), 130
Whelton, 1998	12	28	-3.60 (-3.99, -3.21)	-4.7 (2.6), 294	-1.1 (2.2), 291
Whelton, 1998	18	28	-3.60 (-4.30, -2.80)	-4.4 (2.2), 294	-0.8 (2.2), 291
Whelton, 1998	30	28	-3.90 (-5.10, -2.70)	-4.7 (4.4), 294	-0.9 (3.5), 291
Wing, 1998	12	24	-7.10 (-10.94, -3.26)	-7.4 (9.7), 30	-0.3 (4.5), 29
Wing, 1998	24	24	-2.20 (-5.51, 1.11)	-2.5 (8.4), 32	-0.3 (4.5), 31

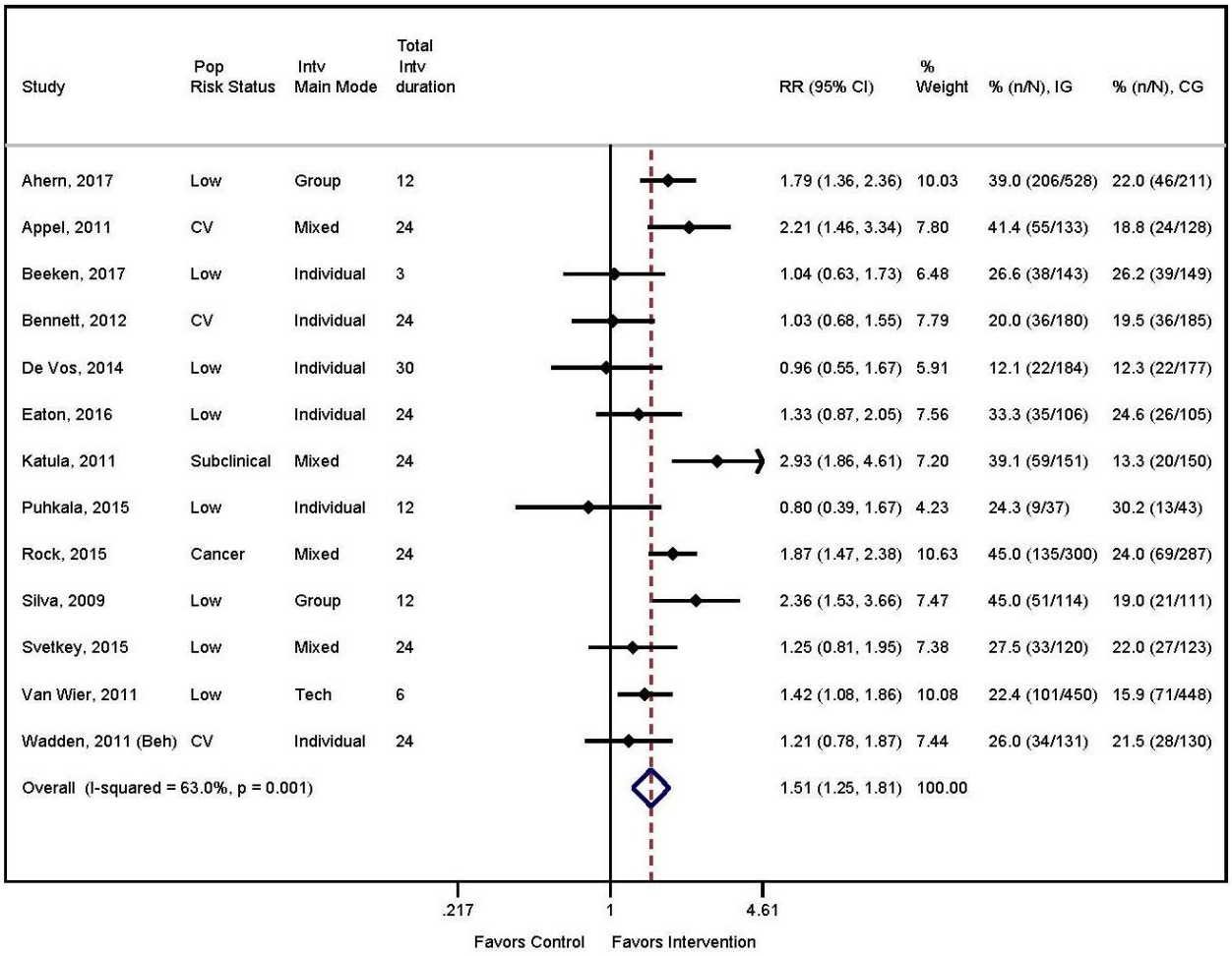
Abbreviations: BL = baseline; CG = control group; CI = confidence interval; IG = intervention group; Intv = intervention; MD = mean difference; SD = standard deviation

Figure 7. Pooled Analysis of Risk of Losing ≥5% of Body Weight at 12 to 18 Months in Behavior-Based Weight Loss Interventions Compared With Controls



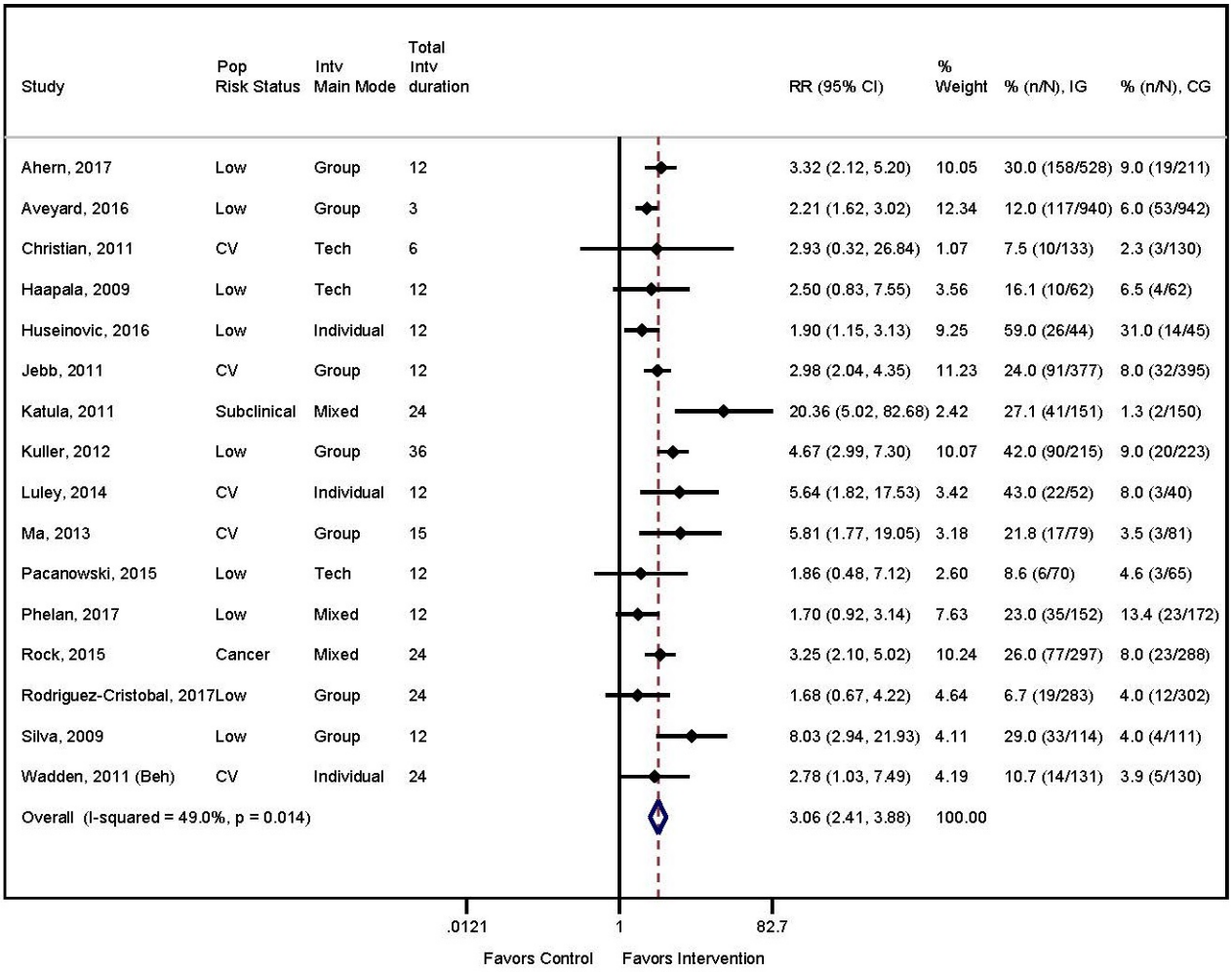
Abbreviations: Cancer = elevated cancer risk; CG = control group; CI = confidence interval; CV = increased cardiovascular risk; IG = intervention group; Intv = intervention; Low = low cardiovascular risk or unselected; Pop = population; RR = risk ratio; Subclinical = increased subclinical cardiovascular risk

Figure 8. Pooled Analysis of Risk of Losing ≥5% of Body Weight at 24 Months in Behavior-Based Weight Loss Interventions Compared With Controls



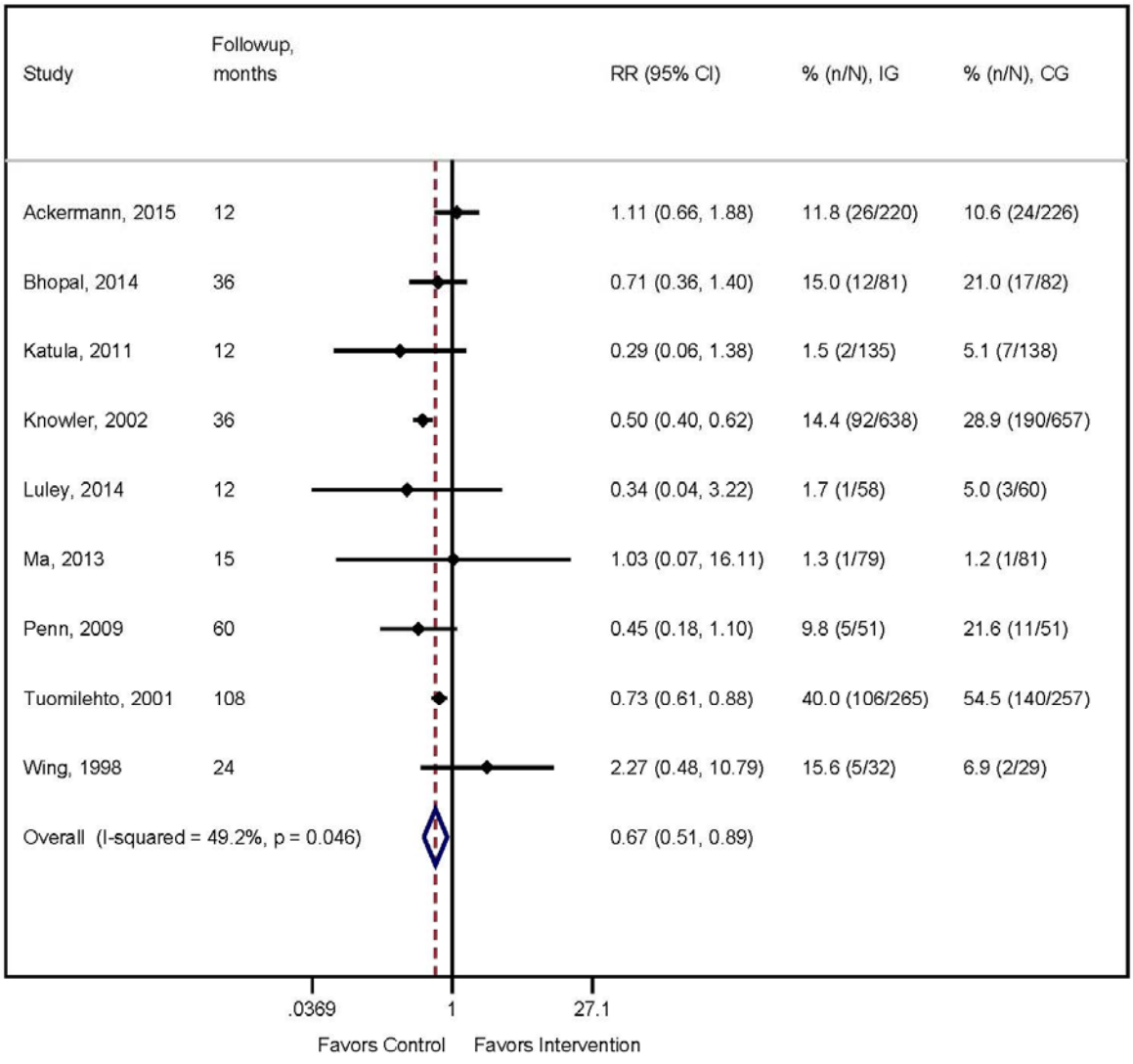
Abbreviations: Cancer = elevated cancer risk; CG = control group; CI = confidence interval; CV = increased cardiovascular risk; IG = intervention group; Intv = intervention; Low = low cardiovascular risk or unselected; Pop = population; RR = risk ratio; Subclinical = increased subclinical cardiovascular risk

Figure 9. Pooled Analysis of Risk of Losing ≥10% of Body Weight at 12 to 18 Months in Behavior-Based Weight Loss Interventions Compared With Controls



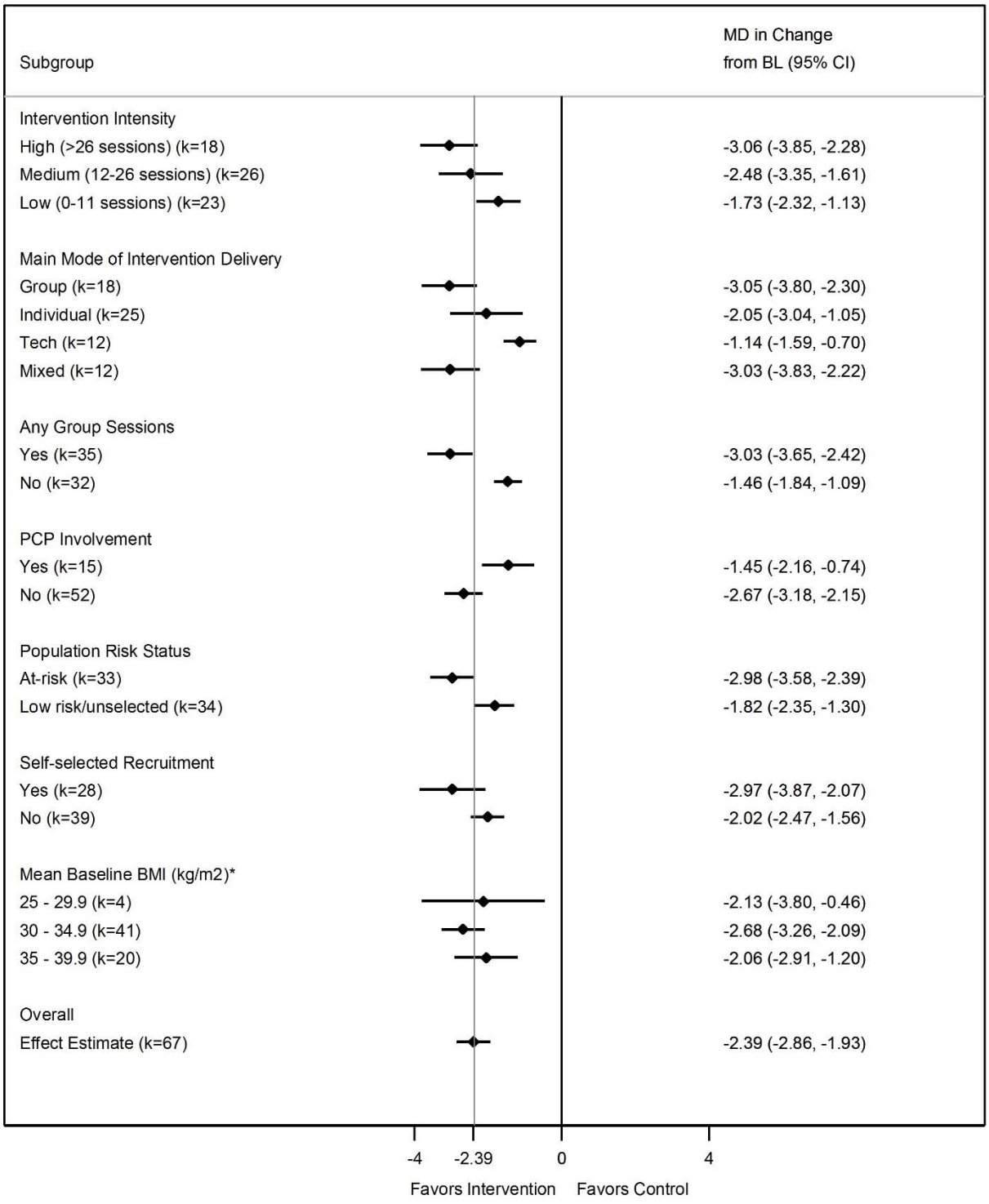
Abbreviations: Cancer = elevated cancer risk; CG = control group; CI = confidence interval; CV = increased cardiovascular risk; IG = intervention group; Intv = intervention; Low = low cardiovascular risk or unselected; Pop = population; RR = risk ratio; Subclinical = increased subclinical cardiovascular risk

Figure 10. Pooled Analysis of Risk of Developing Diabetes in Behavior-Based Weight Loss Interventions Compared With Controls



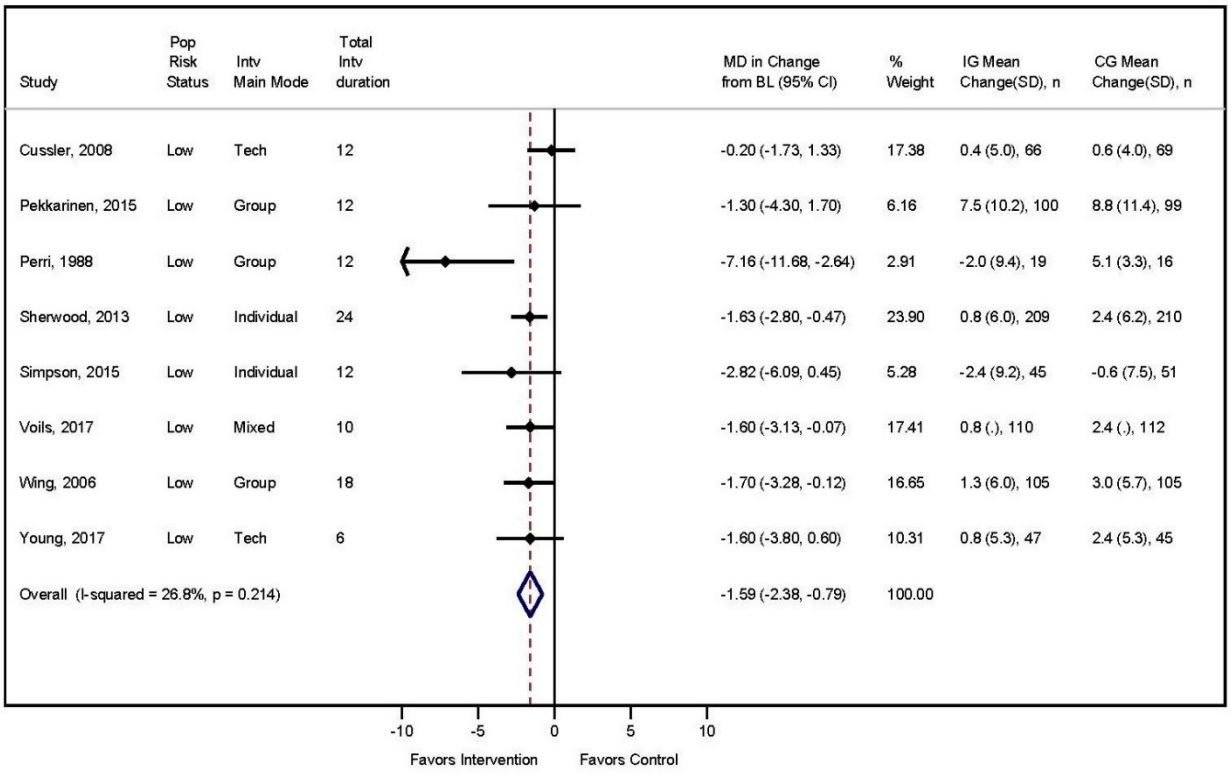
Abbreviations: CG = control group; CI = confidence interval; IG = intervention group; RR = risk ratio

Figure 11. Pooled Analysis for Prespecified Subgroups of Trials for Change in Weight at 12 to 18 Months in Behavior-Based Weight Loss Interventions Compared With Controls



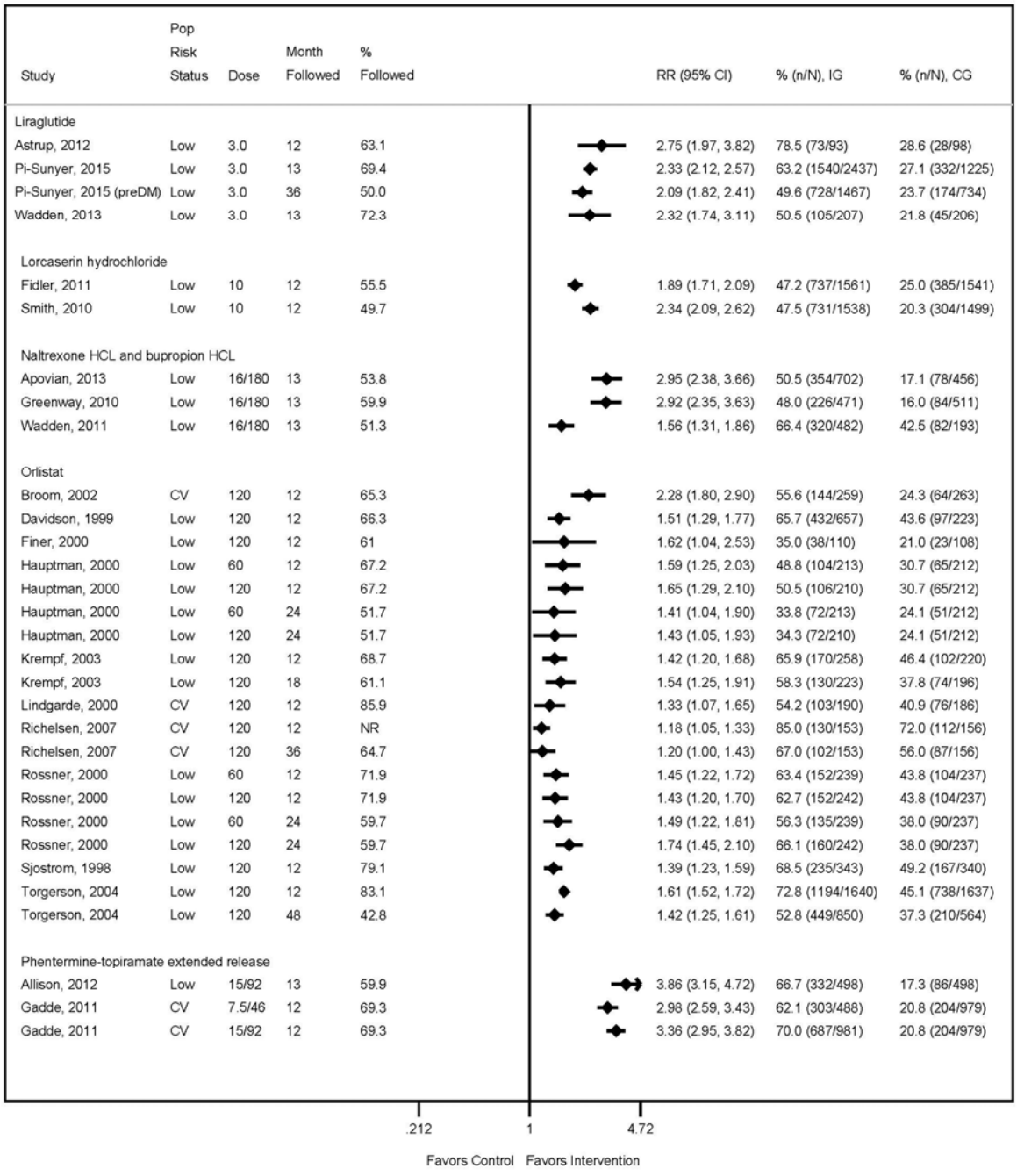
*k=65. Two trials' baseline mean BMI were not reported.
Abbreviations: BMI = body mass index; BL = baseline; CI = confidence interval; MD = mean difference; PCP = primary care provider

Figure 12. Pooled Analysis of Change in Weight at 12 to 18 Months in Behavior-Based Weight Maintenance Interventions Compared With Controls



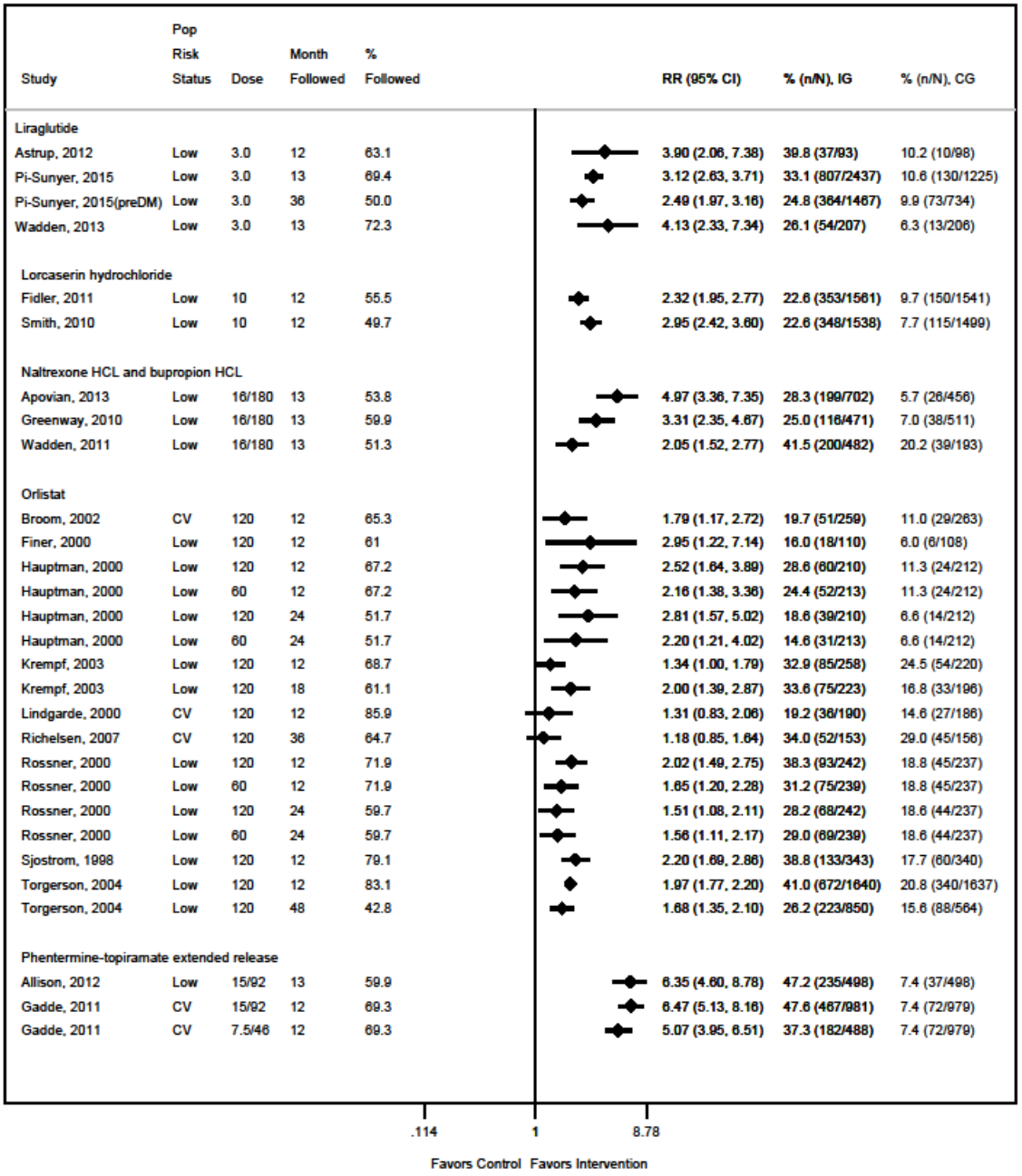
Abbreviations: BL = baseline; Cancer = elevated cancer risk; CG = control group; CI = confidence interval; CV = increased cardiovascular risk; IG = intervention group; Intv = intervention; Low = low cardiovascular risk or unselected; MD = mean difference; Pop = population; SD = standard deviation; Subclinical = increased subclinical cardiovascular risk

Figure 13. Risk of Losing ≥5% of Body Weight in Medication-Based Weight Loss Interventions Compared With Controls, All Studies and All Timepoints



Abbreviations: CG = control group; CI = confidence interval; CV = increased cardiovascular risk; IG = intervention group;; Low = low cardiovascular risk or unselected; Pop = population; RR = risk ratio

Figure 14. Proportion of Participants Losing ≥10% of Body Weight in Medication-Based Weight Loss Interventions Compared With Controls With Multiple Followup Timepoints



Abbreviations: CG = control group; CI = confidence interval; CV = increased cardiovascular risk; IG = intervention group; Low = low cardiovascular risk or unselected; Pop = population; RR = risk ratio

Table 1. Recent Guidelines on the Assessment of Overweight and Obesity in Adults

Organization, year	Recommended assessment
AACE/ACE, 2016[377]	All adults should be screened annually using a BMI measurement. Waist circumference should be measured in all patients with BMI <35 kg/m^2.
Canadian Task Force, 2015[182]	Recommend measuring height and weight and calculating BMI at appropriate primary care visits.
Academy of Nutrition and Dietetics, 2015[142]	All adult patients should have annual height and weight to calculate BMI and annual waist circumference
NICE, 2014[144]	Use BMI as a practice estimate of adiposity. Supplement with waist circumference for BMI <35. Interpret BMI with caution in patients of Asian origin, older adults, and muscular adults.
AHA/ACC/TOS, 2013[156]	Measure height and weight and calculate BMI at annual visits or more frequently. Measure waist circumference at annual visits or more frequently in overweight and obese adults.

Abbreviations: AACE = American Academy of Clinical Endocrinologists; ACC = American College of Cardiology; ACE = American College of Endocrinology; AHA = American Heart Association; BMI = body mass index; k/m^2 = kilograms per meters squared; NICE = National Institute for Health and Care Excellence; TOS = The Obesity Society

Table 2. Characteristics for All Trials, by Intervention Type and Author

Type	Author, year	Study name	PR	Quality	N rand	% FU (mos)	Study duration	Country	KQ1	KQ2	KQ3
Behavior-based weight loss interventions	Ackermann, 2008[214]	DEPLOY		Fair	92	67.4 (12)	12	US		X	
	Ackermann, 2015[215]	RAPID-YDPP		Fair	509	84.5 (12)	12	US		X	X
	Ahern, 2017[323]	WRAP		Fair	1267	64.9 (12)	12	UK	X	X	X
	Anderson, 2014[217]	BeWEL		Good	329	92.7 (12)	12	UK		X	X
	Appel, 2011[219]	POWER Hopkins		Good	415	85.5 (12)	24	US	X	X	X
	Aveyard, 2016[221]			Fair	1882	75.4 (12)	12	UK		X	
	Beeken, 2017[318]	10TT	X	Fair	537	59.2 (12)	24	UK		X	
	Bennett, 2012[224]	Be Fit, Be Well [POWER]		Good	365	69.3 (12)	24	US		X	X
	Bhopal, 2014[225]	PODOSA		Good	171	97.7 (36)	36	UK		X	X
	Burke, 2005[228]	ADAPT	X	Fair	241	79.7 (16)	40	Australia		X	
	Cadmus-Bertram, 2016[229]	HELP		Fair	105	83.8 (12)	12	US		X	
	Chirionos, 2016[230]	CHARMS		Fair	120	77.5 (12)	12	US		X	
	Christian, 2011[231]			Fair	279	94.3 (12)	12	US		X	
	Cohen, 1991[232]		X	Fair	30	100 (12)	12	US		X	
	de Vos, 2014[234]	PROOF		Fair	407	90.4 (12)	80	The Netherlands	X	X	
	Demark-Wahnefried, 2014[235]	DAMES		Good	136	94.1 (12)	12	US	X	X	X
	Eaton, 2016[237]	Choose to Lose		Fair	211	75.4 (12)	24	US		X	X
	Fischer, 2016[319]			Fair	163	96.3 (12)	12	US		X	
	Fitzgibbon, 2010[240]	ORBIT	X	Fair	213	89.2 (18)	18	US		X	
	Godino, 2016[242]	SMART		Good	404	93.3 (12)	24	US		X	X
	Greaves, 2015[243]	Waste the Waist		Fair	108	88.9 (12)	12	UK	X	X	
	Haapala, 2009[245]		X	Fair	125	68.0 (12)	12	Finland		X	
	Hunt, 2014[249]	FFIT		Good	748	92.0 (12)	12	Scotland	X	X	X
	Huseinovic, 2016[250]			Fair	110	80.9 (12)	12	Sweden		X	
	Jakicic, 2011[251]			Fair	269	72.9 (18)	18	US		X	X
	Jansson, 2013[252]			Fair	133	70.7 (12)	24	Sweden	X	X	
	Jebb, 2011[253]			Fair	772	57.6 (12)	24	Germany, UK, Australia		X	X
	Jeffery, 1993[254]	Trial of Food Provision and Monetary Incentives	X	Fair	202	87.0 (12)	30	US		X	
	Jenkins, 2017[320]			Fair	919	64.7 (18)	18	Canada			X

Table 2. Characteristics for All Trials, by Intervention Type and Author

Type	Author, year	Study name	PR	Quality	N rand	% FU (mos)	Study duration	Country	KQ1	KQ2	KQ3
	Jolly, 2011[255]	Lighten Up		Fair	740	68.0 (12)	12	UK		X	
	Jones, 1999[256]	HOT	X	Fair	112	91.1 (30)	30	US		X	
	Kanke, 2015[257]			Fair	50	80.0 (12)	12	Japan		X	
	Katula, 2011[258]	HELP PD		Good	301	90.7 (12)	24	US		X	X
	Knowler, 2002[205]	DPP	X	Good	2161	95.0 (12)	55	US	X	X	X
	Kuller, 2012[261]	WOMAN		Good	508	89.8 (18)	48	US		X	
	Kulzer, 2009[262]	PREDIAS	X	Fair	182	90.7 (12)	12	Germany	X	X	
	Kumanyika, 2012[328]			Fair	261	71.6 (12)	12	US		X	X
	Little, 2016[264]			Fair	818	81.4 (12)	12	UK		X	X
	Logue, 2005[324]	REACH		Fair	665	65.0 (12)	24	US		X	
	Luley, 2014[265]			Fair	184	76.6 (12)	12	Germany		X	
	Ma, 2013[266]	E-LITE		Good	241	91.7 (15)	24	US		X	X
	Marrero, 2016[267]			Fair	225	77.8 (12)	12	US		X	
	Martin, 2008[269]		X	Fair	144	64.6 (12)	18	US		X	
	Mensink, 2003[325]	SLIM	X	Fair	114	80.7 (24)	24	The Netherlands		X	X
	Mitsui, 2008[270]		X	Fair	46	93.5 (12)	12	Japan		X	
	Moore, 2003[271]		X	Fair	843	67.0 (12)	18	UK		X	
	Morgan, 2011[272]	SHED-IT		Fair	65	70.8 (12)	12	Australia		X	
	Nakade, 2012[274]	SCOP		Fair	235	96.2 (12)	24	Japan		X	
	Nanchahal, 2012[275]	CAMWEL		Fair	381	57.0 (12)	12	UK	X	X	
	Narayan, 1998[276]		X	Fair	95	92.6 (12)	12	US		X	
	Nicklas, 2014[277]	Balance after Baby		Fair	75	80.0 (12)	12	US		X	
	Nilsen, 2011[327]			Fair	213	85.4 (18)	18	Norway		X	
	O'Brien, 2017[321]	PREVENT-DM		Good	63	92.1 (12)	12	US		X	X
	Ockene, 2012[278]	LLDPP		Fair	312	92.6 (12)	12	US	X	X	X
	Pacanowski, 2015[279]			Fair	162	83.3 (12)	24	US		X	
	Parikh, 2010[280]	HEED	X	Fair	99	72.7 (12)	12	US		X	
	Patrick, 2011[281]			Fair	441	70.1 (12)	12	US		X	
	Penn, 2009[283]	EDIPS-Newcastle		Fair	102	80.4 (12)	60	UK		X	
	Phelan, 2017[330]			Good	371	81.9 (12)	12	US		X	X
	Puhkala, 2015[286]			Fair	113	84.1 (12)	24	Finland		X	
	Rock, 2007[289]			Fair	70	92.9 (12)	12	US	X	X	X
	Rock, 2015[288]	ENERGY		Good	697	84.2 (24)	24	US		X	
	Rodriguez-Cristobal, 2017[329]	IMOAP		Fair	864	67.6 (12)	24	Spain		X	
	Rosas, 2015[290]	VAFO		Good	207	83.6 (12)	24	US		X	X
	Ross, 2012[291]	PROACTIVE		Fair	490	80.8 (24)	24	Canada		X	X

Table 2. Characteristics for All Trials, by Intervention Type and Author

Type	Author, year	Study name	PR	Quality	N rand	% FU (mos)	Study duration	Country	KQ1	KQ2	KQ3
	Shapiro, 2012[293]	Text4Diet		Fair	170	76.5 (12)	12	US		X	
	Silva, 2009[295]		X	Fair	239	87.0 (12)	24	Portugal		X	
	Stevens, 1993[300]	TOHP I	X	Good	564	93.6 (18)	18	US		X	
	Stevens, 2001[301]	TOHP II	X	Good	1191	92.0 (18)	48	US	X	X	
	Svetkey, 2015[302]	CITY		Good	365	89.0 (12)	24	US		X	
	Thomas, 2017[322]			Good	271	86.3 (12)	12	US		X	
	Tsai, 2010[305]			Good	50	94.0 (12)	12	US		X	X
	Tuomilehto, 2001[306]	Finnish DPS	X	Good	523	96.9 (12)	126	Finland	X	X	
	van Wier, 2011[308]	ALIFE@ WORK		Fair	1386	57.6 (24)	24	The Netherlands		X	
	von Gruenigen, 2012[310]	SUCCEED		Fair	75	78.7 (12)	12	US	X	X	
	Wadden, 2011[206]	POWER-UP		Good	261	85.1 (12)	24	US	X	X	X
	Whelton, 1998[326]	TONE	X	Good	585	86.0 (18)#	30	US	X	X	
	Wing, 1998[314]			Fair	154	77.9 (12)	24	US		X	
	Wylie-Rosett, 2001[315]			Fair	588	80.6 (12)	12	US	X	X	
	Yeh, 2016[316]			Fair	60	96.7 (12)	12	US		X	
Behavior-based weight loss maintenance interventions	Cussler, 2008[233]	HW4L	X	Fair	135	82.2 (12)	12	US		X	
	Pekkarinen, 2015[282]			Fair	201	81.6 (12)	24	Finland	X	X	X
	Perri, 1988[284]		X	Fair	123	74.0 (18)	18	US		X	
	Sherwood, 2013[294]	Keep It Off		Good	419	86.6 (12)	24	US		X	
	Simpson, 2015[296]	WILMA		Fair	166	83.7 (12)	12	UK	X	X	X
	Svetkey, 2008[303]	WLM	X	Good	1032	95.4 (12)	60	US		X	
	Voils, 2017[309]			Fair	222	85.1 (13)	13	US		X	X
	Wing, 2006[313]	STOP		Fair	314	92.4 (12)	18	US		X	
	Young, 2017[317]			Good	92	82.6 (12)	36	Australia		X	
Medication-based Weight loss interventions	Acharya, 2006[213]		X	Fair	NA	NA†	12	UK			X
	Allison, 2012[216]	EQUIP		Fair	1026	59.9 (13)	13	US		X	X
	Apovian, 2013[218]	COR-11		Fair	1496	53.8 (13)	13	US	X	X	X
	Aronne, 2013[168]	EQUATE		Fair	324	99.7 (6)	6	US			X
	Astrup, 2012[220]			Fair	191	63.1 (12)	24	Europe‡	X	X	X
	Bakris, 2002[222]	Orlistat and Resistant Hypertension	X	Fair	554	96.6 (12)	12	US			X
	Broom, 2002[226]	Orlistat UK Study	X	Fair	142	96.5 (6)	12	UK			X
	Broom, 2002[227]	UK Multimorbidity Study	X	Fair	531	65.3 (12)	12	UK		X	X
	Davidson, 1999[160]		X	Fair	892	66.3 (12)	24	US		X	X

Table 2. Characteristics for All Trials, by Intervention Type and Author

Type	Author, year	Study name	PR	Quality	N rand	% FU (mos)	Study duration	Country	KQ1	KQ2	KQ3
	Derosa, 2003[236]		X	Fair	50	96.0 (12)	12	Italy		X	X
	Farr, 2016[238]			Fair	48	75.0 (1)	1	US			X
	Fidler, 2011[173]	BLOSSOM		Fair	3203	55.5 (12)	12	US	X	X	X
	Finer, 2000[239]		X	Fair	228	61.0 (12)	12	UK		X	X
	Gadde, 2011[241]	CONQUER/ SEQUEL		Fair	2487	69.3 (12)	25	US	X	X	X
	Greenway, 2010[244]	COR-1		Fair	1164	59.9 (13)	13	US	X	X	X
	Hauptman, 2000[246]		X	Fair	635	67.2 (12)	24	US		X	X
	Hong, 2013[248]			Fair	193972	NR	NA†	UK			X
	Kim, 2013[259]			Fair	68	75.0 (3.5)	4	US			X
	Krempf, 2003[260]		X	Fair	696	61.1 (18)	18	France		X	X
	Lindgarde, 2000[263]	Swedish Multimorbidity Study	X	Fair	376	85.9 (12)	12	Sweden		X	X
	Martin, 2011[268]			Fair	57	91.2 (2)	2	US			X
	Muls, 2001[273]	ObelHyx	X	Fair	294	86.7 (6)	12	Belgium			X
	Pi-Sunyer, 2015[285]	SCALE Obesity and Prediabetes		Fair	3731	69.4 (13)	36	Multisite§	X	X	X
	Rossner, 2000[292]		X	Fair	729	71.9 (12)	24	Europe	X	X	X
	Sjostrom, 1998[297]		X	Fair	688	79.1 (12)	24	Europe‖		X	X
	Smith, 2010[172]	BLOOM		Fair	3182	49.7 (12)	24	US	X	X	X
	Smith, 2011[298]			Fair	131	96.9 (6)		US, Sweden			X
	Smith, 2012[299]			Fair	435	57.9 (6)	6	US			X
	Swinburn, 2005[304]		X	Fair	339	79.4 (12)	12	Australia, New Zealand	X	X	X
	Torgerson, 2004[161]	XENDOS	X	Fair	3305	83.1 (12)	48	Sweden		X	X
	Van Gaal, 1998[307]	Orlistat Dose-Ranging Study Group	X	Fair	367	79.1 (6)	6	Europe¶			X
	Wadden, 2011[311]	COR-BMOD		Fair	793	51.3 (13)	12	US	X	X	X

Table 2. Characteristics for All Trials, by Intervention Type and Author

Type	Author, year	Study name	PR	Quality	N rand	% FU (mos)	Study duration	Country	KQ1	KQ2	KQ3
Medication-based weight loss maintenance interventions	Hill, 1999[247]		X	Fair	542	73.7 (12)	12	US		X	X
	Richelsen, 2007[287]		X	Fair	309	64.7 (36)	36	Scandinavia		X	X
	Wadden, 2013[312]	SCALE Maintenance		Fair	422	72.3 (13)	16	US, Canada		X	X

* All but two studies[213, 248] were RCTs
† Not RCT
‡ 8 EU countries
§ 27 countries
‖ 15 EU sites, specific countries NR
¶ Austria, Belgium, Brazil, Finland, Germany, Italy, Sweden, Switzerland, and UK
# For full sample, including overweight and non-overweight participants

Abbreviations: 10TT = Ten Top Tips; ADAPT = Activity, Diet and Blood Pressure Trial; BLOOM = Behavioral Modification and Lorcaserin for Overweight and Obesity Management; CAMWEL = Camden Weight Loss; BLOSSOM = Behavioral Modification and Lorcaserin Second Study for Obesity Management; CHARMS = Community Health and Risk-reduction for Metabolic Syndrome; CITY = Cell Phone Intervention for You; COR-1 = Contrave Obesity Research-1; COR-11 = CONTRAVE Obesity Research-II; COR-BMOD = Contrave Obesity Research - Behavior Modification; DAMES = Daughters And Mothers Against Breast Cancer; DEPLOY = Diabetes Education & Prevention with a Lifestyle Intervention offered at the YMCA; DPP = Diabetes Prevention Program; DPS = Diabetes Prevention Study; EDIPS = European Diabetes Prevention Study; E-LITE = Evaluation of Lifestyle Interventions to Treat Elevated Cardiometabolic Risk in Primary Care; ENERGY = Exercise and Nutrition to Enhance Recovery and Good Health for You; FFIT = Football Fans in Training; FU = followup; HEED = Project Help Educate to Eliminate Diabetes; HELP PD = Healthy Partnerships to Prevent Diabetes; HOT = Hypertension Optimal Treatment; HW4L = Healthy Weight for Life; IMOAP = Group motivational intervention in overweight/obese patients in primary prevention of cardiovascular disease in the primary healthcare area; KQ = key question; LLDPP = Lawrence Latino Diabetes Prevention Project; mos = months; ObelHyx = Obesity Linked with Hypercholesterolemia treated with Xenical; ORBIT = Obesity Reduction Black Intervention; PODOSA = Prevention of Diabetes and Obesity in South Asians; POWER = Practice Based Opportunities for Weight Reduction; POWER-UP = Practice-based Opportunities for Weight Reduction at the University of Pennsylvania; PREDIAS = Prevention of Diabetes Self-Management Program; PROACTIVE = Prevention and Reduction of Obesity through Active Learning; PR = previous review; PREVENT-DM = The Promotora Effectiveness Versus Metformin Trial; PROOF = Prevention of Knee Osteoarthritis in Overweight Females; rand = randomized; RAPID-YDPP = Reaching Out to Prevent Increases in Diabetes - YMCA model for Diabetes Prevention Program; REACH = Reasonable Eating and Activity to Change Health; SCOP = Saku Control Obesity Program; SHED-IT = Self-Help, Exercise, and Diet using Information Technology; SLIM = Study on lifestyle-intervention and impaired glucose tolerance Maastricht; SMART = Social Mobile Approaches to Reduce weighT; STOP = Study to Prevent Regain; SUCCEED = Survivors of Uterine Cancer Empowered by Exercise and Healthy Diet; TOHP = Trials of Hypertension Prevention Phase; TONE = Group motivational intervention in overweight/obese patients in primary prevention of cardiovascular disease in the primary healthcare area; UK = United Kingdom; US = United States; VAFO = Vivamos Activos Fair Oaks; WILMA = Weight Loss Maintenance in Adults; WLM = Weight Loss Maintenance; WOMAN = Women on the Move through Activity and Nutrition; WRAP = Weight-loss programme referrals for adults in primary care; XENDOS = XENical in the prevention of Diabetes in Obese Subjects

Table 3. Population Characteristics for All Included Trials, Sorted by Intervention Type and Author

Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
Behavior-based weight loss	Ackermann, 2008[214] (DEPLOY)	Adults with prediabetes	Sub CV Risk	92	Yes	≥24	31.4 (5.0)	NR	58.3	55.4	White: 81.5 Black: 12.0 Hisp: 3.3 Other: 5.4	Prediabetes: 100
	Ackermann, 2015[215] (RAPID-YDPP)	Adults with prediabetes, aged ≥18 years	Sub CV Risk	509	No	≥24	36.8 (8.5)	NR	51.0	70.7	White: 35.0 Black: 57.0 Hisp: 3.1 Other: 4.9	Prediabetes: 100
	Ahern, 2017[323] (WRAP)	Adults aged ≥18 years	Low Risk/ Unselected	1267	No	≥28	34.5 (5.2)	110.4	53.2	67.8	White: 89.7 Black: 1.8 Asian: 2.8 Other: 1.2	NR
	Anderson, 2014[217] (BeWEL)	Adults with screen-detected colorectal adenoma, aged 50-74 years	Cancer Risk	329	No	>25	30.7 (4.2)	104.3	63.6	26.1	White: 99.4 Asian: 0.3 Other: 0.3	Diabetes: 14.0
	Appel, 2011[219] (POWER Hopkins)	Adults with ≥1 CV risk factor, aged >21 years	CV Risk	415	No	30-50	36.6 (5.0)	118.1	54.0	63.6	White: 56.1 Black: 41.0 Hisp: 2.2 Asian: 1.0 Other: 1.9	Diabetes: 23.1 Dyslipidemia: 67.7 Hypertension: 76.3
	Aveyard, 2016[221]	Adults, aged ≥18 years	Low Risk/ Unselected	1882	No	≥30†	34.9 (4.9)	NR	56.0	57.2	White: 94.9 Black: 1.5 Asian: 2.6 AI/NA: 0.0 Other: 0.7	NR
	Beeken, 2017[318] (10TT)	Adults, aged ≥ 18 years	Low Risk/ Unselected	537	No	≥ 30	35.0 (NR)	111.5	59.4	65.7	White: 94.9 Black: 1.9 Asian: 2.2 Other: 0.9	NR
	Bennett, 2012[224] (Be Fit, Be Well [POWER])	Adults with hypertension, aged ≥21 years	CV Risk	365	No	30-50	37.0 (5.1)	NR	54.6	68.5	White: 3.6 Black: 71.2 Hisp: 13.2 Asian: 1.1 AI/NA: 1.6 Other: 0.8	Hypertension: 100

Table 3. Population Characteristics for All Included Trials, Sorted by Intervention Type and Author

Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
	Bhopal, 2014[225] (PODOSA)	South Asian adults with prediabetes, aged ≥35 years	Sub CV Risk	171	No	NR‡	30.5 (4.8)	103.0	52.5	54.4	Other: 100	Prediabetes: 100
	Burke, 2005[228] (ADAPT)	Adults with hypertension, aged 40-70 years	CV Risk	241	Yes	>25	30.1 (2.7)	95.2	56.2	55.6	NR	Diabetes: 0 Hypertension: 100
	Cadmus-Bertram, 2016[229] (HELP)	Women with history of breast cancer or elevated risk, aged 40-75 years	Cancer Risk	105	No	≥27.5	32.1 (4.0)	NR	60.2	100	White: 86.6	NR
	Chirionos, 2016[230] (CHARMS)	Adults with metabolic syndrome, ages 30-70 years	CV Risk	120	NR	≥25	NR	104.9	51.7	55.8	White: 5.0 Black: 10.9 Hisp: 84.0 Asian: 0 AI/NA: 0 Other: 0	Diabetes: 0
	Christian, 2011[231]	Adults with ≥2 components of the metabolic syndrome, aged 18-75 years	CV Risk	279	No	≥25	34.3 (7.4)	115.3	49.6	68.4	White: 50.6 Hisp: 44.1 Other: 5.3	Diabetes: 0
	Cohen, 1991[232]	Adults with hypertension, aged 20-75 years	CV Risk	30	No	≥27.8 (men), ≥27.3 (women)	34.1 (NR)	NR	59.5	73.3	NR	Hypertension: 100
	de Vos, 2014[234] (PROOF)	Women, aged 50-60 years, free of knee osteoarthritis	Low Risk/ Unselected	407	No	≥27.0	32.4 (4.3)	105.5	55.7	100	White: 93.4 Black: 0.6 Asian: 1.4 Other: 4.6	Hypertension: 71.5
	Demark-Wahnefried, 2014[235] (DAMES)	Mother/daughter dyads (postmenopausal breast cancer survivor and her adult daughters)	Cancer Risk	136	Yes	25-39.9	31.0 (2.6)	96.1	61.3	100	White: 74.0 Black: 18.0 Hisp: 7.0 Asian: 1.0 AI/NA: 0.0 Other: 0.0	NR

Table 3. Population Characteristics for All Included Trials, Sorted by Intervention Type and Author

Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
	Eaton, 2016[237] (Choose to Lose)	Adults, aged 18-79 years	Low Risk/ Unselected	211	No	≥25	37.7 (6.6)	115.4	48.5	79.2	White: 82.9 Black: 9.5 Hisp: 4.3 Other: 3.3	Diabetes: 16.6 Dyslipidemia: 41.7 Hypertension: 49.3
	Fischer, 2016[319]	Prediabetic adults, aged ≥ 18 years	Sub CV Risk	163	No	25-50	NR	NR	46.4	75.8	NR	Diabetes: 0 Prediabetes: 100
	Fitzgibbon, 2010[240] (ORBIT)	African American women, aged 30-65 years	Low Risk/ Unselected	213	Yes	30-50	39.2 (5.7)	NR	46.0	100	White: 0 Black: 100 Asian: 0 AI/NA: 0 Other: 0	NR
	Godino, 2016[242] (SMART)	College students, aged 18 to 35 years	Low Risk/ Unselected	404	Yes	≥25.0-34.9	29.0 (2.7)	87.8	22.7	70.3	White: 41.8 Black: 3.7 Hisp: 30.9 Asian: 23.8 AI/NA: 1.5 Other: 20.0	NR
	Greaves, 2015[243] (Waste the Waist)	Adults with ≥1 CV risk factor, aged 40–74 years	CV Risk	108	No	≥28	32.7 (3.1)	110.0	65.1	30.6	White: 100 Black: 0 Asian: 0 AI/NA: 0 Other: 0	Diabetes: 0 Prediabetes: 8.5
	Haapala, 2009[245]	Adults, aged 25-44 years	Low Risk/ Unselected	125	Yes	26-36	30.5 (2.7)	97.6	38.1	77.4	NR	Diabetes: 0
	Hunt, 2014[249] (FFIT)	Men, aged 35-65 years	Low Risk/ Unselected	748	Yes	≥28.0	35.3 (4.9)	118.4	47.1	0	White: 98.4 Other: 0.9	NR
	Huseinovic, 2016[250]	Postpartum women	Low Risk/ Unselected	110	Yes	≥27	31.7 (3.7)	97.8	32.2	100	NR	NR
	Jakicic, 2011[251]	Adults, aged 18-55 years	Low Risk/ Unselected	269	Yes	25-29.9	27.1 (1.7)	90.4	44.4	91.4	White: 79.8 Black: 14.9 Hisp: 1.6 Asian: 1.2 AI/NA: 0.4 Other: 1.6	NR
	Jansson, 2013[252]	Adults, aged 18-70 years	Low Risk/ Unselected	133	No	NR§	33.7 (NR)	NR	47.0	72.2	NR	Diabetes: 13.5 Dyslipidemia: 33.1 Hypertension: 36.8

Table 3. Population Characteristics for All Included Trials, Sorted by Intervention Type and Author

Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
	Jebb, 2011[253]	Adults with ≥1 risk factor for obesity-related disease, aged ≥18 years	CV Risk	772	No	27–35	31.4 (2.6)	99.9	47.4	86.5	NR	Diabetes: 6.6
	Jeffery, 1993[254] (Trial of Food Provision and Monetary Incentives)	Adults, aged 25-45 years	Low Risk/ Unselected	202	Yes	NR‖	31.0 (NR)	NR	37.5	50.0	White: 92.1 Other: 7.9	NR
	Jenkins, 2017[320]	Adults, aged ≥ 18 years	Low Risk/ Unselected	919	Yes	>25	32.4 (NR)	101.4	44.7	77.3	White: 60.0 Other: 28.7	Diabetes: 0
	Jolly, 2011[255] (Lighten Up)	Adults, aged ≥18 years	Low Risk/ Unselected	740	No	≥30¶	33.8 (3.8)	NR	49.3	69.3	White: 87.5 Black: 6.0 Asian: 3.0 Other: 3.5	NR
	Jones, 1999[256] (HOT)	Adults with hypertension, aged 50-80 years	CV Risk	112	NR	≥27	34.0 (6.0)	NR	58.0	52.0	White: 59.8 Black: 40.2	Diabetes: 0 Hypertension: 100
	Kanke, 2015[257]	Japanese adults with ≥1 CV risk factor, aged 30-69 years	CV Risk	50	No	≥25	NR	NR	NR	36.0	Asian: 100	Diabetes: 16.0 Dyslipidemia: 38.0 Hypertension: 84.0
	Katula, 2011[258] (HELP PD)	Adults with prediabetes, aged ≥21 years	Sub CV Risk	301	Yes	25-39.9	32.7 (4.0)	104.7	57.9	57.5	White: 74.0 Black: 24.7 Hisp: 1.3 Other: 1.3	Diabetes: 0 Prediabetes: 100 Hypertension: 0
	Knowler, 2002 (DPP)	Adults with prediabetes, aged ≥25 years	Sub CV Risk	2161	Yes	≥24	34.0 (6.7)	105.1	50.4	68.5	White: 54.0 Black: 19.6 Hisp: 16.0 Asian: 5.0 AI/NA: 5.5	Diabetes: 0 Prediabetes: 100 Dyslipidemia: 44.1 Hypertension: 30.0

Table 3. Population Characteristics for All Included Trials, Sorted by Intervention Type and Author

Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
	Kuller, 2012[261] (WOMAN)	Postmenopausal women, current or recent users of hormone therapy, aged 52-62 years	Low Risk/ Unselected	508	Yes	25-39.9	30.8 (3.8)	105.9	57.0	100	White: 88.0 Black: 11.0	Diabetes: 0 Dyslipidemia: 0 Hypertension: 0
	Kulzer, 2009[262] (PREDIAS)	Adults with prediabetes, aged 20-70 years	Sub CV Risk	182	NR	≥26	31.5 (5.3)	106.6	56.3	43.0	NR	Diabetes: 0 Prediabetes: 100
	Kumanyika, 2012[328]	Adults with obesity, ages 18-70 years	Low Risk/ Unselected	261	No	27-55	37.2 (6.4)	111.4	47.2	84.3	White: 18.0 Black: 65.0 Hisp: 16.0 Asian: 1.0	Diabetes: 18.4 Hypertension: 43.7
	Little, 2016[264]	Adults, aged ≥18 years	Low Risk/ Unselected	818	No	≥30#	36.7 (5.7)	NR	53.7	63.6	NR	Diabetes: 16.6
	Logue, 2005[324] (REACH)	Adults, aged 40-69 years	Low Risk/ Unselected	665	Yes	>27††††	NR	NR	NR	68.9	Black: 26.3	Diabetes: 13.8 Dyslipidemia: 33.4 Hypertension: 43.5
	Luley, 2014[265]	Adults with metabolic syndrome, aged 30-60 years	CV Risk	184	Yes	NR**	33.3 (5.2)	109.8	50.2	41.0	NR	Diabetes: 0
	Ma, 2013[266] (E-LITE)	Adults with prediabetes or metabolic syndrome, aged ≥18 years	CV Risk	241	No	≥25	32.0 (5.4)	106.3	52.9	46.5	White: 78.0 Hisp: 4.1 Asian: 17.0	Diabetes: 0 Prediabetes: 54.0
	Marrero, 2016[267]	Prediabetic adults, aged ≥18 years	Sub CV Risk	225	Yes	≥24††	36.8 (7.1)	NR	51.6	84.8	White: 64.4 Black: 25.3 Hisp: 6.0 Asian: 6.7 Other: 1.8	Diabetes: 0
	Martin, 2008[269]	African American women, aged 18-65 years	Low Risk/ Unselected	144	No	≥25	39.1 (7.7)	110.3	41.8	100	White: 0 Black: 100 Hisp: 0 Asian: 0 AI/NA: 0 Other: 0	NR

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Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
	Mensink, 2003[325] (SLIM)	Adults, aged 40-70 years	Sub CV Risk	114	No	≥25‡‡‡‡	29.5 (0.5)	102.4	56.7	43.9	White: 100 Black: 0 Hisp: 0 Asian: 0 AI/NA: 0 Other: 0	Diabetes: 0 Prediabetes: 100
	Mitsui, 2008[270]	Japanese adults, aged 50-69 years	Low Risk/ Unselected	46	Yes	NR‡‡	25.2 (2.4)	93.8	63.3	54.3	Asian: NR§§	Hypertension: 17.4
	Moore, 2003[271]	Adults, aged 16-64 years	Low Risk/ Unselected	843	No	≥30	36.9 (5.7)	NR	48.6	73.9	NR	NR
	Morgan, 2011[272] (SHED-IT)	Men, aged 18–60 years	Low Risk/ Unselected	65	Yes	27-37	30.6 (2.8)	103.1	35.9	0	NR	NR
	Nakade, 2012[274] (SCOP)	Japanese adults, aged 40-64 years	Low Risk/ Unselected	235	No	≥28.4	30.6 (3.1)	102.2	54.2	50.0	White: 0 Black: 0 Hisp: 0 Asian: 100 AI/NA: 0 Other: 0	Dyslipidemia: 56.2 Hypertension: 69.5
	Nanchahal, 2012[275] (CAMWEL)	Adults, aged ≥18 years	Low Risk/ Unselected	381	No	≥25	33.5 (5.5)	106.7	48.8	72.2	White: 72.6	Diabetes: 12.3
	Narayan, 1998[276]	Gila River Indian Community adults, aged 25-54 years	Low Risk/ Unselected	95	Yes	≥27 (men), ≥25 (women)	34.9 (NR)	113.0	33.5	75.8	White: 0 Black: 0 Asian: 0 AI/NA: 100 Other: 0	Diabetes: 0
	Nicklas, 2014[277] (Balance after Baby)	Postpartum (6 weeks) women with prior gestational diabetes mellitus, aged 18-45 years	Sub CV Risk	75	No	≥24‖‖	31.4 (5.6)	NR	33.4	100	White: 57.3 Black: 30.7 Hisp: 20.0 Asian: 12.0	Diabetes: 0 Prediabetes: 32.0
	Nilsen, 2011[327]	Adults, aged 18-64 years	Sub CV Risk	213	No	NA§§§§	36.8 (6.0)	NR	46.5	50.0	NR	Diabetes: 0 Hypertension: 73.7

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Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
	O'Brien, 2017[321] (PREVENT-DM)	Hispanic women with prediabetes, aged ≥20 years	Sub CV Risk	63	Yes	≥23	33.4 (7.0)	98.3	44.8	100	White: 0 Black: 0 Hisp: 100 Asian: 0 AI/NA: 0 Other: 0	Diabetes: 0 Prediabetes: 100 Dyslipidemia: NR Hypertension: NR
	Ockene, 2012[278] (LLDPP)	Latino/Hispanic adults at risk of developing diabetes aged ≥25 years	Sub CV Risk	312	No	>24	33.9 (5.5)	104.4	51.9	74.4	Hisp: 100	Diabetes: 0
	Pacanowski, 2015[279]	Adults, ≥18 years	Low Risk/ Unselected	162	Yes	≥27	33.5 (5.0)	NR	46.6	81.9	White: 88.9 Black: 3.7 Hisp: 0.6 Asian: 1.2 AI/NA: 1.9 Other: 1.3	Diabetes: 0
	Parikh, 2010[280] (HEED)	Adults with prediabetes, aged ≥18 years	Sub CV Risk	99	Yes	≥25	31.5 (4.8)	101.6	48.0	85.0	Black: 9.0 Hisp: 89	Diabetes: 0 Prediabetes: 100 Dyslipidemia: 25.0 Hypertension: 31.0
	Patrick, 2011[281]	Men, aged 25-55 years	Low Risk/ Unselected	441	Yes	≥25	34.2 (4.1)	113.3	43.9	0	White: 71.0 Black: 5.2 Hisp: 18.1 Asian: 1.6 AI/NA: 0.5 Other: 1.6	NR
	Penn, 2009[283] (EDIPS-Newcastle)	Adults with prediabetes, aged >40 years	Sub CV Risk	102	No	>25	33.8 (5.0)	104.4	57.1	59.8	NR	Prediabetes: 100
	Phelan, 2017[330]	Low-income postpartum women, aged 18-40 years	Low Risk/ Unselected	371	No	25-40	31.7 (5.1)	98.4	28.1	100.0	Hisp: 81.6	Diabetes: 0.0
	Puhkala, 2015[286]	Men, aged 30-62 years who are truck or bus drivers	Low Risk/ Unselected	113	Yes	NR##	33.0 (4.5)	114.4	47.0	0	NR	NR

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	Rock, 2007[289]	Women	Low Risk/ Unselected	70	NR	≥25	34.0 (3.5)	111.6	41.1	100	White: 57.1 Black: 10.0 Hisp: 22.9 Asian: 2.9 Other: 7.1	NR
	Rock, 2015[288] (ENERGY)	Breast cancer survivors	Cancer Risk	697	Yes	25-45	31.5 (4.6)	104.2	56.0	100	White: 79.0 Black: 10.3 Hisp: 6.6 AI/NA: 1.6 Other: 2.2	Diabetes: 5.8
	Rodriguez-Cristobal, 2017[329] (IMOAP)	Adults, aged 30-70 years	Low Risk/ Unselected	864	No	>25	34.1 (4.8)	107.7	56.5	77.2	NR	Diabetes: 17.1 Dyslipidemia: 60.2
	Rosas, 2015[290] (VAFO)	Latino adults with ≥1 CV risk factor	CV Risk	207	No	30-60	35.6 (5.3)	NR	47.1	76.8	Hisp: 100.0	Diabetes: 43.0
	Ross, 2012[291] (PROACTIVE)	Sedentary adults	Low Risk/ Unselected	490	No	27-39***	32.3 (4.2)	106.6	51.8	70.2	NR	NR
	Shapiro, 2012[293] (Text4Diet)	Adults, aged 21-65 years	Low Risk/ Unselected	170	Yes	25.0-39.9	32.2 (4.1)	NR	41.9	65.0	White: 64.0	NR
	Silva, 2009[295]	Premenopausal women, aged 25-50 years	Low Risk/ Unselected	239	Yes	25-40	31.5 (4.1)	NR	37.6	100	NR	NR
	Stevens, 1993[300] (TOHP I)	Adults with prehypertension, aged 30-54 years	Sub CV Risk	564	NR	26.1-36.1 (men), 24.3-36.1 (women)	29.5 (2.8)	NR	42.8	31.7	White: 79.4 Black: 18.6	Diabetes: 0 Hypertension: 0
	Stevens, 2001[301] (TOHP II)	Adults with prehypertension, aged 30-54 years	Sub CV Risk	1191	Yes	26.1-37.4 (men), 24.4-37.4 (women)	31.0 (3.2)	NR	43.3	34.3	White: 78.8 Black: 17.5	Diabetes: 0 Hypertension: 0
	Svetkey, 2015[302] (CITY)	Adults, aged 18-35 years	Low Risk/ Unselected	365	Yes	≥25	35.2 (7.8)	110.0	29.4	69.6	White: 56.2 Black: 36.2 Hisp: 5.8 Other: 7.7	Hypertension: 16.2

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	Thomas, 2017[322]	Adults, aged 18-70 years	Low Risk/ Unselected	271	Yes	27-40	33.9 (3.7)	NR	55.0	77.5	White: 91.5 Black: 5.9 Hisp: 2.2 Asian: 1.1 AI/NA: 0.4	NR
	Tsai, 2010[305]	Adults	Low Risk/ Unselected	50	Yes	27–50	36.5 (1.6)	112.3	49.4	88.0	White: 20.0 Black: 80.0	Diabetes: 0
	Tuomilehto, 2001[306] (Finnish DPS)	Adults with prediabetes, aged 40-65 years	Sub CV Risk	523	Yes	>25	31.2 (4.5)	101.3	55.0	67.0	NR	Diabetes: 0 Prediabetes: 100 Dyslipidemia: 5.2 Hypertension: 30.5
	van Wier, 2011[308] ALIFE@WORK	Adults	Low Risk/ Unselected	1386	No	≥25	29.6 (3.5)	101.7	43.0	33.0	NR	NR
	von Gruenigen, 2012[310] (SUCCEED)	Endometrial cancer survivors	Cancer Risk	75	No	≥25	36.4 (7.6)	106.4	57.9	100	White: 90.7 Black: 6.7 Other: 2.7	Diabetes: 21.3 Hypertension: 33.3
	Wadden, 2011 (POWER-UP)[206]	Adults with 2 of 5 components of metabolic syndrome, aged ≥21 years	CV Risk	261	No	30-50	38.5 (4.7)	118.4	51.8	79.7	White: 59.8 Black: 37.6 Hisp: 4.6 Asian: 0.7	Diabetes: 21.0 Dyslipidemia: 65.5 Hypertension: 70.9
	Whelton, 1998[326] (TONE)	Hypertensive adults, aged 60-80 years	CV Risk	585	No	≥27.3	31.2 (2.3)	NR	66.0	52.6	White: 71.8 Black: 28.2	Hypertension: 100
	Wing, 1998[314]	Adults at risk of diabetes, ††† aged 40-55 years	Sub CV Risk	154	Yes	NR‡‡‡	35.9 (4.3)	NR	45.7	79.0	NR	Diabetes: 0
	Wylie-Rosett, 2001[315]	Adults	Low Risk/ Unselected	588	Yes	≥25§§§	35.6 (6.5)	105.2	52.1	82.3	White: 83.0	NR
	Yeh, 2016[316]	Chinese adults with prediabetes	Sub CV Risk	60	No	≥23	26.1 (2.3)	90.6	58.8	56.7	White: 0 Black: 0 Hisp: 0 Asian: 100 AI/NA: 0 Other: 0	Diabetes: 0 Prediabetes: 100

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Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
Behavior-based weight loss maintenance	Cussler, 2008[233] (HW4L)	Adult perimenopausal women, aged 40-55 years	Low Risk/ Unselected	135	Yes	25.0-38.0	30.7 (3.6)	NR	48.2	100	NR	NR
	Pekkarinen, 2015[282]	Adults, aged 18-65 years	Low Risk/ Unselected	201	No	≥35	41.7 (6.1)	NR	47.3	71.4	NR	NR
	Perri, 1988[284]	Adults, aged 22-59 years	Low Risk/ Unselected	123	Yes	NR‖‖	NR	NR	NR	78.9	NR	NR
	Sherwood, 2013[294] (Keep It Off)	Adults who lost ≥10% of their body weight during past year	Low Risk/ Unselected	419	Yes	≥20.5	28.4 (5.0)	NR	46.4	81.6	White: 91.2 Black: 5.2 Asian: 3.3 Other: 1.0	NR
	Simpson, 2015[296] (WILMA)	Adults who lost ≥5% of their weight in previous 12 months, aged 18-70 years	Low Risk/ Unselected	166	Yes	≥30	34.2 (5.9)	104.1	NR	84.3	White: 94.6 Other: 5.4	Diabetes: 18.1 Dyslipidemia: 22.9 Hypertension: 39.2
	Svetkey, 2008[303] (WLM)	Adults with ≥1 CV risk factor, aged ≥ 25 years	CV Risk	1032	Yes	25-45	34.1 (4.8)	NR	55.6	63.4	Black: 37.6 Other: 62.4	Diabetes: 0 Dyslipidemia: 40.0 Hypertension: 87.0
	Voils, 2017[309]	Veterans, aged 18-75 years	Low Risk/ Unselected	222	Yes	≥30	34.0 (6.1)	122	61.8	15.3	White: 58.1 Black: 37.4 Other: 2.7	Hypertension: 0.0
	Wing, 2006[313] (STOP)	Adults who lost ≥10% of their weight within prior 2 years	Low Risk/ Unselected	314	Yes	NR	28.6 (4.8)	NR	51.3	81.2	NR	NR
	Young, 2017[317]	Men, aged 18-65 years	Low Risk/ Unselected	92	Yes	25-40	30.7 (NR)	109.2	49.2	0	NR	NR
Medication-based weight loss	Acharya, 2006[213] (Orlistat)	Adults prescribed orlistat	Low Risk/ Unselected	NA	NR	NR	NR	NR	45	80.1	NR	NR
	Allison, 2012[216] (EQUIP; Phen/Tpm)	Adults, aged 18-70 years	Low Risk/ Unselected	1026	NR	≥35	42.0 (6.1)	120.3	42.6	82.7	White: 80.1 Black: 18.1 Hisp: 15.1 Asian: 0.8	NR

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Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
											AI/NA: 1.3 Other: 1.1	
	Apovian, 2013[218] (COR-11; Nal/Bup)	Adults, aged 18-65 years	Low Risk/ Unselected	1496	NR	30-45¶¶¶	36.2 (4.4)	108.8	44.3	84.7	White: 83.3 Black: 13.7 Other: 2.7	Diabetes: 0 Dyslipidemia: 55.0 Hypertension: 21.3
	Aronne, 2013[168] (EQUATE; Phen/Tpm)	Adults, aged 18-70 years	Low Risk/ Unselected	324	NR	30-45	36.2 (3.9)	110.6	44.7	79.0	White: 77.5 Black: 20.7 Other: 2.2	Diabetes: 0 Dyslipidemia: 21.0 Hypertension: 28.7
	Astrup, 2012[220] (Liraglutide)	Adults, aged 18-65 years	Low Risk/ Unselected	191	Yes	30-40	34.8 (2.8)	108.5	45.9	75.0	NR	Diabetes: 4.0 Prediabetes: 31.0
	Bakris, 2002[222] (Orlistat and Resistant Hypertension; Orlistat)	Adults with hypertension, aged ≥40 years	CV Risk	554	NR	28-43	35.6 (3.9)	109.7	52.9	61.1	White: 85.5 Black: 11.5 Hisp: 2.4 Other: 0.6	Diabetes: 8.4 Dyslipidemia: 37.5 Hypertension: 100
	Broom, 2002[226] (Orlistat UK Study; Orlistat)	Adults with dyslipidemia, aged ≥18 years	CV Risk	142	NR	≥30	36.8 (5.9)	NR	51.5	60.6	NR	Diabetes: 24.8 Dyslipidemia: 100
	Broom, 2002[227] (UK Multimorbidity Study; Orlistat)	Adults with ≥1 CV risk factor, aged 18-80 years	CV Risk	531	NR	≥28	37.0 (6.3)	108.2	46.0	78.4	NR	Prediabetes: 17.0 Dyslipidemia: 72.0 Hypertension: 43.0
	Davidson, 1999[160] (Orlistat)	Adults, aged ≥18 years	Low Risk/ Unselected	892	NR	30-43	36.3 (0.5)	NR	43.5	84.2	White: 80.8 Black: 14.0 Hisp: 4.2	Diabetes: 4.1 Prediabetes: 6.0
	Derosa, 2003[236] (Orlistat)	Adults with dyslipidemia, aged >40 years	CV Risk	50	No	>30	31.9 (1.2)	101.5	52.0	52.0	NR	Dyslipidemia: 100 Hypertension: 0
	Farr, 2016[238] (Lorcaserin)	Adults	Low Risk/ Unselected	48	NR	NR###	36.9 (2.8)	118.1	47.4	52.1	NR	NR

Table 3. Population Characteristics for All Included Trials, Sorted by Intervention Type and Author

Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
	Fidler, 2011[173] (BLOSSOM; Lorcaserin)	Adults, aged 18-65 years	Low Risk/ Unselected	3203	No	30-45¶¶¶	36.0 (4.2)	109.5	43.8	79.2	White: 66.9 Black: 19.5 Hisp: 11.1 Asian: 0.6 Other: 1.8	Diabetes: 0 Prediabetes: 1.4 Dyslipidemia: 27.9 Hypertension: 24.0
	Finer, 2000[239] (Orlistat)	Adults, aged ≥18 years	Low Risk/ Unselected	228	Yes	30-43	36.8 (3.6)	NR	41.4	88.5	White: 94.9 Black: 1.4 Other: 3.7	Diabetes: 0
	Gadde, 2011[241] (CONQUER/ SEQUEL; Phen/Tpm)	Adults with ≥1 CV risk factor, aged 18-70 years	CV Risk	2487	No	27-45	36.6 (4.5)	113.3	51.1	69.8	White: 86.0 Black: 11.9 Asian: 1.1 AI/NA: 0.6 Other: 1.0	Diabetes: 15.8 Prediabetes: 67.7 Dyslipidemia: 36.1 Hypertension: 52.5
	Greenway, 2010[244] (COR-1; Nal/Bup)	Adults, aged 18-65 years	Low Risk/ Unselected	1164	NR	30-45¶¶¶	36.1 (4.2)	109.4	44.0	85.2	White: 75.6 Black: 18.6 Other: 5.9	Diabetes: 0 Dyslipidemia: 49.1 Hypertension: 20.9
	Hauptman, 2000[246] (Orlistat)	Adults, aged >1 years	Low Risk/ Unselected	635	NR	30-44	36.0 (0.3)	NR	42.5	78.3	White: 90.9 Black: 6.8 Hisp: 1.9 AI/NA: 0.2 Other: 0.3	NR
	Hong, 2013[248] (Orlistat)	Adults, aged ≥1 years	Low Risk/ Unselected	193972	No	NR	35.7 (NR)	NR	47	77.7	NR	Diabetes: 6.1 Dyslipidemia: 1.8 Hypertension: 5.6
	Kim, 2013[259] (Liraglutide)	Adults with prediabetes, aged 40-70 years	Sub CV Risk	68	Yes	27-40	31.9 (3.1)	104.8	58.0	64.7	White: 68.6	Prediabetes: 100
	Krempf, 2003[260] (Orlistat)	Adults, aged 18-65 years	Low Risk/ Unselected	696	NR	≥28	36.1 (0.2)	106.1	41.0	86.4	NR	Diabetes: 0
	Lindgarde, 2000[263] (Swedish Multimorbidity Study; Orlistat)	Adults with ≥1 CV risk factor, aged 18-75 years	CV Risk	376	NR	28-38	33.2 (3.0)	106	53.5	63.6	NR	Diabetes: 26.1 Dyslipidemia: 39.9 Hypertension: 74.5

Table 3. Population Characteristics for All Included Trials, Sorted by Intervention Type and Author

Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
	Martin, 2011[268] (Lorcaserin)	Adults, aged 18-65 years	Low Risk/ Unselected	57	NR	27-45	35.5 (4.8)	108.0	48.7	68.4	White: 63.2 Other: 36.8	NR
	Muls, 2001[273] (ObelHyx; Orlistat)	Adults with dyslipidemia, aged 18-70 years	CV Risk	294	NR	27-40	32.9 (3.6)	102.9	48.6	80.7	NR	Diabetes: 0 Dyslipidemia: 100
	Pi-Sunyer, 2015[285] (SCALE Obesity and Prediabetes; Liraglutide)	Adults, aged ≥18 years	Low Risk/ Unselected	3731	No	≥30¶¶¶	38.3 (6.4)	114.8	45.1	78.5	White: 84.9 Black: 9.5 Hisp: 10.5 Asian: 3.6 AI/NA: 0.2 Other: 1.6	Diabetes: 0 Prediabetes: 61.2 Dyslipidemia: 29.4 Hypertension: 34.8
	Rossner, 2000[292] (Orlistat)	Adults, aged ≥18 years	Low Risk/ Unselected	729	NR	28-43	35.1 (3.9)	NR	44.2	82.3	NR	NR
	Sjostrom, 1998[297] (Orlistat)	Adults, aged ≥18 years	Low Risk/ Unselected	688	Yes	28-47	36.0 (NR)	105.6	44.8	83.0	NR	NR
	Smith, 2010[172] (BLOOM; Lorcaserin)	Adults, aged 18-65 years	Low Risk/ Unselected	3182	NR	30-45¶¶¶	36.2 (0.1)	109.4	44.1	83.4	White: 66.8 Black: 18.7 Hisp: 12.4 Asian: 0.8 AI/NA: 0.5 Other: 0.6	Diabetes: 0
	Smith, 2011[298] (Orlistat)	Adults, aged 18-60 years	Low Risk/ Unselected	131	NR	25-34.9****	31.0 (2.1)	100.4	43.4	82.9	White: 76.4 Black: 19.5 Hisp: 3.3 Asian: 0.8	Diabetes: 0
	Smith, 2012[299] (Orlistat)	Active duty US army soldiers	Low Risk/ Unselected	435	No	NR	33.3 (3.4)	NR	NR	25.3	NR	NR
	Swinburn, 2005[304] (Orlistat)	Adults with ≥1 CV risk factor, aged 40-70 years	CV Risk	339	No	30-50	37.8 (5.0)	113.6	52.2	56.9	NR	Diabetes: 26.8 Dyslipidemia: 65.5 Hypertension: 56.6

Table 3. Population Characteristics for All Included Trials, Sorted by Intervention Type and Author

Type	Author, year (Study name; medication)	Population description	Risk category	N rand	Self-selected	Eligible BMI (kg/m^2)	Mean BL BMI (kg/m^2) (SD)	Mean BL WC (cm)	Mean age	Female (%)	Race/ Ethnicity (%)	Baseline comorbidities (%)*
	Torgerson, 2004[161] (XENDOS; Orlistat)	Adults, aged 30-60 years	Low Risk/ Unselected	3305	Yes	≥30	37.3 (4.3)	115.2	43.3	55.2	NR	Diabetes: 0 Prediabetes: 21.2
	Van Gaal, 1998[307] (Orlistat Dose-Ranging Study Group; Orlistat)	Adults, aged ≥18 years	Low Risk/ Unselected	367	NR	28-43	34.7 (4.0)	NR	41.7	77.7	NR	Diabetes: 0
	Wadden, 2011 (Med)[311] (COR-BMOD; Nal/Bup)	Adults, aged 18-65 years	Low Risk/ Unselected	793	NR	30-45¶¶¶	36.5 (4.2)	109.2	45.8	89.9	White: 69.8 Black: 23.8 Other: 6.3	Diabetes: 0
Medication-based weight loss maintenance	Hill, 1999[247] (Orlistat)	Adults, aged ≥18 years	Low Risk/ Unselected	542	NR	28-43	32.8 (0.2)	NR	46.1	83.9	White: 88.4 Black: 5.2 Hisp: 5.6 Other: 0.7	Diabetes: 0
	Richelsen, 2007[287] (Orlistat)	Adults with ≥1 CV risk factor, aged 18-65 years	CV Risk	309	NR	30-45	37.5 (NR)	119	47.0	50.8	NR	Diabetes: 22.3 Prediabetes: 26.9
	Wadden, 2013[312] (SCALE Maintenance; Liraglutide)	Adults	Low Risk/ Unselected	422	NR	≥30¶¶¶	35.6 (5.9)	108.6	46.2	81.5	White: 84.1 Black: 13.5 Other: 2.6	Diabetes: 0 Dyslipidemia: 29.4 Hypertension: 31.2

* Prediabetes defined by impaired fasting glucose (FPG: 100-125 mg/dL (5.6-6.9 mmol/L), impaired glucose tolerance (2 hour plasma glucose in the 75-g oral glucose tolerance test of 140-199 mg/dL (7.8-11.0 mmol/L), or A1C 5.7−6.4% (39−47 mmol/mol)
† Or, BMI ≥25 if Asian ethnicity
‡ WC ≥90 cm (men) or ≥80 cm (women)
§ Patients seeking advice about overweight/obesity
‖ 14-32 kg overweight
¶ Or, BMI ≥28 kg/m2 to <30 kg/m2 (≥23 to <25 kg/m2 for South Asians) required to have CV risk factor
# Or, BMI ≥28 to <30 kg/m2 with CV risk factor
** WC >80 cm (women), >94 cm (men)
†† ≥23 if Asian

‡‡ WC ≥85 cm (men) or ≥90 cm (women)
§§ Assume 100% given setting
‖‖ ≥22 if Asian
¶¶ ≥30% likelihood of being diagnosed with diabetes over the succeeding 7.5 years per risk factor algorithm
WC ≥100 cm
*** WC ≥102 cm (men) or ≥88 cm (women)
††† One or two biological parents with type 2 diabetes
‡‡‡ 30-100% overweight
§§§ Or, BMI>24 kg/m2 with CV risk factor
‖‖‖ 20-100% over ideal weight
¶¶¶ Or, BMI ≥27 to <30 kg/m2 with CV risk factor
Article states that population is obese but no inclusion BMI provided
**** WC >102 cm (men) or >88 cm (women)
†††† >27 or WHR >0.950 for men, >0.800 for women
‡‡‡‡ ≥25 (or family history of DM)§§§§ FINDRISC (Finnish Diabetes Risk questionnaire) -score ≥9

Abbreviations: 10TT = Ten Top Tips; ADAPT = Activity, Diet and Blood Pressure Trial; AI/AN = American Indian/Alaska Native; BL = baseline; BLOOM = Behavioral Modification and Lorcaserin for Overweight and Obesity Management; BMI = body mass index; CAMWEL = Camden Weight Loss; cm = centimeter; BLOSSOM = Behavioral Modification and Lorcaserin Second Study for Obesity Management; BMI = body mass index; CHARMS = Community Health and Risk-reduction for Metabolic Syndrome; CITY = Cell Phone Intervention for You; cm = centimeter; COR-1 = Contrave Obesity Research-1; COR-11 = CONTRAVE Obesity Research-II; COR-BMOD = Contrave Obesity Research - Behavior Modification; CV = cardiovascular; DAMES = Daughters And Mothers Against Breast Cancer; DEPLOY = Diabetes Education & Prevention with a Lifestyle Intervention offered at the YMCA; DPP = Diabetes Prevention Program; DPS = Diabetes Prevention Study; EDIPS = European Diabetes Prevention Study; E-LITE = Evaluation of Lifestyle Interventions to Treat Elevated Cardiometabolic Risk in Primary Care; ENERGY = Exercise and Nutrition to Enhance Recovery and Good Health for You; FFIT = Football Fans in Training; FPG = Fasting Plasma Glucose; FU = followup; HEED = Project Help Educate to Eliminate Diabetes; IMOAP = Group motivational intervention in overweight/obese patients in primary prevention of cardiovascular disease in the primary healthcare area; kg = kilogram; KQ = key question; HELP PD = Healthy Partnerships to Prevent Diabetes; Hisp = Hispanic; HOT = Hypertension Optimal Treatment; HW4L = Healthy Weight for Life; LLDPP = Lawrence Latino Diabetes Prevention Project; mmol/L = millimoles per liter; Nal-Bup = Naltrexone HCL and bupropion HCL; NR = not reported; ObelHyx = Obesity Linked with Hypercholesterolemia treated with Xenical; ORBIT = Obesity Reduction Black Intervention; Phen-Top = Phentermine-topiramate extended release; PODOSA = Prevention of Diabetes and Obesity in South Asians; POWER = Practice Based Opportunities for Weight Reduction; POWER-UP = Practice-based Opportunities for Weight Reduction at the University of Pennsylvania; PREDIAS = Prevention of Diabetes Self-Management Program; PREVENT-DM = The Promotora Effectiveness Versus Metformin Trial; PROACTIVE = Prevention and Reduction of Obesity through Active Learning; PR = previous review; PROOF = Prevention of Knee Osteoarthritis in Overweight Females; rand = randomized; RAPID-YDPP = Reaching Out to Prevent Increases in Diabetes - YMCA model for Diabetes Prevention Program; REACH = Reasonable Eating and Activity to Change Health; SCOP = Saku Control Obesity Program; SHED-IT = Self-Help, Exercise, and Diet using Information Technology; SLIM = Study on lifestyle-intervention and impaired glucose tolerance Maastricht; SMART = Social Mobile Approaches to Reduce weighT; STOP = Study to Prevent Regain; SUCCEED = Survivors of Uterine Cancer Empowered by Exercise and Healthy Diet; TOHP = Trials of Hypertension Prevention Phase; TONE = Group motivational intervention in overweight/obese patients in primary prevention of cardiovascular disease in the primary healthcare area; VAFO = Vivamos Activos Fair Oaks; WC = waist circumference; WILMA = Weight Loss Maintenance in Adults; WLM = Weight Loss Maintenance; WOMAN = Women on the Move through Activity and Nutrition; WRAP = Weight-loss programme referrals for adults in primary care; XENDOS = XENical in the prevention of Diabetes in Obese Subjects

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
Ackermann, 2008[214] (DEPLOY)	IG1	YMCA-DPP group-based diabetes prevention intervention	Group	X	Total: 12 Core: 5 Support: 7	1 x brief individual session (2-5 min) 16 x group sessions (60-90 min)	7-9 x group sessions (min NR)	23	Community (YMCA)	No	YMCA instructor
Ackermann, 2015[215] (RAPID-YDPP)	IG1	YMCA-DPP group-based diabetes prevention intervention	Group	X	Total: 12 Core: 6 Support: 6	16 x group sessions (60-90 min)	6-8 x group sessions (60 min)	24	Community (YMCA)	No	YMCA instructor
Ahern, 2017 (WRAP)[323]	IG1	Weight Watchers (52-weeks)	Group	X	Total: 12 Core: 12 Support: 0	52 x group sessions (min NR)		52	Community	No	NR
	IG2	Weight Watchers (12-weeks)	Group	X	Total: 3 Core: 3 Support: 0	12 x group sessions (min NR)		12	Community	No	NR
Anderson, 2014[217] (BeWEL)	IG1	Individual counseling plus telephone followup	Individual + Phone	X	Total: 12 Core: 3 Support: 9	3 x individual sessions (60 min)	9 x telephone consultations (15 min)	12	Research center	NR	Lifestyle counselor
Appel, 2011[219] (POWER Hopkins)	IG1	Web-based self-monitoring and feedback plus in-person counseling	Mixed	X	Total: 24 Core: 24 Support: 0	24 x group counseling sessions (90 min) 27 x individual counseling sessions (20 min) 15 x phone sessions (20 min) + weekly visits to website and monthly e-mail messages		+36	Research clinic and home (web-based)	Yes	Lifestyle coach

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Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
	IG2	Telephone coaching and web-based monitoring	Phone with tech support		Total: 24 Core: 24 Support: 0	33 x telephone calls (20 min) plus web-based self-monitoring		21	Home (web- and telephone-based)	Yes	Lifestyle coach
Aveyard, 2016[221]	IG1	Referral to free weight loss program (Slimming World) and FU appointment	Group	X	Total: 3 Core: 3 Support: 0	1 x individual session (<30 sec) 1 x followup appointment (NR min) 12 x optional group sessions (60 min)		14	Primary care	Yes	PCP
Beeken, 2017[318] (10TT)	IG1	Individual counseling	Individual	X	Total: 3 Core: 3 Support: 0	1 x individual session (30 min)		1	Primary care clinic	Yes	Nurse or healthcare assistant
Bennett, 2012[224] (Be Fit, Be Well [POWER])	IG1	Web-based weight loss and hypertension self-monitoring and feedback plus telephone support	Phone with tech support		Total: 24 Core: 24 Support: 0	Web-based self-monitoring18 x telephone calls (20 min) 12 x optional group sessions (min NR)		12	Home (web-based) and community health center	Yes	Community health educator and PCP endorsement
Bhopal, 2014[225] (PODOSA)	IG1	Family-based dietary counseling	Individual	X	Total: 36 Core: 36 Support: 0	15 x individual counseling sessions (min NR) 3 x group sessions (min NR)		8	Home or community	No	Dietitian

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Burke, 2005[228] (ADAPT)	IG1	Individual and group-based counseling focused on decreasing blood pressure	Mixed	X	Total: 16 Core: 4 Support: 12	1 x individual session (30 min) 6 x group sessions (90 min) 5 nontailored print handouts	≥6 x individual counseling sessions (min NR) 6 x group sessions (90 min) 4 nontailored print handouts "Regular" telephone contact	19	NR	No	NR
Cadmus-Bertram, 2016[229] (HELP)	IG1	Telephone coaching and web-based monitoring	Phone with tech support		Total: 12 Core: 6 Support: 6	12 x health coaching telephone calls (30 min) plus web-based self-monitoring	6 x health coaching telephone calls (30 min) plus web-based self-monitoring	18	Home (telephone- and web-based)	No	Lay health coach
Chirionos, 2016[230] (CHARMS)	IG1	DPP-based group counseling	Group	X	Total: 12 Core: 3 Support: 9	8 x group sessions (90 min)	9 x monthly group counseling sessions (90 min)	17	NR	No	Research staff
Christian, 2011[231]	IG1	Computer-based self-management program with PCP feedback	Tech	X	Total: 6 Core: 6 Support: 0	Computer-based self-management program plus 2 x individual sessions (min NR)		2	Community health center	Yes	Computer expert system and PCP
Cohen, 1991[232]	IG1	PCP counseling on dietary changes	Individual	X	Total: 12 Core: 12 Support: 0	12 x individual sessions (min NR)		12	Primary care	Yes	PCP

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
de Vos, 2014[234] (PROOF)	IG1	Individual counseling (Motivational interviewing) and group PA sessions	Individual	X	Total: 30 Core: 6 Support: 24	Individual session (240 min, # of sessions NR) 20 X group physical activity sessions (60 min)	FU visits (NR)	24	NR	NR	Dietitian and physical therapist
Demark-Wahnefried, 2014[235] (DAMES)	IG1	Tailored print materials	Print		Total: 12 Core: 12 Support: 0	6 mailed surveys and tailored print materials		0	Home (print-based)	NR	NA
	IG2	Tailored print materials using mother-daughter team-based approach	Print		Total: 12 Core: 12 Support: 0	6 mailed surveys and tailored print materials		0	Home (print-based)	NR	NA
Eaton, 2016[237] (Choose to Lose)	IG1	Individual counseling plus telephone and tailored print support	Individual + Phone	X	Total: 24 Core: 12 Support: 12	3 x individual sessions (90 min) 8 x phone calls (25 min) 12 printed materials (tailored exercise feedback reports) 2 exercise-related DVDs	18 printed materials (tailored and non-tailored) 4 exercise feedback reports 2 nutrition-related DVDs	11	Research clinic	Yes	Registered dietitian
Fischer, 2016[319]	IG1	Text messages	Tech		Total: 12 Core: 12 Support: 0	6 x weekly text messages		0	Home	No	NR

Table 4. Behavior-Based Weight Loss Intervention Characteristics

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Fitzgibbon, 2010[240] (ORBIT)	IG1	Intensive group and individual counseling	Mixed	X	Total: 18 Core: 6 Support: 12	52 x group sessions (60-90 min) 6 x individual motivational interview sessions (20-30 min) 26 weekly newsletters	52 x group sessions (45-60 min) 12 x individual sessions (20-30 min) 12 x group exercise (min NR) 12 monthly newsletters	80	University	No	Research interven-tionist
Godino, 2016[242] (SMART)	IG1	Social networking intervention	Tech		Total: 24 Core: 24 Support: 0	Participants encouraged to interact with study technology (Facebook, mobile apps, website, technology-based communication with health coach) at least 5 times per week		0	Home (web-based)	No	Health coach
Greaves, 2015[243] (Waste the Waist)	IG1	Group counseling	Group	X	Total: 9 Core: 1 Support: 8	4 x group sessions (120 min)	5 x group sessions (90 min)	9	Community	No	Lifestyle coach
Haapala, 2009[245]	IG1	Text-based intervention (Weight Balance®)	Tech		Total: 12 Core: 12 Support: 0	Daily mobile phone messages as initiated by participants		0	Home (telephone-based)	No	NR

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
Hunt, 2014[249] (FFIT)	IG1	Group counseling and supervised exercise sessions	Group	X	Total: 12 Core: 3 Support: 9	12 x group and PA sessions (90 min)	1 x group session (NR min) + 6 e-mail prompts every 6-8 weeks	12	Community	NR	Community coaching staff
Huseinovic, 2016[250]	IG1	Individual counseling session plus ongoing phone and text-based support	Phone		Total: 12 Core: 3 Support: 9	1 x individual counseling session (0 min) followed by biweekly text messages or phone calls to track weight and provide feedback	Standardized monthly e-mails	1	Primary care	No	Dietitian
Jakicic, 2011[251]	IG1	High physical activity prescription supported with individual and group counseling	Mixed	X	Total: 18 Core: 6 Support: 12	6 x individual sessions (min NR) 18 group sessions (min NR)	24 x group sessions (min NR) 24 x telephone calls (min NR)	48	NR	NR	Physical activity counselor
	IG2	Moderate physical activity prescription supported with individual and group counseling	Mixed	X	Total: 18 Core: 6 Support: 12	6 x individual sessions (min NR) 18 x group sessions (min NR)	24 x group sessions (min NR) 24 x telephone calls (min NR	48	NR	NR	PA counselor
Jansson, 2013[252]	IG1	Individual and telephone counseling	Individual + Phone	X	Total: 24 Core: 24 Support: 0	10 x individual sessions (min NR) 4 x telephone		5	Primary care	NR	Research nurse and physio-therapist

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
						calls (min NR)					
Jebb, 2011[253]	IG1	Free access to weekly Weight Watchers meetings	Group	X	Total: 12 Core: 12 Support: 0	52 x group sessions (min NR)		52	Community-based Weight Watchers sites	No	Weight Watchers group leader
Jeffery, 1993[254] (Trial of Food Provision and Monetary Incentives)	IG1	Group counseling plus food provision and incentive	Group	X	Total: 18 Core: 18 Support: 0	33 x group sessions (min NR)		28	NR	No	Research interven-tionist
	IG2	Group counseling plus food provisions	Group	X	Total: 18 Core: 18 Support: 0	33 x group sessions (min NR)		28	NR	No	Interven-tionist
	IG3	Group counseling plus incentive	Group	X	Total: 18 Core: 18 Support: 0	33 x group sessions (min NR)		28	NR	No	Interven-tionist
	IG4	Group counseling	Group	X	Total: 18 Core: 18 Support: 0	33 x group sessions (min NR)		28	NR	No	Interven-tionist
Jenkins, 2017[320]	IG1	Telephone counseling	Phone		Total: 6 Core: 6 Support: 0	9 x phone calls (20-30 mins)		9	Home (telephone-based)	No	NR
	IG2	Telephone counseling and food basket	Phone		Total: 6 Core: 6 Support: 0	9 x phone calls (20-30 mins) plus weekly food basket		9	Home (telephone-based)	No	NR
	IG3	Food basket	Phone		Total: 6 Core: 6 Support: 0	Weekly food basket		0	Home	No	NA
Jolly, 2011[255] (Lighten Up)	IG1	NHS Size Down program	Group	X	Total: 3 Core: 3 Support: 0	8 x weekly group sessions (120 min)		8	Community	No	Community food advisors
	IG2	Weight Watchers	Group	X	Total: 3 Core: 3 Support: 0	12 x weekly group sessions (60 min)		12	Community	No	NR

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	IG3	Slimming World	Group	X	Total: 3 Core: 3 Support: 0	12 x weekly group sessions (90 min)		12	Community	No	NR
	IG4	Rosemary Conley	Group	X	Total: 3 Core: 3 Support: 0	12 x weekly group sessions (90 min)		12	Community	No	NR
	IG5	NHS General Practice counseling	Individual	X	Total: 3 Core: 3 Support: 0	1 x initial session (30 min) 11 x weekly individual sessions (15-20 min)		12	Primary care	Yes	PCP
	IG6	NHS Pharmacy counseling	Individual	X	Total: 3 Core: 3 Support: 0	1 x initial session (30 min) 11 x weekly individual sessions (15-20 min)		12	Pharmacy	No	Pharmacist
	IG7	Participant choice of intervention	Group	X	Total: 3 Core: 3 Support: 0	12 x weekly group or 1-on-1 sessions (min NR)		12	Community	Yes	Mixed by program (community members, PCPs, or pharmacists)
Jones, 1999[256] (HOT)	IG1	Individual and group counseling	Mixed	X	Total: 30 Core: 3 Support: 27	2 x individual sessions (min NR) 6 x group sessions (min NR)	4-9 x group sessions (min NR)	9	NR	No	Registered dietitian
Kanke, 2015[257]	IG1	Individual PCP counseling	Individual	X	Total: 12 Core: 12 Support: 0	6-12 x individual sessions (7 min)		12	Primary care	Yes	PCP

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
Katula, 2011[258] (HELP PD)	IG1	DPP-based group and individual counseling with community health worker and registered dietitian	Mixed	X	Total: 24 Core: 6 Support: 18	3 x individual sessions (min NR) 24 x group sessions (min NR)	18 x phone sessions (min NR) 18 x group sessions (min NR)	39	Community	NR	Community health workers
Knowler, 2002[205] (DPP)	IG1	Intensive lifestyle intervention with individual counseling as well as optional exercise sessions	Individual	X	Total: 38 Core: 6 Support: 32	1 x initial individual session (20-30 min) 16 x individual sessions (30-45 min) 48 x optional supervised exercise sessions (45-60 min)	32 x individual sessions with in-person contact at least every other month (30-45 min) 248 x optional supervised exercise sessions (45-60 min) 11 x optional group courses (min NR)	23	Research clinic	No	Case managers
Kuller, 2012[261] (WOMAN)	IG1	Group counseling	Group	X	Total: 36 Core: 12 Support: 24	40 x group sessions (min NR)	24 x group sessions (min NR)	40	Research clinic	NR	Multi-disciplinary team
Kulzer, 2009[262] (PREDIAS)	IG1	Group counseling	Group	X	Total: 10 Core: 2 Support: 8	8 x group sessions (90 min)	4 x booster group sessions (90 min)	12	NR	No	Diabetes educators or psycholo-gists
Kumanyika, 2012[328]	IG1	DPP-based individual counseling	Individual	X	Total: 12 Core: 12 Support: 0	4 x PCP counseling sessions (10-15 mins) 12 x individual coaching		17	Primary care	Yes	PCP and lifestyle coaches

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
						sessions (10-15 mins)					
Little, 2016[264]	IG1	POWeR+ web-based intervention plus individual counseling	Tech	X	Total: 6 Core: 6 Support: 0	24 x web-based sessions (min NR) 3 x individual counseling sessions (min NR) 4 x optional individual counseling sessions (min NR)		31	Home (web-based) and research clinic	No	Research nurse
	IG2	POWeR+ web-based intervention plus telephone or email counseling	Tech		Total: 6 Core: 6 Support: 0	24 x web-based sessions (min NR) 3 x phone or email contacts (min NR) 2 x optional phone or email contacts (min NR)		29	Home (web-based)	No	Research nurse
Logue, 2005[324] (REACH)	IG1	Individual + telephone counseling plus personalized mailings	Individual +Phone	X	Total: 24 Core: 24 Support: 0	4 x individual sessions (10 min) 24 x phone calls (15 min)		14	Primary care and home	Yes	Dietitians, weight loss advisors, PCPs

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
Luley, 2014[265]	IG1	Self-monitoring via accelerometer and 4Sigma telephone counseling	Phone with tech support		Total: 12 Core: 12 Support: 0	12 x telephone calls (20 min)		12	Home (web-based)	No	Doctor and nurse
	IG2	Self-monitoring via accelerometer and Active Body Control tailored print materials	Tech		Total: 12 Core: 12 Support: 0	52 x weekly tailored mailed reports		0	Home (web-based)	NR	Carer
Ma, 2013[266] (E-LITE)	IG1	DPP-based group counseling	Group	X	Total: 15 Core: 3 Support: 12	12 x group sessions (90-120 min) including supervised PA (30-45 min)	Email contact every 2-4 weeks plus web-based self-monitoring	12	Primary care	NR	E-LITE lifestyle coach (registered dietitian)
	IG2	DPP-based DVD coaching (Group Lifestyle Balance)	Tech		Total: 15 Core: 3 Support: 12	1 x group orientation session (min NR) 12 x weekly sessions delivered via DVD (min NR)	Email contact every 2-4 weeks plus web-based self-monitoring	12	Home (DVD-based)	NR	E-LITE lifestyle coach (registered dietitian)
Marrero, 2016[267]	IG1	Weight Watchers	Group	X	Total: 12 Core: 12 Support: 0	Free access to weekly Weight Watchers group counseling sessions		52	Community	No	Weight Watchers group leader
Martin, 2008[269]	IG1	Individual PCP counseling	Individual	X	Total: 6 Core: 6 Support: 0	6 x individual sessions (15 min)		6	Primary care	Yes	PCP
Mensink, 2003[325] (SLIM)	IG1	Individual counseling	Individual	X	Total: 24 Core: 24 Support: 0	11 x individual sessions (min NR)		6	NR	No	Dieticians, exercise trainers

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
Mitsui, 2008[270]	IG1	Group-based education plus exercise training	Group	X	Total: 12 Core: 12 Support: 0	25 x group sessions (min NR)		25	Community	NR	Dietitian
Moore, 2003[271]	IG1	PCP training	Individual	X	Total: 12 Core: 12 Support: 0	Providers: 3 x group training sessions (90 min) Patients: Average of 8 individual sessions (min NR)		8	Primary care	Yes	Dietitian
Morgan, 2011[272] (SHED-IT)	IG1	Web-based intervention	Tech		Total: 3 Core: 3 Support: 0	1 x information session (75-min) plus web-based self-monitoring program		1	Home (web-based)	NR	Research staff
Nakade, 2012[274] (SCOP)	IG1	Individual and group counseling	Mixed	X	Total: 12 Core: 12 Support: 0	5 x individual sessions (30 min)5 x group sessions (20 min)		5	Community health center	NR	Dietitian and exercise instructors
Nanchahal, 2012[275] (CAMWEL)	IG1	Individual counseling	Individual	X	Total: 9 Core: 9 Support: 0	14 x individual sessions (30 min)		14	Primary care	No	Research staff
Narayan, 1998[276]	IG1	Group counseling (Pima Action)	Group	X	Total: 12 Core: 12 Support: 0	52 x group sessions (min NR) Optional home visits		52	NR	NR	Research staff and dietitian
Nicklas, 2014[277] (Balance after Baby)	IG1	Web-based intervention plus telephone counseling	Tech		Total: 12 Core: 12 Support: 0	12-18 x web-based module sessions (min NR) 24 x phone/		36	Home (web-based)	No	Registered dietitian

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
						email sessions (min NR)					
Nilsen, 2011[327]	IG1	Group counseling	Group	X	Total: 18 Core: 5 Support: 13	1 x individual sessions (30 mins) 7 x group sessions (300 mins)	3 x individual consults with PCP @ NR mins	10	Research clinic	Yes	Physician, nurse, dietician, physio-therapist, and ergonomist
O'Brien, 2017[321] (PREVENT-DM)	IG1	Group counseling	Group	X	Total: 12 Core: 12 Support: 0	24 x group sessions (90 mins)		24	Community health center	No	Community health workers
Ockene, 2012[278] (LLDPP)	IG1	Group and individual counseling	Mixed	X	Total: 12 Core: 12 Support: 0	1 x individual session (60 min) 2 x individual sessions (30 min) 1 x group session (90 min) 12 x group sessions (60 min)		16	Home and senior community center	No	Community intervent-ionist
Pacanowski, 2015[279]	IG1	Web-based self-monitoring (Caloric Titration Method)	Tech		Total: 12 Core: 12 Support: 0	1 x educational presentation (min NR) plus daily self-weighing and monitoring via website		1	Home (web-based)	NR	NA
Parikh, 2010[280] (HEED)	IG1	Peer-led group counseling	Group	X	Total: 2.5 Core: 2.5 Support: 0	8 x group sessions (90 min)		8	Community	No	Community leaders and peers
Patrick, 2011[281]	IG1	Web-based intervention	Tech		Total: 12 Core: 12 Support: 0	52 x web sessions and tailored		52	Home (web-based)	NR	NA

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
						feedback (min NR)					
Penn, 2009[283] (EDIPS-Newcastle)	IG1	Individual counseling	Individual	X	Total: 60 Core: 60 Support: 0	23 x individual sessions (30 min) Optional group sessions (# of sessions and min NR)		7	NR	No	Dietitian and physio-therapist
Phelan, 2017[330]	IG1	Web-based self-monitoring and feedback plus in-person group counseling	Mixed	X	Total: 12 Core: 12 Support: 0	12 x group sessions (60 mins) 4 x text messages/week 52 x weekly web sessions		12	WIC clinic and home	No	Dietitians, WIC program staff, study intervent-ionists
Puhkala, 2015[286]	IG1	Individual and telephone counseling (LIFE)	Individual + Phone	X	Total: 12 Core: 12 Support: 0	5 x individual sessions (60 min) 7 x phone sessions (30 min)		13	NR	No	Nutritionist and physio-therapist
Rock, 2007[289]	IG1	Referral and free access to Jenny Craig	Individual	X	Total:12 Core:12 Support: 0	52 x individual sessions (min NR)		52	Community	NR	Dietitian and Jenny Craig consultants
Rock, 2015[288] (ENERGY)	IG1	Group counseling with telephone and e-mail support	Mixed	X	Total: 24 Core: 6 Support: 18	20 x group sessions (60 min) plus 14-16 calls or e-mails	6 x group sessions (60 min) plus 24-38 calls or e-mails	42	Research clinic	NR	Dietitian, psychol-ogist, and exercise physiol-ogist
Rodriguez-Cristobal, 2017[329] (IMOAP)	IG1	Group counseling	Group	X	Total: 24 Core: 6 Support: 18	4 x PCP visits (min NR) 12 x group sessions (60 mins)	4 x PCP visits (min NR) 20 x group sessions (60 mins)	32	Primary care	No	Research nurse

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
Rosas, 2015[290] (VAFO)	IG1	DPP-based group and individual counseling (case management)	Mixed	X	Total: 24 Core: 12 Support: 12	12 x group sessions (120 min) 4 x individual sessions (30 min)	3 x group sessions (120 min) 1 x individual session (30 min)	18	Community health center	NR	Research staff
	IG2	DPP-based group and individual counseling (case management + community health worker support)	Mixed	X	Total: 24 Core:12 Support: 12	12 x group sessions (120 min) 4 x individual sessions (30 min) 5 x CHW home visits (min NR)	3 x group sessions (120 min) 1 x individual session (30 min) 2 x CHW home visits (min NR)	23	Community health center, home	No	Research staff & community health workers
Ross, 2012[291] (PROACTIVE)	IG1	Individual counseling (Motivational interviewing)	Individual	X	Total: 24 Core: 6 Support: 18	15 x individual sessions (60 min)	6 x individual sessions (60 min) (months 7-12) 12 x individual sessions (30-60 min) (months 12-24)	21	Primary care	NR	Health educator
Shapiro, 2012[293] (Text4Diet)	IG1	Text messages	Tech		Total: 12 Core: 12 Support: 0	4 x text messages/day		0	Home (text-based)	NR	NA
Silva, 2009[295]	IG1	Group counseling	Group	X	Total: 12 Core: 12 Support: 0	30 x group sessions (120 min)		30	University	NR	Exercise physiologist, nutritionist, dietitian, and psychologist
Stevens, 1993[300] (TOHP I)	IG1	Group counseling	Group	X	Total: 18 Core: 4 Support: 14	1 x individual session (min NR) 14 x weekly group sessions (90 min)	15 x monthly group sessions with optional individual check-ins (min NR)	23	NR	No	Registered dietitian and psychol-ogist or exercise psychol-ogist

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
Stevens, 2001[301] (TOHP II)	IG1	Group counseling	Group	X	Total: 36 Core: 4 Support: 32	1 x individual session (min NR) 14 x weekly group sessions (90 min)	6 x biweekly group sessions (90 min) (months 5-17) 3-6 x "Minimodules"/ refresher courses consisting of up to 6 sessions each (min NR) Participant-initiated individual counseling	27	NR	No	Dietitian and health educator
Svetkey, 2015[302] (CITY)	IG1	Group counseling, telephone support, and self-monitoring through smartphone (personal coach)	Mixed	X	Total: 24 Core: 24 Support: 0	6 x weekly group sessions (120 min) 22 x monthly calls (20 min)		16	NR	NR	Research staff
	IG2	Smartphone-based self-monitoring	Tech		Total: 24 Core: 24 Support: 0	NR x smartphone app prompts		0	Home (smartphone-based)	No	NA
Thomas, 2017[322]	IG1	Weight Watchers Online plus activity tracke	Tech		Total: 12 Core: 12 Support: 0	Access to Weight Watchers online plus activity tracker		0	Home (web-based)	No	NA
	IG2	Weight Watchers Online	Tech		Total: 12 Core: 12 Support: 0	Access to Weight Watchers online		0	Home (web-based)	No	NA

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
Tsai, 2010[305]	IG1	Primary care-based individual counseling	Individual	X	Total: 12 Core: 12 Support: 0	4 x brief PCP sessions (2-3 min) 8 x individual sessions with MA (15-20 min)		12	Primary care	Yes	Medical assistant and PCP
Tuomilehto, 2001[306] (Finnish DPS)	IG1	Individual counseling plus optional PA and group sessions	Individual	X	Total: 48 Core: 12 Support: 36	7 x individual sessions (30-60 min) Optional supervised exercise sessions 2x per week Optional group sessions, expert lessons, phone calls, etc.	12 x individual counseling sessions (every 3 months) (30-60 min) Optional supervised exercise sessions 2x per week Optional group sessions, expert lessons, phone calls	7	Research center	No	Nutritionist
van Wier, 2011[308] (ALIFE@ WORK)	IG1	Web-based intervention	Tech		Total: 6 Core: 6 Support: 0	10 x web-based sessions plus followup e-mails w/counselors		10	Home (web-based)	NR	Dietitian and physical activity scientists
	IG2	Workbook- and telephone-based counseling	Phone		Total: 6 Core: 6 Support: 0	10 workbook modules plus followup phone calls w/counselors		10	Home (print- and telephone-based)	No	Dietitian and physical activity scientists
von Gruenigen, 2012[310] (SUCCEED)	IG1	Group and individual counseling	Mixed	X	Total: 12 Core: 12 Support: 0	16 x group sessions (60 mins) (months 1-6) 3 x PCP sessions (min		19	NR	Yes	Psychologist, registered dietitian, physical

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Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
						NR) (months 1-12) Print, telephone, and e-mail support (months 7-12)					therapist, PCP
Wadden, 2011[206] (POWER-UP)	IG1	Individual counseling	Individual	X	Total: 24 Core: 24 Support: 0	8 x individual sessions with PCP (5-7 min) 24 x individual sessions with lifestyle coach (10-15 min)		16	Primary care	Yes	Medical assistant and PCP
Whelton, 1998[326] (TONE)	IG1	Group and individual counseling	Mixed	X	Total: 28 Core: 7 Support: 21	Intensive phase: 12 x group sessions (3 per month; min NR) 4 x monthly individual sessions (min NR) Extended phase: 6 x biweekly group sessions (min NR)	Maintenance phase: 21 x monthly group sessions (min NR)	22	University research center	No	Nutritionists, exercise counselors
Wing, 1998[314]	IG1	Group counseling (diet and PA focus)	Group	X	Total: 24 Core: 12 Support: 12	39 x group sessions (min NR)	Two 6-week refresher courses	39	NR	NR	Behavior therapist, registered dietitian, exercise physiolog-ist
	IG2	Group counseling (diet focus)	Group	X	Total: 24 Core: 12 Support: 12	39 x group sessions (min NR)	Two 6-week refresher courses	39	NR	No	Behavior therapist, registered dietitian

Table 4. Behavior-Based Weight Loss Intervention Characteristics

Author, year (Study name)	IG	Brief description	Main mode of delivery	In-person support	Duration (mos)	Core components	Support components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
	IG3	Group counseling (PA focus)	Group	X	Total: 24 Core: 12 Support: 0	39 x group sessions (min NR)	Two 6-week refresher courses	39	NR	No	Behavior therapist, exercise physiologist
Wylie-Rosett, 2001[315]	IG1	Computer-based program plus individual and group counseling	Mixed	X	Total: 12 Core: 12 Support: 0	21 x computer sessions (30 min) 6 x group sessions (min NR) 18 x phone/face-to-face sessions (min NR)		45	Home (web-based) and research center	NR	Dietitian and cognitive behavioral therapist
	IG2	Computer-based intervention	Tech		Total: 12 Core: 12 Support: 0	21 x computer sessions (30 min)		21	Home (web-based)	NR	NA
Yeh, 2016[316]	IG1	DPP-based group counseling	Group	X	Total: 12 Core: 6 Support: 6	12 x biweekly group sessions (90-120 min)	6 x followup group sessions (90-120 min)	18	Community	No	Lifestyle coach

Abbreviations: 10TT = Ten Top Tips; ADAPT = Activity, Diet and Blood Pressure Trial; CAMWEL = Camden Weight Loss; CHARMS = Community Health and Risk-reduction for Metabolic Syndrome; CHW = community health worker; CITY = Cell Phone Intervention for You; DAMES = Daughters And Mothers Against Breast Cancer; DEPLOY = Diabetes Education & Prevention with a Lifestyle Intervention offered at the YMCA; DPP = Diabetes Prevention Program; DPS = Diabetes Prevention Study; EDIPS = European Diabetes Prevention Study; E-LITE = Evaluation of Lifestyle Interventions to Treat Elevated Cardiometabolic Risk in Primary Care; ENERGY = Exercise and Nutrition to Enhance Recovery and Good Health for You; FFIT = Football Fans in Training; FU = followup; HEED = Project Help Educate to Eliminate Diabetes; HELP PD = Healthy Partnerships to Prevent Diabetes; HOT = Hypertension Optimal Treatment; IG = intervention group; IMOAP = Group motivational intervention in overweight/obese patients in primary prevention of cardiovascular disease in the primary healthcare area; LLDPP = Lawrence Latino Diabetes Prevention Project; min = minutes; mos = months; NA = not applicable; NHS = National Health Service (UK); NR = not reported; ORBIT = Obesity Reduction Black Intervention; PA = physical activity; PCP = primary care provider; PODOSA = Prevention of Diabetes and Obesity in South Asians; POWER = Practice Based Opportunities for Weight Reduction; POWER-UP = Practice-based Opportunities for Weight Reduction at the University of Pennsylvania; PREDIAS = Prevention of Diabetes Self-Management Program; PROACTIVE = Prevention and Reduction of Obesity through Active Learning; PREVENT-DM = The Promotora Effectiveness Versus Metformin Trial; REACH = Reasonable Eating and Activity to Change Health; PROOF = Prevention of Knee Osteoarthritis in Overweight Females; RAPID-YDPP = Reaching Out to Prevent Increases in Diabetes - YMCA model for Diabetes Prevention Program; REACH = Reasonable Eating and Activity to Change Health; SCOP = Saku Control Obesity Program; SHED-IT = Self-Help, Exercise, and Diet using Information Technology; SLIM = Study on lifestyle-intervention and impaired glucose tolerance Maastricht; SMART = Social Mobile Approaches to Reduce weighT; SUCCEED = Survivors of Uterine Cancer Empowered by Exercise and Healthy Diet; Tech = technology-based; TOHP = Trials of Hypertension Prevention Phase; TONE = Group motivational intervention in

overweight/obese patients in primary prevention of cardiovascular disease in the primary healthcare area; VAFO = Vivamos Activos Fair Oaks; WOMAN = Women on the Move through Activity and Nutrition; YMCA = The Young Men's Christian Association; WRAP = Weight-loss programme referrals for adults in primary care

Table 5. Behavior-Based Weight Loss Intervention Components

Author, year	Arm	Main mode of intervention delivery	In-person contact	Group sessions	Individual sessions	Technology	DPP-based	Commercial program	MI	PA sessions	Weight loss goal set	Addressed barriers	Addressed pros and cons	Active use of self-monitoring	Involved spouse or family
Ackermann, 2008[214]	IG1	Group	X	X	X		X				X	X		X	
Ackermann, 2015[215]	IG1	Group	X	X			X				X			X	
Ahern, 2017[323]	IG1	Group	X	X				X							
	IG2	Group	X	X				X							
Anderson, 2014[217]	IG1	Individual + Phone	X		X				X		X	X		X	
Appel, 2011[219]	IG1	Mixed	X	X	X	X			X		X	X	X	X	
	IG2	Phone with tech support				X					X	X	X	X	
Aveyard, 2016[221]	IG1	Group	X	X	X			X				X	X	X	
Beeken, 2017[318]	IG1	Individual	X		X									X	
Bennett, 2012[224]	IG1	Phone with tech support		X	X					X	X	X		X	
Bhopal, 2014[225]	IG1	Individual	X	X	X								X	X	X
Burke, 2005[228]	IG1	Mixed	X	X	X							X	X		X
Cadmus-Bertram, 2016[229]	IG1	Phone with tech support			X						X			X	
Chirionos, 2016[230]	IG1	Group	X	X			X				X			X	
Christian, 2011[231]	IG1	Tech	X		X	X			X		X	X	X	X	
Cohen, 1991[232]	IG1	Individual	X		X						X				
de Vos, 2015[234]	IG1	Individual	X		X				X	X	X	X	X	X	
Demark-Wahnefried, 2014[235]	IG1	Print									X	X	X	X	X
	IG2	Print									X	X	X	X	X
Eaton, 2016[237]	IG1	Individual + Phone	X		X						X	X	X	X	
Fischer, 2016[319]	IG1	Tech				X	X					X	X	X	
Fitzgibbon, 2010[240]	IG1	Mixed	X	X	X				X	X	X	X	X	X	
Godino, 2016[242]	IG1	Tech				X					X	X		X	
Greaves, 2015[243]	IG1	Group	X	X							X	X	X	X	X
Haapala, 2009[245]	IG1	Tech				X					X			X	
Hunt, 2014[249]	IG1	Group	X	X						X	X		X	X	
Huseinovic, 2016[250]	IG1	Phone			X						X	X		X	
Jakicic, 2011[251]	IG1	Mixed	X	X	X					X				X	
	IG2	Mixed	X	X	X					X				X	
Jansson, 2013[252]	IG1	Individual + Phone	X		X						X			X	
Jebb, 2011[253]	IG1	Group	X	X				X			X	X	X	X	
Jeffery, 1993[254]	IG1	Group	X	X							X			X	
	IG2	Group	X	X							X			X	
	IG3	Group	X	X							X			X	
	IG4	Group	X	X							X			X	
Jenkins, 2017[320]	IG1	Phone			X							X	X		X
	IG2	Phone			X							X	X		X
	IG3	Phone													X

Table 5. Behavior-Based Weight Loss Intervention Components

Author, year	Arm	Main mode of intervention delivery	In-person contact	Group sessions	Individual sessions	Technology	DPP-based	Commercial program	MI	PA sessions	Weight loss goal set	Addressed barriers	Addressed pros and cons	Active use of self-monitoring	Involved spouse or family
Jolly, 2011[255]	IG1	Group	X	X				X			X	X	X	X	
	IG2	Group	X	X				X			X	X	X	X	
	IG3	Group	X	X				X			X	X	X	X	
	IG4	Group	X	X				X		X		X	X	X	
	IG5	Individual	X		X						X	X	X	X	
	IG6	Individual	X		X						X	X	X	X	
	IG7	Group	X	X	X			X		X	X	X	X	X	
Jones, 1999[256]	IG1	Mixed	X	X	X						X				
Kanke, 2015[257]	IG1	Individual	X		X						X	X	X	X	
Katula, 2011[258]	IG1	Mixed	X	X	X		X				X	X		X	
Knowler, 2002[205]	IG1	Individual	X	X	X		X			X	X	X	X	X	
Kuller, 2012[261]	IG1	Group	X	X							X		X	X	
Kulzer, 2009[262]	IG1	Group	X	X							X	X	X	X	
Kumanyika, 2012[328]	IG1	Individual	X		X		X				X	X	X	X	
Little, 2016[264]	IG1	Tech	X		X						X	X	X	X	
	IG2	Tech			X	X					X	X	X	X	
Logue, 2005[324]	IG1	Individual+Phone	X		X							X	X	X	
Luley, 2014[265]	IG1	Phone with tech support			X									X	
	IG2	Tech				X								X	
Ma, 2013[266]	IG1	Group	X	X			X			X	X	X	X	X	
	IG2	Tech		X		X	X				X	X	X	X	
Marrero, 2016[267]	IG1	Group	X	X				X			X			X	
Martin, 2008[269]	IG1	Individual	X		X							X	X		
Mensink, 2003[325]	IG1	Individual	X		X					X	X			X	
Mitsui, 2008[270]	IG1	Group	X	X										X	
Moore, 2003[271]	IG1	Individual	X		X						X				
Morgan, 2011[272]	IG1	Tech			X	X					X	X	X	X	
Nakade, 2012[274]	IG1	Mixed	X	X	X					X	X	X	X	X	
Nanchahal, 2012[275]	IG1	Individual	X		X						X	X	X	X	
Narayan, 1998[276]	IG1	Group	X	X										X	
Nicklas, 2014[277]	IG1	Tech				X	X				X	X		X	
Nilsen, 2011[327]	IG1	Group	X	X	X				X	X	X				
O'Brien, 2017[321]	IG1	Group	X	X			X				X	X	X	X	
Ockene, 2012[278]	IG1	Mixed	X	X	X		X					X	X	X	
Pacanowski, 2015[279]	IG1	Tech			X	X					X			X	
Parikh, 2010[280]	IG1	Group	X	X								X	X		
Patrick, 2011[281]	IG1	Tech				X					X	X	X	X	
Penn, 2009[283]	IG1	Individual	X	X	X				X		X	X	X	X	

Table 5. Behavior-Based Weight Loss Intervention Components

Author, year	Arm	Main mode of intervention delivery	In-person contact	Group sessions	Individual sessions	Technology	DPP-based	Commercial program	MI	PA sessions	Weight loss goal set	Addressed barriers	Addressed pros and cons	Active use of self-monitoring	Involved spouse or family
Phelan, 2017[330]	IG1	Mixed	X	X	X	X					X	X	X	X	
Puhkala, 2015[286]	IG1	Individual + Phone	X		X						X	X		X	
Rock, 2007[289]	IG1	Individual	X		X			X			X	X	X	X	
Rock, 2015[288]	IG1	Mixed	X	X	X						X	X	X	X	
Rodriguez-Cristobal, 2017[329]	IG1	Group	X	X								X	X		
Rosas, 2015[290]	IG1	Mixed	X	X	X		X		X		X	X	X	X	
	IG2	Mixed	X	X	X		X		X		X	X	X	X	
Ross, 2012[291]	IG1	Individual	X		X				X		X	X	X	X	
Shapiro, 2012[293]	IG1	Tech				X					X	X	X	X	
Silva, 2009[295]	IG1	Group	X	X								X	X	X	
Stevens, 1993[300]	IG1	Group	X	X	X					X	X	X		X	X
Stevens, 2001[301]	IG1	Group	X	X	X						X	X	X	X	X
Svetkey, 2015[302]	IG1	Mixed	X	X	X	X			X		X	X	X	X	
	IG2	Tech				X			X		X	X	X	X	
Thomas, 2017[322]	IG1	Tech				X		X			X			X	
	IG2	Tech				X		X			X			X	
Tsai, 2010[305]	IG1	Individual	X		X									X	
Tuomilehto, 2001[306]	IG1	Individual	X	X	X					X	X			X	X
van Wier, 2011[308]	IG1	Tech			X	X					X	X		X	
	IG2	Phone			X						X	X		X	
von Gruenigen, 2012[310]	IG1	Mixed	X	X	X						X	X	X	X	
Wadden, 2011[206]	IG1	Individual	X		X						X	X	X	X	
Whelton, 1998[326]	IG1	Mixed	X	X	X						X	X		X	
Wing, 1998[314]	IG1	Group	X	X						X	X	X	X	X	
	IG2	Group	X	X							X	X	X	X	
	IG3	Group	X	X						X	X	X	X	X	
Wylie-Rosett, 2001[315]	IG1	Mixed	X	X	X	X					X	X	X	X	
	IG2	Tech				X					X	X	X	X	
Yeh, 2016[316]	IG1	Group	X	X			X			X				X	X

Abbreviations: DPP = Diabetes Prevention Program; IG = intervention group; MI = motivational interviewing; PA = physical activity; Tech = technology-based

Table 6. Behavior-Based Weight Loss Maintenance Intervention Characteristics

Author, year (Study name)	Arm	Brief description	Main mode of delivery	In-person support	Duration (mos)	Weight loss phase components	Maintenance components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
Cussler, 2008[233] (HW4L)	IG1	Web-based monitoring and support	Tech		12	Weekly group meetings (150 min/session). 4 month duration Required weight loss to enter maintenance: None	2 x website orientation sessions (60 min) and ongoing online support groups	2	NR	No	NR
Pekkarinen, 2015[282]	IG1	Group counseling	Group	X	12	Week 2-11 included VLCDD followed by a 2 week refeeding phase. 15 Weekly group Sessions (1.5 hours) during 17 week weight loss phase. Required weight loss to enter maintenance: None	12 x group sessions (90 min)	12	Outpatient obesity research clinic	NR	Nutritionist, nurse, and physiotherapist
Perri, 1988[284]	IG1	Group counseling plus social influence and increased physical activity	Group	X	12	Weekly 2-hour weekly group sessions for 20 weeks. Required weight loss to enter maintenance: None	26 x group sessions (120 min)	26	NR	Yes	Clinical psychologist paired with physician or nurse practitioner
	IG2	Group counseling plus increased physical activity	Group	X	12	Weekly 2-hour weekly group sessions for 20 weeks. Required weight loss to enter maintenance: None	26 x group sessions (120 min)	26	NR	Yes	Clinical psychologist paired with physician or nurse practitioner

Table 6. Behavior-Based Weight Loss Maintenance Intervention Characteristics

Author, year (Study name)	Arm	Brief description	Main mode of delivery	In-person support	Duration (mos)	Weight loss phase components	Maintenance components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
	IG3	Group counseling plus social influence program	Group	X	12	Weekly 2-hour weekly group sessions for 20 weeks. Required weight loss to enter maintenance: None	26 x group sessions (120 min)	26	NR	Yes	Clinical psychologist paired with physician or nurse practitioner
	IG4	Group counseling	Group	X	12	Weekly 2-hour weekly group sessions for 20 weeks. Required weight loss to enter maintenance: None	26 x group sessions (120 min)	26	NR	Yes	Clinical psychologist paired with physician or nurse practitioner
Sherwood, 2013[294] (Keep It Off)	IG1	Telephone-based counseling	Phone			No WL intervention given. Required weight loss to enter maintenance: ≥ 10% WL in past year	10 x telephone calls (20 min) 14 x telephone calls (15 min)	24	Home	NR	NR
Simpson, 2015[296] (WILMA)	IG1	Individual counseling	Individual + Phone	X	12	No WL intervention given. Required weight loss to enter maintenance: ≥ 5% WL in past year	6 x individual MI sessions (60 min) 9 x telephone counseling sessions (20 min)	15	NR	NR	Motivational interviewing practitioner
	IG2	Individual counseling	Individual + Phone	X	12	No WL intervention given. Required weight loss to enter maintenance: ≥	Two individual sessions (length NR) followed by 2 phone sessions (~20 minutes)	4	NR	NR	Motivational interviewing practitioner

Table 6. Behavior-Based Weight Loss Maintenance Intervention Characteristics

Author, year (Study name)	Arm	Brief description	Main mode of delivery	In-person support	Duration (mos)	Weight loss phase components	Maintenance components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
						5% WL in past year	(about 6 months apart).				
Svetkey, 2008[303] (WLM)	IG1	Individual and telephone counseling	Individual + Phone	X	60	Weekly group sessions (1.5-2 hours) over approximately 6 months (20 total). Required weight loss to enter maintenance: ≥ 4 kg during WL phase	Maintenance, phase 1:23 x phone sessions (5-15 min)7 x individual sessions (45-60 min) Maintenance, phase 2: Continued contact group only:4 x group sessions (min NR) 26 x phone sessions (5-15 min)	12	NR	No	Research interventionist
	IG2	Web-based monitoring	Tech		30	Weekly group sessions (1.5-2 hours) over approximately 6 months (20 total). Required weight loss to enter maintenance: ≥ 4 kg during WL phase	No sessions. Web-based monitoring only.	0	NR	No	NA
Voils, 2017[309]	IG1	Group and individual counseling	Mixed	X	10	Biweekly group meetings for 16 weeks (8 sessions total). Required weight loss to enter maintenance: ≥4 kg during WL phase	3 x group sessions (min NR) 8 x individual phone sessions (min NR)	11	University campus & home	No	Registered dietitian

Table 6. Behavior-Based Weight Loss Maintenance Intervention Characteristics

Author, year (Study name)	Arm	Brief description	Main mode of delivery	In-person support	Duration (mos)	Weight loss phase components	Maintenance components	Total # of sessions in first 12 mos	Setting	PCP involved?	Provider
Wing, 2006[313] (STOP)	IG1	Group Counseling	Group	X	18	No WL intervention given. Required weight loss to enter maintenance: ≥ 10% WL in past 2 years	4 x weekly meetings (min NR) 17 x monthly meetings (min NR)	15	Hospital clinic	NR	Nutritionist, exercise physiologist, and clinical psychologist
	IG2	Web-based intervention	Tech		18	No WL intervention given. Required weight loss to enter maintenance: ≥ 10% WL in past 2 years	1 x introductory session (min NR) 4 x weekly chat-room meetings (min NR) 17 x monthly chat-room meetings (min NR)	16	Internet	NR	Nutritionist, exercise physiologist, and clinical psychologist
Young, 2017[317]	IG1	Web-based intervention	Tech		6	Self-administered weight loss program (DVD, logbooks, and motivational messaging). Required weight loss to enter maintenance: ≥ 4kg during WL phase	Web-based self-monitoring program (min NA)	0	Home (web-based)	NR	Research staff

Abbreviations: HW4L = Healthy Weight for Life; IG = intervention group; kg = kilograms; min = minute(s); mos = months; NA = not applicable; NR = not reported; PCP = primary care provider; STOP = Study to Prevent Regain; Tech = technology-based; WILMA = Weight Loss Maintenance in Adults; WL = weight loss; WLM = Weight Loss Maintenance

Table 7. Behavior-Based Weight Loss Maintenance Intervention Components

Author, year	Arm	Main mode of intervention delivery	In-person contact	Group sessions	Individual sessions	Tech-based	DPP-based	Commercial program	MI	PA sessions	Weight loss goal set	Addressed barriers	Addressed pros and cons	Active use of self-monitoring	Involved spouse or family
Cussler, 2008[233]	IG1	Tech				X								X	
Pekkarinen, 2015[282]	IG1	Group	X	X						X	X	X	X	X	
Perri, 1988[284]	IG1	Group	X	X						X	X	X	X	X	
	IG2	Group	X	X						X		X		X	
	IG3	Group	X	X							X	X	X	X	
	IG4	Group	X	X								X		X	
Sherwood, 2013[294]	IG1	Phone			X							X	X	X	
Simpson, 2015[296]	IG1	Individual + Phone	X		X				X			X	X	X	
	IG2	Individual + Phone	X		X							X	X	X	
Svetkey, 2008[303]	IG1	Individual + Phone	X		X				X		X	X	X	X	
	IG2	Tech				X					X	X	X	X	
Voils, 2017[309]	IG1	Mixed	X	X	X							X	X	X	X
Wing, 2006[313]	IG1	Group	X	X	X						X	X	X	X	
	IG2	Tech		X	X	X					X	X	X	X	
Young, 2017[317]	IG1	Tech				X						X	X	X	

Abbreviations: DPP = Diabetes Prevention Program; MI = motivational interviewing; PA = physical activity; Tech = technology-based

Table 8. Medication-Based Intervention Characteristics

Drug	Author, year (Study name)	Run-in (weeks)	Duration (mos)	Dosage	Behavioral intervention	Weighing frequency	Adherence
Liraglutide	Astrup, 2012[220]	2	12	3.0mg QD	Prescribed 500 kcal/day deficit diet. Encouraged to maintain or increase physical activity. Advised on diet and physical activity through treatment. Pedometers provided, food diaries collected quarterly for review by dietician.	Weekly during dose escalation (initial 4 weeks) followed by once/month	Adherence: NR Completing study on drug: IG: 70.0% CG: 63.3%
	Kim, 2013[259]*	NA	3.5	1.8mg QD	Prescribed 500 kcal/day deficit diet with individualized meal plan. Food diaries kept throughout study. Advised to maintain baseline physical activity.	Weekly over 1st month, then bimonthly	Adherence: NR Completing study on drug: IG: 68.6% CG: 81.8%
	Pi-Sunyer, 2015[285] le Roux, 2017[339] (SCALE Obesity and Prediabetes)	NA	13 (36 months for prediabetics)	3.0mg QD	Prescribed 500 kcal/day deficit diet and advised in increase physical activity to 150 min/week. Counseling on lifestyle modification in individual or group setting. Food diaries assessed every two months.	Evaluated every 2 weeks until week 8 and then evaluated every 4 weeks until week 44, then evaluated at weeks 50, 56, 58, 60, 64, 68 and 70; prediabetes subgroup at 160 and 172 weeks	Adherence: NR Completing study on drug: IG: 71.9% CG: 64.4% Completing study on drug (36 months, prediabetics): IG: 52.6% CG:45.0%
	Wadden, 2013[312]† (SCALE Maintenance)	4-12	13	3.0mg QD	Prescribed 500 kcal/day deficit diet. Encouraged to exercise 150 min/week with pedometer. 15-20 minute counseling sessions every 4 weeks.	Every week during drug escalation then every 4 weeks. Week 0, 1, 2, 3, 4, 6, 10, 14, 18, 22, 26, 30, 34, 38, 42, 46 and 52.	Adherence: NR Completing study on drug: IG: 75.0% CG: 69.5%
Lorcaserin hydrochloride	Farr, 2016[238]*		1	10mg BID		Weeks 1, 2, and 4	Adherence: NR Completing study on drug: IG: 70.8% CG: 79.2%
	Fidler, 2011[173] (BLOSSOM)	NA	12	10mg BID	Prescribed 600 kcal/day deficit diet. Advised to exercise 30 min/day. Nutritional and physical activity counseling provided monthly. Food diaries used as motivational tools but not formally analyzed.	Weeks 2 and 4 and monthly thereafter through week 52	Adherence: IG received drug for an average of 257 (SD=139) out of 365 days (CG: 242 [SD=143]). Completing study on drug: IG: 57.2% CG: 52.0%
	Martin, 2011[268]*	1	2	10mg BID	Prescribed 600 kcal/day deficit diet by dietician. Prescribed	Weekly clinic visits	Adherence: NR Completing study on drug:

Table 8. Medication-Based Intervention Characteristics

Drug	Author, year (Study name)	Run-in (weeks)	Duration (mos)	Dosage	Behavioral intervention	Weighing frequency	Adherence
					exercise plan to contribute to 600 kcal/day deficit.		IG: 93.1% CG: 89.3%
	Smith, 2010[172] (BLOOM)	NA	12	10mg BID	Prescribed 600 kcal/day deficit diet. Encouraged to exercise moderately for 30 min/day. Standard nutritional and physical activity counseling.	2 & 4 weeks, then on a monthly basis	Adherence: NR Completing study on drug: IG: 55.4% CG: 45.1%
Naltrexone HCL and bupropion HCL	Apovian, 2013[218] (COR-11)	NA	13	16/180mg TID	Prescribed 500 kcal/day deficit diet. Advised to increase physical activity. Behavior modification advice every 12 weeks.	Every 4 weeks	Adherence: NR Completing study on drug: IG: 53.7% CG: 53.9%
	Greenway, 2010[244] (COR-1)	NA	13	16/180mg TID	Prescribed 500 kcal/day deficit diet and advised to increase physical activity.	Every 4 weeks	Adherence: NR Completing study on drug: IG: 50.8% CG: 49.9%
	Wadden, 2011 (Med)[311] (COR-BMOD)	NA	13	16/180mg TID	Prescribed 1,200 kcal/day diet to 1,500 kcal/day diet based on baseline weight and health. Encouraged to increase physical activity to 180 min/week (first 6 months) up to 360 min/week. Received 28 90-min group behavioral counseling sessions.	Every 4 weeks	Adherence: Attended mean 18.7 sessions (SD=6.8) BMOD sessions out of 28 (CG: 17.5 [SD=7.3]). Completing study on drug: IG: 57.9% CG: 58.4%
Orlistat	Acharya, 2006[213]*	NA	5 (median)	NR	NR	NR	Adherence: NR Completing study on drug: NA
	Bakris, 2002[222]* (Orlistat and Resistant Hypertension)	NA	12	120mg TID	Prescribed 600 kcal/day deficit diet. Encouraged to participate in moderate physical activity. Periodic meetings with dieticians to review food diaries	11 visits over 52 weeks	Adherence: NR Completing study on drug: IG: 57.6% CG: 38.4%
	Broom, 2002[226]* (Orlistat UK Study)	NA	6	120mg TID	Prescribed 600 kcal/day deficit diet. Dietary and physical activity advice provided by dietician.	Every 4 weeks	Adherence: NR Completing study on drug: IG: 67.6% CG: 84.5%
	Broom, 2002[227] (UK Multimorbidity Study)	2	12	120mg TID	Prescribed 600 kcal/day deficit diet, reduced additional 300 kcal/day at 6 months.	12 times over 12 months	Adherence: NR Completing study on drug: IG: 70.2% CG: 60.5%

Table 8. Medication-Based Intervention Characteristics

Drug	Author, year (Study name)	Run-in (weeks)	Duration (mos)	Dosage	Behavioral intervention	Weighing frequency	Adherence
	Davidson, 1999[160]	4	12	120mg TID	4 behavioral modifications sessions with dietician. Prescribed 500-800 kcal/day deficit diet using food diaries. Encouraged to exercise 20-30 minutes 3-5 times/week.	17 times in 1 year (including final)	Adherence: NR Completing study on drug: IG: 68.6% CG: 59.4%
	Derosa, 2003[236]	4	12	120mg TID	Prescribed 1500 kcal/day deficit diet with 30 minutes of bicycle exercise 4 days/week. Behavioral modification sessions with dietician every 3 months with food and exercise dairy assessment.	2 times (including final)	Adherence: NR Completing study on drug: NR
	Finer, 2000[239]	4	12	120mg TID	Prescribed 600 kcal/day deficit diet (minimum 1200 kcal/day). Reduction of additional 300 kcal/day after 24 weeks.	15 times over 12 months	Adherence: NR Completing study on drug: IG: 64.0% CG: 57.9%
	Hauptman, 2000[246]	4	12	120mg TID	Year 1 (Weight loss): Dietary guidance from study physician, viewed 4 behavioral modification videos. Prescribed 1200-1500 kcal/day diet. Encouraged brisk walking 20-30 minutes 3-5 days/week. Year 2 (Maintenance): Diet increased by 300 kcal/day.	Every 2 weeks for the first month, every 4 weeks until week 52, and every 8 weeks in the second year.	Adherence: NR Completing study on drug: 12 months: IG1 (360mg): 71.9% IG2 (180mg): 72.3% CG: 57.5% 24 months: IG1 (360mg): 55.7% IG2 (180mg): 56.3% CG: 42.9%
		4	24	60mg TID	Year 1 (Weight loss): Dietary guidance from study physician, viewed 4 behavioral modification videos. Prescribed 1200-1500 kcal/day diet. Encouraged brisk walking 20-30 minutes 3-5 days/week. Year 2 (Maintenance): Diet increased by 300 kcal/day.	Every 2 weeks for the first month, every 4 weeks until week 52, and every 8 weeks in the second year.	
	Hill, 1999[247]†	24	12	120mg TID	Dietary and behavioral counseling for 1 year addressing maintenance of weight loss. Food diaries examined quarterly.	Bi-weekly (month 1), monthly (months 1 to 5) bimonthly (months 6-12)	Adherence: NR Completing study on drug: IG1 (360mg): 69.6% IG2 (180mg): 76.9% CG: 73.4%

Table 8. Medication-Based Intervention Characteristics

Drug	Author, year (Study name)	Run-in (weeks)	Duration (mos)	Dosage	Behavioral intervention	Weighing frequency	Adherence
		24	12	60mg TID	Dietary and behavioral counseling for 1 year addressing maintenance of weight loss. Food diaries collected every 3 months.	Bi-weekly (month 1), monthly (months 1 to 5) bimonthly (months 6-12)	
	Hong, 2013[248]*	NA	At least 12	NR	NA‡	NA	Adherence: NR Completing study on drug: NA
	Krempf, 2003[260]	2	18	120mg TID	Prescribed tailored weight loss diet with 20% energy reduction with further 10% reductions as needed for weight loss (minimum of 1200 kcal/day). Food diaries collected every 4 months.	18 over 18 months	Adherence: NR Completing study on drug: IG: 47.1% CG: 44.6%
	Lindgarde, 2000[263] (Swedish Multimorbidity Study)	2	12	120mg TID	Prescribed 600 kcal/day deficit diet, reduced additional 300 kcal/day at 6 months. Encouraged to walk 30 min/day Monthly dietary counseling, information leaflets, and videotapes provided.	10 times over 1 year	Adherence: NR Completing study on drug: IG: 83.7% CG: 88.2%
	Muls, 2001[273]* (ObelHyx)	2	6	120mg TID	Prescribed 600 kcal/day diet (1200 kcal/day minimum). Dietician assessed dietary compliance at weeks 4, 12, and 24.	Monthly	Adherence: NR Completing study on drug: IG: 87.1% CG: 86.4%
	Richelsen, 2007[287]†	8	36	120mg TID	Prescribed 600 kcal/day deficit diet. Advised in increase physical activity. Monthly dietician counseling for 18 months, than every 3 months. Food diaries collected yearly.	Monthly for first 18 months, then 3 month intervals.	Adherence: NR Completing study on drug: NR
	Rossner, 2000[292]	4	24	120mg TID	Year 1: Prescribed 600 kcal/day deficit diet. Monthly advice from dietician with assessment of food diaries.Year 2: Participants who lost ≥3 kg between weeks 40-52 adjusted to 10% energy deficit diet. Advice from dietician every two months.	Every 2 weeks for the first 2 months, monthly from months 3 to 6, then every other month.	Adherence: NR Completing study on drug: 12 months: IG1 (360mg): 74.1% IG2 (180mg): 76.4% CG: 65.0% 24 months: IG1 (360mg): 65.2% IG2 (180mg): 57.9%

Table 8. Medication-Based Intervention Characteristics

Drug	Author, year (Study name)	Run-in (weeks)	Duration (mos)	Dosage	Behavioral intervention	Weighing frequency	Adherence
		4	24	60mg TID	Year 1: Prescribed 600 kcal/day deficit diet. Monthly advice from dietician with assessment of food diaries. Year 2: Participants who lost ≥3 kg between weeks 40-52 adjusted to 10% energy deficit diet. Advice from dietician every two months.	Every 2 weeks for the first 2 months, monthly from months 3 to 6, then every other month.	CG: 56.0%
	Sjostrom, 1998[297]	4	12	120mg TID	Prescribed 600 kcal/day deficit diet (minimum 1200 kcal/day). Reduction of additional 300 kcal/day after 24 weeks (minimum 1000 kcal/day).	15 times	Adherence: NR Completing study on drug: IG: 82.3% CG: 75.8%
	Smith, 2011[298]*	NA	6	120mg TID	Prescribed 500 kcal/day deficit diet. Encouraged to exercise regularly. Received education materials on dietary counseling.	Twice in month 1, then monthly for months 2-6	Adherence: NR Completing study on drug: IG: 76.9% CG: 66.7%
	Smith, 2012[299]*	NA	6	60mg TID	Attended Weigh-to-Stay program consisting of 3 education sessions (1-2 hours) including information on nutrition from registered dietician, physical activity from physical therapist, and a 30-60 minute private nutrition counseling session with dietician.	Every 4 weeks	Adherence: In ITT population: self-reported med compliance ≤85% each month. >60% of participants reported occasionally consuming less than 3 pills/day (results reported for both CG & IG combined) Completing study on drug: IG: 16.0% CG: 10.0%
	Swinburn, 2005[304]	4	12	120mg TID	Advised by dietician to reduce dietary fat intake to between 25-30% of daily energy intake (about 40 g/day) and undertake regular moderate-intensity physical activity at least 30 min most days. Food diaries collected at weeks 12 and 52.	2 clinic visits over 4 weeks (lead-in) and 13 visits over 52 weeks (treatment)	Adherence: NR Completing study on drug: IG: 77.6% CG: 81.1%

Table 8. Medication-Based Intervention Characteristics

Drug	Author, year (Study name)	Run-in (weeks)	Duration (mos)	Dosage	Behavioral intervention	Weighing frequency	Adherence
	Torgerson, 2004[161] (XENDOS)	NA	48	120mg TID	Prescribed 800 kcal/day deficit diet (readjusted after 6 months to account for weight loss). Advised to walk at least 1 extra km/day and keep exercise diary. Dietary counseling every 2 weeks for first 6 months, than monthly thereafter.	16 times over 4 years (4 times 12 months)	Adherence: For ITT population, 93.3% of doses from first dose until termination (CG: 92.8%) Completing study on drug: IG: 51.9% CG: 34.6%
	Van Gaal, 1998[307]* (Orlistat Dose-Ranging Study Group)	4	6	120mg TID	Prescribed 600 kcal/day deficit diet (minimum 1200 kcal/day), adjusted if BMI fell below 22 kg/m^2 on 2 consecutive visits. Counseling from dietician with food diaries kept 9 times during study period.	Day 15 and 29, and then every 4 weeks (7 times)	Adherence: NR Completing study on drug: IG1 (360mg): 81.1% IG2 (180mg): 76.6% CG: 78.4%
		4	6	60mg TID	Prescribed 600 kcal/day deficit diet (minimum 1200 kcal/day), adjusted if BMI fell below 22 kg/m^2 on 2 consecutive visits. Counseling from dietician with food diaries kept 9 times during study period.	Day 15 and 29, and then every 4 weeks (7 times)	
Phentermine-topiramate extended release	Allison, 2012 (EQUIP)[216]	NA	13	15/92mg QD	Prescribed 500 kcal/day deficit diet with increased water consumption. Advised in increase physical activity. Received standardized lifestyle counseling based on the LEARN manual.	Monthly	Adherence: NR Completing study on drug: IG: 58.8% CG: 46.9%
	Aronne, 2013 (EQUATE)[168]*	NA	6	15/92mg QD	Prescribed 500 kcal/day deficit diet with monitoring by food diaries. Advised to increase physical activity as tolerated. Brief monthly visits to discuss goals, incorporated LEARN manual.	6 monthly visits	Adherence: NR Completing study on drug: Total for all groups: 65.5% completed a study visits on study drug, NR by arm
		NA	6	7.5/46mg QD		6 monthly visits	
	Gadde, 2011[241]	NA	13 (CONQUER) + 12 (SEQUEL)	15/92mg QD	Advised to follow LEARN guidance with instructions to reduce caloric intake by 500	13 monthly visits + 12 monthly visits for SEQUEL extension	Adherence: NR Completing study on drug: 13 months:

Table 8. Medication-Based Intervention Characteristics

Drug	Author, year (Study name)	Run-in (weeks)	Duration (mos)	Dosage	Behavioral intervention	Weighing frequency	Adherence
	(CONQUER/ SEQUEL)				kcal/day and implement physical activity guidelines.		IG1 (15/92mg): 63.8% IG2: 7.5/46mg): 69.1% CG: 56.8% 25 months: IG1 (15/92mg): 24.6 IG2: 7.5/46mg): 25.5% CG: 19.7%
		NA	13 (CONQUER) + 12 (SEQUEL)	7.5/46mg QD		13 monthly visits + 12 monthly visits for SEQUEL extension	

* Included for harms only
† Weight Loss Maintenance study
‡ Retrospective data from UK Clinical Practice Research Datalink (CPRD) from 09/1998 to 12/2008

Abbreviations: BID = twice a day; BLOOM = Behavioral Modification and Lorcaserin for Overweight and Obesity Management; BLOSSOM = Behavioral Modification and Lorcaserin Second Study for Obesity Management; BMI = body mass index; CG = control group; COR-1 = Contrave Obesity Research-1; COR-11 = CONTRAVE Obesity Research-II; COR-BMOD = Contrave Obesity Research - Behavior Modification; IG = intervention group; ITT = intention-to-treat; kcal = kilocalorie; km = kilometer; LEARN = Lifestyle, Exercise, Attitude, Relationships, Nutrition; mg = milligram; NA = not applicable; NR = not reported; QD = once a day; ObelHyx = Obesity Linked with Hypercholesterolemia treated with Xenical; SD = standard deviation; TID = three times a day; XENDOS = XENical in the prevention of Diabetes in Obese Subjects

Table 9. Results of Behavior-Based Weight Loss and Weight Loss Maintenance Interventions on Health-Related Quality of Life

Author, year (Study name) Quality	FU, mos	IG	IG N	Instrument	IG Mean (SD) BL	IG Mean change (95% CI or SD)	CG N	CG Mean (SD) BL	CG Mean change (95% CI or SD)	Study-reported between-group mean difference (95% CI or SD)
Ahern, 2017[323] (WRAP) Fair	12	IG1	504	EQ5D-3L	0.793 (0.249)	-0.012 (0.011)*	197	0.786 (0.266)	-0.014 (0.018)*	0.014 (-0.025 to 0.054); p=0.476
		IG2	508		0.783 (0.249)	0.009 (0.011)*	197	0.786 (0.266)	-0.014 (0.018)*	0.029 (-0.011 to 0.069); p=0.150
	24	IG1	504		0.793 (0.249)	-0.018 (0.011)*	197	0.786 (0.266)	-0.005 (0.018)*	-0.014 (-0.052 to 0.025); p=0.486
		IG2	508		0.783 (0.249)	-0.015 (0.012)*	197	0.786 (0.266)	-0.005 (0.018)*	-0.011 (-0.050 to 0.028); p=0.486
Appel, 2011[219] Rubin, 2013[378] (SF-12, EQ-5D) (POWER Hopkins) Good	24	IG1	100	SF-12 Mental	52.16 (9.60)	Mean (SE) -0.50 (0.76)	88	51.06 (8.71)	0.62 (0.95)	-1.12 (-3.52 to 1.27)
				SF-12 Physical	47.06 (8.92)	2.23 (0.75)		46.83 (7.95)	-0.29 (0.97)	2.52 (0.11 to 4.93); p<0.05
				EQ-5D VAS	75.12 (18.95)	6.14 (1.78)		73.34 (17.63)	4.31 (1.77)	1.83 (-3.07 to 6.74)
				EQ-5D single index	0.88 (0.12)	-0.01 (0.01)		0.87 (0.11)	-0.01 (0.01)	-0.0003 (-0.04 to 0.03)
		IG2	115	SF-12 Physical	47.53 (8.42)	1.16 (0.77)		46.83 (7.95)	-0.29 (0.97)	1.45 (-0.99 to 3.90)
				SF-12 Mental	52.53 (7.40)	-1.07 (0.68)		51.06 (8.71)	0.62 (0.95)	-1.70 (-3.99 to 0.60)
				EQ-5D VAS	76.64 (15.72)	3.45 (1.53)		73.34 (17.63)	4.31 (1.77)	-0.86 (-5.47 to 3.75)
				EQ-5D single index	0.88 (0.12)	-0.01 (0.01)		0.87 (0.11)	-0.01 (0.01)	-0.004 (-0.04 to 0.03)
de Vos, 2014[234] (PROOF) Fair	30	IG1	186	EQ-5D	NR	NR	180	NR	NR	NS, NR
Demark-Wahnefried, 2014[235] (DAMES) Good	12	IG1	23	SF-36 Mental	56.6 (8.2)	-1.9 (-6.0 to 2.2)	18	53.7 (8.5)	2.4 (-1.0 to 5.8)	p=0.35
		IG2	23		52.1 (11.7)	0.6 (-3.8 to 5.0)	18	53.7 (8.5)	2.4 (-1.0 to 5.8)	p=0.46
		IG1	23	SF-36 Physical	44.3 (8.3)	2.2 (-2.1 to 6.5)	18	45.3 (8.5)	0.9 (-1.4 to 3.2)	p=0.73
		IG2	23		44.3 (11.9)	-2.3 (-5.0 to 0.4)	18	45.3 (8.5)	0.9 (-1.4 to 3.2)	p=0.16

Table 9. Results of Behavior-Based Weight Loss and Weight Loss Maintenance Interventions on Health-Related Quality of Life

Author, year (Study name) Quality	FU, mos	IG	IG N	Instrument	IG Mean (SD) BL	IG Mean change (95% CI or SD)	CG N	CG Mean (SD) BL	CG Mean change (95% CI or SD)	Study-reported between-group mean difference (95% CI or SD)
Greaves, 2015 (Waist the Waist)[243] Fair	12	IG1	55	EQ-5D VAS	77.0 (14.9)	NR	53	76.4 (17.0)	NR	1.36 (-3.37 to 6.04)
Jansson, 2013[252] Fair	12	IG1	45	SF-36 and EQ-5D	NR	NR	49	NR	NR	NS, NR
Hunt, 2014[249] (FFIT) Good	12	IG1	316	SF-36 Mental	48.9 (10.1)	1.9 (0.9 to 2.8)	351	48.3 (9.2)	1.6 (0.8 to 2.4)	0.50 (-0.62 to 1.62) p=0.3822
				SF-36 Physical	47.0 (7.9)	2.3 (1.5 to 3.2)	351	47.7 (7.5)	0.2 (-0.6 to 0.9)	1.89 (0.89 to 2.90) p=0.0002
Knowler, 2012[205]† Florez, 2012[379] (SF-36 [38 months] & SF-6D [38 months] Ackermann, 2009[380] (SF-6D, QWB-SA, SF-6D [12 months], SF-36 [12 months]) (DPP) Good	12	IG1	1017	SF-36 Mental	53.7 (7.6)	-0.70 (8.67)	1018	54.0 (7.4)	-1.16 (8.33)	NR
			1017	SF-36 Physical	50.6 (6.9)	1.33 (7.0)	1018	50.4 (7.2)	-0.04 (7.12)	NR
	38	IG1	1048	SF-36 Mental	53.7 (7.6)	NR	850	50.4 (7.2)	NR	0.29 (0.32)
			1048	SF-36 Physical	50.6 (6.9)	NR	850	50.4 (7.2)	NR	1.57 (0.30); p<0.01
	12	IG1	268	Quality of Well-Being Index (QWB-SA)	0.7 (0.1)	0.02 (0.1)	252	0.7 (0.1)	0.01 (0.1)	NR
	12	IG1	1015	SF-6D Health utility index	0.8 (0.1)	0.0 (0.1)	1018	0.8 (0.1)	-0.01 (0.1)	NR
	38	IG1	1048	SF-6D Health utility index	0.8 (0.1)	NR	850	0.8 (0.1)	NR	0.01 (0.004) p<0.05
Kulzer, 2009[262]† (PREDIAS) Fair	12	IG1	91	WHO-Five Well-Being Index (WHO-5)	15.3 (5.1)	1.4 (3.9)	91	14.3 (4.9)	0.0 (4.2)	1.40 (0.22 to 2.58); p=0.101
Nanchahal, 2012[275] (CAMWEL) Fair	12	IG1	103	EQ-VAS	47.42 (30.68)	NR	114	NR	NR	NS, NR
				Obesity-related QOL	48.22 (30.18)	NR	114	NR	NR	NS, NR
Ockene, 2012[278] Fair	12	IG1	147	SF-12	NR	NR	142	NR	NR	NR

Table 9. Results of Behavior-Based Weight Loss and Weight Loss Maintenance Interventions on Health-Related Quality of Life

Author, year (Study name) Quality	FU, mos	IG	IG N	Instrument	IG Mean (SD) BL	IG Mean change (95% CI or SD)	CG N	CG Mean (SD) BL	CG Mean change (95% CI or SD)	Study-reported between-group mean difference (95% CI or SD)
Pekkarinen, 2015[282]§ Fair	24	IG1	50	SF-36	NR	NR	38	NR	NR	NS, NR
Rock, 2015[288] Demark-Wahnefried, 2015[381] (ENERGY) Good	12	IG1	269	SF-36 Vitality Subscale	58.7 (21.35)	NR	244	58.7	NR	p=0.51
			270	SF-36 Physical Function Subscale	80.2 (18.67)	NR	244	79.0 (18.38)	NR	p=0.05
	24	IG1	257	SF-36 Vitality Subscale	58.7 (21.35)	NR	248	58.7	NR	p=0.19
			257	SF-36 Physical Function Subscale	80.2 (18.67)	NR	248	79.0 (18.38)	NR	p=0.62
Simpson, 2015[296]§ (WILMA) Fair	12	IG1	45	EQ-5D Index score	NA	NA	51	NA	NA	OR: 0.85 (0.29 to 2.46)‖
		IG2	43	EQ-5D Index score	NA	NA	51	NA	NA	OR: 1.39 (0.49 to 3.94)‖
von Gruenigen, 2012[310] McCarroll, 2014[382] (SUCCEED) Fair	12	IG1	41	Functional Assessment of Cancer Therapy-General (FACT-G)	NR	NR	34	NR	NR	NS, NR
Wadden, 2011[206]† Sarwer, 2013[383] (POWER-UP) Good	12	IG1	131	IWQOL-Lite (total)	69.4 (17.5)	NR	130	68.8 (17.5)	NR	NS, NR
				SF-12 Mental	48.9 (9.8)	NR		48.7 (10.5)	NR	NS, NR
				SF-12 Physical	43.9 (9.0)	NR		43.4 (9.5)	NR	NS, NR
				EQ-5D Index score	70.4 (18.8)	NR		67.0 (20.0)	NR	NS, NR
Wylie-Rosett, 2001[315] Swencionis, 2013[384] Fair	12	IG1	194	Psychological Well-Being Index	NR	NR	97	NR	NR	NS, NR‡
		IG2	183		NR	NR		NR	NR	NS, NR‡

* SE

† Included in previous review

‡Results not reported by group, but no significant differences in well-being were found between groups at 12 months (anxiety p=0.53, depression p=0.32, positive well-being p=0.39, self-control p=0.11, general health p=0.38, vitality p=0.35, total well-being p=0.29)

§Weight Loss Maintenance study

‖Reported as dichotomized analysis of (those with scores <100 vs. those with scores of 100 due to skewed and bimodal distribution of followup scores

Table 9. Results of Behavior-Based Weight Loss and Weight Loss Maintenance Interventions on Health-Related Quality of Life

Abbreviations: BL = baseline; CAMWEL = Camden Weight Loss; CG = control group; CI = confidence interval; DAMES = Daughters And Mothers Against Breast Cancer; DPP = Diabetes Prevention Program; EQ-5D = EuroQol Five Dimensions; EQ-VAS = EuroQol Visual Analogue Scale; FFIT = Football Fans in Training; FU = followup; IG = intervention group; IWQOL = Impact of Weight on Quality of Life; mos = months; n = number of participants; NA = not applicable; NR = not reported; NS = not statistically significant; OR = odds ratio; PA = physical activity; POWER-UP = Practice-based Opportunities for Weight Reduction at the University of Pennsylvania; PREDIAS = Prevention of Diabetes Self-Management Program; PROOF = Prevention of Knee Osteoarthritis in Overweight Females; QOL = quality of life; SD = standard deviation; SE = standard error; SF = short form; SUCCEED = Survivors of Uterine Cancer Empowered by Exercise and Healthy Diet; WILMA = Weight Loss Maintenance in Adults; WRAP = Weight-loss programme referrals for adults in primary care

Table 10. Results of Medication-Based Weight Loss and Weight Loss Maintenance Interventions on Health-Related Quality of Life

Drug	Author, year (Study name) Quality	FU, mos	IG	IG N	Instrument	IG Mean (SD) BL	IG Mean change (95% CI or SD)	CG N	CG Mean (SD) BL	CG Mean change (95% CI or SD)	Study-reported between-group mean difference (95% CI or SD)
Liraglutide	Astrup, 2012[220] Fair	24	3.0mg QD	98	IWQOL-Lite (total)	NR	NR	98	NR	NR	NR*
	Pi-Sunyer, 2015[285] le Roux, 2017[339] (SCALE Obesity and Prediabetes) Fair	13	3.0mg QD	2437	IWQOL-Lite (total)	73.0 (18.2)	10.6 (13.3)	1225	72.6 (18.2)	7.7 (2.8)	3.1 (2.2 to 4.0); p<0.0001
		13	3.0mg QD	2437	SF-36 Mental	53.8 (8.1)	0.2 (8.1)	1225	54 (7.9)	-0.9 (9.1)	0.9 (0.3 to 1.5); p=0.003
			3.0mg QD	2437	SF-36 Physical	48.2 (8.4)	3.6 (6.8)	1225	47.7 (8.7)	2.1 (7.7)	1.7 (1.2 to 2.2); p<0.001
		36†	3.0mg QD	1472	SF-36 Mental	NR	-0.5 (8.7)	738	NR	-1.4 (9.2)	0.8 (-0.1 to 1.6); p=0.08
			3.0mg QD	1472	SF-36 Physical	NR	3.1 (7.3)	738	NR	2.6 (7.6)	0.9 (0.2 to 1.6); p=0.0156
Lorcaserin hydrochloride	Fidler, 2011[173] (BLOSSOM) Fair	12	10mg BID	1561	IWQOL-Lite (total)	74.7 (16.1)	LSM: 11.8 (10.1)	1541	75.3 (15.6)	LSM: 10.0 (10.1)	p<0.001
	Smith, 2010[172] (BLOOM) Fair	12	10mg BID	1538	IWQOL-Lite (total)	73.92 (0.41)‡	12.4 (0.4)‡	1499	73.85 (0.42)‡	10.7 (0.4)‡	p<0.001
Nal-Bup	Apovian, 2013[218] (COR-11) Fair	13	16/180mg TID	702	IWQOL-Lite (total)	71.9 (17.1)	LSM: 10.9 (0.5)‡	456	73.0 (15.9)	6.4 (0.6)‡	p<0.001
	Greenway, 2010[244] (COR-1) Fair	13	16/180mg TID	471	IWQOL-Lite (total)	70.3 (16.5)	LSM: 12.7 (11.6 to 13.8)	511	71.8 (17.2)	LSM: 8.6 (-7.5 to 9.6)	LSM change: p<0.0001
	Wadden, 2011[311] (COR-BMOD) Fair	12	16/180mg TID	482	IWQOL-Lite (total)	71.9 (15.4)	LSM: 13.4 (12.3 to 14.5)	193	73.5 (15.6)	LSM: 10.3 (8.6 to 12.0)	p<0.001

Table 10. Results of Medication-Based Weight Loss and Weight Loss Maintenance Interventions on Health-Related Quality of Life

Drug	Author, year (Study name) Quality	FU, mos	IG	IG N	Instrument	IG Mean (SD) BL	IG Mean change (95% CI or SD)	CG N	CG Mean (SD) BL	CG Mean change (95% CI or SD)	Study-reported between-group mean difference (95% CI or SD)
Orlistat	Rossner, 2000[292] Fair	24	120mg TID	NR	Global and obesity-specific health state preference	NR	NR	NR	NR	NR	Satisfaction with: Medication: p<0.001 WL: p=0.001 WL program: p=0.002 Overall treatment: p<0.001 Less overweight distress: p<0.05
			60mg TID	NR		NR	NR	NR	NR	NR	Satisfaction with: Medication: p<0.05 WL: NS, NR WL program: NS, NR Overall treatment: p<0.05 Less overweight distress: p<0.05
	Swinburn, 2005[304] Fair	12	120mg TID	166	SF-36	NR	NR	167	NR	NR	NS, NR§
Phen-Top	Gadde, 2011[241] (CONQUER/ SEQUEL) Fair	13	15/92mg QD	NR	IWQOL-Lite (total)	NR	NR	NR	NR	NR	NR‖
			7.5/46mg QD	NR		NR	NR	NR	NR	NR	NR
			15/92mg QD	NR	SF-36	NR	NR	NR	NR	NR	NR¶
			7.5/46mg QD	NR		NR	NR	NR	NR	NR	NR

* Quality of life improved in all groups at years 1. Total change and statistical significance NR.
† Participants with prediabetes at baseline only
‡ Standard error
§ Vitality subscale: Higher scores in IG (p=0.006); all other domains NS
‖ Reported to have greater improvements on most QOL measures compared with placebo, data NR
¶ Reported to have greater improvements on most QOL measures compared with placebo, data NR

Abbreviations: BID = twice a day; BLOOM = Behavioral Modification and Lorcaserin for Overweight and Obesity Management; BL = baseline; BLOSSOM = Behavioral Modification and Lorcaserin Second Study for Obesity Management; CI = confidence interval; COR-1 = Contrave Obesity Research-1; COR-11 = CONTRAVE Obesity Research-II; COR-BMOD = Contrave Obesity Research - Behavior Modification; IWQOL = Impact of Weight on Quality of Life; LSM = least squares mean; mg = milligram; Nal-Bup = Naltrexone HCL and bupropion HCL; NR = not reported; NS = not statistically significant; Phen-Top = Phentermine-topiramate extended release; QD = once a day; SD = standard deviation; SF = short form; TID = three times a day; WL = weight loss

Table 11. Pooled Results of Weight Loss Outcomes for Behavior-Based Weight Loss Interventions

Outcome	Followup	Mean Differencein Change (95% CI)	Trials, k	n	I^2, %
Weight, kg[§]	12-18 months	−2.39 (−2.86 to −1.93)	67	22065	90.0
	24 months	−1.45 (−2.03 to −0.87)	21	7268	67.9
Weight, % change	12-18 months	−3.10 (−3.51 to −2.68)	26	5734	99.5
BMI, kg/m^2	12-18 months	−1.01 (−1.29 to −0.74)	40	10924	92.2
Waist circumference, cm[‖]	12-18 months	−2.51 (−3.15 to −1.87)	41	12180	94.6
Outcome	**Followup**	**Risk Ratio (95% CI)**	**Trials, k**	**n**	**I^2, %**
≥ 5% weight loss	12-18 months	1.94 (1.70 to 2.22)	38	12231	67.2
	24 months	1.51 (1.25 to 1.81)	13	4824	63.0
≥ 10% weight loss	12-18 months	3.06 (2.41 to 3.88)	16	6975	49.0

§ To convert kg to lbs, multiply by 2.205
‖ To convert cm to inches, multiply by 0.394

Abbreviations: BMI = body mass index; cm = centimeter(s); CI = confidence interval; kg= kilogram(s); lb(s) = pound(s)

Table 12. Results of Behavior-Based Weight Loss Interventions on Incident Diabetes

Author, year (Study name) Quality	FU, mos	IG	IG N	IG FU n (%)	CG N	CG FU n (%)	Study-reported between-group difference
Ackermann, 2015[215] (RAPID-YDPP) Fair	12	IG1	220	26 (11.8)	226	24 (10.6)	p=0.7
Bhopal, 2014[225] (PODOSA) Good	36	IG1	81	12 (15.0)	82	17 (21.0)	OR=0.68 (0.27 to 1.67) p=0.37
Katula, 2011[258] (HELP PD) Good	12	IG1	135	2 (1.5)	138	7 (5.1)	p=0.12
Knowler, 2012[205]* (DPP) Good	36	IG1	638	4.8† 92 (14.4)‖	657	11.0† 190 (28.9)‖	NR -58% (48% to 66%) NNT=6.9 (5.4 to 9.5)
Luley, 2014[265] Fair	12	IG1	58	1 (1.7)	60	3 (5.0)	NR
		IG2	60	0 (0.0)	60	3 (5.0)	NR
Ma, 2013[266] (E-LITE) Good	15	IG1	79	1 (1.3)	81	1 (1.2)	NR
	15	IG2	81	0 (0.0)	81	1 (1.2)	NR
Nicklas, 2014[277] (Balance after Baby) Fair	12	IG1	36	0 (0.0)	39	3 (7.7)	NS, NR
O'Brien, 2017[321] (PREVENT-DM) Good	12	IG1	33	0 (0.0)	30	1 (3.3)	NR
Parikh, 2010[280]* (HEED) Fair	12	IG1	50	0.36‡	49	0.33‡	NS, NR
Penn, 2009[283] (EDIPS-Newcastle) Fair	60	IG1	51	32.7 (10.7 to 74.6)§ 5 (9.8)	51	67.1 (34.2 to 117.5)§ 11 (21.6)	NR RR=0.45 (0.20 to 1.20)
Rock, 2015[288] Sedjo, 2016[385] (ENERGY) Good	12	IG1	271	0 (0.0)	245	1 (0.4%)	NR
Tuomilehto, 2001[306]* Lindstrom, 2013[340] (Finnish DPS) Good	12	IG1	265	5 (1.9)	257	16 (6.2)	NR
	24			15 (5.7)		37 (14.4)	NR
	36			22 (8.3)		51. (19.8)	NR
	48			24 (9.1)		53 (20.6)	NR
	60			27 (10.2)		57 (22.2)	NR
	72			27 (10.2)		59 (23.0)	HR=0.4 (0.30 to 0.70) p <0.001
	108			106 (40.0)		140 (54.5)	HR=0.61 (0.48 to 0.79) p <0.001
Wing, 1998[314] Fair	24	IG1	32	5.0 (15.6)	29	2.0 (6.9)	NR, p=0.079 for 4-group comparison
		IG2	33	10.0 (30.3)	29	2.0 (6.9)	
		IG3	28	4.0 (14.3)	29	2.0 (6.9)	

* Included in previous review
† Cases//100 person-years

Table 12. Results of Behavior-Based Weight Loss Interventions on Incident Diabetes

‡ Cases/person-years
§ Cases/1000 person-years (95% confidence interval)
‖ Cumulative incidence: 38.0% per 100 person-years

Abbreviations: CG = control group; DPP = Diabetes Prevention Program; DPS = Diabetes Prevention Study; EDIPS = European Diabetes Prevention Study; E-LITE = Evaluation of Lifestyle Interventions to Treat Elevated Cardiometabolic Risk in Primary Care; ENERGY = Exercise and Nutrition to Enhance Recovery and Good Health for You ; FU = followup; HEED = Project Help Educate to Eliminate Diabetes; HELP PD = Healthy Partnerships to Prevent Diabetes; HR = hazard ratio; IG = intervention group; mos= months; NNT = number needed to treat; NR = not reported; NS = not statistically significant; OR = odds ratio; PA = physical activity; PODOSA = Prevention of Diabetes and Obesity in South Asians; PREVENT-DM = The Promotora Effectiveness Versus Metformin Trial; RAPID-YDPP = Reaching Out to Prevent Increases in Diabetes - YMCA model for Diabetes Prevention Program; RR = risk ratio; YMCA = The Young Men's Christian Association

Table 13. Results of Medication-Based Weight Loss Interventions on Weight Loss, by Drug

Drug	Author Year	FU, mos	% FU	Dose	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*; study-reported p-value
Liraglutide	Astrup, 2012[220]	12	63.1	3.0mg QD	93	97.5 (13.8)	-7.8 (NR)	98	97.3 (12.3)	-2.0 (NR)	-5.80 (-8.00 to -3.70); p<0.0001
	Pi-Sunyer, 2015[285]	13	69.4	3.0mg QD	2437	106.2 (21.2)	-8.4 (-8.7 to -8.1)	1225	106.2 (21.7)	-2.8 (-3.2 to -2.4)	-5.60 (-6.00 to -5.10); p<0.001
	le Roux, 2017[339]	36†	50.0	3.0mg QD	1472	107.5 (21.6)	-6.5 (-6.9 to -6.1)	738	107.9 (21.8)	-2.0 (-2.5 to -1.5)	-4.60 (-5.30 to -3.90); p<0.0001
Lorcaserin hydrochloride	Fidler, 2011[173]	12	55.5	10mg BID	1561	100.3 (15.7)	LSM: -5.8 (-6.1 to -5.5)	1541	100.8 (16.2)	LSM: -2.9 (-3.2 to -2.6)	LSM: -2.90 (NR); p<0.001
	Smith, 2010[172]	12	49.7	10mg BID	1538	100.4 (16.0)	-5.8 (-6.2 to -5.4)	1499	99.7 (15.9)	-2.2 (-2.4 to -2.0)	-3.60 (-4.04 to -3.16); p<0.001
Nal-Bup	Apovian, 2013[218]	13	53.8	16/180mg TID	702	100.3 (16.6)	LSM: -6.2 (-6.6 to -5.8)	456	99.2 (15.9)	LSM: -1.3 (-1.9 to -0.7)	NR; p<0.001
	Greenway, 2010[244]	13	59.9	16/180mg TID	471	99.7 (15.9)	LSM: -6.1 (-6.7 to -5.5)	511	99.5 (14.3)	LSM: -1.4 (-2.0 to -0.8)	NR; p<0.0001
Orlistat	Broom, 2002[227]	12	65.3	120mg TID	259	100.9 (20.5)	-5.8 (-6.8 to -4.8)	263	101.8 (19.8)	-2.3 (-3.1 to -1.5)	-3.50 (-4.79 to -2.21); p<0.0001
	Davidson, 1999[160]	12	66.3	120mg TID	657	100.7 (15.4)	-8.8 (-9.5 to -8.0)	223	100.6 (13.4)	-5.8 (-7.1 to -4.5)	-2.95 (-4.45 to -1.45); p<0.001
	Derosa, 2003[236]	12	96.0	120mg TID	25	94.2 (9.8)	-8.6 (-9.0 to -8.2)	23	95.3 (10.2)	-7.6 (-7.9 to -7.3)	-1.00 (-1.49 to -0.51); p=NR
	Finer, 2000[239]	12	61.0	120mg TID	110	97.9 (12.9)	LSM: -3.3 (NR)	108	98.4 (15.0)	LSM: -1.3 (NR)	LSM: -1.99 (-3.60 to -0.38); p=0.016
	Hauptman, 2000[246]	12	67.2	120mg TID	210	100.5 (14.2)	-7.9 (-9.1 to -6.8)	212	101.8 (14.6)	-4.1 (-5.2 to -3.0)	-3.80 (-5.37 to -2.23); p=0.001
		12		60mg TID	213	100.4 (14.6)	-7.1 (-8.1 to -6.0)	212	101.8 (14.6)	-4.1 (-5.2 to -3.0)	-2.94 (-4.46 to -1.42); p=0.001
		18	NR	120mg TID	210	100.5 (14.2)	-6.2 (-7.4 to -5.0)	212	101.8 (14.6)	-2.9 (-4.0 to -1.8)	-3.29 (-4.94 to -1.64); p=0.001
		18	NR	60mg TID	213	100.4 (14.6)	-5.8 (-6.8 to -4.8)	212	101.8 (14.6)	-2.9 (-4.0 to -1.8)	-2.85 (-4.36 to -1.34); p=0.001
		24	51.7	120mg TID	210	100.5 (14.2)	-5.0 (-6.5 to -3.6)	212	101.8 (14.6)	-1.6 (-2.9 to -0.4)	-3.37 (-5.25 to -1.49); p=0.001
		24		60mg TID	213	100.4 (14.6)	-4.5 (-5.7 to -3.3)	212	101.8 (14.6)	-1.6 (-2.9 to -0.4)	-2.81 (-4.51 to -1.11); p=0.001

Table 13. Results of Medication-Based Weight Loss Interventions on Weight Loss, by Drug

Drug	Author Year	FU, mos	% FU	Dose	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*; study-reported p-value
	Krempf, 2003[260]	12	68.7	120mg TID	346	97.0 (16.7)	LSM: -6.3 (-7.3 to -5.3)	350	97.5 (16.8)	LSM: -3.3 (-4.3 to -2.3)	NR; p<0.0001
		18	61.1	120mg TID	346	97.0 (16.7)	LSM: -5.3 (-6.3 to -4.3)	350	97.5 (16.8)	LSM: -2.4 (-3.4 to -1.4)	NR; p<0.0001
	Lindgarde, 2000[263]	12	85.9	120mg TID	190	96.1 (13.7)	-5.6 (-6.3 to -4.9)	186	95.9 (13.5)	-4.3 (-5.1 to -3.5)	-1.30 (-2.43 to -0.17); p<0.05
	Rossner, 2000[292]	12	71.9	120mg TID	242	96.7 (13.8)	-9.4 (-10.2 to -8.6)	237	97.7 (14.6)	-6.4 (-7.3 to -5.5)	-3.00 (-4.17 to -1.83); p<0.001
		12		60mg TID	239	99.1 (14.3)	-8.5 (-9.4 to -7.6)	237	97.7 (14.6)	-6.4 (-7.3 to -5.5)	-2.10 (-3.36 to -0.84); p<0.001
		24	59.7	120mg TID	242	96.7 (13.8)	-7.4 (-8.3 to -6.5)	237	97.7 (14.6)	-4.3 (-5.2 to -3.4)	-3.10 (-4.40 to -1.80); p<0.001
		24		60mg TID	239	99.1 (14.3)	-6.6 (-7.7 to -5.5)	237	97.7 (14.6)	-4.3 (-5.2 to -3.4)	-2.30 (-3.71 to -0.89); p=0.005
	Sjostrom, 1998[297]	12	79.1	120mg TID	343	99.1 (NR)	-10.3 (NR)	340	99.8 (NR)	-6.1 (NR)	-4.20 (NR); p<0.001
	Swinburn, 2005[304]	12	79.4	120mg TID	170	103.3 (17.8)	-4.7 (-5.9 to -3.5)	169	106.9 (17.8)	-0.9 (-1.5 to -0.3)	-3.80 (-5.12 to -2.48); p=0.001
	Torgerson, 2004[161]	12	83.1	120mg TID	1640	110.4 (16.3)	-10.6 (NR)	1637	110.6 (16.5)	-6.2 (NR)	-4.40 (NR); p<0.001
		48	42.8	120mg TID	1640	110.4 (16.3)	-5.8 (NR)	1637	110.6 (16.5)	-3.0 (NR)	LSM: -2.70 (NR); p<0.001
Phen-Top	Gadde, 2011[241]	13	69.3	15/92 mg QD	981	103.0 (17.6)	LSM: -10.2 (-10.8 to -9.7)	979	103.3 (18.1)	LSM: -1.4 (-2.0 to -0.8)	NR; p<0.0001
		13		7.5/46 mg QD	488	102.6 (18.2)	LSM: -8.1 (-8.9 to -7.4)	979	103.3 (18.1)	LSM: -1.4 (-2.0 to -0.8)	NR; p<0.0001

* Study-reported adjusted between group difference in mean change reported if available; otherwise, calculated unadjusted between group difference.
† Individuals with prediabetes at baseline only

Abbreviations: BID = twice a day; BL = baseline; CG = control group; CI = confidence interval; cm = centimeters; FU = followup; kg = kilograms; LSM = least squares mean; mg = milligram; mos = months; Nal-Bup = Naltrexone HCL and bupropion HCL; NR = not reported; Phen-Top = Phentermine-topiramate extended release; QD = once a day; SD = standard deviation; TID = three times a day; WC = waist circumference

Table 14. Results of Medication-Based Weight Loss Interventions on Waist Circumference, by Drug

Drug	Author, year	FU, mos	% FU	Dose	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
Liraglutide	Astrup, 2012[220]	12	63.1	3.0mg QD	93	109.0 (8.3)	-7.8 (NR)	98	108.0 (10.0)	-3.0 (NR)	-4.70 (-7.10 to -2.40); p<0.0001
	Pi-Sunyer, 2015[285]	13	69.4	3.0mg QD	2437	115.0 (14.4)	-8.2 (-8.5 to -7.9)	1225	114.5 (14.3)	-3.9 (-4.3 to -3.5)	-4.20 (-4.70 to -3.70); p<0.001
	le Roux, 2017[339]	36†	50.0	3.0mg QD	1472	116.5 (14.4)	-6.9 (-7.3 to -6.5)	738	116.7 (13.9)	-3.4 (-3.9 to -2.9)	-3.50 (-4.20 to -2.80); p<0.0001
Lor-Hyd	Fidler, 2011[173]	12	55.5	10mg BID	1561	108.9 (12.2)	LSM: -6.3 (-6.7 to -5.9)	1541	110.2 (12.5)	LSM: -4.1 (-4.5 to -3.7)	NR; p<0.001
	Smith, 2010[172]	12	49.7	10mg BID	1538	109.6 (12.0)	-6.8 (-7.2 to -6.4)	1499	109.2 (12.0)	-3.9 (-4.3 to -3.5)	-2.90 (-3.45 to -2.35); p<0.001
Nal-Bup	Apovian, 2013[218]	13	53.8	16/180mg TID	702	109.0 (11.8)	LSM: -6.7 (-7.3 to -6.1)	456	108.6 (11.8)	LSM: -2.1 (-3.1 to -1.1)	NR; p<0.001
	Greenway, 2010[244]	13	59.9	16/180mg TID	471	108.8 (11.3)	LSM: -6.2 (-7.1 to -5.4)	511	110.0 (12.2)	LSM: -2.5 (-3.3 to -1.6)	NR; p<0.0001
	Wadden, 2011[311]	12	51.3	16/180mg TID	482	109.3 (11.4)	-10.2 (-10.9 to -9.0)	193	109.0 (11.8)	-7.0 (-8.3 to -5.3)	-3.20 (-4.98 to -1.42); p<0.001
Orlistat	Broom, 2002[227]	12	65.3	120mg TID	259	107.8 (15.6)	-6.0 (NR)	263	108.6 (16.4)	-2.6 (NR)	-3.39 (NR); p<0.0001
	Derosa, 2003[236]	12	96.0	120mg TID	25	100.8 (5.3)	-3.0 (-3.4 to -2.6)	23	102.3 (6.2)	-2.4 (-2.6 to -2.2)	-0.60 (-1.02 to -0.18); p=NR
	Krempf, 2003[260]	18	61.1	120mg TID	346	105.6 (14.9)	LSM: -5.3 (-6.7 to -3.9)	350	106.5 (15.0)	LSM: -3.5 (-4.9 to -2.1)	NR; p<0.05
	Lindgarde, 2000[263]	12	85.9	120mg TID	190	106.0 (10.8)	-4.8 (NR)	186	106.0 (11.0)	-4.1 (NR)	-0.70 (NR); p>0.05
	Rossner, 2000[292]	12	71.9	120mg TID	242	NR	-6.2 (NR)	237	NR	-4.7 (NR)	-1.50 (NR); p=NR, NS
		12		60mg TID	239	NR	-6.0 (NR)	237	NR	-4.7 (NR)	-1.30 (NR); p=NR, NS
		24	59.7	120mg TID	242	NR	-5.1 (NR)	237	NR	-3.1 (NR)	-2.00 (NR); p<0.05
		24	59.7	60mg TID	239	NR	-4.7 (NR)	237	NR	-3.1 (NR)	-1.60 (NR); p=NR
	Swinburn, 2005[304]	12	79.4	120mg TID	170	112.4 (12.8)	-5.1 (-6.2 to -4.0)	169	114.8 (13.1)	-1.9 (-2.5 to -1.3)	-3.20 (-4.43 to -1.97); p=0.001
	Torgerson, 2004[161]	12	83.1	120mg TID	1640	115.0 (10.4)	-9.6 (NR)	1637	115.4 (10.4)	-7.0 (NR)	-2.60 (NR); p<0.01
		48	42.8	120mg TID	1640	115.0 (10.4)	-6.4 (NR)	1637	115.4 (10.4)	-4.4 (NR)	-2.00 (NR); p<0.01
Phen-Top	Allison, 2012[216]	12	59.9	15/92mg QD	498	120.1 (14.6)	LSM: -10.9 (-11.8 to -10.0)	498	120.5 (13.9)	LSM: -3.1 (-4.0 to -2.2)	NR; p<0.0001
	Gadde, 2011[241]	13	69.3	15/92mg QD	981	113.2 (12.2)	LSM: -9.2 (-9.8 to -8.6)	979	113.4 (12.2)	LSM: -2.4 (-3.0 to -1.8)	NR; p<0.0001

Table 14. Results of Medication-Based Weight Loss Interventions on Waist Circumference, by Drug

Drug	Author, year	FU, mos	% FU	Dose	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
		13		7.5/46mg QD	488	112.6 (12.5)	LSM: -7.6 (-8.4 to -6.9)	979	113.4 (12.2)	LSM: -2.4 (-3.0 to -1.8)	NR; p<0.0001

* Study-reported adjusted between group difference in mean change reported if available; otherwise, calculated unadjusted between group difference.
† Individuals with prediabetes at baseline only

Abbreviations: BID = twice a day; BL = baseline; CG = control group; CI = confidence interval; cm = centimeters; FU = followup; IG = intervention group; Lor-Hyd = Lorcaserin hydrochloride; LSM = least squares mean; mg = milligram; mos = months; QD = once a day; Nal-Bup = Naltrexone HCL and bupropion HCL; NA = not applicable; NR = not reported; NS = not statistically significant; Phen-Top = Phentermine-topiramate extended release; QD = once a day; SD = standard deviation; TID = three times a day;

Table 15. Results of Medication-Based Weight Loss and Weight Loss Maintenance Interventions on Incident Diabetes

Drug	Author, year (Study name) Quality	FU, months	Dosage	IG N	IG FU n (%)	CG N	CG FU n (%)	Study-reported between-group difference (95% CI)
Liraglutide	Pi-Sunyer, 2015[285] le Roux, 2017[339] (SCALE Obesity and Prediabetes) Fair	13	3.0mg QD	2437	4 (0.16%)	1225	14 (1.1%)	OR: 8.1 (2.6 to 25.3) p<0.001
		36*	3.0mg QD	1472	26 (1.8%)	738	46 (6.2%)	HR: 0.21 (95% CI: 0.13-0.34, p<0.0001)
Orlistat	Torgerson, 2004[161] (XENDOS) Fair	48	120mg TID	1640	101 (6.2%)	1637	147 (9.0%)	HR: 0.63 (0.46 to 0.87) p=0.0052
	Richelsen, 2007[287]† Fair	36	120mg TID	153	8 (5.2%)	156	17 (10.9%)	p=0.041
Phen/Top	Gadde, 2011 (CONQUER/SEQUEL) Fair	13	15/92mg QD	828	14 (1.7%)	834	30 (3.6%)	RR: 0.47 (0.25 to 0.88) p=NR
		13	7.5/46mg QD	430	12 (2.8%)	834	30 (3.6%)	RR: 0.78 (0.40 to 1.50) p=NR

* 36 month outcomes are for individuals with prediabetes at baseline only
† Weight loss maintenance trial

Abbreviations: CG = control group; CI = confidence interval; FU = followup; IG = intervention group; HR = hazard ratio; LSM = least squares mean; mg = milligram; mos = months; QD = once a day; Nal-Bup = Naltrexone HCL and bupropion HCL; NR = not reported; OR = odds ratio; Phen-Top = Phentermine-topiramate extended release; RR = risk ratio; TID = three times a day; XENDOS = XENical in the prevention of Diabetes in Obese Subjects

Table 16. Percent of Individuals Experiencing at Least One Adverse Event in Studies of Medication-Based Weight Loss and Weight Loss Maintenance

Drug	Author, year	FU, mos	Dosage	IG N	IG FU n (%)	CG N	CG FU n (%)	Study-reported between-group difference
Liraglutide	Astrup, 2012[220]	12	3.0mg QD	93	89 (95.7)	98	87 (88.8)	NR
	Pi-Sunyer, 2015[285]	13	3.0mg QD	2481	1992 (80.3)	1242	786 (63.3)	NR
		36*	3.0mg QD	1501	1421 (94.7)	747	668 (89.4)	NR
	Wadden, 2013[312]†	13	3.0mg QD	212	194 (91.5)	210	186 (88.6)	NR
Lorcaserin	Farr, 2016[238]	1	10mg BID	24	3 (12.5)	24	1 (4.2)	NR
	Fidler, 2011[173]	12	10mg BID	1602	1323 (82.6)	1601	1205 (75.3)	NR
Nal-Bup	Apovian, 2013[218]	13	16/180mg TID	992	852 (85.9)	492	370 (75.2)	NR, NS
	Greenway, 2010[244]	13	16/180mg TID	573	476 (83.1)	569	390 (68.5)	<0.05
Orlistat	Bakris, 2002[222]	12	120mg TID	276	246 (89.0)	275	195 (71.0)	<0.001
	Broom, 2002[227]	6	120mg TID	67	64 (95.5)	71	61 (85.9)	NR
	Krempf, 2003[260]	18	120mg TID	346	298 (86.1)	350	253 (72.3)	<0.001
	Muls, 2001[273]	6	120mg TID	147	118 (80.0)	143	96 (67.0)	0.016
	Sjostrom, 1998[297]	12	120mg TID	343	322 (94.0)	340	279 (82.0)	NR
	Smith, 2011[298]	6	60mg TID	63	57 (90.5)	64	52 (81.2)	NR
	Swinburn, 2005[304]	12	120mg TID	170	161 (94.7)	169	158 (93.5)	NR
	Van Gaal, 1998[307]	6	120mg TID	120	101 (84.0)	124	86 (69.0)	NR
		6	60mg TID	123	102 (83.0)	124	86 (69.0)	NR
Phen-Top	Allison, 2012[216]	13	15/92mg QD	511	432 (84.5)	513	374 (72.9)	NR

* Individuals with prediabetes at baseline only

† Weight loss maintenance study

Abbreviations: BID = twice a day; CG = control group; FU = followup; IG = intervention group; mg = milligram; mos = months; QD = once a day; Nal-Bup = Naltrexone HCL and bupropion HCL; NR = not reported; NS = not statistically significant; Phen-Top = Phentermine-topiramate extended release; TID = three times a day

Table 17. Percent of Individuals Experiencing at Least One Serious Adverse Event in Studies of Medication-Based Weight Loss and Weight Loss Maintenance

Drug	Author, year	FU, mos	Dosage	IG N	IG FU n (%)	CG N	CG FU n (%)	Study-reported between-group difference
Liraglutide	Astrup, 2012[220]	12	3.0mg QD	93	7 (7.5)	98	3 (3.1)	NR
	Pi-Sunyer, 2015[285]	13	3.0mg QD	2481	154 (6.2)	1242	62 (5.0)	NR
	le Roux, 2017[339]	36*	3.0mg QD	1501	227 (15.1)	747	96 (12.8)	NR
	Wadden, 2013†	13	3.0mg QD	212	9 (4.2)	210	5 (2.4)	NR
Lorcaserin	Fidler, 2011[173]	12	10mg BID	1602	49 (3.1)	1601	36 (2.2)	NR
	Martin, 2011[268]	2	10mg BID	29	0 (0.0)	28	0 (0.0)	NR
	Smith, 2010[172]	12	10 mg BID	1593	NR	1584	NR	NR‡
Nal-Bup	Apovian, 2013[218]	13	16/180mg TID	992	21 (2.1)	492	7 (1.4)	NR, NS
	Greenway, 2010[244]	13	16/180mg TID	573	9 (1.6)	569	8 (1.4)	NR
	Wadden, 2011[311]	12	16/180mg TID	584	2 (0.3)	200	0 (0.0)	NR
Orlistat	Bakris, 2002[222]	12	120mg TID	276	14 (5.1)	275	15 (5.4)	NR
	Broom, 2002[226]	6	120mg TID	67	4 (6.0)	71	6 (8.4)	NR
	Broom, 2002[227]	12	120mg TID	259	13 (5.0)	263	17 (6.5)	NR
	Derosa, 2003[236]	12	120mg TID	27	0 (0.0)	23	0 (0.0)	NR
	Finer, 2000[239]	12	120mg TID	23	3 (13.0)	23	6 (26.0)	NR
	Krempf, 2003[260]	18	120mg TID	346	5 (1.4)	350	4 (1.1)	NR
	Lindgarde, 2000[263]	12	120mg TID	190	19 (10.0)	186	5 (2.7)	NR
	Richelsen, 2007[287]†	36	120mg TID	153	18 (11.8)	156	28 (17.9)	NS, NR
	Sjostrom, 1998[297]	12	120mg TID	343	25 (7.3)	340	24 (7.0)	NR
	Smith, 2011[298]	6	60mg TID	63	2 (3.2)	64	1 (1.6)	NR
	Swinburn, 2005[304]	12	120mg TID	170	16 (9.4)	169	12 (7.1)	NR
	Torgerson, 2004[161]	48	120mg TID	1640	246 (15.0)	1637	213 (13.0)	NR
	Van Gaal, 1998[307]	6	120mg TID/60mg TID	243	12 (4.9)	124	2 (1.6)	NR
Phen-Top	Allison, 2012[216]	13	15/92mg QD	511	13 (2.5)	513	13 (2.5)	NR
	Aronne, 2013[168]	6	15/92mg QD	108	2 (1.8)	109	0 (0.0)	NR
		6	7.5/46mg QD	106	1 (0.9)	109	0 (0.0)	NR
	Gadde, 2011[241]	13	15/92mg QD	994	50 (5.0)	993	40 (4.0)	NS, NR
		13	7.5/46mg QD	498	15 (3.0)	993	40 (4.0)	NS, NR
		25	15/92mg QD	295	12 (4.1)	227	9 (4.0)	NR
		25	7.5/46mg QD	153	4 (2.6)	227	9 (4.0)	NR

* Participants with prediabetes at baseline only

† Weight loss maintenance study

‡ Rates of serious adverse events were reported to be similar among the study groups

Abbreviations: BID = twice a day; CG = control group; FU = followup; IG = intervention group; mos = months; QD = once a day; mg = milligram; Nal-Bup = Naltrexone HCL and bupropion HCL; NR = not reported; NS = not statistically significant; Phen-Top = Phentermine-topiramate extended release; TID = three times a day

Table 18. Summary of Evidence, by Key Question and Intervention Type

Intervention	No. of Studies (k), no. of Observations (n)	Summary of Findings	Consistency/ Precision	Reporting Bias	Overall Study Quality	Body of Evidence Limitations	EPC Assessment of Overall Strength of Evidence	Applicability
KQ1. Health outcomes								
Behavior-based weight loss	k=18 RCTs (13 trials identified in update) n=9543	All-cause mortality: 4 trials reported no differences between groups at up to 16 years FU. CVD: 2 trials reported no differences between groups in the incidence of CVD events after 3 and 10 years of FU. QOL: 15 trials reported no consistent effects at 1 year or greater FU.	Reasonably consistent/ Imprecise	None suspected	Good: 9 Fair: 9	Few trials reported CVD morbidity or CVD- or all-cause related-mortality with longer term followup or sufficient power to detect differences. QOL variably measured and few trials reported absolute values.	Low	Trials reporting all-cause mortality and CVD events were limited to adults with obesity with prediabetes or prehypertension.
Behavior-based weight maintenance	k=2 RCTs (both trials identified in update) n=366	QOL: No consistent effects of maintenance interventions on QOL after 1- to 2-years FU.	Inconsistent/ Imprecise	None suspected	Good: 0 Fair: 2	No trials reported health outcomes beyond QOL. QOL data limited and poorly reported.	Insufficient	Design of trials was mixed with 1 including a weight loss intervention for all participants within the trial and the other recruiting participants after ≥5% weight loss in the past year. Trials represented a general, unselected population with BMIs ≥30 (in trial with weight loss before study entry)

Table 18. Summary of Evidence, by Key Question and Intervention Type

Intervention	No. of Studies (k), no. of Observations (n)	Summary of Findings	Consistency/ Precision	Reporting Bias	Overall Study Quality	Body of Evidence Limitations	EPC Assessment of Overall Strength of Evidence	Applicability
								to ≥35 kg/m^2 (in trial with weight loss as part of study).
Medication-based weight loss	k=10 RCTs (8 trials identified in update) n=17315	CVD: 2 trials reported few events in either group. QOL: 10 trials generally reported improved QOL scores in those randomized to medications compared to placebo.	Reasonably consistent/ Imprecise	None suspected	Good: 0 Fair: 10	Number of CVD events low with insufficient power to detect differences. Trials with high drop-out rates and QOL absolute values not reported in 4 of 10 trials. In studies with value, differences were small and of unclear clinical significance.	Low	Trials were of highly selected populations with multiple exclusions relevant to health outcomes (e.g. history of serious medical conditions, CV events, psychiatric illness)
Medication-based weight maintenance	k=0	NA	NA	NA	NA	NA	NA	NA
KQ2. Weight outcomes								
Behavior-based weight loss	k=79 RCTs (59 trials identified in update) n=24101	Pooled results of 67 trials indicated greater weight loss from behavior-based weight loss interventions vs. control conditions at 12-18 months (mean difference in weight change [MD], −2.39 kg [95% CI, −2.86 to −1.93]; k=67; n=22065; I^2=90.0%). Mean absolute changes in weight ranged	Reasonably consistent/ Reasonably precise	None suspected	Good: 23 Fair: 56	Few trials reported baseline cardiovascular risk status of participants. Very few trials reported differences in weight change at longer FU (e.g., 2 years or longer) or after a period of no intervention to examine maintenance of effects. Considerable statistical heterogeneity in all pooled analyses.	Moderate	Majority took place in US in community-based or research settings. Few included primary care involvement. Interventions were highly variable in delivery mode but used similar behavior change strategies and messages. Most interventions were 1-2 years in duration and over one-third were

Table 18. Summary of Evidence, by Key Question and Intervention Type

Intervention	No. of Studies (k), no. of Observations (n)	Summary of Findings	Consistency/ Precision	Reporting Bias	Overall Study Quality	Body of Evidence Limitations	EPC Assessment of Overall Strength of Evidence	Applicability
		from −0.5 kg (1.1 lb) to −9.3 kg (20.5 lb) among intervention participants and from 1.4 kg (3.1 lb) to −5.6 (12.3 lbs) among control participants. Weight change at FU beyond 12-18 months was not as well reported but found consistent, although generally attenuated, effects over time. Heterogeneity within each individual intervention arm confounded with differences in the populations, settings, and trial quality, make it nearly impossible to disentangle what variables might be driving larger effects. A meta-analysis of 38 trials reported that intervention participants had 1.94 times greater probability of losing 5% of their initial weight vs.						group-based interventions. Half of trials represented an unselected population eligible for participation based on BMI. The remaining half recruited adults who were overweight or with obesity and at high CV risk (prediabetes, hypertension, high-normal blood pressure, metabolic syndrome). Median BMI was 33.4 kg/m^2 across trials. Median age was 50.3 years.

Table 18. Summary of Evidence, by Key Question and Intervention Type

Intervention	No. of Studies (k), no. of Observations (n)	Summary of Findings	Consistency/ Precision	Reporting Bias	Overall Study Quality	Body of Evidence Limitations	EPC Assessment of Overall Strength of Evidence	Applicability
		control groups over 12-18 months (RR, 1.94 [95% CI, 1.70 to 2.22], k=38; n=12231, I^2=67.2%) which translated into a NNT of 8.						
Behavior-based weight maintenance	k=9 (6 trials identified in update) n=2701	Pooled results of 8 trials indicated greater weight maintenance from behavior-based maintenance interventions than control conditions at 12-18 months (MD, −1.59 kg [3.5 lbs] [95% CI, −2.38 to −0.79]; k=8; n=1408; I^2=26.8%). Eight of the nine trials reported that both intervention and control participants regained weight over 12-18 months of maintenance with the intervention participants experiencing less weight regain; the remaining trial noted that both groups continued to lose weight with	Reasonably consistent/ Reasonably precise	None suspected	Good: 3 Fair: 6	Only three trials provided data beyond 18 months FU.	Moderate	Design of trials was mixed with some including a weight loss intervention for all participants within the trial (k=6) and the others recruiting participants after documented or self-reported weight loss. Majority took place in US in community-based or research settings and few included primary care involvement. All but one of the trials represented a general, unselected population. Mean BMI at enrollment in weight loss phase was 34.2 kg/m^2. Median age was 49.2 years.

Table 18. Summary of Evidence, by Key Question and Intervention Type

Intervention	No. of Studies (k), no. of Observations (n)	Summary of Findings	Consistency/ Precision	Reporting Bias	Overall Study Quality	Body of Evidence Limitations	EPC Assessment of Overall Strength of Evidence	Applicability
		no differences between groups.						
Medication-based weight loss	k= 20 (9 trials identified in update) n= 25742	Trials indicated greater weight loss from weight loss medications vs. placebo at 12-18 months (mean/LSM difference in weight change [MD] between medication and placebo ranged from −1.0 to -5.8 kg [2.2 to 12.8 lb]; no meta-analysis conducted). Absolute changes in weight ranged from mean/LSM of -3.3 to -10.6 kg [7.3 to 23.4 lb] among medication participants and from -0.9 to -7.6 kg [2.0 to 16.8 lb] among placebo participants over 12-18 months. Medication participants had a 1.2 to 3.9 times greater probability of losing 5% of their initial weight vs. placebo participants over 12-18 months.	Reasonable consistent/ Imprecise	None suspected	Good: 0 Fair: 20	Trials generally had low followup (10 trials with ≥35% attrition) and most were of short duration (13 months FU or less). Limited data reporting (e.g. only report least square means (LSM), no between group difference in mean change or variability around difference) Very few trials reported differences in weight change at longer followup (e.g., 2 years or longer) or after a period of no intervention to examine maintenance of effects.	Low	One-half took place in the US with the majority occurring in academic, research, or specialty care settings. Few included primary care involvement. Nearly one-half had run-in periods to assess medication compliance. Most interventions were 1-2 years in duration. Median BMI was 36.1 kg/m^2 and median age was 45.

Table 18. Summary of Evidence, by Key Question and Intervention Type

Intervention	No. of Studies (k), no. of Observations (n)	Summary of Findings	Consistency/ Precision	Reporting Bias	Overall Study Quality	Body of Evidence Limitations	EPC Assessment of Overall Strength of Evidence	Applicability
Medication-based weight maintenance	k= 3 (1 trial identified in update) n= 1273	Trials indicate greater weight maintenance in medication than placebo participants over 12 to 36 months (MD ranged from -0.6 to -3.5; no meta-analysis conducted). Absolute changes ranged from weight loss of 6.3 kg [14.0 lb] to gain of 5.1 kg [11.2 lb] among medication participants compared to gain of 0.1 to 7.1 kg [0.2 to 15.7 lb] in placebo participants.	Reasonable consistent/ Imprecise	None suspected	Good: 0 Fair: 3	Trials generally had low followup (23-30% attrition or NR) and were of short duration (2 trials of only 12-13 months duration).	Insufficient	All were conducted in research clinics in the US, Canada, and Scandinavia. Participants were required to lose 5 to 8 percent of baseline weight prior to randomization. The mean baseline Median BMI was 35.6 kg/m^2 and median age was 46.2 years.
KQ2. Intermediate Outcomes								
Behavior-based weight loss	k=22 RCTs (17 trials identified in update) n=9135	Incident diabetes (13 trials, n=4095): Absolute cumulative incidence of diabetes at up to 3 years FU ranged from 0-15% in IG and 0-28.9% in CG. DPP and Finnish DPS found statistically significant lower incidence of developing	Reasonably consistent/ Imprecise	None suspected	Good: 9 Fair: 13	Intermediate health outcomes were not well reported. Small size and short duration of many studies limited power to detect differences in intermediate outcomes in majority of studies.	Moderate*	All but one trial reporting incident diabetes was limited to adults with prediabetes.

Table 18. Summary of Evidence, by Key Question and Intervention Type

Intervention	No. of Studies (k), no. of Observations (n)	Summary of Findings	Consistency/ Precision	Reporting Bias	Overall Study Quality	Body of Evidence Limitations	EPC Assessment of Overall Strength of Evidence	Applicability
		diabetes at 3-9 years; no other trial found differences between groups but trials generally had smaller sample sizes and shorter FU. Other IOs: Prevalence of hypertension, metabolic syndrome, use of CVD medications, and estimated 10-year risk of CVD were sparsely reported. Limited evidence from larger trials for reduced prevalence of hypertension and use of CVD medications; limited and mixed results for metabolic syndrome and 10-year CVD risk.						
Behavior-based weight maintenance	k=0	NA	NA	NA	NA	NA	NA	NA

Table 18. Summary of Evidence, by Key Question and Intervention Type

Intervention	No. of Studies (k), no. of Observations (n)	Summary of Findings	Consistency/ Precision	Reporting Bias	Overall Study Quality	Body of Evidence Limitations	EPC Assessment of Overall Strength of Evidence	Applicability
Medication-based weight loss	k=6 (4 trials identified in update) n=13256	Incident diabetes (3 trials; n=9484): Absolute cumulative incidence of diabetes at up to 4 years FU ranged from 0-6% in medication and 1-11% in placebo arms, which were statistically different for most drugs. Other IOs: 4 trials reported mixed results for use of lipid-lowering and antihypertensive medications, prevalence of metabolic syndrome, and 10-year CVD risk score.	Reasonably consistent†/ Imprecise	None suspected	Good: 0 Fair: 6	Trials generally had high drop out rates.	Insufficient	21-67% of participants had prediabetes.
Medication-based weight maintenance	k=1 (no trials identified in update) n=309	Incident diabetes: Absolute cumulative incidence of diabetes at 3 years FU was 5% in medication and 11% in placebo arms, which was statistically different.	NA	None suspected	Good: 0 Fair: 1	Only 1 trial with 35% drop-out	Insufficient	26% of participants had prediabetes.

Table 18. Summary of Evidence, by Key Question and Intervention Type

Intervention	No. of Studies (k), no. of Observations (n)	Summary of Findings	Consistency/ Precision	Reporting Bias	Overall Study Quality	Body of Evidence Limitations	EPC Assessment of Overall Strength of Evidence	Applicability
KQ3. Harms								
Behavior-based weight loss and weight maintenance	k=30 RCTs (28 trials identified in update) n=12824	There were no serious harms related to the interventions and most trials noted no differences between groups in the rates of adverse events, including cardiovascular events. In the three trials large enough to examine musculoskeletal issues between groups, results were mixed.	Reasonably consistent/ Precise	None suspected‡	Good: 15 Fair: 15	Harms sparsely reported for included trials. Few details provided about how harms were recorded and specific events that occurred. Did not include observational evidence on harms related to intentional weight loss.	Low	Applicable to United States primary care population.
Medication-based weight loss and weight maintenance	k=33 RCTs and 2 observational studies (17 studies identified in update) n=239428	SAE's were relatively uncommon and generally similar between groups. Those randomized to medications experienced more adverse events, which resulted in higher drop out rates in the medication arms than in the placebo arms.	Reasonably consistent/ Imprecise	None suspected	Good: 0 Fair: 35	Few conducted statistical testing of differences between groups; harms listed on labels not well evaluated	Moderate	Highly selected group chosen for low risk of serious AE's.

* Moderate strength of evidence for incident diabetes; Low strength of evidence for other intermediate outcomes
† Data for incident diabetes is consistent but data for CVD are inconsistent
‡ Suspected in one case for a behavior-based maintenance trial

Table 18. Summary of Evidence, by Key Question and Intervention Type

Abbreviations: AE = adverse event; BMI = body mass index; CG = control group; CI = confidence interval; CV = cardiovascular; CVD = cardiovascular disease; DPP = Diabetes Prevention Program; DPS = Diabetes Prevention Study; EPC = evidence-based practice center; FU = followup; IG = intervention group; IO = intermediate outcome; kg = kilogram(s); kg/m^2 = kilogram per square meter; lb. = pound(s); LSM = least squares mean; MD = mean difference; NA = not applicable; NNT = number needed to treat; No. = number; NR = not reported; QOL = quality of life; RCT = randomized controlled trial; RR = risk ratio; SAE = serious adverse event

Contextual Question 1: Relationship between BMI and disease/mortality

The association between BMI and mortality can be described as a J-shaped curve with progressively greater mortality as BMI increases above 25 to 30 kg/m^2. Obesity (BMI≥30 kg/m^2) has been associated with an increased risk of death, especially in adults under the age of 65 years.[70, 71] According to a 2014 NHANES report, obesity advanced death in the United States by 1.6 years for those with BMIs between 30 and 34.9 kg/m^2 (Class I) and by 3.7 years for those with BMIs of 35 kg/m^2 and above (Class II and III obesity).[71] The burden of obesity was greatest among adults aged 45 to 64 and among women.[71] Ischemic heart disease, diabetes, cancer (especially liver, kidney, breast, gallbladder, pancreas, endometrial, prostate, and colon cancers), and renal, hepatic, and respiratory diseases are leading causes of death in those who have obesity.[72, 73]

Whether being overweight (BMI 25 to 29.9 kg/m^2) is associated with an increased mortality risk has been the subject of considerable public health debate.[74] Some,[73, 75-80] but not all,[29, 70, 81, 82] studies have found an increased risk of death in those who are overweight. A 2013 systematic review of 97 studies (2.88 million individuals) found that being overweight was associated with a decreased risk of death.[70] On the other hand, in an even larger pooled analysis of 239 studies from four continents, the Global BMI Mortality Collaboration reported that after excluding the first 5 years of followup (to control for potential bias from weight change due to occult disease and reverse causation), those who were overweight did have an increased risk of death (OR, 1.07 [95% CI, 1.07 to 1.08] for BMI 25 to <27.5 kg/m^2; OR, 1.20 [95% CI, 1.18 to 1.22] BMI 27.5 to <30 kg/m^2).[79] However, whether excluding early mortality (2 to 5 years after BMI measurement) reduces or increases bias is controversial.[386] The difficulty in conducting these studies is that conditions leading to death may cause lower BMI rather than lower BMI causing death (reverse causation bias). A recent analysis of the Nurses' Health Study (NHS) I and II and the Health Professionals Follow-Up Study (HPFS) attempted to avoid this problem by looking at maximum BMI over 16 years of prospective weight history. Maximum BMI in overweight, Class I obesity, and Class II obesity categories were all associated with a statistically significant increased risk for all-cause death (increased risk of 6%, 24%, and 73%, respectively). The nadir for risk for all-cause death was 22.5 to 24.9 kg/m^2 among all participants.[80] In addition, those who were overweight at baseline and remained so during followup did not have an increased risk of death compared with those who were normal weight during the entire observation period. In contrast, those who were obese throughout the study (at baseline and during followup) had an increased risk of death compared with those who were not overweight or obese at all time points.[80]

Being overweight or having obesity has been associated with an increased risk of coronary heart disease (CHD), even after adjustment for established risk factors.[38-41] The risk of type 2 diabetes has been strongly associated with being overweight or having obesity.[42] Increasing BMI has been associated with an increased risk of multiple cancers including uterine, gallbladder, kidney, cervical, thyroid, leukemia, multiple myeloma, liver, colon, ovarian, esophagus, pancreas, and postmenopausal breast cancers.[43-47] For example, based on a 2014 population-based cohort study of 5.24 million U.K. adults, a 1 kg/m^2 population wide increase in BMI was estimated to result in 3790 additional annual U.K. patients developing one of the cancers positively associated with BMI.[46] According to a 2017 umbrella review of systematic reviews and meta-analyses, for every 5 kg/m^2 increase in body mass index, cancer risk increases ranged from 9 percent (RR 1.09, 95%

CI 1.06 to 1.13) for rectal cancer among men to 56 percent (RR 1.56, 95% CI 1.34 to 1.81) for biliary tract system cancer.[47]

Other diseases that have been associated with obesity include ischemic stroke,[11, 48, 49] heart failure,[41] atrial fibrillation/flutter,[50, 51] venous thrombosis,[52] gallstones,[53-55] gastroesophageal reflux disease,[56] renal disease,[57, 58] and sleep apnea.[59] Midlife obesity has been associated with later-in-life dementia.[60, 61] Obesity also increases the risk of developing osteoarthritis[62, 63] and is associated with functional disability.[64] Some observational studies suggest that individuals with obesity, even those without comorbid diseases, can have a decreased quality of life compared to normal-weight individuals.[65-67] As a result of the increased morbidity, there is increased use of health care services and costs among individuals with obesity.[68, 69]

Studies may have found different associations between BMI and risk of mortality and morbidity due to underlying population differences. For example, age, ethnicity, health conditions, and/or physical fitness level may influence the association between BMI and health outcomes. As part of CQ1, we examined whether the predictive value of BMI for future mortality and health risks differed by specific population subgroups.

The relationship between BMI and mortality appears to be less reliable in older adults[80] due to the central fat redistribution, decreased muscle mass, and decreased stature that occurs with aging.[85-88] The 2013 AHA/ACC/TOS report on the Management of Overweight and Obesity in Adults concluded there was insufficient evidence to address the adequacy of existing BMI cut-points in adults above the age of 65.[3] However, five pooled analyses, three published since that report, suggest that in community-dwelling adults, optimal BMI changes with aging. While the shape of the curve still appears to be J-shaped, with higher and lower BMIs being associated with increased mortality, the nadir of the curve appears to be shifted upward. While most studies found that those in the overweight range have the lowest mortality,[70, 85, 86, 89] the Global BMI Mortality Collaboration[79] found the nadir BMI was 24 kg/m² for baseline ages 70 to 89 years (compared with 22-23 kg/m² in younger age groups). Whether those with Class 1 obesity (BMI 30-35 kg/m²) have an increased mortality risk is less clear, but several of the reviews noted that BMIs in the lower obesity range (i.e.., 30-35 range) may not be associated with increased mortality risk in older-aged people.[70, 85, 89] Most evidence suggests that those with Class II and III obesity (BMIs>35 kg/m²) have an increased mortality risk.[31, 70, 85, 89] Obesity has been associated with higher rates of physical and functional disability and functional decline in older populations;[31, 90-92] however, whether overweight is associated with physical decline is less clear.[31, 90]

The relationship between percent body fat and BMI differs among ethnic groups. For example, for the same BMI, non-Hispanic blacks have the lowest percentage of body fat, followed next by non-Hispanic whites; Mexican Americans and Asians have the greatest percentage of body fat for a given BMI.[4, 5] Such differences have raised concerns about the appropriateness of current BMI cut-offs for all ethnic groups. However, the BMI thresholds have generally been based on morbidity and mortality outcomes and not the BMI-adiposity relationship.[4] All ethnic and racial groups have increased mortality, cardiovascular disease risk, and type 2 diabetes risk with increasing BMI, but there may be group-specific differences in absolute risk, the level of BMI at which increased risk occurs, and the strength of the relationship.[6-20]

In Asians, the BMI associated with increased diabetes risk[14, 21-23] and mortality[24-27] is lower than in Caucasians, consistent with their higher body fat at a given BMI level; therefore, WHO suggested that countries consider setting lower potential BMI action points for Asians (along the BMI continuum from 23.0 to 27.5 kg/m^2).[18] The evidence on whether current BMI cutoffs are appropriate for non-Hispanic blacks and Hispanics is mixed. In 2013, the National Institute of Health and Care Excellence (NICE) in the United Kingdom concluded that blacks and other minority ethnic groups in the United Kingdom are at an equivalent risk of diabetes, other health conditions or mortality at a lower BMI than the white European population.[23] However, the evidence was not considered sufficient to make recommendations on the use of new BMI thresholds for classifying whether member of these groups have overweight or obesity. In contrast, several studies of U.S. cohorts that were not included in the NICE report have found that obesity is less strongly associated with risk of death among blacks,[28] especially among black women, and that the BMI associated with the lowest mortality risk may be higher in blacks than whites.[6, 20, 29, 30] We identified only one study examining Hispanic/Latina women, and it found that those who had obesity at baseline had higher risks of developing a major chronic disease by 85 years of age compared with white women with obesity.[31] Given the complexity of the relationship between BMI and ethnicity, and the limited, conflicting data, the AHA/ACC/TOS did not recommend changing the BMI thresholds for blacks, Hispanics, or other ethnic groups.[3] The AHA/ACC/TOS panel noted a "critical" lack of studies on racial-ethnic differences in Western countries to determine whether different cut-points for racial and ethnic subgroups might be appropriate.

The association between being overweight and mortality risk may also be influenced by environmental and person-specific factors such as disease history, diet, and physical activity. For example, in one pooled analysis, individuals with overweight but without cardiovascular risk factors, often termed "metabolically healthy," did not have a statistically significant increased risk of mortality over 10 years compared with metabolically healthy, normal-weight individuals.[93] In other studies, fitness level has been a mediating factor in whether overweight individuals have an increased risk of mortality.[94-97]

Contextual Question 2: Relationship between central adiposity and disease/mortality

Patients with abdominal obesity (also called central adiposity, visceral, android, or male-type obesity) are at increased risk for heart disease, cancer, diabetes, and death.[129-134] Multiple ways of measuring central adiposity have been proposed, including waist circumference, waist-to-hip ratio,[135] waist-to-height ratio,[136, 137] the body shape index (ABSI,[138-140] derived from weight, height and waist circumference), and anthropometric risk index (ARI,[141] derived from height, BMI, and ABSI). Waist circumference, which can be measured in clinical settings with a flexible tape placed on a horizontal plane at the level of the iliac crest as seen from the anterior view, is used most frequently by clinicians and is recommended for inclusion as part of the routine obesity evaluation by several organizations including the American Heart Association (AHA), the American College of Cardiology (ACC), The Obesity Society (TOS), the National Institute of Health (NIH), and the Canadian Task Force on Preventive Health Care.

The 2013 AHA/ACC/TOS report on The Management of Overweight and Obesity in Adults concluded that there was a consistent, continuous relationship between increasing waist

circumference and increased risk of cardiovascular disease, diabetes, and all-cause mortality.[3] Due to insufficient evidence, the panel was unable to formulate an evidence statement on specific waist circumference cut-points and recommended more research on this issue. In the absence of evidence, the panel recommended continuing with use of the current cut-points until further evidence became available.[3] The 1998 Obesity Clinical Practice Guidelines recommended that waist circumference be considered elevated when ≥40 in (102 cm) for men and ≥35 in (88 cm) for women.[147] However, the WHO Expert Consultation concluded that these levels were associated with substantially increased risk and recommended also using lower cut-points (>94 cm in men, >80 cm in women) to identify increased risk.[148] The International Diabetes Federation suggested different cut-points for South Asian, Chinese, and Japanese men and women (>90 cm in men, >80 cm in women).[149, 150]

The AHA report suggested future research on the independent and combined effects of BMI and waist circumference to determine whether waist circumference would add to the prediction of chronic disease incidence and mortality by BMI. Since the 2013 AHA/ACC/TOS report, there have been two large pooled analyses, both of which have concluded that waist circumference is associated with mortality risk independent of BMI and that combining waist circumference with BMI may more accurately assess obesity-related mortality risk.[145, 146]

Waist circumference measurements may be particularly useful among elderly populations due to the fat redistribution that occurs with aging.[85] A pooled analysis of over 58,000 people aged 65 to 74 years old found that waist circumference was associated with mortality after adjusting for BMI. Those with an elevated waist circumference (≥102 cm in men and ≥88 cm in women) had an elevated risk of all-cause mortality across all BMI categories (healthy weight, overweight, and obese) compared to those with a healthy weight and small waist circumference (<94 cm in men and <80 cm in women). Of particular interest, the relative risk of mortality in older people with a healthy weight combined with a large waist was generally higher than for those with overweight and a small waist.[151]

Whether adding waist circumference to obesity screening in non-white groups improves the prediction of further health outcomes is unclear. Waist circumference has been independently associated with health risk in many higher-risk populations, such as South Asians or Mexicans, who appear to have a higher prevalence of obesity-associated morbidities such as diabetes.[15, 152] Whether waist circumference can improve the predictive ability of obesity screening for health outcomes has been most closely examined in blacks, but the evidence is conflicting.[28, 131, 153-155]

Contextual Question 3: Health benefits of weight loss

The epidemiological literature related to the effects of weight loss on long-term health outcomes has several important limitations. First, many studies do not describe whether the weight loss was intentional or unintentional. This is a key distinction as unintentional weight loss is associated with important confounders such as illness, depression, smoking, and heavy drinking.[387] Another important consideration is the baseline BMI of the population. Whether weight loss has benefits for health may differ among those who have normal, overweight, or obesity, and many studies do not stratify for baseline weight. Also, those who intentionally lost weight often had a higher BMI than those who did not attempt weight loss, even within the same BMI category. Finally, many studies relied on recall to determine the amount of weight loss,

dates of weight loss, and whether the loss was intentional. Whether weight loss was sustained was usually not reported. In order to improve applicability of this CQ to the AO report, we limited our review to cohort studies of intentional weight loss among those who were overweight or had obesity at baseline. We included studies that relied on participant recall because there were few studies that used objectively measured weight.

In studies of overweight populations, intentional weight loss was either not associated with long-term mortality[349, 350] or associated with an increased risk of mortality.[352, 353] In studies of people with higher BMIs (into the high overweight and obese category), intentional weight loss was generally associated with a small, decreased risk of mortality, although results varied among subgroups. In the prospective Cancer Prevention Cohort, women with obesity-related illness who intentionally lost any amount of weight had an approximately 20 percent decreased risk of mortality (95% CI, 68 to 94%);[354] the risk reduction was strongest in women who lost the weight within 1 year. Women without obesity-related illness and men in this same cohort did not have a decreased mortality risk with intentional weight loss.[351] In contrast, in the British regional heart study cohort, men with BMIs ≥28 kg/m^2 who lost weight for personal reasons had a lower risk of dying (23% reduction [95% CI, 6 to 95%]).[355] In men and women in the National Health Survey who had intentional weight loss (mean baseline BMI 30.4 kg/m^2), mortality risk was lowered by almost 30 percent (71% reduction [95% CI, 55 to 92%). Of interest, those who attempted weight loss had lower mortality rates independent of actual weight loss amount.[356]

Among overweight U.S. women, intentional weight loss was not associated with decreased risk of overall cancer, but was associated with a borderline decreased risk of obesity-related cancers (RR, 1.22 [95% CI, 1.00 to 1.50]).[357] A recent study used data from the Nurses' Health Study to estimate the 26-year risk of CHD under several hypothetical weight loss strategies. A 5 to 10 percent weight loss among those with a baseline BMI greater than 25 kg/m^2 was not associated with a decreased risk of cardiovascular disease but was associated with a decreased risk of type 2 diabetes.[358] Although this study included both intentional and unintentional weight loss, sensitivity analyses including an intentionality question from one questionnaire did not change their findings.

In people who undergo bariatric surgery, there are significant improvements in diabetes,[359, 360] sleep apnea,[360, 361] quality of life,[362] depression,[363] and pain and physical function.[364] Data on long-term health outcomes such as mortality, cardiovascular disease, and cancer are still lacking. However, the amount of weight loss that occurs with weight loss surgery is much greater than what can usually be achieved with behavior-based weight loss interventions and only people with severe obesity or obesity with comorbidities are candidates for bariatric surgery. In addition, there are metabolic changes that occur after surgery, independent of weight loss, which could contribute to improvements in health outcomes among those who undergo surgery.

In conclusion, there is little evidence to suggest that intentional weight loss among those who are overweight, especially those with BMIs <28, is associated with decreased mortality. Intentional weight loss among those who have obesity may lead to a small decrease in mortality risk, but the literature is conflicting, especially for men and those without obesity-related comorbidities. The literature is scant and limited on the effects of intentional weight loss on other outcomes such as cardiovascular disease and cancer

Key:
/ = subject heading
$ = truncation
* = truncation
ab = word in abstract
adj# = adjacent within x number of words
fs = floating subheading
hw = subject heading word
id = key phrase identifier
kw = keyword
md = methodology
pt = publication type
ti = word in title

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 (weight or adipos*):ti or (obesity or obese or overweight or "weight loss"):ti,ab,kw
#2 behavio*:ti,ab,kw
#3 counsel*.ti,ab,kw
#4 cognitive:ti,ab,kw
#5 (orlistat or alli or xenical or lorcaserin or Belviq or (phentermine near/2 topiramate) or Qsymia or (bupropion near/2 naltrexone) or liraglutide or Victoza or Saxenda or contrave):ti,ab,kw
#6 (diet* or nutrition*):ti,ab,kw
#7 (weightwatcher* or (weight next watcher*)):ti,ab,kw
#8 "physical activity":ti,ab,kw
#9 exercise:ti,ab,kw
#10 (lifestyle or "life style"):ti,ab,kw next (modification* or intervention*):ti,ab,kw
#11 {or #2-#10}
#12 #1 and #11
#13 "weight loss":ti,ab,kw next (intervention* or program* or trial*):ti,ab,kw
#14 (weight next reduc*):ti,ab,kw next (intervention* or program* or trial*):ti,ab,kw
#15 "weight management":ti,ab,kw next (intervention* or program* or trial*):ti,ab,kw
#16 "weight control":ti,ab,kw next (intervention* or program* or trial*):ti,ab,kw
#17 ("weight loss maintenance" next (intervention* or program* or trial*)):ti,ab,kw
#18 {or #12-#17}
#19 (child* or adolescen* or pediatric* or paediatric*)
#20 adult*
#21 (#19 not #20)
#22 (#18 not #21) Publication Year from 2010 to 2016, in Trials

Ovid Medline [ALL KQ]

1 Obesity/
2 Obesity, Morbid/
3 Overweight/
4 Obesity, Metabolically Benign/
5 Weight loss/

6 obes$.ti.
7 overweight.ti.
8 weight.ti.
9 (adipos$ or body fat).ti.
10 (obes$ or overweight or weight loss).ti,ab.
11 limit 10 to ("in data review" or in process or "pubmed not medline")
12 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 11
13 Weight Reduction Programs/
14 Behavior Therapy/
15 Cognitive Therapy/
16 Counseling/
17 Directive Counseling/
18 Self-Help Groups/
19 counsel$.ti,ab.
20 (behav$ adj3 (therap$ or program$ or intervention$)).ti,ab.
21 Health Education/
22 Anti-Obesity Agents/
23 orlistat.ti,ab.
24 alli.ti,ab.
25 xenical.ti,ab.
26 lorcaserin.ti,ab.
27 Belviq.ti,ab.
28 (phentermine adj2 topiramate).ti,ab.
29 Qsymia.ti,ab.
30 (bupropion adj2 naltrexone).ti,ab.
31 liraglutide.ti,ab.
32 Victoza.ti,ab.
33 Saxenda.ti,ab.
34 contrave.ti,ab.
35 Diet, Reducing/
36 Diet, Fat-Restricted/
37 Caloric Restriction/
38 Diet Therapy/
39 (diet$ adj counsel$).ti,ab.
40 (diet$ adj education$).ti,ab.
41 (nutrition$ adj counsel$).ti,ab.
42 (nutrition$ adj education$).ti,ab.
43 (nutrition$ adj intervention$).ti,ab.
44 (diet$ adj (modif$ or therapy or intervention$ or strateg$)).ti,ab.
45 ((diet or dieting or slim$) adj (club$ or organi?ation$)).ti,ab.
46 (weight reduc$ adj diet$).ti,ab.
47 (weightwatcher$ or weight watcher$).ti,ab.
48 Exercise/
49 Exercise Therapy/
50 Motor Activity/
51 Physical Conditioning, Human/

52 Physical Fitness/
53 physical activity.ti,ab.
54 (exercise adj3 (therap$ or program$ or intervention$)).ti,ab.
55 ((lifestyle or life style) adj (modification$ or intervention$)).ti,ab.
56 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55
57 12 and 56
58 Obesity/dh, th, dt, rh [Diet Therapy, Therapy, Drug Therapy, Rehabilitation]
59 Obesity, Morbid/dh, th, dt, rh
60 Overweight/dh, th, dt, rh
61 (weight loss adj (intervention$ or program$ or trial$)).ti,ab.
62 (weight reduc$ adj (intervention$ or program$ or trial$)).ti,ab.
63 (weight management adj (intervention$ or program$ or trial$)).ti,ab.
64 (weight control adj (intervention$ or program$ or trial$)).ti,ab.
65 (weight loss maintenance adj (intervention$ or program$ or trial$)).ti,ab.
66 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65
67 limit 66 to "all child (0 to 18 years)"
68 limit 66 to "all adult (19 plus years)"
69 67 not 68
70 66 not 69
71 limit 70 to animals
72 limit 70 to humans
73 71 not 72
74 70 not 73
75 clinical trials as topic/ or controlled clinical trials as topic/ or randomized controlled trials as topic/ or meta-analysis as topic/
76 (clinical trial or controlled clinical trial or meta analysis or randomized controlled trial).pt.
77 Random$.ti,ab.
78 control groups/ or double-blind method/ or single-blind method/
79 clinical trial$.ti,ab.
80 controlled trial$.ti,ab.
81 meta analy$.ti,ab.
82 75 or 76 or 77 or 78 or 79 or 80 or 81
83 74 and 82
84 Mortality/
85 Morbidity/
86 Death/
87 "Drug-Related Side Effects and Adverse Reactions"/
88 safety.ti,ab.
89 harm$.ti,ab.
90 mortality.ti,ab.
91 toxicity.ti,ab.
92 complication$.ti,ab.
93 (adverse adj2 (interaction$ or response$ or effect$ or event$ or reaction$ or outcome$)).ti,ab.

94 adverse effects.fs.
95 toxicity.fs.
96 mortality.fs.
97 (risky behavior$ or risky behaviour$).ti,ab.
98 weight cycling.ti,ab.
99 Athletic injuries/
100 Malnutrition/
101 nutritional defici$.ti,ab.
102 Arrhythmias, Cardiac/
103 Arrhythmia$.ti,ab.
104 Bone Density/
105 (bone adj3 loss).ti,ab.
106 Bone Resorption/
107 (death or deaths).ti,ab.
108 suicide/
109 Suicide, Attempted/
110 suicid$.ti,ab.
111 84 or 85 or 86 or 87 or 88 or 89 or 90 or 91 or 92 or 93 or 94 or 95 or 96 or 97 or 98 or 99 or 100 or 101 or 102 or 103 or 104 or 105 or 106 or 107 or 108 or 109 or 110
112 74 and 111
113 case-control studies/ or cohort studies/ or longitudinal studies/ or follow-up studies/ or prospective studies/
114 Questionnaires/
115 case control$.ti,ab.
116 cohort.ti,ab.
117 longitudinal.ti,ab.
118 (follow-up or followup).ti,ab.
119 prospective.ti,ab.
120 (comparison group$ or control group$).ti,ab.
121 observational.ti,ab.
122 retrospective studies/
123 retrospective$.ti,ab.
124 database$.ti,ab.
125 nonrandomi$.ti,ab.
126 113 or 114 or 115 or 116 or 117 or 118 or 119 or 120 or 121 or 122 or 123 or 124 or 125
127 112 and 126
128 83 or 127
129 limit 128 to english language
130 limit 129 to yr="2010 -Current"

PsycInfo

1 obesity.ti,id,hw.
2 obese.ti,id,hw.
3 overweight.ti,id,hw.
4 weight loss.ti,id,hw.
5 1 or 2 or 3 or 4

6 weight control/
7 behavior therapy/
8 cognitive behavior therapy/
9 cognitive therapy/
10 Cognitive Techniques/
11 Behavior Modification/
12 Behavior Change/
13 Motivational Interviewing/
14 counseling/
15 counseling.id.
16 counselling.id.
17 orlistat.ti,ab,id,hw.
18 alli.ti,ab,id,hw.
19 xenical.ti,ab,id,hw.
20 lorcaserin.ti,ab,id,hw.
21 Belviq.ti,ab,id,hw.
22 (phentermine adj2 topiramate).ti,ab,id,hw.
23 Qsymia.ti,ab,id,hw.
24 (bupropion adj2 naltrexone).ti,ab,id,hw.
25 liraglutide.ti,ab,id,hw.
26 Victoza.ti,ab,id,hw.
27 Saxenda.ti,ab,id,hw.
28 contrave.ti,ab,id,hw.
29 Diets/
30 Dietary Restraint/
31 Exercise/
32 Physical Activity/
33 Aerobic Exercise/
34 Walking/
35 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34
36 5 and 35
37 random$.ti,ab,id,hw.
38 placebo$.ti,ab,hw,id.
39 controlled trial$.ti,ab,id,hw.
40 clinical trial$.ti,ab,id,hw.
41 meta analy$.ti,ab,hw,id.
42 metaanaly$.ti,ab,hw,id.
43 treatment outcome clinical trial.md.
44 37 or 38 or 39 or 40 or 41 or 43
45 36 and 44
46 safety.ti,ab,id,hw.
47 (harm or harms or harmful or harmed).ti,ab,id,hw.
48 "side effects (drug)"/
49 toxicity.ti,ab,id,hw.
50 complication$.ti,ab,id,hw.

51 (adverse adj2 (interaction$ or response$ or effect$ or event$ or reaction$ or outcome)).ti,ab,id,hw. (26219)
52 (risky behavior$ or risky behaviour$).ti,ab,id,hw.
53 mortality.ti,ab,id,hw.
54 morbidity.ti,ab,id,hw.
55 death.ti,ab,id,hw.
56 Nutritional Defici$.ti,ab,id,hw.
57 arrhythmia$.ti,ab,id,hw.
58 (bone adj3 loss).ti,ab,id,hw.
59 bone resorption.ti,ab,id,hw.
60 injur$.ti,ab,id,hw.
61 suicid$.ti,ab,id,hw.
62 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61
63 36 and 62
64 45 or 63
65 limit 64 to (100 childhood <birth to age 12 yrs> or 120 neonatal <birth to age 1 mo> or 140 infancy <2 to 23 mo> or 160 preschool age <age 2 to 5 yrs> or 180 school age <age 6 to 12 yrs> or 200 adolescence <age 13 to 17 yrs>)
66 limit 64 to ("300 adulthood <age 18 yrs and older>" or 320 young adulthood <age 18 to 29 yrs> or 340 thirties <age 30 to 39 yrs> or 360 middle age <age 40 to 64 yrs> or "380 aged <age 65 yrs and older>" or "390 very old <age 85 yrs and older>")
67 65 not 66
68 64 not 67
69 limit 68 to (english language and yr="2010 -Current")

Pubmed, publisher-supplied records

#44 Search **(((#43) AND publisher[sb]) AND English[Language]) AND ("2010/01/01"[Date - Publication] : "3000"[Date - Publication])**

#43 Search **#39 NOT #42**

#42 Search **#40 NOT #41**

#41 Search **adult*[tiab]**

#40 Search **(child*[tiab] OR adolescen*[tiab])**

#39 Search **#23 OR #38**

#38 Search **#18 AND #37**

#37 Search **#24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36**

#36 Search **suicid*[tiab]**

#35 Search **death[tiab] OR deaths[tiab]**

#34 Search **bone[tiab] AND loss[tiab]**

#33 Search **arrhythmia*[tiab]**

#32 Search **nutritional[tiab] AND (deficient*[tiab] OR deficienc*[tiab])**

#31 Search **weight cycling[tiab]**

#30 Search **risky[tiab] AND (behavior*[tiab] OR behaviour*[tiab])**

#29 Search **(adverse[tiab] AND (interaction*[tiab] OR response*[tiab] OR effect*[tiab] OR event*[tiab] OR reaction*[tiab] OR outcome*[tiab]))**

#28 Search **complication*[tiab]**

#27 Search **toxicity[tiab]**

#26 Search **mortality[tiab]**

#25 Search **(harm[tiab] OR harms[tiab] OR harmful[tiab] OR harmed[tiab])**

#24 Search **safety[tiab]**

#23 Search **#18 AND #22**

#22 Search **#19 OR #20 OR #21**

#21 Search **(control[tiab] OR controls[tiab] OR controlled[tiab] OR controled[tiab]) AND (trial[tiab] OR trials[tiab])**

#20 Search **"clinical trial"[tiab] OR "clinical trials"[tiab] OR random*[tiab]**

#19 Search **systematic review[sb] OR metaanaly*[tiab] OR meta analysis[tiab]**

#18 Search **#1 AND #17**

#17 Search **#2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16**

#16 Search **(lifestyle[tiab] OR "life style"[tiab]) AND (modification*[tiab] OR intervention*[tiab])**

#15 Search **exercise[tiab] AND (therap*[tiab] OR intervention*[tiab] OR program[tiab] OR programs[tiab])**

#14 Search **"physical activity"[tiab]**

#13 Search **weightwatcher*[tiab] OR (weight[tiab] AND watcher*[tiab])**

#12 Search **(diet[tiab] OR dieting[tiab] OR slim*[tiab]) AND (club*[tiab] OR organization*[tiab] OR organisation*[tiab])**

#11 Search **(diet[tiab] OR diets[tiab] OR dietary[tiab]) AND (intervention*[tiab])**

#10 Search **(nutrition*[tiab]) AND (intervention*[tiab])**

#9 Search **(nutrition*[tiab]) AND (education*[tiab])**

#8 Search **(nutrition*[tiab]) AND (counsel*[tiab])**

#7 Search **(diet[tiab] OR diets[tiab] OR dietary[tiab]) AND (counsel*[tiab])**

#6 Search **(diet[tiab] OR diets[tiab] OR dietary[tiab]) AND (education*[tiab])**

#5 Search **orlistat[tiab] OR alli[tiab] OR xenical[tiab] OR lorcaserin[tiab] OR Belviq[tiab] OR(phentermine[tiab] AND topiramate[tiab]) OR Qsymia[tiab] OR (bupropion[tiab] AND naltrexone[tiab]) OR liraglutide[tiab] OR Victoza[tiab] OR Saxenda[tiab] OR contrave[tiab]**

#4 Search **cognitive[tiab]**

#3 Search **(behavio*[tiab] AND (therap*[tiab] OR program*[tiab] OR intervention*[tiab]))**

#2 Search **counsel*[tiab]**

#1 Search **obese[title] OR obesity[title] OR overweight[title] OR weight[title] OR "body fat"[title] OR adipos*[title]**

Appendix B Table 1. Inclusion and Exclusion Criteria

	Include	Exclude
Study aim	Weight loss or weight loss maintenance	• Primary prevention of overweight or obesity • Treatment of cardiovascular disease • Management of diabetes* • Treatment of cancer
Condition definition	Overweight or obesity as defined by BMI or other weight-related measurement	
Population	• Adults age ≥18 years who are candidates for weight loss/maintenance interventions and selected based on an above normal BMI (e.g., ≥25 kg/m^2) or other weight-related measure (e.g., waist circumference) • Patients may or may not have additional risk factors, including hypertension, dyslipidemia, impaired glucose tolerance, or impaired fasting glucose (i.e., prediabetes)	Studies limited to: • Populations not selected based on a weight-related measure (i.e., BMI, waist circumference, weight) • Adults with secondary causes of obesity, such as steroid use • Adults with a chronic disease for which weight loss/maintenance is part of disease management (e.g., osteoarthritis, known cardiovascular disease, diabetes mellitus, polycystic ovary syndrome, sleep apnea) • Adults with a known chronic disease not generalizable to the primary care population (e.g., eating disorder, cancer, chronic kidney disease, severe mental illness, cognitive impairment) • Children and adolescents • Parents (if intended behavior change is directed toward children) • Pregnant women • Adults in institutions
Setting	• Studies conducted in or recruited from primary care or a health care system or that could feasibly be implemented in or referred from primary care • In order for an intervention to be feasible for primary care referral, it would need to be conducted as part of a health care setting or be widely available in the community at a national level (e.g., commercial weight loss programs, technology interventions)	Studies conducted in or recruited from settings not generalizable to primary care (e.g., worksites, university classrooms, institutional settings), in a population with pre-existing social ties (e.g., from the same worksite or church), or in a setting where the intervention could not be reproduced in primary care or within a broader health system

Appendix B Table 1. Inclusion and Exclusion Criteria

	Include	Exclude
Interventions	Interventions focusing on weight loss/maintenance, including the following: • Behavioral counseling intervention, either alone or as part of a larger multicomponent intervention on healthful diet and nutrition, physical activity, sedentary behavior, or a combination thereof, including but not limited to: assessment with feedback, advice, collaborative goal-setting, assistance, exercise prescriptions (referral to exercise facility or program), arranging further contacts, or provider training • Pharmacologic interventions that are approved by the U.S. Food and Drug Administration as first-line, long-term weight loss/management medications: o Orlistat o Lorcaserin hydrochloride o Phentermine-topiramate extended release o Naltrexone hydrochloride and bupropion hydrochloride o Liraglutuide (Saxenda) • Combination of these interventions • Interventions may be delivered via face-to-face contact, telephone, print materials, or technology (e.g., computer-based, text messages), and can be delivered by numerous potential interventionists, including but not limited to: physicians, nurses, exercise specialists, dietitians, nutritionists, and behavioral health specialists	• Surgical procedures (laparoscopic adjustable gastric banding, Roux-en-Y gastric bypass, biliopancreatic diversion with duodenal switch, sleeve gastrectomy) • Nonsurgical devices and procedures (balloon system, vagus nerve stimulation) • Medications that are not approved by the U.S. Food and Drug Administration as long-term weight loss agents, including new agents currently under evaluation (e.g., leptin, peptide YY, oxyntomodulin, melanocortin-4 receptor agonists), agents taken off the market (e.g., fenfluramine, dexfenfluramine, sibutramine), and agents only approved for short-term weight loss (e.g., diethylpropion, phentermine, benzphetamine, phendimetrazine) • Medications only indicated for the treatment of type 2 diabetes (e.g., metformin, pramlintide, empagliflozin, albiglutide, dulaglutide, alogliptin, exenatide) • Complementary and alternative treatments (e.g., acupuncture, mindfulness) • Dietary supplements intended for weight loss (e.g., chitosan, guar gum, chromium, ginseng, glucomannan, green tea, hydroxycitric acid, L-carnitine, psyllium, pyruvate supplements, St. John's wort, conjugated linoleic acid) • Broader community-based programs (e.g., mass media, social marketing, changes to the community built environment, legislation)
Comparisons	For studies of behavioral interventions: • No treatment (e.g., wait-list control, usual care) • Attention control (e.g., similar format and intensity to intervention but different content area) • Minimal intervention comparable to usual care (including the use of generic printed/electronic communications) For studies of pharmacologic interventions: • Placebo • Two groups must participate in identical behavioral intervention component	For studies of behavioral interventions: • Active comparators without a control (as defined in the inclusion criteria) For studies of pharmacologic interventions: • Comparison of different pharmacologic interventions

Appendix B Table 1. Inclusion and Exclusion Criteria

	Include	Exclude
Outcomes	**KQ 1:** Health outcomes: • Mortality • Morbidity (e.g., diabetic amputation, hypertensive nephrosclerosis) • Depression • Emotional functioning as measured by mental subscales of quality of life instruments • Physical functioning as measured by physical subscales of quality of life measures • Disability measures (global measures only, such as activities of daily living) **KQ 2:** Weight outcomes **(required for inclusion)** and incidence or prevalence of related conditions: • Measured weight (e.g., kilograms, pounds) • Relative weight (e.g., BMI, percent overweight, percent obese) • Total adiposity (e.g., dual-energy x-ray absorptiometry, underwater weighing) • Central adiposity (e.g., waist circumference, waist-to-hip circumference ratio) • Weight maintenance • Incidence or prevalence of obesity-related conditions (e.g., diabetes mellitus, hypertension, dyslipidemia, cardiovascular disease, sleep apnea) • Proportion of individuals taking medication for an obesity-related condition **KQ 3:** Adverse outcomes: • Treatment-related harms at any time point after intervention begins (e.g., death, medical issue requiring hospitalization or urgent medical treatment, inducement of eating disorder, nausea or other gastrointestinal effects, reduced bone mineral density, vitamin deficiency) • Discontinuation of medication due to adverse effects • Psychological adverse events related to counseling or medication	**KQ 1:** • Functioning (except as enumerated under health outcomes) • Cost-effectiveness • Behavioral changes (e.g., physical activity, diet, smoking) **KQ 2:** Cardiometabolic measures (e.g., glucose level, blood pressure, lipid levels)
Timing of outcome assessment	**KQs 1, 2:** ≥12 months after start of intervention or baseline assessment (if the intervention start cannot be determined) **KQ 3:** No minimum followup	**KQs 1, 2:** <12 months after baseline
Country	Studies conducted in economically developed countries, defined as member countries of the Organisation for Economic Co-Operation and Development (2015): Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States	• Studies conducted in countries with populations not similar to the United States • Studies conducted in countries that are not a member of the Organisation for Economic Co-Operation and Development

Appendix B Table 1. Inclusion and Exclusion Criteria

	Include	Exclude
Study design	**KQs 1, 2:** Randomized or controlled clinical trials, including cluster randomized trials **KQ 3:** • Systematic reviews, including meta-analyses, of randomized or controlled clinical trials or cohort studies • Randomized or controlled clinical trials, including cluster randomized trials • Large cohort studies or case-control studies reporting serious adverse effects related to weight loss interventions	**KQs 1, 2:** Any observational studies, ecological studies, case reports, case series, or other noncomparative reviews; letters to the editor **KQ 3:** Ecological studies, case-series, and case reports
Publication language	English	Non-English
Study quality	Fair or good (according to design-specific USPSTF criteria)	Poor (according to design-specific USPSTF criteria)

Appendix B. Detailed Data Analysis Methods

We ran random effects meta-analyses using the DerSimonian and Laird method to calculate the pooled differences in means for weight-related outcomes (weight in kilograms, body mass index, percent weight change, and waist circumference) and pooled risk ratios for the proportion of participants losing at least 5 or 10 percent of their baseline weight. We used the between-group differences for each outcome as reported by each respective study and favored adjusted effect estimates over unadjusted. If a between group effect estimate and variance were not provided, we calculated a crude effect estimate.

We converted values in conventional units (pounds, inches) to International System of Units/Système International (SI) values (kilograms, centimeters) for consistency.[388]

In cases where a cluster randomized trial was used but the analysis did not account for the nested nature of the data (as was the case in three trials[231, 232, 269]), we adjusted for the clustering effect by applying a design effect, which was based on an estimated average cluster size (the total number of randomized participants divided by the total number of clusters) and multiplied by an estimated intraclass correlation. We estimated the intraclass correlation to be 0.02 for weight and waist circumference.[389]

Within the pooled analyses, we grouped 12 to 18 month followup data together and 24 month data separately. If a trial reported both 12- and 18-month data, we chose 12 month data to pool. If a trial had more than one active intervention arm, we plotted the most intensive arm or the arm that was the most similar with other interventions included in that respective analysis. We conducted a sensitivity analysis for weight loss at 12-18 months in which we combined data for all active intervention arms to create a single pair-wise comparison to investigate whether choosing one intervention arm altered the effect estimate. The pooled result, including the precision of the estimate, was nearly identical when arms were combined. Thus, we presented the results of the pooled analyses where we choose the most applicable intervention arm from each study. WebPlotDigitizer© version 3.10 was used to extract estimates of within-group means and 95% confidence intervals from figures when tabular or in-text results were not provided.

If the trial did not report some kind of data substitution for missing followup data (e.g., last observation carried forward, baseline observation carried forward) or an analysis that used all observations (e.g., random effects models, general estimating equations), then we used the number of participants with followup in each group for the n's in the meta-analysis. If not available, we used the n randomized.

We used standard calculations to convert standard errors and 95% confidence intervals to standard deviations:

$$SD_{mean} = SE_{mean} * sqrt(n) \text{ or}$$
$$SD_{mean} = (CI_{upper} - CI_{lower}) * sqrt(n) / 3.92$$

If sample size was not large (i.e., less than 60), the calculation of standard deviation from a 95% confidence interval was calculated with the following denominator (based on the t-distribution with degrees of freedom equal to group sample size minus 1):

$$SD_{mean} = ((CI_{upper} - CI_{lower}) * sqrt(n)) / (2*(\textbf{invttail}(n-1,0.025))$$ [invttail(), a function in Stata application]

If reported, within-group change from baseline was used for analysis. Where change scores were not available, they were calculated from baseline and followup measures if possible, using an outcome-specific correlation (0.90). This correlation was used to estimate the standard deviation in the following formula:[208]

$$SD_{change} = Sqrt(SD^2_{base} + SD^2_{post} - (2 * SD_{base} * SD_{post} * r_{base,post}))$$

In one study,[274] results were presented separately for males and females. We used the following formula to calculate a combined mean and standard deviation by group:[208]

$$Mean_{combined} = N_1M_1 + N_2M_2 / N_1 + N_2$$

$$SD_{combined} = \sqrt{\frac{(N_1 - 1)SD_1^2 + (N_2 - 1)SD_2^2 + \frac{N_1N_2}{N_1 + N_2}(M_1^2 + M_2^2 - 2M_1M_2)}{N_1 + N_2 - 1}}$$

The only non-continuous outcomes for which we performed meta-analysis were the proportion of participants losing at least 5 percent and 10 percent of their baseline body weight. We used study-reported adjusted risk ratios as reported; when not reported, we calculated unadjusted risk ratios and 95% confidence intervals using the raw numbers of participants meeting these goals at followup. We calculated the number needed to treat (NNT) for the proportion of participants losing at least 5 percent of their body weight based on the pooled RR and an assumed control risk (ACR) of 14 percent (median proportion in the control groups) using the following formula:[208]

$$NNT = \left| \frac{1}{ACR \times (1 - RR)} \right|$$

We ran sensitivity analyses for weight loss at 12-18 months using a restricted maximum likelihood model with the Knapp-Hartung modification (using the metareg command in Stata), which is a more conservative approach than the DerSimonian and Laird method when there is substantial heterogeneity or the number of studies is small.[390, 391] All statistically significant results remained within the restricted maximum likelihood model, so we show results using the DerSimonian and Laird method.[204]

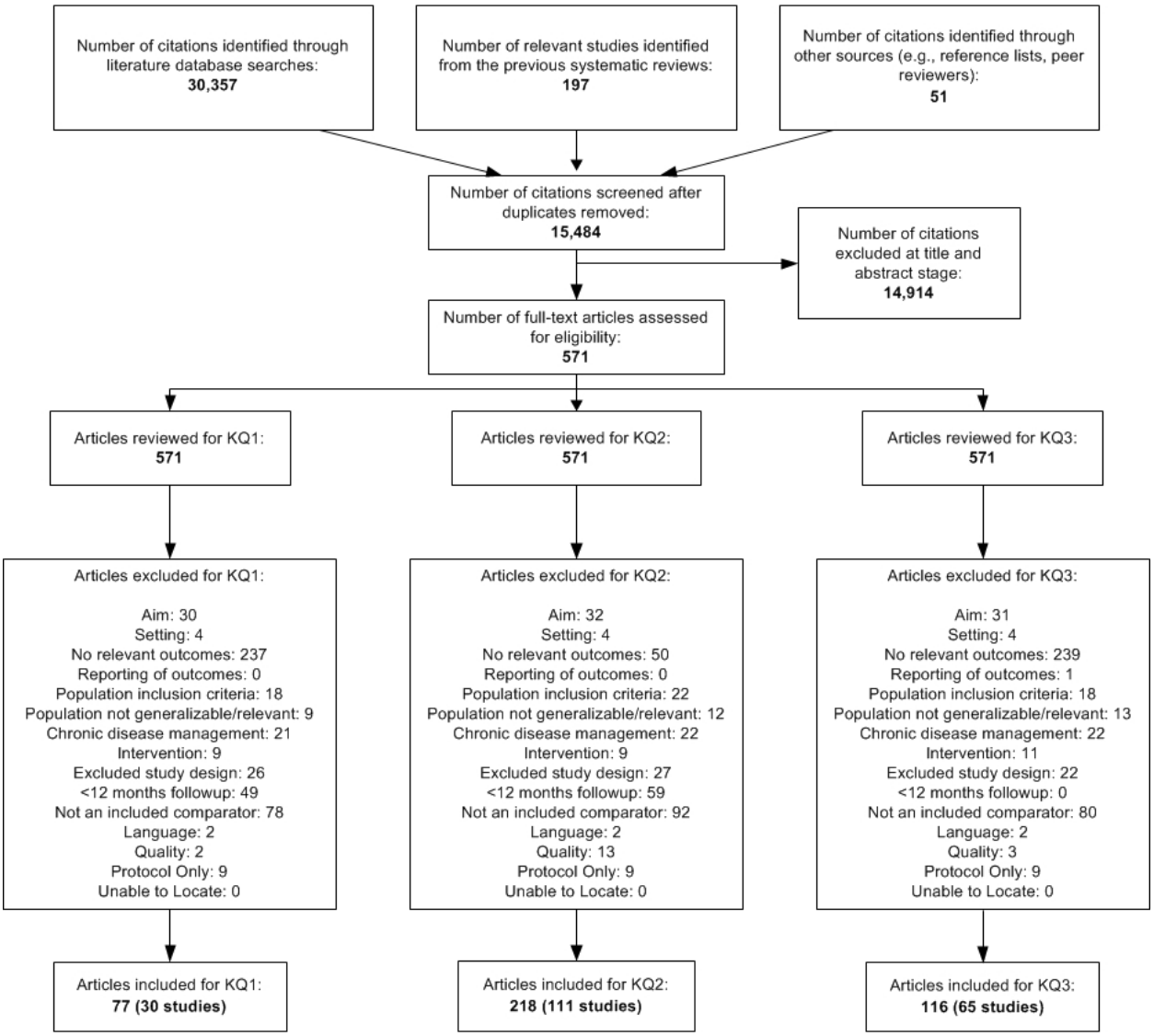
We generated funnel plots to evaluate small-study effects (a possible indication of publication bias) and ran the Egger's test[209] (for continuous data) and Peters' test[210] (for binary data) to assess statistical significance of imbalance in study size and findings that suggest a pattern.

We investigated whether variability among the results was associated with any pre-specified study, population, or intervention characteristics first qualitatively, using visual displays and tables grouped and sorted by these potentially important characteristics and second, through a series of meta-regressions. Specifically, we examined study quality (good versus fair), country (US versus non-US), link to primary care (conducted in or recruited from primary care versus not), whether the population at elevated cardiovascular risk (increased CV risk, increased subclinical CV risk, and elevated cancer risk versus low risk/unselected), participant selection

(self-selected or not reported versus directly recruited), baseline mean body mass index, obesity class (overweight versus class 1 and class 2 obesity; overweight and class 1 obesity versus class 2 obesity), intervention intensity (as continuous number of sessions in the first 12 months and as the continuous number of contacts in the first 12 months), intervention duration (continuous months), main mode of the intervention (mixed, group, individual, or technology-based), whether the intervention included group sessions (yes/no), individual sessions (yes/no), or technology-based components (yes/no), and whether the intervention included self-monitoring (yes/no). Due to concerns about type I errors, we limited exploration of heterogeneity to a single outcome – weight loss in kilograms. Continuous variables were left as continuous variables, and categorical variables were converted to one or more dummy variables. There was some evidence that risk status of the population was correlated with the effect estimates; therefore, we controlled for this variable in all other models.

We used Stata version 13.1 (Stata Corp LP, College Station, TX) for all quantitative analyses. All significance testing was two-sided and results were considered statistically significant if the p-value was 0.05 or less.

Appendix C. Literature Flow Diagram



Appendix D. List of Included Studies

Below is a list of included studies and their ancillary publications (indented below main results publication):

1. Acharya NV, Wilton LV, Shakir SA. Safety profile of orlistat: results of a prescription-event monitoring study. Int J Obes (Lond). 2006;30(11):1645-52. PMID: 16552401. http://dx.doi.org/10.1038/sj.ijo.0803323
    a. Perrio MJ, Wilton LV, Shakir SA. The safety profiles of orlistat and sibutramine: results of prescription-event monitoring studies in England. Obesity (Silver Spring). 2007;15(11):2712-22. PMID: 18070762 http://dx.doi.org/10.1038/oby.2007.323
2. Ackermann RT, Finch E, Brizendine E, et al. Translating the Diabetes Prevention Program into the community. The DEPLOY Pilot Study. Am J Prev Med. 2008;35(4):357-63. PMID: 18779029. http://dx.doi.org/10.1016/j.amepre.2008.06.035
    a. Hays LM, Finch EA, Saha C, et al. Effect of self-efficacy on weight loss: a psychosocial analysis of a community-based adaptation of the diabetes prevention program lifestyle intervention. Diabetes Spectr. 2014;27(4):270-5. PMID: 25647049. http://dx.doi.org/10.2337/diaspect.27.4.270
    b. Lipscomb ER, Finch EA, Brizendine E, et al. Reduced 10-year risk of coronary heart disease in patients who participated in a community-based diabetes prevention program: the DEPLOY pilot study. Diabetes Care. 2009;32(3):394-6. PMID: 19106377. http://dx.doi.org/10.2337/dc08-1622
3. Ackermann RT, Liss DT, Finch EA, et al. A Randomized Comparative Effectiveness Trial for Preventing Type 2 Diabetes. Am J Public Health. 2015;105(11):2328-34. PMID: 26378828. http://dx.doi.org/10.2105/AJPH.2015.302641
    a. Ackermann RT, Finch EA, Schmidt KK, et al. Rationale, design, and baseline characteristics of a community-based comparative effectiveness trial to prevent type 2 diabetes in economically disadvantaged adults: the RAPID Study. Contemp Clin Trials. 2014;37(1):1-9. PMID: 24177413. http://dx.doi.org/10.1016/j.cct.2013.10.003
4. Ahern AL, Wheeler GM, Aveyard P, et al. Extended and standard duration weight-loss programme referrals for adults in primary care (WRAP): a randomised controlled trial. Lancet. 2017;389(10085):2214-25. PMID: 28478041. http://dx.doi.org/10.1016/s0140-6736(17)30647-5
    a. Ahern AL, Aveyard PN, Halford JC, et al. Weight loss referrals for adults in primary care (WRAP): protocol for a multi-centre randomised controlled trial comparing the clinical and cost-effectiveness of primary care referral to a commercial weight loss provider for 12 weeks, referral for 52 weeks, and a brief self-help intervention [ISRCTN82857232]. BMC Public Health. 2014;14:620. PMID: 24943673. http://dx.doi.org/10.1186/1471-2458-14-620
5. Allison DB, Gadde KM, Garvey WT, et al. Controlled-release phentermine/topiramate in severely obese adults: a randomized controlled trial (EQUIP). Obesity. 2012;20(2):330-42. PMID: 22051941. http://dx.doi.org/10.1038/oby.2011.330
6. Anderson AS, Craigie AM, Caswell S, et al. The impact of a bodyweight and physical activity intervention (BeWEL) initiated through a national colorectal cancer screening programme: randomised controlled trial. BMJ. 2014;348:g1823. PMID: 24609919. http://dx.doi.org/10.1136/bmj.g1823
    a. Caswell S, Craigie AM, Wardle J, et al. Detailed protocol for the lifestyle intervention in the BeWEL randomised controlled trial of weight loss in adults who have had a colorectal adenoma. BMJ Open. 2012;2(3). PMID: 22637376. http://dx.doi.org/10.1136/bmjopen-2012-001276

b. Craigie AM, Caswell S, Paterson C, et al. Study protocol for BeWEL: the impact of a BodyWEight and physicaL activity intervention on adults at risk of developing colorectal adenomas. BMC Public Health. 2011;11:184. PMID: 21439044. http://dx.doi.org/10.1186/1471-2458-11-184

7. Apovian CM, Aronne L, Rubino D, et al. A randomized, phase 3 trial of naltrexone SR/bupropion SR on weight and obesity-related risk factors (COR-II). Obesity. 2013;21(5):935-43. PMID: 23408728. http://dx.doi.org/10.1002/oby.20309

8. Appel L, Clark J, Yeh H, et al. Comparative effectiveness of weight-loss interventions in clinical practice. N Engl J Med. 2011;365(21):1959-68. PMID: 22085317 http://dx.doi.org/10.1056/NEJMoa1108660

   a. Jerome GJ, Dalcin A, Coughlin JW, et al. Longitudinal accuracy of web-based self-reported weights: results from the Hopkins POWER Trial. J Med Internet Res. 2014;16(7):e173. PMID: 25042773. http://dx.doi.org/10.2196/jmir.3332

   b. Rubin RR, Peyrot M, Wang NY, et al. Patient-reported outcomes in the practice-based opportunities for weight reduction (POWER) trial. Qual Life Res. 2013;22(9):2389-98. PMID: 23515902. http://dx.doi.org/10.1007/s11136-013-0363-3

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b. Lindstrom J, Eriksson JG, Valle TT, et al. Prevention of diabetes mellitus in subjects with impaired glucose tolerance in the Finnish Diabetes Prevention Study: results from a randomized clinical trial. J Am Soc Nephrol. 2003;14(7 Suppl 2):S108-13. PMID: 12819313. http://dx.doi.org/10.1097/01.ASN.0000070157.96264.13

c. Lindstrom J, Louheranta A, Mannelin M, et al. The Finnish Diabetes Prevention Study (DPS): Lifestyle intervention and 3-year results on diet and physical activity. Diabetes Care. 2003;26(12):3230-6. PMID: 14633807. http://dx.doi.org/10.2337/diacare.26.12.3230

d. Lindstrom J, Peltonen M, Eriksson JG, et al. Improved lifestyle and decreased diabetes risk over 13 years: Long-term follow-up of the randomised Finnish Diabetes Prevention Study (DPS). Diabetologia. 2013;56(2):284-93. PMID: 23093136. http://dx.doi.org/10.1007/s00125-012-2752-5

e. Ruusunen A, Voutilainen S, Karhunen L, et al. How does lifestyle intervention affect depressive symptoms? Results from the Finnish Diabetes Prevention Study. Diabet Med. 2012;29(7):e126-32. PMID: 22313027. http://dx.doi.org/10.1111/j.1464-5491.2012.03602.x

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118. Wadden TA, Hollander P, Klein S, et al. Weight maintenance and additional weight loss with liraglutide after low-calorie-diet-induced weight loss: the SCALE Maintenance randomized study.[Erratum appears in Int J Obes (Lond). 2015 Jan;39(1):187], [Erratum appears in Int J Obes (Lond). 2013 Nov;37(11):1514], [Erratum appears in Int J Obes (Lond). 2015 Jan;39(1):187; PMID: 25311036]. Int J Obes (Lond). 2013;37(11):1443-51. PMID: 23812094. http://dx.doi.org/10.1038/ijo.2013.120

    a. Ard J, Cannon A, Lewis CE, et al. The efficacy and safety of liraglutide 3.0 mg for weight management are similar across races: Subgroup analysis across SCALE and phase 2 randomized trials. Diabetes Obes Metab. 2016. PMID: 26744025. http://dx.doi.org/10.1111/dom.12632

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    a. Appel LJ, Espeland M, Whelton PK, et al. Trial of Nonpharmacologic Intervention in the Elderly (TONE). Design and rationale of a blood pressure control trial. Ann Epidemiol. 1995;5(2):119-29. PMID: 7795830. http://dx.doi.org/10.1016/1047-2797(94)00056-Y

    b. Kumanyika SK, Espeland MA, Bahnson JL, et al. Ethnic comparison of weight loss in the Trial of Nonpharmacologic Interventions in the Elderly. Obes Res. 2002;10(2):96-106. PMID: 11836455. http://dx.doi.org/10.1038/oby.2002.16

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    d. Swencionis C, Wylie-Rosett J, Lent MR, et al. Weight change, psychological well-being, and vitality in adults participating in a cognitive-behavioral weight loss program. Health Psychol. 2013;32(4):439-46. PMID: 22888821. http://dx.doi.org/10.1037/a0029186

123. Yeh MC, Heo M, Suchday S, et al. Translation of the Diabetes Prevention Program for diabetes risk reduction in Chinese immigrants in New York City. Diabet Med. 2016;33(4):547-51. PMID: 26179569. http://dx.doi.org/10.1111/dme.12848

124. Young MD, Callister R, Collins CE, et al. Efficacy of a gender-tailored intervention to prevent weight regain in men over 3 years: A weight loss maintenance RCT. Obesity. 2017;25(1):56-65. PMID: 27925437. http://dx.doi.org/10.1002/oby.21696

Appendix E. List of Excluded Studies

Reason for Exclusion*	
E1.	Study aim: Not behavioral or pharmacologic treatment for weight loss
E2a.	Setting: Not conducted in a 'very high' HDI country
E2b.	Setting: Conducted in or recruited from settings not generalizable to primary care (e.g., worksites)
E3a.	Population: Not selected based on weight-related measure
E3b.	Population: Adults with a chronic disease for which weight loss/maintenance is part of disease management (e.g., asthma, DM)
E3c.	Population: Adults with a known chronic disease not generalizable or with secondary causes of obesity (e.g., steroid use)
E3d.	Population: Other population not relevant to current review (e.g., children, pregnant women, institutionalized adults)
E4a.	Outcomes: No relevant outcomes
E4b.	Outcomes: Weight and/height via self-report only
E4c.	Outcomes: Studies not performed in a exclusively overweight or obese population where results for overweight/obese participants were not reported separately
E5a.	Interventions: Intervention out-of-scope
E5b.	Interventions: Surgical procedure or nonsurgical device
E6a.	Study design: Excluded study design
E7.	Study quality: Poor quality rating
E8.	Language
E9.	Protocol only

*Assigned at abstract and full-text phase

Abbreviations: E = exclude; HDI = human development index

1. Ackermann RT, Finch EA, Caffrey HM, et al. Long-term effects of a community-based lifestyle intervention to prevent type 2 diabetes: the DEPLOY extension pilot study. Chronic Illn. 2011;7(4):279-90. PMID: 21840914. **KQ1E4a, KQ2E4a KQ3E4a.**
2. Adler E, Dhruva A, Moran PJ, et al. Impact of a Mindfulness-Based Weight-Loss Intervention on Sleep Quality Among Adults with Obesity: Data from the SHINE Randomized Controlled Trial. J Altern Complement Med. 2016. PMID: 28029852. **KQ1E6c, KQ2E6c, KQ3E6c.**
3. Admiraal WM, Vlaar EM, Nierkens V, et al. Intensive lifestyle intervention in general practice to prevent type 2 diabetes among 18 to 60-year-old South Asians: 1-year effects on the weight status and metabolic profile of participants in a randomized controlled trial. PLoS ONE [Electronic Resource]. 2013;8(7):e68605. PMID: 23894322. **KQ1E5a, KQ2E5a, KQ3E5a.**
4. Aguiar EJ, Morgan PJ, Collins CE, et al. Efficacy of the Type 2 Diabetes Prevention Using LifeStyle Education Program RCT. Am J Prev Med. 2016;50(3):353-64. PMID: 26526160. **KQ1E6b, KQ2E6b, KQ3E4a.**
5. Ahern A, Boyland E, Jebb S, et al. Weight loss interventions in primary care: A qualitative study of participants; accounts of commercial referral and standard care. Obesity facts. 2012;5:196. **KQ1E4a, KQ2E4a KQ3E4a.**
6. Ahn SM, Kim H, Ji E, et al. The effect of orlistat on weight reduction in obese and overweight Korean patients. Arch Pharm Res. 2014;37(4):512-9. PMID: 23839080. **KQ1E6a, KQ2E6a, KQ3E6a.**
7. Alfaris N, Wadden TA, Sarwer DB, et al. Effects of a 2-year behavioral weight loss intervention on sleep and mood in obese individuals treated in primary care practice. Obesity. 2015;23(3):558-64. PMID: 25611944. **KQ1E4a, KQ2E4a, KQ3E4a.**
8. Amano S, Tsubone H, Hanafusa M, et al. Physical and physiological effectiveness of an overall health care program for middle-aged Japanese women with mild obesity: A pilot study. Journal of Traditional & Complementary Medicine. 2015;5(2):88-95. PMID: 26151017. **KQ1E3a, KQ2E3a, KQ3E3a.**
9. Ambeba EJ, Ye L, Sereika SM, et al. The use of mHealth to deliver tailored messages reduces reported energy and fat intake. Journal of Cardiovascular Nursing. 2015;30(1):35-43. PMID: 24434827. **KQ1E6c, KQ2E6c, KQ3E6c.**
10. Anderssen S, Holme I, Urdal P, et al. Diet and exercise intervention have favourable effects on blood pressure in mild hypertensives: the Oslo Diet and Exercise Study (ODES). Blood Press. 1995;4(6):343-9. PMID: 8746601. **KQ1E4a, KQ2E6c, KQ3E4a.**
11. Annesi JJ, Johnson PH, Tennant GA, et al. Weight Loss and the Prevention of Weight Regain: Evaluation of a Treatment Model of Exercise Self-Regulation Generalizing to Controlled Eating. Perm. 2016;20(3):4-17. PMID: 26901268. **KQ1E6c, KQ2E6c, KQ3E6c.**
12. Annesi JJ, Mareno N. Indirect effects of exercise on emotional eating through psychological predictors of weight loss in women. Appetite. 2015;95:219-27. PMID: 26184339. **KQ1E6c, KQ2E6c, KQ3E6c.**
13. Annesi JJ, Mareno N, McEwen K. Psychosocial predictors of emotional eating and their weight-loss treatment-induced changes in women with obesity. Eat Weight Disord. 2015. PMID: 26233235. **KQ1E6c, KQ2E6c, KQ3E6c.**

Appendix E. List of Excluded Studies

14. Anonymous. Contrave--a combination of bupropion and naltrexone for weight loss. Med Lett Drugs Ther. 2014;56(1455):112-4. PMID: 25372849. **KQ1E6a, KQ2E6a, KQ3E6a.**
15. Anton SD, Manini TM, Milsom VA, et al. Effects of a weight loss plus exercise program on physical function in overweight, older women: a randomized controlled trial. Clin Interv Aging. 2011;6:141-9. PMID: 21753869. **KQ1E3b, KQ2E3b, KQ3E3b.**
16. Applegate WB, Miller ST, Elam JT, et al. Nonpharmacologic intervention to reduce blood pressure in older patients with mild hypertension. Arch Intern Med. 1992;152(6):1162-6. PMID: 1599343. **KQ1E6b, KQ2E6b, KQ3E4a.**
17. Ariel D, Kim SH, Abbasi F, et al. Effect of liraglutide administration and a calorie-restricted diet on lipoprotein profile in overweight/obese persons with prediabetes. Nutrition, Metabolism and Cardiovascular Diseases. 2014;24(12):1317-22. **KQ1E6b, KQ2E6b, KQ3E4a.**
18. Armamento-Villareal R, Aguirre LE, Qualls C, et al. Effect of Lifestyle Intervention on the Hormonal Profile of Frail, Obese Older Men. Journal of Nutrition, Health & Aging. 2016;20(3):334-40. PMID: 26892583. **KQ1E3c, KQ2E3c, KQ3E3c.**
19. Armamento-Villareal R, Sadler C, Napoli N, et al. Weight loss in obese older adults increases serum sclerostin and impairs hip geometry but both are prevented by exercise training. J Bone Miner Res. 2012;27(5):1215-21. PMID: 22392834. **KQ1E3c, KQ2E3c, KQ3E3c.**
20. Arzola-Paniagua MA, Garcia-Salgado Lopez ER, Calvo-Vargas CG, et al. Efficacy of an orlistat-resveratrol combination for weight loss in subjects with obesity: A randomized controlled trial. Obesity. 2016;24(7):1454-63. PMID: 27221771. **KQ1E6b, KQ2E6b, KQ3E7.**
21. Austel A, Ranke C, Wagner N, et al. Weight loss with a modified Mediterranean-type diet using fat modification: a randomized controlled trial. European Journal of Clinical Nutrition. 2015;69(8):878-84. PMID: 25690866. **KQ1E6c, KQ2E6c, KQ3E6c.**
22. Azadbakht L, Izadi V, Surkan PJ, et al. Effect of a High Protein Weight Loss Diet on Weight, High-Sensitivity C-Reactive Protein, and Cardiovascular Risk among Overweight and Obese Women: A Parallel Clinical Trial. International journal of endocrinology print. 2013;2013:971724. **KQ1E2a, KQ2E2a, KQ3E2a.**
23. Azar KM, Aurora M, Wang EJ, et al. Virtual small groups for weight management: an innovative delivery mechanism for evidence-based lifestyle interventions among obese men. Translational Behavioral Medicine. 2015;5(1):37-44. PMID: 25729451. **KQ1E6b, KQ2E6b, KQ3E4a.**
24. Baer HJ, Wee CC, Oray J, et al. Use of Electronic Health Records for Addressing Overweight and Obesity in Primary Care. Brigham and Women's Hospital, Division of General Medicine and Primary Care. AHRQ/ K01 HS019789; 2015. PMID: **KQ1E9, KQ2E9, KQ3E9.**
25. Baetge C, Earnest CP, Lockard B, et al. Efficacy of a randomized trial examining commercial weight loss programs and exercise on metabolic syndrome in overweight and obese women. Appl Physiol Nutr Metab. 2017:1-12. PMID: 28044449. **KQ1E6c, KQ2E6c, KQ3E4a.**
26. Barone Gibbs B, Kinzel LS, Pettee Gabriel K, et al. Short- and long-term eating habit modification predicts weight change in overweight, postmenopausal women: results from the WOMAN study. J Acad Nutr Diet. 2012;112(9):1347-55, 55.e1-2. PMID: 22939439. **KQ1E4a, KQ2E4a, KQ3E4a.**
27. Bays H, Pi-Sunyer X, Hemmingsson JU, et al. Liraglutide 3.0mg for weight management: weight-loss dependent and independent effects. Curr Med Res Opin. 2017;33(2):225-9. PMID: 27817208. **KQ1E4a, KQ2E4a, KQ3E4a.**
28. Beavers KM, Beavers DP, Nesbit BA, et al. Effect of an 18-month physical activity and weight loss intervention on body composition in overweight and obese older adults. Obesity. 2014;22(2):325-31. PMID: 23963786. **KQ1E3c, KQ2E3c, KQ3E3c.**
29. Beavers KM, Case LD, Blackwell CS, et al. Effects of weight regain following intentional weight loss on glucoregulatory function in overweight and obese adults with pre-diabetes. Obes Res Clin Pract. 2015;9(3):266-73. PMID: 25293586. **KQ1E4a, KQ2E4a, KQ3E4a.**
30. Befort CA, Klemp JR, Fabian C, et al. Protocol and recruitment results from a randomized controlled trial comparing group phone-based versus newsletter interventions for weight loss maintenance among rural breast cancer survivors. Contemp Clin Trials. 2014;37(2):261-71. PMID: 24486636. **KQ1E4a, KQ2E6c, KQ3E4a.**
31. Befort CA, Klemp JR, Sullivan DK, et al. Weight loss maintenance strategies among rural breast cancer survivors: The rural women connecting for better health trial. Obesity. 2016;24(10):2070-7. PMID: 27581328. **KQ1E4a, KQ2E6c, KQ3E4a.**
32. Bennett WL, Gudzune KA, Appel LJ, et al. Insights from the POWER practice-based weight loss trial: a focus group study on the PCP's role in weight management. J Gen Intern Med. 2014;29(1):50-8. PMID: 24002616. **KQ1E4a, KQ2E4a, KQ3E4a.**
33. Bennett WL, Wang NY, Gudzune KA, et al. Satisfaction with primary care provider involvement is associated with greater weight loss: Results from the practice-based POWER trial. Patient Educ Couns. 2015;98(9):1099-105. PMID: 26026649. **KQ1E4a, KQ2E4a, KQ3E4a.**
34. Berne C, the Orlistat ST. A randomized study of orlistat in combination with a weight management programme in obese patients with Type 2 diabetes treated with metformin. Diabet Med. 2005;22(5):612-8. PMID: 15842517. **KQ1E3b, KQ2E3b, KQ3E3b.**

35. Bernstein AM, Gendy G, Rudd N, et al. Management of prediabetes through lifestyle modification in overweight and obese African-American women: the Fitness, Relaxation, and Eating to Stay Healthy (FRESH) randomized controlled trial. Public Health. 2014;128(7):674-7. PMID: 24996961. **KQ1E6b, KQ2E6b, KQ3E4a.**
36. Bertz F, Brekke HK, Ellegard L, et al. Diet and exercise weight-loss trial in lactating overweight and obese women. Am J Clin Nutr. 2012;96(4):698-705. PMID: 22952179. **KQ1E4a, KQ2E7, KQ3E4a.**
37. Bertz F, Winkvist A, Brekke HK. Sustainable weight loss among overweight and obese lactating women is achieved with an energy-reduced diet in line with dietary recommendations: results from the LEVA randomized controlled trial. J Acad Nutr Diet. 2015;115(1):78-86. PMID: 25088520. **KQ1E4a, KQ2E4a, KQ3E4a.**
38. Blackford K, Jancey J, Lee AH, et al. Effects of a home-based intervention on diet and physical activity behaviours for rural adults with or at risk of metabolic syndrome: A randomised controlled trial. The International Journal of Behavioral Nutrition and Physical Activity Vol 13 2016, ArtID 13. 2016;13. **KQ1E6b, KQ2E6b, KQ3E4a.**
39. Blackman A, Foster GD, Zammit G, et al. Effect of liraglutide 3.0mg in individuals with obesity and moderate or severe obstructive sleep apnea: the SCALE Sleep Apnea randomized clinical trial. Int J Obes (Lond). 2016;40(8):1310-9. PMID: 27005405. **KQ1E3b, KQ2E3b, KQ3E3b.**
40. Block G, Azar KM, Romanelli RJ, et al. Improving diet, activity and wellness in adults at risk of diabetes: randomized controlled trial. Nutr Diabetes. 2016;6(9):e231. PMID: 27643726. **KQ1E1a, KQ2E1a, KQ3E1a.**
41. Blumenthal JA, Babyak MA, Hinderliter A, et al. Effects of the DASH diet alone and in combination with exercise and weight loss on blood pressure and cardiovascular biomarkers in men and women with high blood pressure: the ENCORE study. Arch Intern Med. 2010;170(2):126-35. PMID: 20101007. **KQ1E4a, KQ2E6c, KQ3E6c.**
42. Borkoles E, Carroll S, Clough P, et al. Effect of a non-dieting lifestyle randomised control trial on psychological well-being and weight management in morbidly obese pre-menopausal women. Maturitas. 2016;83:51-8. PMID: 26602363. **KQ1E1a, KQ2E1a, KQ3E1a.**
43. Bouchonville M, Armamento-Villareal R, Shah K, et al. Weight loss, exercise or both and cardiometabolic risk factors in obese older adults: results of a randomized controlled trial. Int J Obes (Lond). 2014;38(3):423-31. PMID: 23823329. **KQ1E3c, KQ2E3c, KQ3E3c.**
44. Brawley L, Rejeski WJ, Gaukstern JE, et al. Social cognitive changes following weight loss and physical activity interventions in obese, older adults in poor cardiovascular health. Ann Behav Med. 2012;44(3):353-64. PMID: 22773225. **KQ1E3c, KQ2E3c, KQ3E3c.**
45. Burke V, Mansour J, Beilin LJ, et al. Long-term follow-up of participants in a health promotion program for treated hypertensives (ADAPT). Nutr Metab Cardiovasc Dis. 2008;18(3):198-206. **KQ1E4a, KQ2E4a, KQ3E4a.**
46. Cadmus Bertram LA, Pierce JP, Patterson RE, et al. Training overweight/obese older women at high risk for breast cancer to use web-based weight loss tools: The HELP pilot study. J Clin Oncol. 2011;29(15_suppl):e11128. PMID: 28023850. **KQ1E6c, KQ2E6c, KQ3E6c.**
47. Campbell K, Foster-Schubert K, Xiao L, et al. Injuries in sedentary individuals enrolled in a 12-month, randomized, controlled, exercise trial. Journal of Physical Activity & Health. 2012;9(2):198-207. PMID: 22368219. **KQ1E1a, KQ2E1a, KQ3E1a.**
48. Campbell PT, Gross MD, Potter JD, et al. Effect of exercise on oxidative stress: a 12-month randomized, controlled trial. Medicine & Science in Sports & Exercise. 2010;42(8):1448-53. PMID: 20139793. **KQ1E1a, KQ2E1a, KQ3E1a.**
49. Campbell-Scherer DL, Asselin J, Osunlana AM, et al. Implementation and evaluation of the 5As framework of obesity management in primary care: design of the 5As Team (5AsT) randomized control trial. Implement Sci. 2014;9:78. PMID: 24947045. **KQ1E9, KQ2E9, KQ3E9.**
50. Carels RA, Young KM, Koball A, et al. Transforming your life: an environmental modification approach to weight loss. Journal of Health Psychology. 2011;16(3):430-8. PMID: 20929947. **KQ1E6b, KQ2E6b, KQ3E4a.**
51. Cavallo DN, Sisneros JA, Ronay AA, et al. Assessing the Feasibility of a Web-Based Weight Loss Intervention for Low-Income Women of Reproductive Age: A Pilot Study. JMIR Res Protoc. 2016;5(1):e30. PMID: 26920252. **KQ1E6a, KQ2E6a, KQ3E6a.**
52. Chang SH, Chen MC, Chien NH, et al. Effectiveness of community-based exercise intervention programme in obese adults with metabolic syndrome. Journal of Clinical Nursing. 2016;25(17-18):2579-89. PMID: 27501160. **KQ1E6b, KQ2E6b, KQ3E4a.**
53. Chao D, Espeland MA, Farmer D, et al. Effect of voluntary weight loss on bone mineral density in older overweight women. J Am Geriatr Soc. 2000;48(7):753-9. PMID: 10894313. **KQ1E3a, KQ2E3a, KQ3E3a.**
54. Christian JG, Bessesen DH, Byers TE, et al. Clinic-based support to help overweight patients with type 2 diabetes increase physical activity and lose weight. Arch Intern Med. 2008;168(2):141-6. PMID: 18227359. **KQ1E3b, KQ2E3b, KQ3E3b.**
55. Colleran HL, Lovelady CA. Use of MyPyramid Menu Planner for Moms in a weight-loss intervention during lactation. J Acad Nutr Diet. 2012;112(4):553-8. PMID: 22709705. **KQ1E6b, KQ2E6b, KQ3E4a.**

Appendix E. List of Excluded Studies

56. Conroy MB, Bryce CL, McTigue KM, et al. Promoting weight maintenance with electronic health record tools in a primary care setting: Baseline results from the MAINTAIN-pc trial. Contemp Clin Trials. 2017;54:60-7. PMID: 28089764. **KQ1E9, KQ2E9, KQ3E9.**
57. Conroy MB, Sward KL, Spadaro KC, et al. Effectiveness of a physical activity and weight loss intervention for middle-aged women: healthy bodies, healthy hearts randomized trial. J Gen Intern Med. 2015;30(2):207-13. PMID: 25391601. **KQ1E4a, KQ2E7, KQ3E4a.**
58. Cooper Z, Doll HA, Hawker DM, et al. Testing a new cognitive behavioural treatment for obesity: A randomized controlled trial with three-year follow-up. Behaviour Research & Therapy. 2010;48(8):706-13. PMID: 20691328. **KQ1E6c, KQ2E6c, KQ3E6c.**
59. Courteix D, Valente-dos-Santos J, Ferry B, et al. Multilevel Approach of a 1-Year Program of Dietary and Exercise Interventions on Bone Mineral Content and Density in Metabolic Syndrome--the RESOLVE Randomized Controlled Trial.[Erratum appears in PLoS One. 2015;10(10):e0140307; PMID: 26440101]. PLoS ONE [Electronic Resource]. 2015;10(9):e0136491. PMID: 26376093. **KQ1E6a, KQ2E6a, KQ3E6a.**
60. Cox KL, Burke V, Beilin LJ, et al. A comparison of the effects of swimming and walking on body weight, fat distribution, lipids, glucose, and insulin in older women--the Sedentary Women Exercise Adherence Trial 2. Metabolism: Clinical & Experimental. 2010;59(11):1562-73. PMID: 20197194. **KQ1E6c, KQ2E6c, KQ3E6c.**
61. Crain AL, Sherwood NE, Martinson BC, et al. Mediators of Weight Loss Maintenance in the Keep It Off Trial. Ann Behav Med. 2017. PMID: 28508330. **KQ1E4a, KQ2E4a, KQ3E4a.**
62. Davis BR, Oberman A, Blaufox MD, et al. Effect of antihypertensive therapy on weight loss. The Trial of Antihypertensive Interventions and Management Research Group. Hypertension. 1992;19(4):393-9. PMID: 1555871. **KQ1E4a, KQ2E7, KQ3E4a.**
63. Davis KK, Tate DF, Lang W, et al. Racial Differences in Weight Loss Among Adults in a Behavioral Weight Loss Intervention: Role of Diet and Physical Activity. J Phys Act Health. 2015. PMID: 25742122. **KQ1E6c, KQ2E6c, KQ3E6c.**
64. Davy B, Winett R, Savla J, et al. Resist diabetes: a randomized clinical trial for resistance training maintenance in adults with prediabetes. Plos one. 2017;12(2) (no pagination). **KQ1E1a, KQ2E1a, KQ3E1a.**
65. Dekkers JC, van Wier MF, Ariens GA, et al. Comparative effectiveness of lifestyle interventions on cardiovascular risk factors among a Dutch overweight working population: a randomized controlled trial. BMC Public Health. 2011;11(1):49. PMID: 21261935. **KQ1E4a, KQ2E4a, KQ3E4a.**
66. Demark-Wahnefried W, Morey MC, Sloane R, et al. Reach out to enhance wellness home-based diet-exercise intervention promotes reproducible and sustainable long-term improvements in health behaviors, body weight, and physical functioning in older, overweight/obese cancer survivors. J Clin Oncol. 2012;30(19):2354-61. PMID: 22614994. **KQ1E1a, KQ2E1a, KQ3E1a.**
67. Dennison L, Morrison L, Lloyd S, et al. Does brief telephone support improve engagement with a web-based weight management intervention? Randomized controlled trial. J Med Internet Res. 2014;16(3):e95. PMID: 24681761. **KQ1E6b, KQ2E6b, KQ3E4a.**
68. Derosa G, Maffioli P, Salvadeo SA, et al. Comparison of orlistat treatment and placebo in obese type 2 diabetic patients. Expert Opinion on Pharmacotherapy. 2010;11(12):1971-82. PMID: 20569086. **KQ1E3b, KQ2E3b, KQ3E3b.**
69. Dong F, Zhang Y, Huang Y, et al. Long-term lifestyle interventions in middle-aged and elderly men with nonalcoholic fatty liver disease: a randomized controlled trial. Sci. 2016;6:36783. PMID: 27830836. **KQ1E3b, KQ2E3b, KQ3E3b.**
70. Donnelly JE, Goetz J, Gibson C, et al. Equivalent weight loss for weight management programs delivered by phone and clinic. Obesity. 2013;21(10):1951-9. **KQ1E6c, KQ2E6c, KQ3E6c.**
71. Donnelly JE, Washburn RA, Smith BK, et al. A randomized, controlled, supervised, exercise trial in young overweight men and women: the Midwest Exercise Trial II (MET2). Contemp Clin Trials. 2012;33(4):804-10. PMID: 22504223. **KQ1E6c, KQ2E6c, KQ3E6c.**
72. Douglas IJ, Bhaskaran K, Batterham RL, et al. The effectiveness of pharmaceutical interventions for obesity: weight loss with orlistat and sibutramine in a United Kingdom population-based cohort. British Journal of Clinical Pharmacology. 2015;79(6):1020-7. PMID: 25641659. **KQ1E6a, KQ2E6a, KQ3E4a.**
73. Douglas IJ, Langham J, Bhaskaran K, et al. Orlistat and the risk of acute liver injury: self controlled case series study in UK Clinical Practice Research Datalink. BMJ. 2013;346:f1936. PMID: 23585064. **KQ1E6a, KQ2E6a, KQ3E6a.**
74. Driehuis F, Barte JC, Ter Bogt NC, et al. Maintenance of lifestyle changes: 3-year results of the Groningen Overweight and Lifestyle study. Patient Educ Couns. 2012;88(2):249-55. PMID: 22560253. **KQ1E1a, KQ2E1a, KQ3E1a.**
75. Duggan C, Tapsoba J, Wang C, et al. Dietary weight loss and exercise effects on serum biomarkers of angiogenesis in overweight postmenopausal women: A randomized controlled trial. Cancer Res. 2016;76(14):4226-35. PMID: 27417562. **KQ1E6c, KQ2E6c, KQ3E6c.**

76. Duggan C, Tapsoba JD, Wang CY, et al. Dietary Weight Loss, Exercise, and Oxidative Stress in Postmenopausal Women: A Randomized Controlled Trial. Cancer Prev Res (Phila Pa). 2016;9(11):835-43. PMID: 27803047. **KQ1E4a, KQ2E4a, KQ3E4a.**
77. Duggan C, Xiao L, Wang CY, et al. Effect of a 12-month exercise intervention on serum biomarkers of angiogenesis in postmenopausal women: a randomized controlled trial. Cancer Epidemiol Biomarkers Prev. 2014;23(4):648-57. PMID: 24501378. **KQ1E4a, KQ2E4a, KQ3E4a.**
78. Duncan S, Goodyear-Smith F, McPhee J, et al. Family-centered brief intervention for reducing obesity and cardiovascular disease risk: A randomized controlled trial. Obesity. 2016;24(11):2311-8. PMID: 27616217. **KQ1E1a, KQ2E1a, KQ3E1a.**
79. Durso LE. The relationship of internalized weight bias to weight change in treatment-seeking overweight adults. Dissertation Abstracts International: Section B: The Sciences and Engineering. 2013;73(7-B(E)):No Pagination Specified. **KQ1E6c, KQ2E6c, KQ3E6c.**
80. E B. A 12-week web based intervention to treat overweight and obesity. Nutridate. 2013;24:2-4. **KQ1E6b, KQ2E6b, KQ3E4a.**
81. Faurschou A, Gyldenløve M, Rohde U, et al. Lack of effect of the glucagon-like peptide-1 receptor agonist liraglutide on psoriasis in glucose-tolerant patients--a randomized placebo-controlled trial. Journal of the European Academy of Dermatology and Venereology : JEADV. 2015;29(3):555-9. **KQ1E3b, KQ2E3b, KQ3E3b.**
82. Fianu A, Bourse L, Naty N, et al. Long-Term Effectiveness of a Lifestyle Intervention for the Primary Prevention of Type 2 Diabetes in a Low Socio-Economic Community--An Intervention Follow-Up Study on Reunion Island. PLoS ONE [Electronic Resource]. 2016;11(1):e0146095. PMID: 26731676. **KQ1E6a, KQ2E6a, KQ3E6a.**
83. Finkelstein EA, Kruger E, Karnawat S. Cost-Effectiveness Analysis of Qsymia for Weight Loss. Pharmacoeconomics. 2015;33(7):699-706. PMID: 24986038. **KQ1E4a, KQ2E4a, KQ3E4a.**
84. Fjeldsoe BS, Goode AD, Phongsavan P, et al. Evaluating the Maintenance of Lifestyle Changes in a Randomized Controlled Trial of the 'Get Healthy, Stay Healthy' Program. JMIR Mhealth Uhealth. 2016;4(2):e42. PMID: 27166643. **KQ1E3a, KQ2E3a, KQ3E3a.**
85. Foley P, Steinberg D, Levine E, et al. Track: A randomized controlled trial of a digital health obesity treatment intervention for medically vulnerable primary care patients. Contemp Clin Trials. 2016;48:12-20. PMID: 26995281. **KQ1E9, KQ2E9, KQ3E9.**
86. Fontbonne A, Charles MA, Juhan-Vague I, et al. The effect of metformin on the metabolic abnormalities associated with upper-body fat distribution. BIGPRO Study Group. Diabetes Care. 1996;19(9):920-6. PMID: 8875083. **KQ1E5a, KQ2E5a, KQ3E5a.**
87. Forman EM, Butryn ML, Manasse SM, et al. Acceptance-based versus standard behavioral treatment for obesity: Results from the mind your health randomized controlled trial. Obesity (Silver Spring). 2016;24(10):2050-6. **KQ1E6c, KQ2E6c, KQ3E6c.**
88. Foster-Schubert KE, Alfano CM, Duggan CR, et al. Effect of diet and exercise, alone or combined, on weight and body composition in overweight-to-obese postmenopausal women. Obesity. 2012;20(8):1628-38. PMID: 21494229. **KQ1E4a, KQ2E6c, KQ3E4a.**
89. Frank LL, Sorensen BE, Yasui Y, et al. Effects of exercise on metabolic risk variables in overweight postmenopausal women: a randomized clinical trial. Obesity Res. 2005;13(3):615-25. PMID: 15833948 **KQ1E4a, KQ2E6c, KQ3E6c.**
90. Frey-Hewitt B, Vranizan KM, Dreon DM, et al. The effect of weight loss by dieting or exercise on resting metabolic rate in overweight men. Int J Obes. 1990;14(4):327-34. PMID: 2361810. **KQ1E6c, KQ2E6c, KQ3E4a.**
91. Friedenreich CM, Woolcott CG, McTiernan A, et al. Adiposity changes after a 1-year aerobic exercise intervention among postmenopausal women: a randomized controlled trial. Int J Obes (Lond). 2011;35(3):427-35. PMID: 20820172. **KQ1E3a, KQ2E3a, KQ3E3a.**
92. Fujioka K, O'Neil P, Davies M, et al. Early Weight Loss with Liraglutide 3.0 mg Predicts 1-Year Weight Loss and is Associated with Improvements in Clinical Markers. Obesity (silver spring, md). 2016;24(11):2278-88. PMID: 27804269. **KQ1E4a, KQ2E4a, KQ3E4a.**
93. Fujioka K, Plodkowski R, O'Neil PM, et al. The relationship between early weight loss and weight loss at 1 year with naltrexone ER/bupropion ER combination therapy. Int J Obes (Lond). 2016;40(9):1369-75. PMID: 27328752. **KQ1E3b, KQ2E3b, KQ3E3b.**
94. Fukuoka Y, Gay CL, Joiner KL, et al. A Novel Diabetes Prevention Intervention Using a Mobile App: A Randomized Controlled Trial With Overweight Adults at Risk. Am J Prev Med. 2015;49(2):223-37. PMID: 26033349. **KQ1E6b, KQ2E6b, KQ3E4a.**
95. Fuller NR, Lau NS, Markovic TP, et al. Investigating general medication prescription by general practitioners during a 12-month randomized controlled weight loss trial. Clin Obes. 2017. PMID: 28429577. **KQ1E4a, KQ2E4a, KQ3E4a.**
96. Fuller NR, Williams K, Shrestha R, et al. Changes in physical activity during a weight loss intervention and follow-up: a randomized controlled trial. Clin. 2014;4(3):127-35. PMID: 25826767. **KQ1E4a, KQ2E4a, KQ3E4a.**

Appendix E. List of Excluded Studies

97. Gagnon C, Brown C, Couture C, et al. A cost-effective moderate-intensity interdisciplinary weight-management programme for individuals with prediabetes. Diabetes & Metabolism. 2011;37(5):410-8. PMID: 21489843. **KQ1E6c, KQ2E6c, KQ3E6c.**
98. Gambineri A, Patton L, Vaccina A, et al. Treatment with flutamide, metformin, and their combination added to a hypocaloric diet in overweight-obese women with polycystic ovary syndrome: a randomized, 12-month, placebo-controlled study. J Clin Endocrinol Metab. 2006;91(10):3970-80. PMID: 16868063. **KQ1E5a, KQ2E5a, KQ3E5a.**
99. Ganjali S, Sahebkar A, Mahdipour E, et al. Investigation of the effects of curcumin on serum cytokines in obese individuals: a randomized controlled trial. ScientificWorldJournal. 2014;2014:898361. PMID: 24678280. **KQ1E3a, KQ2E3a, KQ3E3a.**
100. Garvey WT, Ryan DH, Henry R, et al. Prevention of type 2 diabetes in subjects with prediabetes and metabolic syndrome treated with phentermine and topiramate extended release. Diabetes care. 2014;37(4):912-21. **KQ1E4a, KQ2E4a, KQ3E4a.**
101. Gerdes S, Dethlefs B, Personke Y, et al. Online weight-loss coaching for patients with psoriasis: results of a pilot study. Br J Dermatol. 2016;174(3):674-6. PMID: 26399576. **KQ1E6b, KQ2E6b, KQ3E4a.**
102. Gill DP, Blunt W, De Cruz A, et al. Hockey Fans in Training (Hockey FIT) pilot study protocol: a gender-sensitized weight loss and healthy lifestyle program for overweight and obese male hockey fans. BMC Public Health. 2016;16(1):1096. PMID: 27756351. **KQ1E6c, KQ2E6c, KQ3E6c.**
103. Gilliam ML. Long-term effects of weight-reducing diets in hypertensive patients. Obstetrics and gynecology. 2012;119(1):180-1. PMID: None. **KQ1E6a, KQ2E6a, KQ3E6a.**
104. Gillison F, Greaves C, Stathi A, et al. 'Waste the Waist': the development of an intervention to promote changes in diet and physical activity for people with high cardiovascular risk. Br J Health Psychol. 2012;17(2):327-45. PMID: 22107451. **KQ1E4a, KQ2E4a, KQ3E4a.**
105. Gillison F, Stathi A, Reddy P, et al. Processes of behavior change and weight loss in a theory-based weight loss intervention program: a test of the process model for lifestyle behavior change. Int. 2015;12:2. PMID: 25592314. **KQ1E4a, KQ2E4a, KQ3E4a.**
106. Gjevestad E, Karlsen TI, Roislien J, et al. The effectiveness of secondary and tertiary care lifestyle intervention in morbidly obese patients: a 1-year non-randomized controlled pragmatic clinical trial. Clin. 2013;3(1-2):39-50. PMID: 25586390. **KQ1E6c, KQ2E6c, KQ3E6c.**
107. Gnagnarella P, Draga D, Baggi F, et al. Promoting weight loss through diet and exercise in overweight or obese breast cancer survivors (InForma): study protocol for a randomized controlled trial. Trials. 2016;17:363. PMID: 27464488. **KQ1E9, KQ2E9, KQ3E9.**
108. Gogebakan O, Kohl A, Osterhoff MA, et al. Effects of weight loss and long-term weight maintenance with diets varying in protein and glycemic index on cardiovascular risk factors: the diet, obesity, and genes (DiOGenes) study: a randomized, controlled trial. Circulation. 2011;124(25):2829-38. PMID: 22104550. **KQ1E6b, KQ2E6b, KQ3E4a.**
109. Gokcel A, Gumurdulu Y, Karakose H, et al. Evaluation of the safety and efficacy of sibutramine, orlistat and metformin in the treatment of obesity. Diabetes Obes Metab. 2002;4(1):49-55. PMID: 11874442. **KQ1E5a, KQ2E5a, KQ3E5a**
110. Gomez-Pardo E, Fernandez-Alvira JM, Vilanova M, et al. A Comprehensive Lifestyle Peer Group-Based Intervention on Cardiovascular Risk Factors: The Randomized Controlled Fifty-Fifty Program.[Erratum appears in J Am Coll Cardiol. 2016 Mar 22;67(11):1385]. J Am Coll Cardiol. 2016;67(5):476-85. PMID: 26562047. **KQ1E1a, KQ2E1a, KQ3E1a.**
111. Goodfellow J, Agarwal S, Harrad F, et al. Cluster randomised trial of a tailored intervention to improve the management of overweight and obesity in primary care in England. Implement Sci. 2016;11(1):77. PMID: 27233633. **KQ1E6b, KQ2E6b, KQ3E4a.**
112. Greenway FL, Dunayevich E, Tollefson G, et al. Comparison of combined bupropion and naltrexone therapy for obesity with monotherapy and placebo. J Clin Endocrinol Metab. 2009;94(12):4898-906. **KQ1E4a, KQ2E6b, KQ3E5a.**
113. Greenway FL, Whitehouse MJ, Guttadauria M, et al. Rational design of a combination medication for the treatment of obesity. Obesity (Silver Spring). 2009;17(1):30-9. **KQ1E4a, KQ2E6b, KQ3E5a.**
114. Grilo CM, White MA. Orlistat with behavioral weight loss for obesity with versus without binge eating disorder: randomized placebo-controlled trial at a community mental health center serving educationally and economically disadvantaged Latino/as. Behaviour Research & Therapy. 2013;51(3):167-75. PMID: 23376451. **KQ1E4a, KQ2E6b, KQ3E3d.**
115. Groeneveld IF, Proper KI, van der Beek AJ, et al. Sustained body weight reduction by an individual-based lifestyle intervention for workers in the construction industry at risk for cardiovascular disease: results of a randomized controlled trial. Prev Med. 2010;51(3-4):240-6. PMID: 20692282. **KQ1E1a, KQ2E1a, KQ3E1a.**
116. Haas MC, Bodner EV, Brown CJ, et al. Calorie restriction in overweight seniors: response of older adults to a dieting study: the CROSSROADS randomized controlled clinical trial. J Nutr Gerontol Geriatr. 2014;33(4):376-400. PMID: 25424512. **KQ1E6c, KQ2E6c, KQ3E6c.**

Appendix E. List of Excluded Studies

117. Habermann N, Makar KW, Abbenhardt C, et al. No effect of caloric restriction or exercise on radiation repair capacity. Medicine & Science in Sports & Exercise. 2015;47(5):896-904. PMID: 25160845. **KQ1E4a, KQ2E4a, KQ3E4a.**
118. Hales S, Turner-McGrievy GM, Wilcox S, et al. Social networks for improving healthy weight loss behaviors for overweight and obese adults: A randomized clinical trial of the social pounds off digitally (Social POD) mobile app. Int J Med Inf. 2016;94:81-90. PMID: 27573315. **KQ1E6c, KQ2E6c, KQ3E6c.**
119. Hall KS, Pieper CF, Edelman DE, et al. Lessons learned when innovations go awry: a baseline description of a behavioral trial-the Enhancing Fitness in Older Overweight Veterans with Impaired Fasting Glucose study. Transl Behav Med. 2011;1(4):573-87. PMID: 22866170. **KQ1E1a, KQ2E1a, KQ3E1a.**
120. Halseth A, Shan K, Walsh B, et al. Method-of-use study of naltrexone sustained release (SR)/bupropion SR on body weight in individuals with obesity. Obesity. 2017;25(2):338-45. PMID: 28026920. **KQ1E6c, KQ2E6c, KQ3E6c.**
121. Handelsman Y, Odeh S, Troupin B, editors. Use of phentermine/topiramate extended-release (PHEN/TPM ER) in obese/overweight subjects with dysglycemia. 11th Annual World Congress on Insulin Resistance, Diabetes and Cardiovascular Disease, WCIRDC 2014 Nov 7-9; Los Angeles, CA. KQ Search 1 - CENTRAL: Endocrine Practice; I1a to Gadde 2011 [7242]. **KQ1E4a, KQ2E4a, KQ3E4a.**
122. Hanefeld M, Sachse G. The effects of orlistat on body weight and glycaemic control in overweight patients with type 2 diabetes: a randomized, placebo-controlled trial. Diabetes Obes Metab. 2002;4(6):415-23. PMID: 12406041. **KQ1E3b, KQ2E3b, KQ3E3b.**
123. Hardcastle S, Taylor A, Bailey M, et al. A randomised controlled trial on the effectiveness of a primary health care based counselling intervention on physical activity, diet and CHD risk factors. Patient Educ Couns. 2008;70(1):31-9. PMID: 17997263. **KQ1E1a, KQ2E1a, KQ3E1a.**
124. Hardcastle SJ, Taylor AH, Bailey MP, et al. Effectiveness of a motivational interviewing intervention on weight loss, physical activity and cardiovascular disease risk factors: a randomised controlled trial with a 12-month post-intervention follow-up. Int. 2013;10:40. PMID: 23537492. **KQ1E1a, KQ2E1a, KQ3E1a.**
125. Harris L, Melville C, Jones N, et al. A single-blind, pilot randomised trial of a weight management intervention for adults with intellectual disabilities and obesity: study protocol. Pilot feasibility stud. 2015;1:5. PMID: 27965785. **KQ1E6c, KQ2E6c, KQ3E6c.**
126. Hartman SJ, Nelson SH, Cadmus-Bertram LA, et al. Technology- and Phone-Based Weight Loss Intervention: Pilot RCT in Women at Elevated Breast Cancer Risk. Am J Prev Med. 2016;51(5):714-21. PMID: 27593420. **KQ1E6b, KQ2E6b, KQ3E4a.**
127. Heideman WH, Wit M, Middelkoop BJC, et al. Diabetes risk reduction in overweight first degree relatives of type 2 diabetes patients: Effects of a low-intensive lifestyle education program (DiAlert) A randomized controlled trial. Patient education and counseling. 2015;98(4):476-83. **KQ1E6b, KQ2E6b, KQ3E4a.**
128. Hersey JC, Khavjou O, Strange LB, et al. The efficacy and cost-effectiveness of a community weight management intervention: a randomized controlled trial of the health weight management demonstration. Prev Med. 2012;54(1):42-9. PMID: 22001689. **KQ1E6c, KQ2E6c, KQ3E6c.**
129. Hesselink AE, Rutten GE, Slootmaker SM, et al. Effects of a lifestyle program in subjects with Impaired Fasting Glucose, a pragmatic cluster-randomized controlled trial. BMC Fam Pract. 2015;16:183. PMID: 26695176. **KQ1E5a, KQ2E5a, KQ3E5a.**
130. Hinderliter AL, Sherwood A, Craighead LW, et al. The long-term effects of lifestyle change on blood pressure: One-year follow-up of the ENCORE study. Am J Hypertens. 2014;27(5):734-41. PMID: 24084586. **KQ1E4a, KQ2E6c, KQ3E6c.**
131. Hollander P, Gupta AK, Plodkowski R, et al. Effects of naltrexone sustained-release/bupropion sustained-release combination therapy on body weight and glycemic parameters in overweight and obese patients with type 2 diabetes.[Erratum appears in Diabetes Care. 2014 Feb;37(2):587]. Diabetes Care. 2013;36(12):4022-9. PMID: 24144653. **KQ1E3b, KQ2E3b, KQ3E3b.**
132. Hollander PA, Elbein SC, Hirsch IB, et al. Role of orlistat in the treatment of obese patients with type 2 diabetes. A 1-year randomized double-blind study. Diabetes Care. 1998;21(8):1288-94. PMID: 9702435. **KQ1E3b, KQ2E3b, KQ3E3b.**
133. Hollenbeak CS, Weinstock RS, Cibula D, et al. Cost-effectiveness of SHINE: A Telephone Translation of the Diabetes Prevention Program. Health serv. 2016;9:21-8. PMID: 27429556. **KQ1E6c, KQ2E6c, KQ3E6c.**
134. Hope AA, Kumanyika SK, Shults J, et al. Changes in Health-Related Quality of Life among African-Americans in a lifestyle weight loss program. Quality of Life Research. 2010;19(7):1025-33. PMID: 20458545. **KQ1E6a, KQ2E6a, KQ3E6a.**
135. HPT. The Hypertension Prevention Trial: three-year effects of dietary changes on blood pressure. Hypertension Prevention Trial Research Group. Arch Intern Med. 1990;150(1):153-62. PMID: 2404477. **KQ1E4a, KQ2E3a, KQ3E4a.**

136. Hu G, Tian H, Zhang F, et al. Tianjin Gestational Diabetes Mellitus Prevention Program: study design, methods, and 1-year interim report on the feasibility of lifestyle intervention program. Diabetes Research & Clinical Practice. 2012;98(3):508-17. PMID: 23010556. **KQ1E2a, KQ2E2a, KQ3E2a.**

137. Hua K, Hao G, Li W. Cardiovascular outcomes of lifestyle intervention in hypertensive patients with antihypertensive agents. Int J Cardiol. 2017;227:751-6. PMID: 27810294. **KQ1E3a, KQ2E3a, KQ3E3a.**

138. Hunter GR, Brock DW, Byrne NM, et al. Exercise training prevents regain of visceral fat for 1 year following weight loss. Obesity. 2010;18(4):690-5. PMID: 19816413. **KQ1E6c, KQ2E6c, KQ3E6c.**

139. Iepsen EW, Lundgren J, Dirksen C, et al. Treatment with a GLP-1 receptor agonist diminishes the decrease in free plasma leptin during maintenance of weight loss. Int J Obes (Lond). 2015;39(5):834-41. PMID: 25287751. **KQ1E6c, KQ2E6c, KQ3E6c.**

140. Iepsen EW, Lundgren JR, Hartmann B, et al. GLP-1 Receptor Agonist Treatment Increases Bone Formation and Prevents Bone Loss in Weight-Reduced Obese Women. Journal of Clinical Endocrinology & Metabolism. 2015;100(8):2909-17. PMID: 26043228. **KQ1E6c, KQ2E6c, KQ3E6c.**

141. Imayama I, Alfano CM, Kong A, et al. Dietary weight loss and exercise interventions effects on quality of life in overweight/obese postmenopausal women: a randomized controlled trial. Int. 2011;8:118. PMID: 22026966. **KQ1E6c, KQ2E6c, KQ3E4a.**

142. Imayama I, Alfano CM, Mason C, et al. Weight and metabolic effects of dietary weight loss and exercise interventions in postmenopausal antidepressant medication users and non-users: a randomized controlled trial. Prev Med. 2013;57(5):525-32. PMID: 23859929. **KQ1E4a, KQ2E6c, KQ3E4a.**

143. Irwin ML, Yasui Y, Ulrich CM, et al. Effect of exercise on total and intra-abdominal body fat in postmenopausal women: a randomized controlled trial. JAMA. 2003;289(3):323-30. PMID: 12525233. **KQ1E4a, KQ2E6c, KQ3E6c.**

144. Jakicic JM, Davis KK, Rogers RJ, et al. Effect of Wearable Technology Combined With a Lifestyle Intervention on Long-term Weight Loss: The IDEA Randomized Clinical Trial. JAMA. 2016;316(11):1161-71. PMID: 27654602. **KQ1E6c, KQ2E6c, KQ3E6c.**

145. Jakicic JM, Rickman AD, Lang W, et al. Time-based physical activity interventions for weight loss: a randomized trial. Medicine & Science in Sports & Exercise. 2015;47(5):1061-9. PMID: 25160843. **KQ1E4a, KQ2E6a, KQ3E4a.**

146. Janney CA, Jakicic JM. The influence of exercise and BMI on injuries and illnesses in overweight and obese individuals: A randomized control trial. The International Journal of Behavioral Nutrition and Physical Activity Vol 7 Jan 2010, ArtID 1. 2010;7. **KQ1E3a, KQ2E3a, KQ3E3a.**

147. Janus ED, Best JD, Davis-Lameloise N, et al. Scaling-up from an implementation trial to state-wide coverage: results from the preliminary Melbourne Diabetes Prevention Study. Trials. 2012;13:152. PMID: 22929458. **KQ1E3a, KQ2E3a, KQ3E3a.**

148. Jay MR, Gillespie CC, Schlair SL, et al. The impact of primary care resident physician training on patient weight loss at 12 months. Obesity. 2013;21(1):45-50. PMID: 23505167. **KQ1E6a, KQ2E6a, KQ3E6a.**

149. Jeffery RW, Wing RR, Sherwood NE, et al. Physical activity and weight loss: does prescribing higher physical activity goals improve outcome? Am J Clin Nutr. 2003;78(4):684-9. PMID: 14522725. **KQ1E6c, KQ2E6c, KQ3E6c.**

150. Jensen P, Zachariae C, Christensen R, et al. Effect of weight loss on the cardiovascular risk profile of obese patients with psoriasis. Acta Derm Venereol. 2014;94(6):691-4. PMID: 24556829. **KQ1E6b, KQ2E6b, KQ3E4a.**

151. Jerome GJ, Rubin RR, Clark JM, et al. From efficacy to effectiveness: lessons learned from the Practice-Based Opportunities for Weight Reduction (POWER) trial. J. 2012;1(3):213-6. PMID: 24237403. **KQ1E4a, KQ2E4a, KQ3E4a.**

152. Jordan J, Astrup AV, Day WW. Effects of phentermine and extended-release topiramate alone and in combination on cardiovascular risk factors. Diabetologia. 2012;55:S285. **KQ1E6a, KQ2E6a, KQ3E6a.**

153. Juul L, Andersen VJ, Arnoldsen J, et al. Effectiveness of a brief theory-based health promotion intervention among adults at high risk of type 2 diabetes: One-year results from a randomised trial in a community setting. Primary care diabetes. 2016;10(2):111-20. PMID: 26259517. **KQ1E3a, KQ2E3a, KQ3E3a.**

154. Kaholokula JK, Mau MK, Efird JT, et al. A family and community focused lifestyle program prevents weight regain in Pacific Islanders: a pilot randomized controlled trial. Health Education & Behavior. 2012;39(4):386-95. PMID: 21551421. **KQ1E6c, KQ2E6c, KQ3E6c.**

155. Kallings LV, Sierra Johnson J, Fisher RM, et al. Beneficial effects of individualized physical activity on prescription on body composition and cardiometabolic risk factors: results from a randomized controlled trial. European journal of cardiovascular prevention and rehabilitation : official journal of the European Society of Cardiology, Working Groups on Epidemiology & Prevention and Cardiac Rehabilitation and Exercise Physiology. 2009;16(1):80-4. PMID: 19237997. **KQ1E6b, KQ2E6b, KQ3E4a.**

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156. Kastarinen MJ, Puska PM, Korhonen MH, et al. Non-pharmacological treatment of hypertension in primary health care: a 2-year open randomized controlled trial of lifestyle intervention against hypertension in eastern Finland. J Hypertens. 2002;20(12):2505-12. PMID: 12473876. **KQ1E4a, KQ2E3a, KQ3E4a.**

157. Kegler MC, Haardorfer R, Alcantara IC, et al. Impact of Improving Home Environments on Energy Intake and Physical Activity: A Randomized Controlled Trial. Am J Public Health. 2016;106(1):143-52. PMID: 26696290. **KQ1E1a, KQ2E1a, KQ3E1a.**

158. Kelley DE, Bray GA, Pi-Sunyer FX, et al. Clinical efficacy of orlistat therapy in overweight and obese patients with insulin-treated type 2 diabetes: A 1-year randomized controlled trial. Diabetes Care. 2002;25(6):1033-41. PMID: 12032111. **KQ1E3b, KQ2E3b, KQ3E3b.**

159. Keranen AM, Strengell K, Savolainen MJ, et al. Effect of weight loss intervention on the association between eating behaviour measured by TFEQ-18 and dietary intake in adults. Appetite. 2011;56(1):156-62. PMID: 20955744. **KQ1E6c, KQ2E6c, KQ3E6c.**

160. Keyserling TC, Samuel-Hodge CD, Pitts SJ, et al. A community-based lifestyle and weight loss intervention promoting a Mediterranean-style diet pattern evaluated in the stroke belt of North Carolina: the Heart Healthy Lenoir Project. BMC Public Health. 2016;16:732. PMID: 27495295. **KQ1E6c, KQ2E6c, KQ3E6c.**

161. Kiernan M, Brown SD, Schoffman DE, et al. Promoting healthy weight with "stability skills first": a randomized trial. Journal of Consulting & Clinical Psychology. 2013;81(2):336-46. **KQ1E6c, KQ2E6c, KQ3E6c.**

162. Kiernan M, King AC, Stefanick ML, et al. Men gain additional psychological benefits by adding exercise to a weight-loss program. Obes Res. 2001;9(12):770-7. PMID: 11743061. **KQ1E6c, KQ2E6c, KQ3E4a.**

163. Kim Y, Pike J, Adams H, et al. Telephone intervention promoting weight-related health behaviors. Prev Med. 2010;50(3):112-7. PMID: 20006642. **KQ1E6b, KQ2E6b, KQ3E4a.**

164. Kirk EP, Jacobsen DJ, Gibson C, et al. Time course for changes in aerobic capacity and body composition in overweight men and women in response to long-term exercise: the Midwest Exercise Trial (MET). Int J Obes Relat Metab Disord. 2003;27(8):912-9. PMID: 12861232. **KQ1E1a, KQ2E1a, KQ3E1a.**

165. Kolotkin RL, Chen S, Klassen P, et al. Patient-reported quality of life in a randomized placebo-controlled trial of naltrexone/bupropion for obesity. Clin. 2015;5(5):237-44. PMID: 26222044. **KQ1E3b, KQ2E3b, KQ3E3b.**

166. Kolotkin RL, Gadde KM, Peterson CA, et al. Health-related quality of life in two randomized controlled trials of phentermine/topiramate for obesity: What mediates improvement? Qual Life Res. 2015. PMID: 26446094. **KQ1E4a, KQ2E4a, KQ3E4a.**

167. Kraschnewski JL, Stuckey HL, Rovniak LS, et al. Efficacy of a weight-loss website based on positive deviance. A randomized trial. Am J Prev Med. 2011;41(6):610-4. PMID: 22099238. **KQ1E6b, KQ2E6b, KQ3E4a.**

168. Krukowski RA, DiLillo V, Ingle K, et al. Design and Methods of a Synchronous Online Motivational Interviewing Intervention for Weight Management. JMIR Res Protoc. 2016;5(2):e69. PMID: 27095604. **KQ1E6c, KQ2E6c, KQ3E6c.**

169. Kuller LH, Simkin-Silverman LR, Wing RR, et al. Women's Healthy Lifestyle Project: A randomized clinical trial: results at 54 months. Circulation. 2001;103(1):32-7. PMID: 11136682. **KQ1E1a, KQ2E1a, KQ3E1a.**

170. Kulzer B, Hermanns N, Krichbaum M, et al. Primary prevention of type 2 diabetes by lifestyle modification. Results of the PRAEDIAS prevention program. [German]. Diabetologe. 2014;10(4):276-85. **KQ1E8, KQ2E8, KQ3E8.**

171. Laitner MH, Minski SA, Perri MG. The role of self-monitoring in the maintenance of weight loss success. Eat. 2016;21:193-7. **KQ1E6c, KQ2E6c, KQ3E6c.**

172. Langford HG, Blaufox MD, Oberman A, et al. Dietary therapy slows the return of hypertension after stopping prolonged medication. JAMA. 1985;253(5):657-64. PMID: 3881608. **KQ1E4a, KQ2E3a, KQ3E4a.**

173. Latner JD, Ciao AC, Wendicke AU, et al. Community-based behavioral weight-loss treatment: long-term maintenance of weight loss, physiological, and psychological outcomes. Behaviour Research & Therapy. 2013;51(8):451-9. PMID: 23747584. **KQ1E2b, KQ2E2b, KQ3E2b.**

174. Leahey T, Fava J, Seiden A, et al. A randomized controlled trial testing an Internet delivered cost-benefit approach to weight loss maintenance. Prev Med. 2016;92:51-7. PMID: 27095323. **KQ1E6b, KQ2E6b, KQ3E4a.**

175. Levy RL, Jeffery RW, Langer SL, et al. Maintenance-tailored therapy vs. standard behavior therapy for 30-month maintenance of weight loss. Prev Med. 2010;51(6):457-9. PMID: 20869984. **KQ1E6c, KQ2E6c, KQ3E6c.**

176. Lillis J, Niemeier HM, Thomas JG, et al. A randomized trial of an acceptance-based behavioral intervention for weight loss in people with high internal disinhibition. Obesity. 2016;24(12):2509-14. PMID: 27804255. **KQ1E6c, KQ2E6c, KQ3E6c.**

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177. Lim SS, Noakes M, Keogh JB, et al. Long-term effects of a low carbohydrate, low fat or high unsaturated fat diet compared to a no-intervention control. Nutrition, metabolism, and cardiovascular diseases : NMCD. 2010;20(8):599-607. **KQ1E4a, KQ2E7, KQ3E7.**
178. Lin M, Mahmooth Z, Dedhia N, et al. Tailored, interactive text messages for enhancing weight loss among African American adults: the TRIMM randomized controlled trial. American Journal of Medicine. 2015;128(8):896-904. PMID: 25840035. **KQ1E4a, KQ2E6b, KQ3E4a.**
179. Livia B, Elisa R, Claudia R, et al. Stage of Change and Motivation to a Healthier Lifestyle before and after an Intensive Lifestyle Intervention. J Obes [serial on the Internet]. 2016 [cited Bridge Search 2 - CENTRAL; 2016(no pagination): Available from: http://onlinelibrary.wiley.com/o/cochrane/clcentral/articles/220/CN-01167220/frame.html. **KQ1E6c, KQ2E6c, KQ3E6c.**
180. Lopez-Olmedo N, Hernandez-Cordero S, Neufeld LM, et al. The Associations of Maternal Weight Change with Breastfeeding, Diet and Physical Activity During the Postpartum Period. Matern Child Health J. 2016;20(2):270-80. PMID: 26525558. **KQ1E5a, KQ2E5a, KQ3E5a.**
181. Lowe MR, Butryn ML, Thomas JG, et al. Meal replacements, reduced energy density eating, and weight loss maintenance in primary care patients: a randomized controlled trial. Obesity. 2014;22(1):94-100. PMID: 23894101. **KQ1E6c, KQ2E6c, KQ3E6c.**
182. Lutes LD, Damschroder LJ, Masheb R, et al. Behavioral Treatment for Veterans with Obesity: 24-Month Weight Outcomes from the ASPIRE-VA Small Changes Randomized Trial. J Gen Intern Med. 2017;32(Suppl 1):40-7. PMID: 28271430. **KQ1E6c, KQ2E6c, KQ3E6c.**
183. Ma W, Huang T, Zheng Y, et al. Weight-Loss Diets, Adiponectin, and Changes in Cardiometabolic Risk in the 2-Year POUNDS Lost Trial. Journal of Clinical Endocrinology & Metabolism. 2016;101(6):2415-22. PMID: 27055193. **KQ1E6c, KQ2E6c, KQ3E6c.**
184. Madigan CD, Aveyard P, Jolly K, et al. Regular self-weighing to promote weight maintenance after intentional weight loss: a quasi-randomized controlled trial. Journal of Public Health. 2014;36(2):259-67. PMID: 23753256. **KQ1E4a, KQ2E4a, KQ3E4a.**
185. Martin CK, Miller AC, Thomas DM, et al. Efficacy of SmartLoss, a smartphone-based weight loss intervention: results from a randomized controlled trial. Obesity. 2015;23(5):935-42. PMID: 25919921. **KQ1E6b, KQ2E6b, KQ3E4a.**
186. Martin-Borras C, Gine-Garriga M, Martinez E, et al. Effectiveness of a primary care-based intervention to reduce sitting time in overweight and obese patients (SEDESTACTIV): a randomized controlled trial; rationale and study design. BMC Public Health. 2014;14:228. PMID: 24597534. **KQ1E1a, KQ2E1a, KQ3E1a.**
187. Mateo KF, Jay M. Access to a behavioral weight loss website with or without group sessions increased weight loss in statewide campaign. Journal of clinical outcomes management. 2014;21(8):345-8. PMID: None. **KQ1E6c, KQ2E6c, KQ3E6c.**
188. Mayer-Davis EJ, D'Antonio AM, Smith SM, et al. Pounds off with empowerment (POWER): a clinical trial of weight management strategies for black and white adults with diabetes who live in medically underserved rural communities. Am J Public Health. 2004;94(10):1736-42. PMID: 15451743. **KQ1E3b, KQ2E3b, KQ3E3b.**
189. McRobbie H, Hajek P, Peerbux S, et al. Tackling obesity in areas of high social deprivation: clinical effectiveness and cost-effectiveness of a task-based weight management group programme - a randomised controlled trial and economic evaluation. Health Technology Assessment (Winchester, England). 2016;20(79):1-150. PMID: 27802843. **KQ1E6c, KQ2E6c, KQ3E6c.**
190. Megakli T, Vlachopoulos SP, Theodorakis Y. Effects of an aerobic and resistance exercise intervention on health-related quality of life in women with obesity. Journal of Applied Biobehavioral Research. 2016;21(2):82-106. **KQ1E1a, KQ2E1a, KQ3E1a.**
191. Mellberg C, Sandberg S, Ryberg M, et al. Long-term effects of a Palaeolithic-type diet in obese postmenopausal women: a 2-year randomized trial. European journal of clinical nutrition. 2014;68(3):350-7. **KQ1E6c, KQ2E6c, KQ3E6c.**
192. Mensinger JL, Calogero RM, Stranges S, et al. A weight-neutral versus weight-loss approach for health promotion in women with high BMI: A randomized-controlled trial. Appetite. 2016;105:364-74. PMID: 27289009. **KQ1E6c, KQ2E6c, KQ3E6c.**
193. Mensinger JL, Calogero RM, Tylka TL. Internalized Weight Stigma Moderates Eating Behavior Outcomes in Women with High BMI Participating in a Healthy Living Program. Appetite. 2016. PMID: 26829370. **KQ1E4a, KQ2E4a, KQ3E4a.**
194. Mensink M, Blaak EE, Corpeleijn E, et al. Lifestyle intervention according to general recommendations improves glucose tolerance. Obes Res. 2003;11(12):1588-96. PMID: 14694225. **KQ1E4a, KQ2E3a, KQ3E3a.**
195. Miles JM, Leiter L, Hollander P, et al. Effect of orlistat in overweight and obese patients with type 2 diabetes treated with metformin. Diabetes Care. 2002;25(7):1123-8. PMID: 12087008. **KQ1E3b, KQ2E3b, KQ3E3b.**
196. Miller GD, Isom S, Morgan TM, et al. Effects of a community-based weight loss intervention on adipose tissue circulating factors. Diabetes Metab Syndr. 2014;8(4):205-11. PMID: 25293442. **KQ1E4a, KQ2E4a, KQ3E4a.**

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197. Mohanka M, Irwin M, Heckbert SR, et al. Serum lipoproteins in overweight/obese postmenopausal women: a one-year exercise trial. Med Sci Sports Exerc. 2006;38(2):231-9. PMID: 16531889 **KQ1E4a, KQ2E6c, KQ3E6c.**
198. Moin T, Damschroder LJ, AuYoung M, et al. Diabetes Prevention Program Translation in the Veterans Health Administration. Am J Prev Med. 2017;13:13. PMID: 28094135. **KQ1E6c, KQ2E6c, KQ3E6c.**
199. Moore R, Diewald L, Wadden T, et al. The impact of a primary care-based weight loss intervention on the quality of life. Int J Obes (Lond). 2013;37(Suppl.1):S25-s30. **KQ1E4a, KQ2E4a, KQ3E4a.**
200. Morey MC, Pieper CF, Edelman DE, et al. Enhanced fitness: a randomized controlled trial of the effects of home-based physical activity counseling on glycemic control in older adults with prediabetes mellitus. J Am Geriatr Soc. 2012;60(9):1655-62. PMID: 22985140. **KQ1E1a, KQ2E1a, KQ3E1a.**
201. Muggia C, Falchi AG, Michelini I, et al. Brief group cognitive behavioral treatment in addition to prescriptive diet versus standard care in obese and overweight patients. A randomized controlled trial. e-SPEN Journal. 2014;9(1):e26-e33. **KQ1E6c, KQ2E6c, KQ3E6c.**
202. Munoz-Rivas N. A randomized, multicentric trial on lorcaserin versus placebo in the management of overweight and obesity. [Spanish]. Revista clinica espanola. 2011;211(1):52-3. **KQ1E8, KQ2E8, KQ3E8.**
203. Murphy PJ, Williams RL. Weight-loss study in African-American Women: lessons learned from project take HEED and future, technologically enhanced directions. Perm. 2013;17(2):55-9. PMID: 23704845. **KQ1E4a, KQ2E4a, KQ3E4a.**
204. Mutsaerts MA, van Oers AM, Groen H, et al. Randomized Trial of a Lifestyle Program in Obese Infertile Women. New England Journal of Medicine. 2016;374(20):1942-53. PMID: 27192672. **KQ1E6b, KQ2E6b, KQ3E4a.**
205. Neoh SL, Sumithran P, Haywood CJ, et al. Combination phentermine and topiramate for weight maintenance: the first Australian experience. Med J Aust. 2014;201(4):224-6. PMID: 25164851. **KQ1E6a, KQ2E6a, KQ3E6a.**
206. Nezami BT, Lang W, Jakicic JM, et al. The Effect of Self-Efficacy on Behavior and Weight in a Behavioral Weight-Loss Intervention. Health Psychol. 2016. PMID: 27183306. **KQ1E6c, KQ2E6c, KQ3E6c.**
207. Nguyen CT, Zhou S, Shanahan W, et al. Lorcaserin in Obese and Overweight Patients Taking Prohibited Serotonergic Agents: A Retrospective Analysis. Clinical Therapeutics. 2016;38(6):1498-509. PMID: 27206567. **KQ1E3b, KQ2E3b, KQ3E3b.**
208. Nicklas JM, Sacks FM, Smith SR, et al. Effect of dietary composition of weight loss diets on high-sensitivity c-reactive protein: the Randomized POUNDS LOST trial. Obesity. 2013;21(4):681-9. PMID: 23712970. **KQ1E6c, KQ2E6c, KQ3E6c.**
209. Nissen SE, Wolski KE, Prcela L, et al. Effect of Naltrexone-Bupropion on Major Adverse Cardiovascular Events in Overweight and Obese Patients With Cardiovascular Risk Factors: A Randomized Clinical Trial. JAMA. 2016;315(10):990-1004. PMID: 26954408. **KQ1E4a, KQ2E4a, KQ3E3b.**
210. Noakes M, Foster P, Keogh J, et al. Comparison of isocaloric very low carbohydrate/high saturated fat and high carbohydrate/low saturated fat diets on body composition and cardiovascular risk. Nutr Metab (Lond). 2006;3:7. PMID: 16403234. **KQ1E4a, KQ2E4a, KQ3E4a.**
211. Nurkkala M, Kaikkonen K, Vanhala ML, et al. Lifestyle intervention has a beneficial effect on eating behavior and long-term weight loss in obese adults. Eat. 2015;18:179-85. PMID: 26112229. **KQ1E4a, KQ2E7, KQ3E4a.**
212. Oh B, Cho B, Han MK, et al. The Effectiveness of Mobile Phone-Based Care for Weight Control in Metabolic Syndrome Patients: Randomized Controlled Trial. JMIR Mhealth Uhealth. 2015;3(3):e83. PMID: 26293568. **KQ1E6c, KQ2E6c, KQ3E6c.**
213. Olszanecka-Glinianowicz M, Dabrowski P, Kocelak P, et al. Long-term inhibition of intestinal lipase by orlistat improves release of gut hormones increasing satiety in obese women. Pharmacol Rep. 2013;65(3):666-71. PMID: 23950589. **KQ1E6b, KQ2E6b, KQ3E4a.**
214. O'Neil PM, Garvey WT, Gonzalez-Campoy JM, et al. Effects of Liraglutide 3.0 Mg on Weight and Risk Factors in Hispanic Versus Non-Hipanic Populations: Subgroup Analysis from Scale Randomized Trials. Endocr Pract. 2016;22(11):1277-87. PMID: 27482610. **KQ1E3b, KQ2E3b, KQ3E3b.**
215. Osunlana AM, Asselin J, Anderson R, et al. 5As Team obesity intervention in primary care: development and evaluation of shared decision-making weight management tools. Clin. 2015;5(4):219-25. PMID: 26129630. **KQ1E4a, KQ2E4a, KQ3E4a.**
216. Paloyo AR, Reichert AR, Reuss-Borst M, et al. Who responds to financial incentives for weight loss? Evidence from a randomized controlled trial. Soc Sci Med. 2015;145:44-52. PMID: 26448164. **KQ1E6b, KQ2E6b, KQ3E4a.**
217. Park HA, Lee JS, Kuller LH, et al. Effects of weight control during the menopausal transition on bone mineral density. J Clin Endocrinol Metab. 2007;92(10):3809-15. PMID: 17635939 **KQ1E4a, KQ2E1a, KQ3E1a.**

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218. Peacock AS, Bogossian FE, Wilkinson SA, et al. A Randomised Controlled Trial to Delay or Prevent Type 2 Diabetes after Gestational Diabetes: Walking for Exercise and Nutrition to Prevent Diabetes for You. International Journal of Endocrinology Print. 2015;2015:423717. PMID: 26089886. **KQ1E6b, KQ2E6b, KQ3E4a.**

219. Perri MG, Limacher MC, von Castel-Roberts K, et al. Comparative effectiveness of three doses of weight-loss counseling: two-year findings from the rural LITE trial. Obesity. 2014;22(11):2293-300. PMID: 25376396. **KQ1E6c, KQ2E6c, KQ3E6c.**

220. Phillips EG, Wells MT, Winston G, et al. Innovative approaches to weight loss in a high-risk population: The small changes and lasting effects (SCALE) trial. Obesity. 2017;25(5):833-41. PMID: 28382755. **KQ1E6c, KQ2E6c, KQ3E6c.**

221. Poddar KH, Ames M, Hsin-Jen C, et al. Positive effect of mushrooms substituted for meat on body weight, body composition, and health parameters. A 1-year randomized clinical trial. Appetite. 2013;71:379-87. PMID: 24056209. **KQ1E6c, KQ2E6c, KQ3E6c.**

222. Poelman MP, de Vet E, Velema E, et al. PortionControl@HOME: results of a randomized controlled trial evaluating the effect of a multi-component portion size intervention on portion control behavior and body mass index. Ann Behav Med. 2015;49(1):18-28. PMID: 25142041. **KQ1E4a, KQ2E7, KQ3E4a.**

223. Ponzani P. Long-term effectiveness and safety of liraglutide in clinical practice. Minerva Endocrinologica. 2013;38(1):103-12. PMID: 23435446. **KQ1E6b, KQ2E6b, KQ3E4a.**

224. Pritchard DA, Hyndman J, Taba F. Nutritional counselling in general practice: a cost effective analysis. J Epidemiol Community Health. 1999;53(5):311-6. PMID: 10396539. **KQ1E4a, KQ2E7, KQ3E4a.**

225. Promrat K, Kleiner DE, Niemeier HM, et al. Randomized controlled trial testing the effects of weight loss on nonalcoholic steatohepatitis. Hepatology. 2010;51(1):121-9. PMID: 19827166. **KQ1E4a, KQ2E3b, KQ3E3b.**

226. Ptomey LT, Willis EA, Goetz JR, et al. Portion-controlled meals provide increases in diet quality during weight loss and maintenance. J Hum Nutr Diet. 2015. PMID: 25664818. **KQ1E6c, KQ2E6c, KQ3E6c.**

227. Puhkala J, Raitanen J, Kolu P, et al. Metabolic syndrome in Finnish women 7 years after a gestational diabetes prevention trial. BMJ Open. 2017;7(3):e014565. PMID: 28298369. **KQ1E3d, KQ2E3d, KQ3E3d.**

228. Radcliff TA, Bobroff LB, Lutes LD, et al. Comparing Costs of Telephone vs Face-to-Face Extended-Care Programs for the Management of Obesity in Rural Settings. J Acad Nutr Diet. 2012;112(9):1363-73. PMID: 22818246. **KQ1E6c, KQ2E6c, KQ3E6c.**

229. Rautio N, Jokelainen J, Saaristo T, et al. Predictors of success of a lifestyle intervention in relation to weight loss and improvement in glucose tolerance among individuals at high risk for type 2 diabetes: the FIN-D2D project. Journal of Primary Care & Community Health. 2013;4(1):59-66. PMID: 23799691. **KQ1E6a, KQ2E6a, KQ3E6a.**

230. Reeves MM, Terranova CO, Erickson JM, et al. Living well after breast cancer randomized controlled trial protocol: evaluating a telephone-delivered weight loss intervention versus usual care in women following treatment for breast cancer. BMC Cancer. 2016;16(1):830. PMID: 27793125. **KQ1E9, KQ2E9, KQ3E9.**

231. Rejeski WJ, Brubaker PH, Goff DC, Jr., et al. Translating weight loss and physical activity programs into the community to preserve mobility in older, obese adults in poor cardiovascular health. Arch Intern Med. 2011;171(10):880-6. PMID: 21263080. **KQ1E3c, KQ2E3c, KQ3E3c.**

232. Rickel KA, Milsom VA, Ross KM, et al. Differential response of African American and Caucasian women to extended-care programs for obesity management. Ethn Dis. 2011;21(2):170-5. PMID: 21749020. **KQ1E6c, KQ2E6c, KQ3E6c.**

233. Rock CL, Flatt SW, Sherwood NE, et al. Effect of a Free Prepared Meal and Incentivized Weight Loss Program on Weight Loss and Weight Loss Maintenance in Obese and Overweight Women: A Randomized Controlled Trial. JAMA. 2010;304(16):1803-10. **KQ1E6c, KQ2E6c, KQ3E6c.**

234. Romano M. A Randomized Clinical Trial of a Tailored Lifestyle Intervention for Obese, Sedentary, Primary Care Patients. Ann Fam Med. 2016;14(4):iii. PMID: 27401435. **KQ1E6a, KQ2E6a, KQ3E6a.**

235. Rosal MC, Haughton CF, Estabrook BB, et al. Fresh Start, a postpartum weight loss intervention for diverse low-income women: design and methods for a randomized clinical trial. BMC Public Health. 2016;16:953. PMID: 27612615. **KQ1E9, KQ2E9, KQ3E9.**

236. Rosas LG, Lv N, Xiao L, et al. Evaluation of a culturally-adapted lifestyle intervention to treat elevated cardiometabolic risk of Latino adults in primary care (Vida Sana): A randomized controlled trial. Contemp Clin Trials. 2016;48:30-40. PMID: 26995280. **KQ1E9, KQ2E9, KQ3E9.**

237. Rosenstock J, Klaff LJ, Schwartz S, et al. Effects of exenatide and lifestyle modification on body weight and glucose tolerance in obese subjects with and without pre-diabetes. Diabetes Care. 2010;33(6):1173-5. PMID: 20332357. **KQ1E5a, KQ2E5a, KQ3E5a.**

238. Ross R, Hudson R, Stotz PJ, et al. Effects of exercise amount and intensity on abdominal obesity and glucose tolerance in obese adults: a randomized trial.[Summary for patients in Ann Intern Med. 2015 Mar 3;162(5):I19; PMID: 25732298]. Annals of Internal Medicine. 2015;162(5):325-34. PMID: 25732273. **KQ1E6b, KQ2E6b, KQ3E6c.**

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239. Runhaar J, Deroisy R, van Middelkoop M, et al. The role of diet and exercise and of glucosamine sulfate in the prevention of knee osteoarthritis: Further results from the PRevention of knee Osteoarthritis in Overweight Females (PROOF) study. Semin Arthritis Rheum. 2016. PMID: 26806185. **KQ1E4a, KQ2E4a, KQ3E4a.**
240. Runhaar J, van Middelkoop M, Reijman M, et al. Prevention of knee osteoarthritis in overweight females: the first preventive randomized controlled trial in osteoarthritis. Am J Med. 2015;128(8):888-95.e4. PMID: 25818496. **KQ1E4a, KQ2E4a, KQ3E4a.**
241. Ryan DH, Johnson WD, Myers VH, et al. Nonsurgical weight loss for extreme obesity in primary care settings: results of the Louisiana Obese Subjects Study. Arch Intern Med. 2010;170(2):146-54. PMID: 20101009. **KQ1E5a, KQ2E5a, KQ3E5a.**
242. Sakane N, Dohi S, Sakata K, et al. Effects of Visceral Fat Accumulation Awareness on a Web-Based Weight-Loss Program: Japanese Study of Visceral Adiposity and Lifestyle Information-Utilization and Evaluation (J-VALUE). ISRN Obesity. 2013;2013:473764. PMID: 24555144. **KQ1E6b, KQ2E6b, KQ3E4a.**
243. Sakane N, Kotani K, Takahashi K, et al. Effects of telephone-delivered lifestyle support on the development of diabetes in participants at high risk of type 2 diabetes: J-DOIT1, a pragmatic cluster randomised trial. BMJ Open. 2015;5(8):e007316. **KQ1E3a, KQ2E3a, KQ3E3a.**
244. Sakane N, Sato J, Tsushita K, et al. Prevention of type 2 diabetes in a primary healthcare setting: three-year results of lifestyle intervention in Japanese subjects with impaired glucose tolerance. BMC Public Health. 2011;11(1):40. PMID: 21235825. **KQ1E3a, KQ2E3a, KQ3E3a.**
245. Schmittdiel JA, Adams SR, Goler N, et al. The impact of telephonic wellness coaching on weight loss: A "Natural Experiments for Translation in Diabetes (NEXT-D)" study. Obesity (Silver Spring). 2017;25(2):352-6. PMID: 28124501. **KQ1E6a, KQ2E6a, KQ3E6a.**
246. Scholz U, Ochsner S, Luszczynska A. Comparing different boosters of planning interventions on changes in fat consumption in overweight and obese individuals: a randomized controlled trial. Int J Psychol. 2013;48(4):604-15. PMID: 22519565. **KQ1E1a, KQ2E1a, KQ3E1a.**
247. Schusdziarra V, Hausmann M, Wiedemann C, et al. Successful weight loss and maintenance in everyday clinical practice with an individually tailored change of eating habits on the basis of food energy density. Eur J Nutr. 2011;50(5):351-61. PMID: 21120658. **KQ1E6a, KQ2E6a, KQ3E6a.**
248. Schuster RJ, Tasosa J, Terwoord NA. Translational research--implementation of NHLBI Obesity Guidelines in a primary care community setting: the Physician Obesity Awareness Project. Journal of Nutrition, Health & Aging. 2008;12(10):764S-9S. **KQ1E6c, KQ2E6c, KQ3E6c.**
249. Shahnazari M, Ceresa C, Foley S, et al. Nutrition-focused wellness coaching promotes a reduction in body weight in overweight US veterans. J Acad Nutr Diet. 2013;113(7):928-35. PMID: 23706353. **KQ1E1a, KQ2E1a, KQ3E1a.**
250. Shaw PA, Yancy WS, Jr., Wesby L, et al. The design and conduct of Keep It Off: An online randomized trial of financial incentives for weight-loss maintenance. Clin Trials. 2016. PMID: 27646508. **KQ1E9, KQ2E9, KQ3E9.**
251. Shea MK, Houston DK, Nicklas BJ, et al. The effect of randomization to weight loss on total mortality in older overweight and obese adults: the ADAPT Study. Journals of Gerontology Series A-Biological Sciences & Medical Sciences. 2010;65(5):519-25. PMID: 20080875. **KQ1E3b, KQ2E3b, KQ3E3b.**
252. Sheppard VB, Hicks J, Makambi K, et al. The feasibility and acceptability of a diet and exercise trial in overweight and obese black breast cancer survivors: The Stepping STONE study. Contemp Clin Trials. 2016;46:106-13. **KQ1E4a, KQ2E6b, KQ3E4a.**
253. Shin DW, Yun JM, Shin JH, et al. Enhancing physical activity and reducing obesity through smartcare and financial incentives: A pilot randomized trial. Obesity. 2017;25(2):302-10. PMID: 28063226. **KQ1E6b, KQ2E6b, KQ3E4a.**
254. Sidhu MS, Daley A, Jolly K. Evaluation of a text supported weight maintenance programme 'Lighten Up Plus' following a weight reduction programme: randomised controlled trial. Int. 2016;13:19. PMID: 26867588. **KQ1E4a, KQ2E6b, KQ3E4a.**
255. Simkin-Silverman LR, Wing RR, Boraz MA, et al. Lifestyle intervention can prevent weight gain during menopause: results from a 5-year randomized clinical trial. Ann Behav Med. 2003;26(3):212-20. PMID: 14644697. **KQ1E1a, KQ2E1a, KQ3E1a.**
256. Simkin-Silverman LR, Wing RR, Boraz MA, et al. Maintenance of cardiovascular risk factor changes among middle-aged women in a lifestyle intervention trial. Womens Health. 1998;4(3):255-71. PMID: 9787651. **KQ1E1a, KQ2E1a, KQ3E1a.**
257. SM K, J VG-P, A W, et al. Effectiveness of a web-based intervention aimed at healthy dietary and physical activity behavior: A randomized controlled trial about users and usage. J Med Internet Res. 2011;13:e32. **KQ1E3a, KQ2E3a, KQ3E3a.**
258. Sniehotta FF, Dombrowski SU, Avenell A, et al. Randomised controlled feasibility trial of an evidence-informed behavioural intervention for obese adults with additional risk factors. PLoS ONE [Electronic Resource]. 2011;6(8):e23040. PMID: 21897841. **KQ1E6b, KQ2E6b, KQ3E4a.**
259. Soe K, Dungan K. Subcutaneous liraglutide reduces weight and improves metabolic control in obese participants. Evidence-based medicine. 2015;20(6):203. **KQ1E6a, KQ2E6a, KQ3E6a.**

260. Spring B, Duncan JM, Janke EA, et al. Integrating technology into standard weight loss treatment: a randomized controlled trial. JAMA Internal Medicine. 2013;173(2):105-11. PMID: 23229890. **KQ1E6c, KQ2E6c, KQ3E6c.**

261. Steinberg DM. Effect of daily self-weighing on weight loss in adults. Dissertation Abstracts International: Section B: The Sciences and Engineering. 2013;74(5-B(E)):No Pagination Specified. **KQ1E6a, KQ2E6a, KQ3E6a.**

262. Steinberg DM, Tate DF, Bennett GG, et al. The efficacy of a daily self-weighing weight loss intervention using smart scales and e-mail. Obesity. 2013;21(9):1789-97. PMID: 23512320. **KQ1E6b, KQ2E6b, KQ3E4a.**

263. Steinberg DM, Tate DF, Bennett GG, et al. Daily self-weighing and adverse psychological outcomes: a randomized controlled trial. Am J Prev Med. 2014;46(1):24-9. PMID: 24355668. **KQ1E6b, KQ2E6b, KQ3E4a.**

264. Steinberg WM, Rosenstock J, Wadden TA, et al. Impact of Liraglutide on Amylase, Lipase, and Acute Pancreatitis in Participants With Overweight/Obesity and Normoglycemia, Prediabetes, or Type 2 Diabetes: Secondary Analyses of Pooled Data From the SCALE Clinical Development Program. Diabetes Care. 2017. PMID: 28473337. **KQ1E4a, KQ2E4a, KQ3E4a.**

265. Stumm G, Blaik A, Kropf S, et al. Long-Term Follow-Up of the Telemonitoring Weight-Reduction Program "Active Body Control". J Diabetes Res. 2016;2016:3798729. PMID: 27088096. **KQ1E7, KQ2E7, KQ3E7.**

266. Tate DF, Jeffery RW, Sherwood NE, et al. Long-term weight losses associated with prescription of higher physical activity goals. Are higher levels of physical activity protective against weight regain? Am J Clin Nutr. 2007;85(4):954-9. **KQ1E6c, KQ2E6c, KQ3E6c.**

267. ter Bogt NC, Bemelmans WJ, Beltman FW, et al. Preventing weight gain: one-year results of a randomized lifestyle intervention. Am J Prev Med. 2009;37(4):270-7. PMID: 19765497. **KQ1E1a, KQ2E1a, KQ3E1a.**

268. ter Bogt NC, Bemelmans WJ, Beltman FW, et al. Preventing weight gain by lifestyle intervention in a general practice setting: three-year results of a randomized controlled trial. Arch Intern Med. 2011;171(4):306-13. PMID: 21357805. **KQ1E1a, KQ2E1a, KQ3E1a.**

269. Thomas EL, Makwana A, Newbould R, et al. Pragmatic study of orlistat 60mg on abdominal obesity. European Journal of Clinical Nutrition. 2011;65(11):1256-62. PMID: 21697820. **KQ1E6a, KQ2E6a, KQ3E6a.**

270. Thompson WG, Kuhle CL, Koepp GA, et al. "Go4Life" exercise counseling, accelerometer feedback, and activity levels in older people. Archives of gerontology and geriatrics. 2014;58(3):314-9. PMID: 24485546. **KQ1E6c, KQ2E6c, KQ3E6c.**

271. Thurston RC, Ewing LJ, Low CA, et al. Behavioral weight loss for the management of menopausal hot flashes: a pilot study. Menopause. 2015;22(1):59-65. PMID: 24977456. **KQ1E6b, KQ2E6b, KQ3E4a.**

272. Toji C, Okamoto N, Kobayashi T, et al. Effectiveness of diet versus exercise intervention on weight reduction in local Japanese residents. Environ. 2012;17(4):332-40. PMID: 22270698. **KQ1E4a, KQ2E6b, KQ3E4a.**

273. Tometich DB, Mosher CE, Winger JG, et al. Effects of diet and exercise on weight-related outcomes for breast cancer survivors and their adult daughters: an analysis of the DAMES trial. Support Care Cancer. 2017. PMID: 28417203. **KQ1E4a, KQ2E4a, KQ3E4a.**

274. Toriola AT, Liu J, Ganz PA, et al. Effect of weight loss on bone health in overweight/obese postmenopausal breast cancer survivors. Breast Cancer Res Treat. 2015;152(3):637-43. PMID: 26175059. **KQ1E4a, KQ2E4a, KQ3E4a.**

275. Trepanowski JF, Kroeger CM, Barnosky A, et al. Effect of Alternate-Day Fasting on Weight Loss, Weight Maintenance, and Cardioprotection Among Metabolically Healthy Obese Adults: A Randomized Clinical Trial. JAMA Intern Med. 2017. PMID: 28459931. **KQ1E6c, KQ2E6c, KQ3E6c.**

276. Trief PM, Weinstock RS, Cibula D, et al. Sustained weight loss one year after group telephone intervention: 3-year results from the SHINE study. Diabetes research and clinical practice. 2014;106(3):e74-e8. **KQ1E4a, KQ2E6c, KQ3E4a.**

277. Trolle B, Flyvbjerg A, Kesmodel U, et al. Efficacy of metformin in obese and non-obese women with polycystic ovary syndrome: a randomized, double-blinded, placebo-controlled cross-over trial. Hum Reprod. 2007;22(11):2967-73. PMID: 17766923. **KQ1E5a, KQ2E5a, KQ3E5a.**

278. Tsai AG, Felton S, Wadden TA, et al. A randomized clinical trial of a weight loss maintenance intervention in a primary care population. Obesity. 2015;23(10):2015-21. PMID: 26334108. **KQ1E6c, KQ2E6c, KQ3E6c.**

279. Tseng E, Wang N-Y, Clark J, et al. Role of PCP referral and weight loss in the Hopkins POWER trial. Preventive Medicine Reports. 2015;2:968-72. **KQ1E4a, KQ2E4a, KQ3E4a.**

280. Tur JJ, Escudero AJ, Alos MM, et al. One year weight loss in the TRAMOMTANA study. A randomized controlled trial. Clinical Endocrinology. 2013;79(6):791-9. PMID: 23163735. **KQ1E4a, KQ2E7, KQ3E4a.**

281. Turk MW, Elci OU, Wang J, et al. Self-monitoring as a mediator of weight loss in the SMART randomized clinical trial. International Journal of Behavioral Medicine. 2013;20(4):556-61. PMID: 22936524. **KQ1E6b, KQ2E6b, KQ3E4a.**

Appendix E. List of Excluded Studies

282. Uusi-Rasi K, Rauhio A, Kannus P, et al. Three-month weight reduction does not compromise bone strength in obese premenopausal women. Bone. 2010;46(5):1286-93. PMID: 19857618. **KQ1E6a, KQ2E6a, KQ3E6a.**

283. van Gemert WA, May AM, Schuit AJ, et al. Effect of Weight Loss with or without Exercise on Inflammatory Markers and Adipokines in Postmenopausal Women: The SHAPE-2 Trial, A Randomized Controlled Trial. Cancer Epidemiol Biomarkers Prev. 2016;25(5):799-806. PMID: 26908432. **KQ1E6b, KQ2E6b, KQ3E4a.**

284. van Genugten L, van Empelen P, Boon B, et al. Results from an online computer-tailored weight management intervention for overweight adults: randomized controlled trial. J Med Internet Res. 2012;14(2):e44. PMID: 22417813. **KQ1E4a, KQ2E6b, KQ3E4a.**

285. Van Name MA, Camp AW, Magenheimer EA, et al. Effective Translation of an Intensive Lifestyle Intervention for Hispanic Women With Prediabetes in a Community Health Center Setting. Diabetes Care. 2016;39(4):525-31. PMID: 26908915. **KQ1E3a, KQ2E3a, KQ3E3a.**

286. van Oers AM, Groen H, Mutsaerts MA, et al. Effectiveness of lifestyle intervention in subgroups of obese infertile women: a subgroup analysis of a RCT.[Erratum appears in Hum Reprod. 2017 Feb;32(2):482; PMID: 27989990]. Human Reproduction. 2016;31(12):2704-13. PMID: 27798042. **KQ1E4a, KQ2E4a, KQ3E4a.**

287. VanWormer JJ, Martinez AM, Benson GA, et al. Telephone counseling and home telemonitoring: the Weigh by Day Trial. American Journal of Health Behavior. 2009;33(4):445-54. **KQ1E6c, KQ2E6c, KQ3E6c.**

288. Venn BJ, Perry T, Green TJ, et al. The effect of increasing consumption of pulses and wholegrains in obese people: a randomized controlled trial. J Am Coll Nutr. 2010;29(4):365-72. PMID: 21041811. **KQ1E6c, KQ2E6c, KQ3E6c.**

289. Vermunt PW, Milder IE, Wielaard F, et al. A lifestyle intervention to reduce Type 2 diabetes risk in Dutch primary care: 2.5-year results of a randomized controlled trial. Diabet Med. 2012;29(8):e223-31. PMID: 22416789. **KQ1E1a, KQ2E1a, KQ3E1a.**

290. Vilchez Barboza V, Klijn TP, Salazar Molina A, et al. Effectiveness of personalized face-to-face and telephone nursing counseling interventions for cardiovascular risk factors: a controlled clinical trial. Rev Lat Am Enfermagem. 2016;24:e2747. PMID: 27508917. **KQ1E1a, KQ2E1a, KQ3E1a.**

291. Villareal DT, Banks M, Sinacore DR, et al. Effect of weight loss and exercise on frailty in obese older adults. Arch Intern Med. 2006;166(8):860-6. PMID: 16636211 **KQ1E4a, KQ2E3c, KQ3E3c.**

292. Villareal DT, Chode S, Parimi N, et al. Weight loss, exercise, or both and physical function in obese older adults. New England Journal of Medicine. 2011;364(13):1218-29. PMID: 21449785. **KQ1E3c, KQ2E3c, KQ3E3c.**

293. Villareal DT, Fontana L, Das SK, et al. Effect of Two-Year Caloric Restriction on Bone Metabolism and Bone Mineral Density in Non-Obese Younger Adults: A Randomized Clinical Trial. J Bone Miner Res. 2016;31(1):40-51. PMID: 26332798. **KQ1E3a, KQ2E3a, KQ3E3a.**

294. Villareal DT, Fontana L, Weiss EP, et al. Bone mineral density response to caloric restriction-induced weight loss or exercise-induced weight loss: a randomized controlled trial.[erratum appears in Arch Intern Med. 2007 Mar 12;167(5):452]. Arch Intern Med. 2006;166(22):2502-10. **KQ1E3a, KQ2E3a, KQ3E3a.**

295. Villareal DT, Miller BV, III, Banks M, et al. Effect of lifestyle intervention on metabolic coronary heart disease risk factors in obese older adults. Am J Clin Nutr. 2006;84(6):1317-23. PMID: 17158411. **KQ1E4a, KQ2E3c, KQ3E3c.**

296. Villareal DT, Shah K, Banks MR, et al. Effect of weight loss and exercise therapy on bone metabolism and mass in obese older adults: a one-year randomized controlled trial. J Clin Endocrinol Metab. 2008;93(6):2181-7. PMID: 18364384. **KQ1E4a, KQ2E3c, KQ3E3c.**

297. Vinkers CD, Adriaanse MA, Kroese FM, et al. Efficacy of a self-management intervention for weight control in overweight and obese adults: a randomized controlled trial. J Behav Med. 2014;37(4):781-92. PMID: 23954938. **KQ1E6b, KQ2E6b, KQ3E4a.**

298. Vissers D, Verrijken A, Mertens I, et al. Effect of long-term whole body vibration training on visceral adipose tissue: a preliminary report. Obesity Facts. 2010;3(2):93-100. PMID: 20484941. **KQ1E6a, KQ2E6a, KQ3E6a.**

299. Voils CI, Grubber JM, McVay MA, et al. Recruitment and Retention for a Weight Loss Maintenance Trial Involving Weight Loss Prior to Randomization. Obesity science & practice. 2016;2(4):355-65. PMID: 28090340. **KQ1E6b, KQ2E6b, KQ3E4a.**

300. Volger S, Wadden TA, Sarwer DB, et al. Changes in eating, physical activity and related behaviors in a primary care-based weight loss intervention. Int J Obes (Lond). 2013;37 Suppl 1:S12-8. PMID: 23921776. **KQ1E4a, KQ2E4a, KQ3E4a.**

301. von Scholten BJ, Davies MJ, Persson F, et al. Effect of weight reductions on estimated kidney function: Post-hoc analysis of two randomized trials. J Diabetes Complications. 2017. PMID: 28462892. **KQ1E4a, KQ2E4a, KQ3E4a.**

302. Wadden TA, Foster GD, Sarwer DB, et al. Dieting and the development of eating disorders in obese women: results of a randomized controlled trial. Am J Clin Nutr. 2004;80(3):560-8. **KQ1E6c, KQ2E6c, KQ3E6c.**

303. Wang J, Sereika SM, Chasens ER, et al. Effect of adherence to self-monitoring of diet and physical activity on weight loss in a technology-supported behavioral intervention. Patient Prefer Adherence. 2012;6:221-6. PMID: 22536058. **KQ1E6c, KQ2E6c, KQ3E6c.**

Appendix E. List of Excluded Studies

304. Warren M, Schmitz KH. Safety of strength training in premenopausal women: musculoskeletal injuries from a two-year randomized trial. Am J Health Promot. 2009;23(5):309-14. PMID: 19445432 **KQ1E1a, KQ2E1a, KQ3E1a.**
305. Wassertheil-Smoller S, Langford HG, Blaufox MD, et al. Effective dietary intervention in hypertensives: sodium restriction and weight reduction. J Am Diet Assoc. 1985;85(4):423-30. PMID: 3884691. **KQ1E3a, KQ2E3a, KQ3E3a.**
306. Waters DL, Vawter R, Qualls C, et al. Long-term maintenance of weight loss after lifestyle intervention in frail, obese older adults. Journal of Nutrition, Health & Aging. 2013;17(1):3-7. PMID: 23299370. **KQ1E6a, KQ2E6a, KQ3E6a.**
307. Watson S, Woodside JV, Ware LJ, et al. Effect of a Web-Based Behavior Change Program on Weight Loss and Cardiovascular Risk Factors in Overweight and Obese Adults at High Risk of Developing Cardiovascular Disease: Randomized Controlled Trial. J Med Internet Res. 2015;17(7):e177. PMID: 26183659. **KQ1E4a, KQ2E7, KQ3E4a.**
308. Weinstock RS, Trief PM, Cibula D, et al. Weight loss success in metabolic syndrome by telephone interventions: results from the SHINE Study. J Gen Intern Med. 2013;28(12):1620-8. PMID: 23843020. **KQ1E4a, KQ2E6c, KQ3E4a.**
309. Weisman CS, Hillemeier MM, Downs DS, et al. Improving women's preconceptional health: long-term effects of the Strong Healthy Women behavior change intervention in the central Pennsylvania Women's Health Study. Womens Health Issues. 2011;21(4):265-71. PMID: 21536455. **KQ1E1a, KQ2E1a, KQ3E1a.**
310. Weiss EP, Racette SB, Villareal DT, et al. Improvements in glucose tolerance and insulin action induced by increasing energy expenditure or decreasing energy intake: a randomized controlled trial. Am J Clin Nutr. 2006;84(5):1033-42. **KQ1E3a, KQ2E3a, KQ3E3a.**
311. Weissman N, Smith S, Fain R, et al. Effects of lorcaserin on pre-existing valvulopathy: a pooled analysis of phase 3 trials. Obesity (silver spring, md). 2017;25(1):39-44. PMID: 27888609. **KQ1E3d, KQ2E3d, KQ3E3d.**
312. Welsh P, Cezard G, Gill JM, et al. Associations between weight change and biomarkers of cardiometabolic risk in South Asians: secondary analyses of the PODOSA trial. Int J Obes (Lond). 2016;40(6):1005-11. PMID: 26927315. **KQ1E4a, KQ2E4a, KQ3E4a.**
313. Werkman A, Hulshof PJ, Stafleu A, et al. Effect of an individually tailored one-year energy balance programme on body weight, body composition and lifestyle in recent retirees: a cluster randomised controlled trial. BMC Public Health. 2010;10(1):110. PMID: 20205704. **KQ1E1a, KQ2E1a, KQ3E1a.**
314. West DS, Gorin AA, Subak LL, et al. A motivation-focused weight loss maintenance program is an effective alternative to a skill-based approach. Int J Obes (Lond). 2011;35(2):259-69. PMID: 20680012. **KQ1E4a, KQ2E6c, KQ3E4a.**
315. Whitham C, Mellor DD, Goodwin S, et al. Weight maintenance over 12 months after weight loss resulting from participation in a 12-week randomised controlled trial comparing all meal provision to self-directed diet in overweight adults. J Hum Nutr Diet. 2014;27(4):384-90. PMID: 24236573. **KQ1E6c, KQ2E6c, KQ3E6c.**
316. Williamson DA, Martin CK, Anton SD, et al. Is caloric restriction associated with development of eating-disorder symptoms? Results from the CALERIE trial. Health Psychol. 2008;27(1:Suppl):Suppl-42. PMID: 18248104. **KQ1E6c, KQ2E6c, KQ3E6c.**
317. Winett RA, Anderson ES, Wojcik JR, et al. Guide to Health: A Randomized Controlled Trial of the Effects of a Completely WEB-Based Intervention on Physical Activity, Fruit and Vegetable Consumption, and Body Weight. Transl Behav Med. 2011;1(1):165-74. PMID: 23503089. **KQ1E6c, KQ2E6c, KQ3E6c.**
318. Wing RR, West DS, Grady D, et al. Effect of weight loss on urinary incontinence in overweight and obese women: results at 12 and 18 months. Journal of Urology. 2010;184(3):1005-10. **KQ1E6c, KQ2E6c, KQ3E6c.**
319. Womble LG, Wadden TA, McGuckin BG, et al. A randomized controlled trial of a commercial internet weight loss program. Obes Res. 2004;12(6):1011-8. **KQ1E6c, KQ2E6c, KQ3E6c.**
320. Wong VW, Chan RS, Wong GL, et al. Community-based lifestyle modification programme for non-alcoholic fatty liver disease: a randomized controlled trial. Journal of hepatology. 2013;59(3):536-42. **KQ1E2a, KQ2E2a, KQ3E2a.**
321. Wood PD, Stefanick ML, Dreon DM, et al. Changes in plasma lipids and lipoproteins in overweight men during weight loss through dieting as compared with exercise. N Engl J Med. 1988;319(18):1173-79. PMID: 3173455. **KQ1E4a, KQ2E6c, KQ3E4a.**
322. Wood PD, Stefanick ML, Williams PT, et al. The effects on plasma lipoproteins of a prudent weight-reducing diet, with or without exercise, in overweight men and women. N Engl J Med. 1991;325(7):461-6. PMID: 1852180. **KQ1E6c, KQ2E6c, KQ3E6c.**
323. Woollard J, Burke V, Beilin LJ, et al. Effects of a general practice-based intervention on diet, body mass index and blood lipids in patients at cardiovascular risk. J Cardiovasc Risk. 2003;10(1):31-40. PMID: 12569235. **KQ1E4a, KQ2E3a, KQ3E4a.**

Appendix E. List of Excluded Studies

324. Xu F, Letendre J, Bekke J, et al. Impact of a program of Tai Chi plus behaviorally based dietary weight loss on physical functioning and coronary heart disease risk factors: a community-based study in obese older women. J Nutr Gerontol Geriatr. 2015;34(1):50-65. PMID: 25803604. **KQ1E6b, KQ2E6b, KQ3E4a.**

325. Yank V, Xiao L, Wilson SR, et al. Short-term weight loss patterns, baseline predictors, and longer-term follow-up within a randomized controlled trial. Obesity. 2014;22(1):45-51. PMID: 23740619. **KQ1E4a, KQ2E4a, KQ3E4a.**

326. Yardley L, Ware LJ, Smith ER, et al. Randomised controlled feasibility trial of a web-based weight management intervention with nurse support for obese patients in primary care. Int. 2014;11:67. PMID: 24886516. **KQ1E4a, KQ2E7, KQ3E4a.**

327. Yates T, Davies M, Gorely T, et al. Effectiveness of a pragmatic education program designed to promote walking activity in individuals with impaired glucose tolerance: a randomized controlled trial. Diabetes Care. 2009;32(8):1404-10. PMID: 19602539. **KQ1E4a, KQ2E1a, KQ3E4a.**

328. Yee CH, So WY, Yip SK, et al. Effect of weight reduction on the severity of lower urinary tract symptoms in obese male patients with benign prostatic hyperplasia: a randomized controlled trial. Korean J Urol. 2015;56(3):240-6; discussion 6-7. PMID: 25763129. **KQ1E3b, KQ2E3b, KQ3E3b.**

329. Yeh HC, Clark JM, Emmons KE, et al. Independent but coordinated trials: insights from the practice-based Opportunities for Weight Reduction Trials Collaborative Research Group. Clin Trials. 2010;7(4):322-32. PMID: 20573639. **KQ1E4a, KQ2E4a, KQ3E4a.**

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Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Ackermann, 2008[214] (DEPLOY)	IG1	Group-based program modeled closely after DPP with some adaptation to improve sustainability in a YMCA setting. Intervention began with one 2-5-min individually-tailored session focused on participants' risk of developing diabetes. Core curriculum then consisted of 16 classroom-style group sessions (8-12 participants per group) focused on building knowledge and skills for goal setting, self-monitoring, and problem-solving. Program sessions lasted 60-90 minutes, and the entire core curriculum was delivered over 16-20 weeks. Goals were 5-7% reduction in body weight and 150 min per week of moderate-level PA. Maintenance activities following the core curriculum involved monthly, large-group meetings at the YMCA during which guest presenters discussed topics such as healthy restaurant eating and food shopping.	76% attended ≥1 group session and of those, they completed 75% of all core curriculum sessions	Minimal intervention: Received 2-5 min personal advice about their risk of developing diabetes, advised to lose 5-10% of weight via caloric restriction + gradual adoption of moderate physical activity (equivalent to 30 min brisk walking daily). Provided with Small Steps, Big Rewards educational materials from the NDEP. Provided information about YMCA resources. Brief counseling repeated at 6 + 12 months.
Ackermann, 2015[215] (RAPID-YDPP)	IG1	Group-based program modeled closely after DPP. At enrollment, participants receive information and encouragement to use local community resources and self-help diabetes prevention materials as well as encouragement to meet with a registered dietitian to develop an action plan for dietary changes and weight loss. Core curriculum then consisted of 16 classroom-style group sessions (8-12 participants per group) over 16-24 weeks focused on goal setting, self-monitoring, and participant-centered problem solving to achieve modest weight loss (5-7% percent weight loss) through a combination of moderate-physical activity (150 min/week) and lower dietary fat and caloric consumption. The core sessions were followed by monthly 60-min support meetings. Participants were also offered tools such as a step counter, measuring cups, food scales, fat and calorie tracking tools, and recipe guides.	62.6% attended ≥1 session 40.0% completed ≥9 session Mean attendance = 9.5 (SD=5.0) sessions	Minimal intervention: Provided with self-help diabetes prevention materials. Encouraged to use local community resources and visit with a registered dietician to develop an action plan for dietary changes and weight loss.
Ahern, 2017 (WRAP)[323]	IGB1	Participants were provided with 52 vouchers allowing them free access to 52 Weight Watchers sessions for 52-weeks at the location and time of their choice and access to Weight Watchers internet resources for 12 months.	Mean number of sessions attended = 28.2 (SD=14.8)	Minimal intervention: Participants given a 32-page booklet by the British Heart Foundation of self-help weight-management strategies. Research staff read a scripted introduction drawing attention to each section of the booklet.
	IGB2	Participants were provided with 12 vouchers allowing them free access to 12 Weight Watchers sessions for 12-weeks at the location and time of their choice and access to Weight Watchers internet resources for the duration of their intervention.	Mean number of sessions attended = 8.4 (SD=4.2)	Minimal intervention: Participants given a 32-page booklet by the British Heart Foundation of self-help weight-management strategies. Research staff read a scripted introduction drawing attention to each section of the booklet.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Anderson, 2014[217] (BeWEL)	IG1	3 (60 minutes), in-person counseling sessions over the first 3 months (including spouse or friend), followed by 9 monthly 15-minute telephone consultations (each participants had a total of 5.25 hours contact over 12 months). Motivational interviewing techniques were utilized to explore self-assessed confidence, ambivalence, and personal values concerning weight change. Participants received British Heart Foundation booklet 'So You Want To Lose Weight For Good'; set a target goal of a 7% reduction in body weight; were provided with a personalized energy prescription of 600 kcal deficit; and bodyweight scales for self-monitoring. Dietary changes and physical activity were covered separately in the first 2 in-person counseling sessions. At the third visit, progress was reviewed and goals revisited. Dietary topics covered caloric reduction through decreasing portion sizes and reducing intakes of sugary drinks, alcohol, fast food, snack foods and processed and red meat. Higher consumption of fruits, vegetables, and whole grains were encouraged. Counseling about personalized physical activity was guided by baseline data and largely focused on brisk walking, with pedometers provided for self-monitoring. Telephone consultations focused on support for making lifestyle changes, checking progress, and discussing areas of success and difficulty. Advice was given on relapse and support for restarting behavioral changes. Participants self-monitored weight throughout study and were provided with feedback at each consultation.	97% attended all in-person sessions, 59% completed all telephone calls, 95% completed at least 5/9 telephone calls	Minimal intervention: Given a copy of the British Heart Foundation booklet 'So You Want To Lose Weight For Good'

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Appel, 2011[219] (POWER Hopkins)	IG1	Intervention focused on behavioral self-management approaches designed to help participants set weight-related goals, self-monitor weight and weight-related behaviors, increase self-efficacy and support, and solve problems. Motivational interviewing was the primary approach to interactions with participants. Participants were encouraged to lose 5% of their weight within 6 months and maintain reduced weight through end of study at 2 years. Participants were encouraged to log on to the study-specific Web site weekly that contained learning modules and opportunities for self-monitoring of weight, calorie intake, and exercise. Monthly e-mail messages were sent to provide tailored feedback. In addition, participants received in-person contact with lifestyle coaches to encourage completing web-based modules and reinforce key behaviors. In-person support included weekly contact in months 1-3 (9 group sessions plus 3 individual sessions), monthly contact in months 4-6 (1 group session plus 2 individual sessions), and two monthly contacts in months 7-24 (1 group and 1 individual session [in-person or via phone per month). Group sessions were 90 minutes and individual and telephone calls were approximately 20 minutes. At routine medical visits, PCP encouraged participant to actively engage in the intervention.	Group sessions, median: Months 1-6: 6.5 Months 7-24: 1 Individual sessions, median: Months 1-6: 4 Months 7-24: 1 Phone calls, median: Months 1-6: 4 Months 7-24: 11 Number of weeks accessed Web site, median: Months 1-6: 23 Months 7-24: 35 Number of Web modules completed, median: Months 1-6: 12 Months 7-24: 16	Usual care: At randomization, participant met with a weight-loss coach for brief orientation to the static website and, if desired, after participant's 24-month follow up visit, can meet again to discuss weight management guidelines. Received NHLBI "Aim for a Healthy Weight" brochure and a list of recommended Web sites promoting weight loss.
	IG2	Intervention focused on behavioral self-management approaches designed to help participants set weight-related goals, self-monitor weight and weight-related behaviors, increase self-efficacy and support, and solve problems. Motivational interviewing was the primary approach to interactions with participants. Participants were encouraged to lose 5% of their weight within 6 months and maintain reduced weight through end of study at 2 years. Participants were encouraged to log on to the study-specific Web site weekly that contained learning modules and opportunities for self-monitoring of weight, calorie intake, and exercise. Monthly e-mail messages were sent to provide tailored feedback. In addition, participants received telephone contact with lifestyle coaches to encourage completing web-based modules and reinforce key behaviors. Personal support included weekly contact in months 1-3 (12 weekly calls), monthly contact in months 4-6 (1 call per month), and monthly calls in months 7-24. Telephone calls were approximately 20 minutes. At routine medical visits, PCP encouraged participant to actively engage in the intervention.	Phone calls, median: Months 1-6: 14 Months 7-24: 16 Number of weeks log-in to Web site, median: Months 1-6: 23 Months 7-24: 35 Number of modules completed, median: Months 1-6: 12 Months 7-24: 16	Usual care: At randomization, participant met with a weight-loss coach for brief orientation to the static website and, if desired, after participant's 24-month follow up visit, can meet again to discuss weight management guidelines. Received NHLBI "Aim for a Healthy Weight" brochure and a list of recommended Web sites promoting weight loss.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Aveyard, 2016[221]	IG1	Brief intervention lasting no more than 30 seconds in which PCP offered to refer participant for free through National Health Service (NHS), to a weight loss program. If the participant agreed to the referral, PCP asked them to make an appointment to return in a month. If participant did not agree with referral and wanted to try weight loss without assistance, PCP asked them to make an appointment to return in a month. The appointments served as an opportunity for PCP to re-refer those who accepted referral but did not attend, refer those who tried to lose weight on their own but did not do well, prescribe orlistat to those who have followed the treatment program but not succeeded (in line with NICE guidance), and to reinforce PCP's seriousness about participant weight change. For NHS referrals, programs were mainly provided by Slimming World, and offered 12 sessions consisting of 1 hour of behavioral group support, once per week.	77% accepted referral to the weight management program and 40% attended followup appointment.	Minimal intervention: PCP provided advice to change behavior to benefit health and was allowed to personalize this advice on the basis of their patient's medical or family history. Patients were asked to schedule a 4-week followup appointment to discuss progress.
Beeken, 2017 (10TT)[318]	IGB1	Participants received the 10TT (10 Top Tips) leaflet which focused on simple diet and exercise behavior, together with a simple logbook for self-monitoring of target behaviors and weight during the 3-month habit acquisition phase, and a wallet sized card with guidance on food labels. A single 30-minute session within the baseline appointment was allocated to take patients through the leaflet using a flip chart and discuss habit formation. At 3 months, patients were mailed a second copy of the 10TT leaflet and were told they could request additional copies of the logbook.	100% received intervention/information NR for using logbook	Usual care: Participants were referred to their PCP for usual care that may have included referral to a dietitian or a community provider (including Weight Watchers). These referrals ranged from 2 appointments to 12 weekly sessions over 3 months.
Bennett, 2012[224] (Be Fit, Be Well [POWER])	IG1	Participants were prescribed 3 tailored goals to modify routine lifestyle behaviors; new goals were selected at 13-week intervals. For the duration of the study, participants maintained a hypertension medication adherence goal (to take their medication as prescribed daily). The tailored behavior change goals, self-monitoring, and skills training were available via a website or interactive voice response which participants were encouraged to use daily. In addition, participants received monthly 15-20-min telephone counseling calls in the first year and bimonthly during the second year (18 telephone calls total) that covered self-monitoring data, problem solving and behavioral skills training. Twelve optional bimonthly group sessions were also offered including interactive skills training and a physical activity component (e.g., group walk), and promoting social support for behavioral change. PCP delivered at least 1 brief, standardized message about the importance of intervention participation. Participants were provided behavior change “prescription” that included PCP’s electronic signature, as well as tailored information	70.6% completed telephone calls: Calls 1-6: 80.4% completion Calls 7-12: 65.0% completion Calls 13-18: 66.7% completion 40.0% participants tracked behavior change goals weekly for at least 50% of trial weeks; 25.0% tracked weekly for at least 75.0% of trial weeks	Usual care: Received NHLIB self-help booklet, "Aim for a Healthy Weight".

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Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
		on community resources (e.g., public parks, walking groups, and farmers' market) and received a walking kit with a pedometer.		
Bhopal, 2014[225] (PODOSA)	IG1	Intervention was modelled after the Finnish Diabetes Prevention Study (FDPS) but tailored to a South Asian (Indian and Pakistani) population living in Scotland. Families had 15 tailored visits with dietitian over 3 years: baseline, monthly for the first 3 months, then every 3 months. Participants were also invited to attend annual group sessions (assume 3 total), including a food shopping tour and brisk walking. Participants and their family were advised on achieving weight loss through a calorie-deficit diet and physical activity of at least 30 min daily brisk walking, using culturally adapted and translated resources. Other advice included information on shopping and cooking (with demonstrations). Dietitian's advice, educational and motivational tools were based on 3-day food diaries and a dietary patterns questionnaire; step counts and Chester step test; bodyweight and waist circumference. Pedometers were also given.	Mean number of visits: 13.7 (SD=2.1)	Minimal intervention: Four visits (annually) with dietitian; and given standardized written and verbal advice on healthy eating, diabetes prevention, promotion of physical activity, and on accessing other weight control and physical activity services.
Burke, 2005[228] (ADAPT)	IG1	Lifestyle intervention including educational and behavioral components and social support from partners. The four month program consisted of individual sessions (# of sessions NR), six 90-min interactive group workshops with 15-25 people per group, and five printed handouts. Individual sessions addressed factors such as cholesterol, blood pressure, weight loss, and diet. Diet messages were based on the DASH diet and promoted diet low in fat (<30% energy from total fat; <10% energy from saturated fat), high in fruits and vegetables, low in salt and sugar, and recommended at least four fish meals per week. Physical activity messages encouraged accumulating at least 30 min of moderate-intensity PA on most days and increasing incidental activity. Additional messages included limiting alcohol intake of no more than two standard drinks per day and quitting smoking for current smokers. Social support from partners was encouraged by attending sessions and by their involvement in family grocery shopping, meal preparation, and physical activity. Intervention encouraged self-directed change with a focus on overcoming barriers, benefits and costs, goal setting, and time management. Twelve month maintenance phase consisted of regular telephone contact, six individual sessions to measure weight and blood pressure and additional sessions as needed, six additional group workshops (twice monthly for the first month, monthly in months 2-3, and then once every three months for months 4-12), and a newsletter every 3 months.	NR	Attention control: Information by the National Heart Foundation and the Health Department of Western Australia and seminars at 2, 7, 12, and 14 months on unrelated topics.

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Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Cadmus-Bertram, 2016[229] (HELP)	IG1	Intervention focused on the development and practice of self-monitoring and self-regulatory skills. Participants were asked to perform 150 min/week of moderate-to-vigorous PA and to restrict calories at a level sufficient to induce initial weight loss of 1-2 lbs./week (approximate deficit of 500 kcal/day). Dietary goals emphasized increased intake of fruits, vegetables, fiber, and decreased intake of unhealthy fats and refined grains. The first 3-6 months of the intervention were focused on weight loss with the remaining 6-9 months focused on maintenance. The intervention was delivered via 18, 30-min phone-based health coaching sessions delivered by trained lay coaches. Each participant was matched with a single coach to provide continuity throughout the intervention. The initial call was schedule in week 1, twice weekly calls in weeks 2-3, weekly calls in weeks 5-8, biweekly call in weeks 10-12, monthly calls in weeks 16-24, and quarterly calls in weeks 28-52. Participants were also taught to self-monitor their diet and PA using a free website (Sparkpeople.com) which also provides forums for social support. A basic pedometer was also provided.	87% of participants completed at least 11 of the 12 calls in the first 6 months and 64% completed at least 15 of the 18 calls across the entire 12-month intervention	Usual care: Received copy of the US Dietary Guidelines for Americans and one brief 15-min telephone call every 3 months. These calls did not include in-depth coaching or recommendations for diet or physical activity change. If a participant mentioned a personal weight loss goal, this was acknowledged but not followed with specific recommendations or coaching.
Chirionos, 2016[230] (CHARMS)	IG1	Seventeen session group lifestyle modification intervention modeled after DPP consisting of a 3-month core curriculum of eight sessions (four weekly and four bi-weekly) followed by a maintenance phase with 9-monthly sessions. Intervention was tailored to a low-income minority population by: providing materials for Hispanic patients, delivering the intervention in Spanish and English according to the participant's preference, and providing culturally relevant examples and dietary recommendations. Sessions were 90-min long. Calorie goals were set on participants' baseline weight; however, participants were not prescribed a structured dietary program. Unsupervised exercise, which consisted of brisk walking, was initiated at week 1, starting with four 15-min weekly sessions, increasing progressively to five 30-min weekly sessions by week 5. Dietary and exercise goals were aligned to national recommendations. Participants were asked to record their food intake in food logs and wear a pedometer for at least one week prior to each session. Sessions targeted a broad range of material related to diet, physical activity and psychosocial well-being.	73% received at least some treatment	Usual care: Received detailed description of their laboratory values at each time-point and met with a medical provider for lifestyle modification advice, which is recommended management of the metabolic syndrome at baseline and at 6 months.

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Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Christian, 2011[231]	IG1	Patients completed a computer-based assessment of their motivational readiness to increase physical activity and make dietary changes just before a usual care visit. The assessment (<10 minutes) solicited information on usual dietary habits, weight-management history, and awareness of the role of diet and exercise in the prevention of diabetes. Upon completion of the assessment, the computer system generated a tailored report providing feedback addressing participant-identified barriers to improving their physical activity and diet. The purpose of this feedback was to enhance participants' motivation to increase PA and reduce caloric intake; to identify potential barriers to making lifestyle changes, and to provide tailored counseling suggestions to enhance readiness, decision-making, and self-efficacy. Before the baseline clinic visit, participants read their report and listed 2-3 dietary and/or PA self-management goals they wants to achieve and were also given a 30-page planning guide that provided general supplemental information on preventing diabetes and achieving goals. The computer expert system also generated a companion report for the patient's physician, which consisted of a less than 1-page bulleted summary of the findings from the patient's assessment and provided the physician with patient-specific counseling recommendations based on an MI approach. Participants reassessed goals at 6 months and again reviewed their goal sheet with their physician, who reinforced patients' goals.	NR	Usual care: Given a packet of health education materials addressing diabetes, diet, and exercise before completing their usual care visit
Cohen, 1991[232]	IG1	12 monthly visits (min NR) with the PCP. At each visit the PCP reviewed the patient's previous day food intake and weight and suggested dietary changes and help set short-term goals in preparation for the next visit. The goal of the dietary advice was to reduce the caloric content of the diet without radically changing the patient's lifestyle. Patients in each group were also instructed about the importance of blood pressure control, but diets were not specifically intended to be salt reducing. Feedback to encourage weight loss was provided based on amount of weight lost or gained. Management of the patient's hypertension medication was left to the PCP.	Mean number of visits: 9.7 (of 12)	Usual care: Physicians received no special instructions or materials. Patients received usual care; physicians could provide or refer patients for dietary advice. Patients in each group were instructed about the importance of blood pressure control.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
de Vos, 2015[234] (PROOF)	IG1	At baseline, participants discussed nutritional habits and PA patterns with a dietitian and set goals related to a low-fat or a low-calorie diet, or both, as well as physical activity. Subsequently, the dietitian put together an individual tailor-made strategy to accomplish these goals and used motivational interviewing techniques. Participants had two appointments with the dietician within the first month and subsequent appointments were determined in dialogue between dietician and participant (limited to 4 hours/year). Participants were also invited to participate in optional group PA classes offered 20 times (1 hour weekly) over six months. Remaining 18 months devoted to followup visits to assess maintenance and no limit was set on the total duration participants could take part in the intervention (up to 2.5 years).	79.0% attended at least one PA session and 57% attended ≥7 sessions. Mean attended sessions = 8 (SD 6).	No intervention
Demark-Wahnefried, 2014[235] (DAMES)	IG1	Tailored diet and exercise intervention that was delivered in parallel and individually to mothers and daughters consisting of 7 installments (1 workbook followed by 6 newsletters) of mailed materials over a 1-year period. Materials reinforced goals proposed by the American Cancer Society and the US dietary guidelines including promoting portion control and diets high in nutrients and low in energy as well as 150 minutes/week of aerobic exercise and twice-weekly strength training. In this group, materials were personalized with individual weight goals and kilocalorie levels required to achieve desired rates of weight loss. In addition, the 3 major foods contributing the highest percentage of kilocalories to each participant's diet were identified through the dietary recalls and individuals were given specific feedback. Participants were encouraged to self-monitor and problem-solve on overcoming perceived barriers. Participants were surveyed bi-monthly on their progress and plans and 6 subsequent newsletters provided tailored feedback. Participants also received specific tools to assist with behavior change including logbooks, portion control tableware, iPods with a set walking pace, and pedometers.	Survey completion: mean (# completed out of 6): 4.00 (SD=2.23) 67% completion: 68% 100% completion: 36%	Minimal intervention: Received bimonthly publically-available brochures related to cancer survivorship, weight loss, healthful diet, and physical activity.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
	IG2	Tailored diet and exercise intervention that emphasized the mother-daughter bond in a team-based approach consisting of 7 installments (1 workbook followed by 6 newsletters) of mailed materials over a 1-year period. Materials reinforced goals proposed by the American Cancer Society and the US dietary guidelines including promoting portion control and diets high in nutrients and low in energy as well as 150 minutes/week of aerobic exercise and twice-weekly strength training. Materials were personalized with individual weight goals and kilocalorie levels required to achieve desired rates of weight loss. In addition, the 3 major foods contributing the highest percentage of kilocalories to each participant's diet were identified through the dietary recalls and individuals were given specific feedback. Participants were encouraged to self-monitor and problem-solve on overcoming perceived barriers. Participants were surveyed bi-monthly on their progress and plans and 6 subsequent newsletters provided tailored feedback. Participants also received specific tools to assist with behavior change including logbooks, portion control tableware, iPods with a set walking pace, and pedometers. In this group, however, mothers and daughters also received information on their team member (mother or daughter). Concepts encouraged effective communication to help carryout goals and help support one another.	Survey completion: Mean (# completed out of 6): 3.96 (SD=2.15) 67% completion: 68% 100% completion: 36%	Minimal intervention: Received bimonthly publically-available brochures related to cancer survivorship, weight loss, healthful diet, and physical activity.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Eaton, 2016[237] (Choose to Lose)	IG1	Twelve months of focused weight loss and lifestyle changes under the guidance of a registered dietitian, followed by a 12-month maintenance intervention. All participants met with their counselor at baseline and set a weight loss goal of 10% over 6 months. They were given a structured meal plan dependent on their starting weight to support a 500 to 1,000 kcal reduced-calorie diet based on DPP guidelines. Participants were encouraged to add 10-min of moderate-intensity PA most days of the week and work up to 300 minutes/week by 6 months. They were given food and exercise self-monitoring diaries for the first 6 months. Participants met again with their counselors at 6 and 12 months to review progress and set new goals as needed. In addition, they received 8 counseling phone calls (20-30 minutes) during year 1; 52 weekly mailings for the first year and monthly in months 13 to 18 and bi-monthly in months 19 to 24. These mailings included tailored and nontailored materials: feedback on food and exercise logs, 2 exercise-related DVDs, 2 nutrition-related DVDs, and non-tailored mailings focused on motivation, weight loss, calorie and exercise goal attainment, journal compliance, food-related issues, and comorbid conditions. PCPs that had identified the participants for participation were updated about the patients' progress during the study to support management of related comorbidities, to give patients further accountability, and to promote adherence to the weight loss and physical activity regimen.	At 1 year: Mean= 2.7 out of 3 individual sessions attended Mean telephone calls= 7	Minimal intervention: Three face-to-face sessions, participants set weight loss goal of 10% over 6 months; given a structured meal plan; encouraged to add 10 minutes a day and work up to 300 minutes of physical activity per week; reviewed progress and set new goals as needed; given food and exercise self-monitoring diaries; received 5 pamphlets by the National Institute for Diabetes and Digestive and Kidney Diseases on weight loss, physical activity, and healthy eating.
Fischer, 2016[319]	IGB1	Participants received six text messages per week (in English or Spanish) relating to nutrition, physical activity, and motivation, as well as a once-weekly text message asking participants to report their most recent weight. Messages were grouped around a DPP curriculum theme in categories: skill teaching (such as keeping a diary and tracking calories or fat), problem solving (such as for relapses or the holidays), motivation, stress reduction, specific recipes, web links for additional resources, and activity promotion messages. Participants were also eligible for individual motivational interviewing appointments with a health coach, generally by telephone. Were eligible for all standard-of-care weight loss resources (including access to DPP classes) and individual appointments with a nutritionist or nurse for diet support.	10 (12.8%) attended DPP classes	Usual care: Eligible for all standard-of-care weight loss resources, including access to DPP classes and individual appointments with a nutritionist or nurse for diet support.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Fitzgibbon, 2010[240] (ORBIT)	IG1	During 6-month weight-loss intervention: Fifty-two twice weekly 60-90 minute small group sessions for 6 months and six monthly 20-30 minute motivational interviewing sessions that were conducted face-to-face or over the phone. The group sessions included physical activity session and taught behavioral strategies like self-monitoring, stimulus and portion control; encouraged to adopt low-fat high-fiber diet with increased fruit and vegetables and decreased caloric intake; encouraged to increase physical activity to 30 minutes 3-4 times per week (10,000 steps/day) and given a pedometer. Participants were given feedback on self-monitoring logs. Motivational interviewing sessions addressed diet or physical activity and build motivation and commitment. During 12-month maintenance intervention: Fifty-two twice weekly 45-60 minute small group sessions in months 7-12; twelve once weekly 45-60 minutes in months 13-15 for exercise classes. The didactic sessions were replaced with a support group conducted by the participants. Twelve monthly 20-30 minute motivational interviewing sessions continued through the end of study and focused on relevant target behaviors (e.g., problem foods and barriers to being physically active). Every other month participants received a newsletter (n=6) which reinforced concepts related to health behavior change.	Group sessions: percentage of classes attended, mean(SD): during months 1-6 was 53.0% (31.5); during months 7-18 was 27.1% (30.2)For motivational interviewing sessions, mean (SD): 3.2 (2.0) during months 1-6; 2.0 (2.1) during months 7-12.	Minimal intervention: Received weekly newsletters throughout 6 months weight loss and monthly during 1-year maintenance. Newsletters covered general health and safety topics. Received monthly telephone calls from staff for questions or concerns about contents in the newsletters. Staff member was not an interventionist and not trained in motivational interviewing.
Godino, 2016[242] (SMART)	IG1	Remotely delivered via six modalities: Facebook, three study-designed mobile apps, text messaging, emails, a website with blog posts, and technology-mediated communication with a health coach (up to ten brief [5-15 min] interactions). Participants were instructed to use at least one or more modalities a minimum of five times per week throughout the 24 months of the intervention. The intervention was adaptively delivered in that new components were developed and released throughout the study in response to patterns of use and participant feedback. Participants could privately or publicly set individually tailored physical activity and dietary goals and then choose how and when to track these behaviors, receive feedback, and participate in goal review. Real-time location-based prompts were sent via text message to reinforce self-regulatory techniques. The heath coach initiated challenges and campaigns that were often culturally themed and promoted changes to weight related behaviors. Participants were asked to make a pledge to participate and set appropriate goals and share these with their existing social networks to promote social support, accountability, and the formation of healthy social norms about weight-related behaviors.	Mean interactions: 98 (9-265) at 6 months, 76 (0-222) at 12 months, 41 (0-198) at 18 months, and 12 (0-161) at 24 months. Interactions equaled sum of interactions on Facebook and mobile apps, text messages sent and replied to, and communication with the study health coach between each study measurement.	Attention control: Access to a different website and quarterly newsletters via email containing information on health topics relevant to young adults (e.g., smoking cessation, sun protection, stress management, sexual health, alcohol and drug use) including general weight loss information that is comparable to what would be received from primary care providers (without specific behavioral recommendations). Participants were encouraged to interact with website on a weekly basis.

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Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Greaves, 2015[243] (Waste the Waist)	IG1	Four 2-hr group-based sessions in the first month to support initial behavioral change then five 90-min maintenance support sessions at 1.5, 2, 4, 6, and 9 months. Goals included increasing PA, reducing intake of total and saturated fat, increasing fiber intake, and other dietary changes to achieve 5% weight loss. Participants were invited to bring along a partner if they wished. Each session comprised a series of short sections to elicit and exchange ideas (e.g., about the importance of exercise, risks of excess weight, healthy eating); learned key facts about diet and physical activity, in addition to the skills of action/coping planning, self-monitoring and problem-solving. Early sessions focused on the skills and information required to adopt a new behavior, and later sessions introduced discussions more relevant to the maintenance of behavior, such as dealing with stress and challenging situations, and how to maintain motivation if weight loss 'plateaus'. Sessions also encouraged emotional self-regulation, and included a cognitive behavioral therapy technique for impulse control. The main focus of sessions was to equip participants with a better understanding of what a healthy lifestyle is and it is importance, as well as to encourage them towards the continued use of self-regulatory activities (goal-setting, self-monitoring of behavior and weight, reviewing progress, problem-solving and review of goals) and to help them to better understand the process of behavior change over the long term. At the start and end of each session participants were reminded of the program's two key messages designed to encourage sustainable lifestyle change; (i) small changes can make a big difference to your weight and your health, and (ii) aim for a lifestyle that is both healthy and enjoyable (make changes that you can live with). Participants were provided with a handbook including information for reference, and were given "take away" tasks each week; these usually included implementing action plans set during session time.	Session attendance: median=7; ≥5, 70%	Usual care: Brief advice from usual PCP care. Received standard pack of written information on cardiovascular risk and the effects of diet and physical activity on such risk. After 12 months, participants were offered condense (two sessions) version of the intervention

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Haapala, 2009[245]	IG1	Tailored mobile phone text messages that can be initiated daily by participants. Program calculated daily energy requirement and sent a tailored feedback via mobile-phone text message indicating percentage reached for the day's target weight; extent to which they had reached their daily weight goal; amount of food to be consumed in proportion to the subject's normal diet; and days remaining until target. Based only on text messages, participants were advised to leave out foods high in sugar and/or fat and cut down on alcohol and increase physical activity. A Website offered personal space for dietary records and tracking weight, including website links to information on healthy nutrition and physical activity. Dieters were allowed to set target weight either as a short- or long-term goal and adjust as needed every 3 mo. Weight loss at 2 kg/month (max of 4.8 kg/month). Self-directed dieting or joining another weight loss program was allowed. If participants reached target weight, they were allowed to continue use for maintenance.	Total number of contacts via mobile phone and internet per week, Mean (SD): - 3 months, 8.2 (4.0) - 6 months, 5.7 (4.6) - 9 months, 3.7 (3.5) - 12 months, 3.1 (3.5)	Waitlist: Received no intervention (offered the intervention after 12 months). Allowed to join another weight loss program.
Hunt, 2014[249] (FFIT)	IG1	12 weekly group-based counseling sessions comprised of advice on healthy eating and PA. The balance of classroom and PA sessions changed during 12 weeks; later sessions focused on PA as men became fitter and shorter classroom sessions focused on revision. PA sessions (aerobic, muscle strengthening, and flexibility exercises) were complemented by an incremental, pedometer-based walking program. The 12 week active phase was followed by a weight maintenance phase w/6 post-program email prompts & a group reunion 6 months after end of sessions.	78.9% attended ≥6 sessions. Providers delivered 86% of key tasks in 26 delivery sessions.	No intervention

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Huseinovic, 2016[250]	IG1	Diet modification intervention. Participants completed a 4-day diet record at baseline to construct a diet plan. Within 1-2 weeks of baseline, women met for a face-to-face visit with a dietitian for 1.5 hours of structured individual diet behavior modification treatment at the primary health care clinics. Advice was to achieve an energy intake reduction of 500 kcal/day with a nutrient composition according the Nordic Nutrition Recommendations. Four key dietary principles (limit consumption of sweets, salty snacks, and caloric drinks, substitute regular foods with low-fat and/or low-sugar alternatives, cover one-half of the plate with vegetables at lunch and dinner, and to reduce portion sizes) were emphasized to achieve a weekly weight loss goal of 0.5 and 6 kg within 12 weeks. The diet plan was presented in a printed booklet with weekly and final weight loss goals, and instructions to self-weigh at least 3 times per week. Throughout the intervention period, women were contacted biweekly with standard text messages and phone calls and were asked to report their weight and were provided with personalize reinforcement and feedback. In the 9-month maintenance phase, participants received standardized monthly e-mails on topics such as the 4 key dietary principles, physical activity, how to deal with the return to work after maternity leave, and strategies for weight loss maintenance and were asked to report their current body weight and provided with individualized reinforcement and feedback by the dietitian through e-mail correspondence.	NR	Minimal intervention: No diet treatment, text messages, or telephone call, but were given a brochure on healthy eating at baseline. Brochure included advice on regular meal patterns, the plate model, selecting low-fat alternatives labels with the green keyhole, reducing energy-containing beverages and a recommendation to aim for a weight-loss rate of 0.5 kg/week.
Jakicic, 2011[251]	IG1	Intervention promoted progression and maintenance of 300 min/week. Participants were prescribed PA that progressed from 100 to 300 min/week, with the dose of PA increasing by 25 min/week at 4-week intervals. For the first six months, participants attended weekly sessions to promote adoption of prescribed PA dose, with each month consisting of three weekly group sessions and one individual session with their assigned PA counselor. For months 7-18, subjects attended two group sessions/month combined with two phone calls/month with their assigned counselor. Each session supplemented with a written lesson that highlighted key points of the session. During months 1-3, subjects encouraged to exercise onsite with intervention staff, with an additional supervised session offered on the weekends to facilitate adoption of prescribed dose. Remaining PA not supervised. Guidance on healthy eating behaviors was given without prescribed reduction of energy intake.	At 6 & 18 months, PA increased by 245 min/day and 155 min/week, respectively.	Minimal intervention: Received PA self-help manual and monthly newsletter on general health.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
	IG2	Intervention promoted progression and maintenance of 150 min/week of structured PA by 12 weeks, with the goal to sustain this dose for the full 18- month intervention. Participants were encouraged to spread the PA over a period of ≥5 days/week and to engage in bouts of PA ≥10 min in duration. Intensity was prescribed as moderate to vigorous, which was defined as 55-85% of age-predicted maximal heart rate or 11-15 of the 15-point rating of perceived exertion scale. For the first six months, participants attended weekly sessions to promote adoption of prescribed PA dose, with each month consisting of three weekly group sessions and one individual session with their assigned PA counselor. For months 7-18, subjects attended two group sessions/month combined with two phone calls/month with their assigned counselor. Each session supplemented with a written lesson that highlighted key points of the session. During months 1-3, subjects encouraged to exercise onsite with intervention staff, with an additional supervised session offered on the weekends to facilitate adoption of prescribed dose. Remaining PA not supervised. Guidance on healthy eating behaviors was given without prescribed reduction of energy intake.	At 6 & 18 months, PA increased by 131 min/week and 66 min/week, respectively.	Minimal intervention: Received PA self-help manual and monthly newsletter on general health.
Jansson, 2013[252]	IG1	Five regular appointments over two years with study nurse and physiotherapist. Written and illustrated information of the "plate model" (illustrates relative proportions of different food groups in relation to adequate amount for consumption) was distributed and described in detail. Patients also given a diary in which PA was to be recorded and returned to physiotherapist at check-ups. At those appointments, a personalized program of regular exercise was designed and continuously adjusted for each participant. In addition, providers contacted patients by telephone 4 times during study months 6, 9, 15, and 21 encouraging patients to comply with advice given and answer questions.	NR	Minimal intervention: Ordinary information used by ordinary staff (doctor, nurse, physiotherapist) on the importance of diet, energy consumption, and PA for weight control. Written information on plate model given with no further discussion. 1 check-in with nurse to review information. Phone call with nurse & physiotherapist @ 3 months to encourage compliance with advice. PA diary provided and shown to physiologist at checkups.
Jebb, 2011[253]	IG1	Participants received free access to weekly Weight Watchers meetings for 12 months. Intervention promoted a calorie-restricted, balanced diet based on healthy eating principles, increased physical activity, and group support. WL goals self-selected w/input from group leader, and participants were encouraged to attend weekly meetings for weigh-in, group discussion, behavioral counseling, and motivation. Participants had access to Internet to monitor food intake, activity, and weight change, as well as participate in	Attended a mean of 3 meetings/month in UK and Australia and 2 meetings/month in Germany	Usual care: Received general WL advice from PCP

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
		community discussion boards, and access info on recipes and meal ideas.		
Jeffery, 1993[254] (Trial of Food Provision and Monetary Incentives)	IG1	Thirty-three (assume 60-min) group sessions included behavioral intervention program with weigh-in, presentation of information, and review of progress; meals were provided: 5 breakfasts and 5 dinners/week with a meal plan and lunch recommendations; individualized calorie goal of 1000 or 1500/day and weight loss goal of 14, 18, or 23 kg; and cash related to weight loss ($25/ week if met and maintained goal, $2.50/week if didn't gain, $12.50 when reached 50% of goal). Exercise recommendations were to walk or bike 5 days/week working to a goal of burning 1000 calories/week. Food and exercise diaries for 20 weeks and 1 week/month after.	Overall, sessions attended: 25-90% Higher attendance in 1st 20-weeks: 90% Attendance 21-52 weeks: 78% Last 53-78 weeks lower: 65%	No intervention: No intervention; could do whatever they wished to lose weight
	IG2	Thirty-three group sessions included behavioral intervention program with weigh-in, presentation of information, and review of progress; meals were provided: 5 breakfasts and 5 dinners/week with a meal plan and lunch recommendations; Individualized calorie goal of 1000 or 1500/day and weight loss goal of 14, 18, or 23 kg. Exercise recommendations were to walk or bike 5 days/week working to a goal of burning 1000 calories/week. Food and exercise diaries for 20 weeks and 1 week/month after.	Overall, sessions attended: 25-90% Higher attendance in 1st 20-weeks: 89% Attendance 21-52 weeks: 75% Last 53-78 weeks lower: 65%	No intervention: Could do whatever they wished to lose weight
	IG3	Thirty-three group sessions included behavioral intervention program with weigh-in, presentation of information, and review of progress; individualized calorie goal of 1000 or 1500/day and weight loss goal of 14, 18, or 23 kg; and cash related to weight loss ($25/ week if met and maintained goal, $2.50/week if didn't gain, $12.50 when reached 50% of goal). Exercise recommendations were to walk or bike 5 days/week working to a goal of burning 1000 calories/week. Food and exercise diaries for 20 weeks and 1 week/month after.	Overall, sessions attended: 25-90% Higher attendance in 1st 20-weeks: 80% Attendance 21-52 weeks: 54% Last 53-78 weeks lower: 37%	No intervention: Could do whatever they wished to lose weight
	IG4	Thirty-three group sessions included behavioral counseling intervention program with weigh-in, presentation of information, and review of progress. Individualized calorie goal of 1000 or 1500/day and weight loss goal of 14, 18, or 23 kg. Exercise recommendations were to walk or bike 5 days/week working to a goal of burning 1000 calories/week. Food and exercise diaries for 20 weeks and 1 week/month after.	Overall, sessions attended: 25-90% Higher attendance in 1st 20-weeks: 65% Attendance 21-52 weeks: 33% Last 53-78 weeks lower: 25%	No intervention: Could do whatever they wished to lose weight
Jenkins, 2017*[320]	IGB1	Dietary advice was provided weekly for the first month and monthly for the following 5 months as 20- to 30-minute telephone interviews with individual participants or the families' primary shopper or cook. The advice addressed benefits, strategies for change, and barriers to change for each participating family member. Participants were	NR	Minimal intervention: Received a copy of Health Canada's Food Guide

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
		encouraged to increase intake of fruit, vegetables, whole grain cereals, to reduce meat and sweets, and to increase consumption of cholesterol-lowering functional foods including soy foods, nuts, and viscous fiber sources such as oats and barley. All participants received a copy of Health Canada's Food Guide. All members of the same family were expected to follow the same treatment. Exercise patterns were recorded but no additional advice was given.		
	IGB2	A weekly food basket was given for 6 months; dietary advice was provided weekly for the first month and monthly for the following 5 months as 20- to 30-minute telephone interviews with individual participants or the families' primary shopper or cook. The advice addressed benefits, strategies for change, and barriers to change for each participating family member. Participants were encouraged to increase intake of fruit, vegetables, whole grain cereals, to reduce meat and sweets, and to increase consumption of cholesterol-lowering functional foods including soy foods, nuts, and viscous fiber sources such as oats and barley. All participants received a copy of Health Canada's Food Guide. All members of the same family were expected to follow the same treatment. Exercise patterns were recorded but no additional advice was given.	NR	Minimal intervention: Received a copy of Health Canada's Food Guide
	IGB3	A weekly food basket was given for 6 months; no dietary advice. Food basket contained fruit, vegetables, whole grain cereals, cholesterol-lowering functional foods including soy foods, nuts, and viscous fiber sources such as oats and barley. All participants received a copy of Health Canada's Food Guide. All members of the same family were expected to follow the same treatment. Exercise patters were recorded but no additional advice was given.	NR	Minimal intervention: Received a copy of Health Canada's Food Guide
Jolly, 2011[255] (Lighten Up)	IG1	NHS group-based program run in community venues consisting of 6 weekly 2-hour group sessions, with followup sessions at 9 and 12 weeks. Focus of program was long term changes in patterns of eating behavior, achieving a balanced diet, and increasing PA in daily life. Predominant behavioral change strategies used included goal setting, stages of change, and self-monitoring in a food diary.	NR	Minimal intervention: Sent vouchers for 12 free sessions at a local gym

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
	IG2	Participants were provided with 12 vouchers allowing them free access to 12-weeks of Weight Watchers at the location and time of their choice. Weight Watchers was provided in accordance with their general guidance and consisted of 12 weekly group 1 hour sessions in which core program was delivered over 5 weeks covering food points system (based on age, gender, height, weight, & activity), beating hunger, taking more physical activity, eating out and keeping motivated. Other sessions delivered to whole group covered recipes, health and nutrition and keeping advice. PA encouraged with the objective to gradually build up to 10,000 steps/day. The plan aims for 500 kcal deficit/day, leading to 0.5-1.0 kg weight loss a week. Rewards are given for 3.2 kg lost and loss of 5% and 10% of body weight.	NR	Minimal intervention: Sent vouchers for 12 free sessions at a local gym
	IG3	Participants were provided with 12 vouchers allowing them free access to 12-weeks of Slimming World at the location and time of their choice. Slimming World was provided in accordance with their general guidance and consisted of 12 weekly group 1.5 hour sessions in which participants were encouraged to eat mainly low energy dense foods to achieve satiety, plus some extras rich in calcium and fiber, with controlled amounts of high energy dense foods. Participants had access to website, magazines, and 1-on-1 telephone support from consultant or other members. PA encouraged, with gradual build up to 30 min moderately intense activity 5 days/week. Individual support if needed using self-monitoring of food and emotions, for and against evaluations, visualization techniques, and personal eating plans. Awards are given for 3.2 kg lost and loss of 10% of body weight.	NR	Minimal intervention: Sent vouchers for 12 free sessions at a local gym
	IG4	Participants were provided with 12 vouchers allowing them free access to 12-weeks of Rosemary Conley at the location and time of their choice. Rosemary Conley was provided in accordance with their general guidance and consisted of 12 weekly 1.5 hour group sessions comprising of weight loss and improved diet, fitness and improvement of physical condition, motivation and self-esteem, use of group support, use of portion pots, and motivational videos. For each session, 45 min devoted to topic areas and remaining 45 to optional exercise class. Additional support is available by email and telephone. Rewards provided for participants who maintain or lose weight and certificates for 3.2 and 6.35 kg milestones.	NR	Minimal intervention: Sent vouchers for 12 free sessions at a local gym

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
	IG5	Twelve weekly one-on-one counseling sessions in general practice (first session = 30 min, remainder = 15-20 min) based around a problem solving approach. Weight loss goals were 5-10% of body weight, at a rate of 0.5-1 kg/week over 3-6 months, followed by maintenance. Content comprised of weight and dieting history; exploration of goals & expectations of patients; eatwell plate; setting goals to reduce calorie intake & increase PA (to 30 min of moderate activity 5 days/week); planning strategies to deal with challenging situations; use of food diaries; and maintaining weight loss. Participants provided with resources as homework to discuss in sessions or use for personal reflection. Participants encouraged to make rewards to self for success.	NR	Minimal intervention: Sent vouchers for 12 free sessions at a local gym
	IG6	Twelve weekly one-on-one counseling sessions in a pharmacy (first session = 30 min, remainder = 15-20 min) based around a problem solving approach. Weight loss goals were 5-10% of body weight, at a rate of 0.5-1 kg/week over 3-6 months, followed by maintenance. Content comprised of weight and dieting history; exploration of goals & expectations of patients; eatwell plate; setting goals to reduce calorie intake & increase PA (to 30 min of moderate activity 5 days/week); planning strategies to deal with challenging situations; use of food diaries; and maintaining weight loss. Participants provided with resources as homework to discuss in sessions or use for personal reflection. Participants encouraged to make rewards to self for success.	NR	Minimal intervention: Sent vouchers for 12 free sessions at a local gym
	IG7	Participants were given the choice of 1 of 6 different weight loss programs: NHS Size Down, Weight Watchers, Slimming World, Rosemary Conley, General Practice one-on-one support, and Pharmacy one-on-one support. 71% participants chose one of the commercial providers - Weight Watchers (29%), Slimming World (14%), Rosemary Conley (28%). 16% chose the Size Down program, 3% chose general practice, and 10% chose pharmacy support.	NR	Minimal intervention: Sent vouchers for 12 free sessions at a local gym
Jones, 1999[256] (HOT)	IG1	Two individual counseling sessions on food selection and preparation, and weight reduction goals with total caloric restriction and reduction of fat intake. Six group support sessions in first 3 months and every 3 to 6 months for duration of the study. Participants were specifically told not to exercise.	NR	Minimal intervention: Informed by research nurses that they should lose weight. Participants had no formal diet counseling or group support.
Kanke, 2015[257]	IG1	At first consultation, participants were informed of their ideal body weight and weight loss goal and counseled on the positive effects of weight reduction for participants' respective preexisting diseases. Subsequent consultations (every 1-2 months) involved routine measurements along with PCP advice on general lifestyle changes	Median consultations/year ([IQR]): 8 (7 to 10) out of 12 = 66.7%	Minimal intervention: Participants received same initial intervention as IG1 at first consultation and usual care was provided at subsequent (every 1-2 month) consultations.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
		for obese people and personalized advice focusing on weight reduction, adjusted to each participant's circumstance and lifestyle.		
Katula, 2011[258] (HELP PD)	IG1	Modified community DPP-based program. Overall goal of the intervention was decreased caloric intake (1,200-1,800 kcal) and increased moderate PA to ≥180 min/week. Participants met for weekly group sessions during Phase 1 (months 1-6) facilitated by CHWs (and monitored by a local diabetes education program [DEP]) and conducted at various community sites (parks and rec centers). In addition, participants received three personalized consultations with a registered dietician during months 1, 3, and 6. Phase 1 objectives included reduction in daily caloric intake and increases in moderate-intensity aerobic exercise in order to produce a weight loss of ~0.3 kg/week to achieve total weight loss goal. During Phase 2 (months 7-24), participants received 2 scheduled contacts with the CHW each month; one group session, and one phone contact. Primary focus of Phase 2 was on weight maintenance.	Phase 1 (months 1-6): participants attended 72.2% of sessions (15.5% made up and 12.4% missed). Phase 2 (months 7-24): participants attended 40.4% of sessions (made up 22.9% and missed 36.7%) Overall: 58.6% of sessions (made up 18.7% and missed 22.8%)	Minimal intervention: To retain participants, usual care enhanced to involve 2 individual sessions during first 3 months and monthly newsletter
Knowler, 2002[205] (DPP)	IG1	Participants attended a baseline (20-30 min) individual session, then 16-weekly individualized sessions (30-60 min) for first 24 weeks and then 12 more bimonthly individualized sessions. The individualized sessions addressed the importance of a healthy lifestyle with clearly defined goals to achieve and maintain a weight reduction of at least 7% of initial body weight through consumption of a healthy low-calorie, low-fat diet and to engage in physical activity of moderate intensity (such as brisk walking for at least 150 min/week; encouraged to avoid excessive alcohol intake and to stop smoking. Sessions also included a private weigh-in review of self-monitoring records, presentation of a new topic, ongoing identification of personal barriers to weight loss and activity, and the development of action plan/goals for the next session. Participants could voluntarily attend supervised physical activity sessions that were offered at least two times per week throughout the trial. Individualized "toolbox' strategies were offered to participants who encountered barriers. Group courses (4-6 weeks long) were also offered focusing on maintenance and topics related to exercise, weight loss, or behavioral issues.	1076 participants (99.7%) completed at least first session of core curriculum and 1024 (95.0%) completed the entire 16-session core curriculum. 1035 (95.9%) completed at least one postcore visit with intervention case manager. Participants attended mean (SD) sessions during year one: 23.6 (7.1); year two: (12.5 (7.1); over entire trial: 50.3 (21.8). Self-monitoring records of dietary fat intake were completed on 11.3 ± 5.3 weeks (range 0 to 23) during the first 6 months of the program and on 20.4 ± 13.5	Minimal intervention: Participants also received placebo pills and attended quarterly visits to promote adherence and to obtain pill counts. Written information was given and a 20-30 min individual session with case manager which occurred annually addressed: the importance of a healthy lifestyle; specifically encouraged to follow the Food Pyramid guideline and to consume equivalent of a National Cholesterol Education Program step 1 diet; lose 5-10% of initial weight through diet and exercise; increase to at least 30 min of moderate activity 5 days/week; avoid excessive alcohol intake; and encouraged to stop smoking.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
			weeks (range 0 to 89) over the first 2 years.	
Kuller, 2012[261] (WOMAN)	IG1	Lifestyle intervention based on the Women's Healthy Lifestyle Project and DPP. The intervention was primarily group-based and facilitated by nutritionists, exercise physiologists, and psychologists. Contact included 40 group-based visits over 12 months and a minimum of 12 monthly visits over the remaining 2 years. Intervention focused on reduction of body weight and waist circumference through dietary modification (saturated fat <7% of total energy or <10 grams/day, total energy intake to 1,300-1,500 kcal, and 10% weight loss and PA goal of 150 mins per week of moderate intensity activity. Examples of specific key behavioral strategies included: self-monitoring, goal setting, stimulus control, problem solving, cognitive restructuring, relapse prevention, social support, and motivational techniques.	NR	Attention control: Health education group had series of 6 seminars during first year of participation and then several times per year through 36 months. Sessions focused on women's health, not CV factors.
Kulzer, 2009[262] (PREDIAS)	IG1	Eight core lessons, once weekly for 8 weeks, focusing on lifestyle modification and 4 bimonthly booster lessons were given (90 min each). Lessons focused on self-management approach and addressed motivational change, weight reduction, healthy diet, eating habits, physical activity, social support, maintenance dealing with failure, and stress management. The lessons were conducted in small groups (median size 7 people). Each participant received an exercise book containing information about diabetes prevention and resources such as a table of caloric values and worksheets for each lesson. Goals focused on changing unhealthful eating habits and increasing physical activity to >150 minutes per week.	NR	Minimal intervention: Same written information about diabetes prevention as intervention group.
Kumanyika, 2012[328]	IGB1	Use of Think Health! a modified cultural adapted DPP-based program delivered over 1 year. Counseling by PCP every 4 months (10-15 minutes). Counseling by Lifestyle coach monthly (10-15 minutes). Sessions addressed food and activity diaries and weight loss goals, healthy eating, increasing physical activity, negative thoughts/stimulus control, food environment/stress management/social cues. Goals set for 1,200-1,800 kcal/day based on weight and individuals were provided calorie counters. Activity goal of 30 min 5 days a week	Number PCP visits completed: 0: 5% 1: 29% 2: 25% 3: 22% 4: 19% Number Lifestyle coach visits completed: 0: 7% 1-4: 48% 5-8: 25% 9-13: 19%	Minimal intervention: Use of Think Health! a modified cultural adapted DPP-based program delivered over 1 year. Counseling by PCP every 4 months (10-15 minutes).

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Little, 2016[264]	IG1	Gender-tailored, automated web-based intervention, POWeR+, designed to support weight management. Intervention involved series of 24 web-based sessions designed to be used over 6 months with novel content, links to external content, and email reminders. Participants chose either a low calorie eating plan (reduction of 600 calories/day) or a low carbohydrate eating plan (limit of 50g/day). Participants based their eating plan on traffic light system that categorizes foods into those than can get eaten freely ('green'), in moderation ('yellow'), or sparingly ('red'). Participants were encouraged to increase their PA levels by choosing either a walking plan (could request pedometer) or a self-selected mixture of other physical activities. Intervention fosters participants' self-regulation skills for autonomously managing their weight rather than providing detailed dietetic advice. Throughout intervention, participants taught active cognitive and behavioral self-regulation techniques ('POWeR tools') to overcome problems such as low motivation, confidence, or relapse. Participants provided evidence of effectiveness of techniques and examples of how others have successfully used them ('POWeR stories'). Participants encouraged to use website weekly to track their weight, set and review eating and PA goals, and receive personalized advice. After entering their weight and whether they had achieved their goals from the previous week, participants received tailored feedback giving encouragement if maintaining weight loss and meeting goals. Weight gain and failure to meet goals triggered automated personalized advice on appropriate goal-setting and planning, boosting motivation, overcoming difficulties, recovering from lapses. In addition, participants had three scheduled face-to-face nurse support sessions in the first three months, and four optional appointments during subsequent three months. Weight gain on two consecutive logins triggered an automated email to the nurse advising that the patient needed further support or participants could request additional support.	Across both IGs, 97% started first session, (77%) completed all three core sessions. Mean 10.16 (SD=11.92) completed weight and goal reviews out of 24. Median: 2 (IQR 1-3) face-to-face contacts, 1 (0-2) phone contact, and 1 (0-2) email contact.	Minimal intervention: Participants directed to a set of two printable web-based pages with brief structured advice. Web-based materials covered strategies to minimize pressure to cut down favorite foods by swapping less healthy foods for healthier choices (healthy foods swap sheet), or to increase fruit and vegetable intake (using NHS five-a-day sheet). Nurses arranged brief followup (5-10 min appointments) to measure weight at 6 and 12 months, but did not provide explicit counseling.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
	IG2	Gender-tailored, automated web-based intervention, POWeR+, designed to support weight management. Intervention involved series of 24 web-based sessions designed to be used over 6 months with novel content, links to external content, and email reminders. Participants chose either a low calorie eating plan (reduction of 600 calories/day) or a low carbohydrate eating plan (limit of 50g/day). Participants based their eating plan on traffic light system that categorizes foods into those than can get eaten freely ('green'), in moderation ('yellow'), or sparingly ('red'). Participants were encouraged to increase their PA levels by choosing either a walking plan (could request pedometer) or a self-selected mixture of other physical activities. Intervention fosters participants' self-regulation skills for autonomously managing their weight rather than providing detailed dietetic advice. Throughout intervention, participants taught active cognitive and behavioral self-regulation techniques ('POWeR tools') to overcome problems such as low motivation, confidence, or relapse. Participants provided evidence of effectiveness of techniques and examples of how others have successful used them ('POWeR stories'). Participants encouraged to use website weekly to track their weight, set and review eating and PA goals, and receive personalized advice. After entering their weight and whether they had achieved their goals from the previous week, participants received tailored feedback giving encouragement if maintaining weight loss and meeting goals. Weight gain and failure to meet goals triggered automated personalized advice on appropriate goal-setting and planning, boosting motivation, overcoming difficulties, recovering from lapses. In addition to weight recording at 6 months, participants had 3 scheduled phone or email contacts and up to 2 optional phone or email contacts in the first 6 months (triggered by weight gain or patient request).	Across both IGs, 97% started first session, (77%) completed all three core sessions. Mean 11.85 (SD=13.85) completed weight and goal reviews out of 24. Median: 1 (IQR 2-4) phone contact and 3 (2-4) email contact.	Minimal intervention: Participants directed to a set of two printable web-based pages with brief structured advice. Web-based materials covered strategies to minimize pressure to cut down favorite foods by swapping less healthy foods for healthier choices (healthy foods swap sheet), or to increase fruit and vegetable intake (using NHS five-a-day sheet). Nurses arranged brief followup (5-10 min appointments) to measure weight at 6 and 12 months, but did not provide explicit counseling.
Logue, 2005[324] (REACH)	IGB1	Four semi-annual counseling sessions with dietician (10 mins) with written dietary and exercise prescriptions based on dietary and exercise recalls. Advised to discuss their lipid and blood pressure values with PCP. Evaluated for anxiety, depression, and binge eating disorder every six months and completed a trans-theoretical model-based stage of change (SOC) assessment every two months. Mailed stage- and behavior-matched workbooks corresponding to SOC profile. Monthly 15-minute phone calls from a weight loss advisor to review behavioral techniques based on their SOC. Access to public domain patient handouts and other materials (menu suggestions, mall walking maps, descriptions of local walking trails). Self-monitoring of the target behaviors was suggested but not	NR	Minimal intervention: Four semi-annual counseling sessions with dietician (10 mins) with written dietary and exercise prescriptions based on dietary and exercise recalls. Advised to discuss their lipid and blood pressure values with PCP.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
		reviewed. PCPs received periodic reports of progress and training on the use of the SOC related materials.		
Luley, 2014[265]	IG1	Intervention began with a 2-hour group informational meeting focused on the Magdeburg Dual Diet (500 kcal/day reduction and low glycemic index foods) and the importance of physical activity. The rest of the intervention was delivered via self-monitoring and telephone support. Participants were given an accelerometer to use for tele-monitoring of physical activity and nutrition. Data on physical activity, nutrition and daily body weight from personal scales were transmitted once a week to a server which then generated reports. These reports were discussed during 12-monthly 20-min telephone calls with 4Sigma counselors. Calls communicated participant's weight loss curve from beginning of the intervention compared to weight loss curves of the other participants; the duration of sensor use for each day of the preceding week was provided as a percentage of 24 hours; the kilocalories used up by exercise and the distanced covered in km; and discussed the cumulative number of kilocalories from nutrition; and commented on progress of the past week.	NR	Minimal intervention: All participants received an explanation of the Magdeburg Dual Diet (500 kcal/day reduction and low glycemic index foods) and physical activity recommendations during one initial 2-hour group session.
	IG2	Intervention began with a 2-hour group informational meeting focused on the Magdeburg Dual Diet (500 kcal/day reduction and low glycemic index foods) and the importance of physical activity. The rest of the intervention was delivered via self-monitoring and mailed print materials. Participants were given an accelerometer to use for tele-monitoring of physical activity and nutrition. Data on physical activity, nutrition and daily body weight from personal scales were transmitted once a week to a server. Weekly individual report letters were generated based on this data and were sent out to participants by mail. Each letter communicated participant's weight loss curve from beginning of the intervention compared to weight loss curves of the other participants; the duration of sensor use for each day of the preceding week was provided as a percentage of 24 hours; the kilocalories used up by exercise and the distanced covered in km; and discussed the cumulative number of kilocalories from nutrition; and commented on progress of the past week.	NR	Minimal intervention: All participants received an explanation of the Magdeburg Dual Diet (500 kcal/day reduction and low glycemic index foods) and physical activity recommendations during one initial 2-hour group session.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Ma, 2013[266] (E-LITE)	IG1	Participants completed a 3-month intensive phase and 12-month maintenance phase. During the 3-month intensive phase, participants received an adapted, 12-session DPP lifestyle intervention curriculum, Group Lifestyle Balance (GLB). Curriculum delivered at 12 weekly sessions to coach-led intervention participants. In addition to receiving GLB materials, participants had food tastings @ check-in and 30-45 mins of guided PA at the end of each weekly class. During the first class, participants were trained to use the AHA Heart360 web portal for goal setting and self-monitoring and were given a scale and pedometer. Coaches sent personalized messages on 2-4 week basis that provided progress feedback and lifestyle coaching based on their Heart360 self-monitoring records during the maintenance phase. Via secure email embedded in the EHR and available to all intervention participants, the lifestyle coach sent standardized biweekly reminder messages about self-monitoring to self-directed intervention participants throughout the intensive and maintenance phases and standardized monthly motivational messages to participants in both interventions during the maintenance phase.	Participants attended mean of 75.1% (SE=25.6%) of 12 weekly group sessions and received median of 19 (IQR, 18-22) email messages during maintenance phase	Usual care
	IG2	Participants completed a 3-month intensive phase and 12-month maintenance phase. During the 3-month intensive phase, participants received an adapted, 12-session DPP lifestyle intervention curriculum, Group Lifestyle Balance (GLB). Curriculum delivered at 12 weekly sessions via home-based DVD. Participants attended a single orientation class in which participants were trained to use the AHA Heart360 web portal for goal setting and self-monitoring and were given a scale and pedometer. Via secure email embedded in the EHR and available to all intervention participants, the lifestyle coach sent standardized biweekly reminder messages about self-monitoring to self-directed intervention participants throughout the intensive and maintenance phases and standardized monthly motivational messages to participants in both interventions during the maintenance phase.	95.1% (77 of 81) participants attended the orientation session. Participants received median of 31 (IQR, 30-32) email messages during maintenance phase.	Usual care

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Marrero, 2016[267]	IG1	Participants first attended a 45-min "activation" session with education on the meaning of prediabetes, how the condition can increase risk for developing type 2 diabetes, and the role of lifestyle modification to reduce risk. A weight loss goal of 7% was set. Following the activation session, participants were enrolled in existing Weight Watchers programs in the community. Participants could choose a group session and location that was convenient for them. Participants were encouraged to attend a weekly session and were also given access to the Weight Watchers e-tools, which included digital tools to track weight, intake, and activity as well as tips to facilitate adherence.	Average number of group sessions attended: 21.6 (1-55). 63% reported using online app.	Minimal intervention: Received personalized advice about their risk for developing diabetes, and those without contraindications were advised (in about 5 minutes) that modest weight loss (5-10%) via caloric restriction and the adoption of moderate physical activity were generally safe and effective in preventing or delaying the onset of diabetes. In addition, there was a 15-min individual counseling session where materials (National Diabetes Education Program's You Game Plan to Prevent Type 2 Diabetes and Small Steps, Big Rewards educational materials) were distributed and overview of how to initiate a risk-reducing lifestyle was provided, including a reproducible tracker to help monitor their food intake, and a booklet with fat gram and calorie content for common foods.
Martin, 2008[269]	IG1	Participants had monthly office visits (1/month for 6 months - 15 mins per visit) with their physician visits addressed weight loss, ways to decrease dietary fat, ways to increase physical activity, dealing with barriers to weight loss, healthy eating, and maintaining motivation. Personalized verbal recommendations and handouts summarizing the focus of each visit.	72.9% completed 6-month program	Usual care: Physicians providing standard care received training on current guidelines for the treatment of obesity, no specific weight loss protocol. Usual obesity management
Mensink, 2003[325] (SLIM)	IGB1	Participants received dietary recommendations based on Dutch guidelines for a healthy diet (energy intake: 55% from carbohydrates, <30-35% from fat, <10% saturated fatty acids, protein 10-15%; cholesterol intake <33mg/MJ; dietary fiber intake 3 g/MJ). Participants were encouraged to stop smoking and reduce alcohol intake, and dietary advice was provided at regular intervals by a skilled dietician on an individual basis (considering 3-day food record). At the end of every session, goals were set for the next visit. If no weight loss occurred in the first year, mild energy restriction was proposed. Participants were encouraged to increase levels of physical activity to at least 30 minutes of moderate physical activity a day at least 5 days a week. At the beginning of the study, individual advice was given on how to increase daily physical activity and goals are set. Participants were encouraged to	NR	Minimal intervention: Participants received verbal and written information about the beneficial effects of a healthy diet, weight loss, and physical activity.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
		participate in a study exercise program, which had components of aerobic exercise training and resistance training and were supervised by trainers. Participants had free access to training sessions and were encouraged to participate at least 1 hour per week.		
Mitsui, 2008[270]	IG1	Fifty-two weeks of self-directed training and dietary counseling. Attended lectures once a week until week 12, once every other week between weeks 13 and 26, and monthly thereafter. Lectured in nutrition, cooking, exercise, and preventive medicine. Advised to perform self-training consisting of walking 20-30 minutes and 2 or 3 self-weight resistance exercises performed for 10 minutes for a total training of 40 minutes. Training was initially recommended for two or three times per week and asked to increase to more than 5 days per week. Walking measured using a pedometer. Trained dietician counseled each participant on dietary habits according to the Dietary Reference Intakes for Japanese, 2005. Total calories, carbohydrates, and fat were not restricted. Participants were advised to refrain from eating snacks and from eating too much dessert, including fruit.	NR	Minimal intervention: Each participant was given a pedometer to record daily steps from walking until bedtime, excluding water activities. Records were sent in by mail.
Moore, 2003[271]	IG1	Primary care staff training consisted of three 90-min small group sessions held no less than 1 week and no more than 2 weeks apart over a 6 week period. All general practitioners and practice nurses were asked to attend all three sessions. The training covered the clinical benefit of weight loss and effective treatment options, including reduction of dietary energy intake, increased physical activity, and pharmaceutical intervention using best evidence. Practices then devised individual weight management protocols after being presented a model in which patients visited their PCP about every two weeks until they had lost 10% of original body weight, then every 1-2 months for maintenance. Providers estimated patient's daily energy requirement and then prescribed a 500 kcal deficit. Diet sheets and supporting written resources were given to patients.	Providers in IG had more visits with patients 8 vs 6 visits (OR=1.3, p=0.05), discussed and recorded weight and weight targets 57% vs 40% (OR=2.0, p=0.003); no difference in exercise compared to controls	Usual care: Control practices asked to provide usual care to patients and did not take part in training.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Morgan, 2011[272] (SHED-IT)	IG1	An initial 75-min face-to-face information session and weight loss program booklet followed by 3 months of online support. Using website, participants self-monitored their weekly weight, dietary intake and exercise (first 4 weeks), set goals, and received social support. Participants were asked to enter their weight once each week online and submit online daily eating and exercise diaries, and individualized feedback based on diary entries was provided on seven occasions by research assistants. Participants were also able to submit questions on a website notice board, which were answered weekly by research staff and accessible to all intervention participants. Program booklet and individualized feedback included anecdotes and weight loss strategies specifically for men.	41.2% submitted 7 weeks of daily eating and exercise diaries and weekly check-ins	Minimal intervention: One 60-min face-to-face information session on weight loss and weight loss program booklet
Nakade, 2012[274] (SCOP)	IG1	Participants received five 30-min individual counseling sessions and 20-min group exercise sessions provided by registered dietitians and exercise instructors at baseline and months 1, 3, 6, & 9. In individual sessions, participants discussed improving lifestyle habits (diet & PA) and set monthly behavioral goals. They were instructed to self-monitor daily weight, step counts, diet, and implementation of plans using worksheet. During PA sessions, an exercise instructor taught participants PA exercises for weight loss, showing specific movements (not group-based exercise classes). For the months between individual sessions, participants reported their progress for the previous month and new goals for the following month via mail.	% participated in 5 face-to-face sessions: Session 1: 100% 2: 98.3% 3: 98.3% 4: 97.4% 5: 95.8% % who mailed records to dietitians ranged from 65.5%-88.2% for months 2-11.	Waitlist
Nanchahal, 2012[275] (CAMWEL)	IG1	Participants attended a total of 14 individual 30-min counseling sessions every 2 weeks for first 12 weeks, every 3 weeks for 12 weeks, and then monthly for next 12 weeks. Topics of sessions included personally agreed weight loss goals, eating and physical activity goals, exploration of motivations for losing weight, personal cues to reduce unhealthy eating and sedentary behavior, support from family and friends, triggers associated with habits and routines, long-term benefits of small changes and the importance of scheduling and time management. A commercially available weight management software package was used to record and monitor participants progress. Participants were given pedometers and handouts associated with each session, including a tailored motivational booklet to encourage increased levels of physical activity and a book of walks in the local area. Participants were also given the British Heart Foundation booklet: “So you want to lose weight … for good.”	Session attendance: 46% (40/87). Of 40 who attended, >70% (10/14) sessions.	Usual care: Routine clinic practice; asked to contact their PCP or receive usual weight management care which could include referral to dietitian, exercise on referral, the 'Shape-Up' program, prescription of weight loss medication, weight loss surgery, or no further treatment. All participants were given the British Heart Foundation booklet: “So you want to lose weight … for good."

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Narayan, 1998[276]	IG1	52 weekly group meetings, reinforced by home visits as needed discussing behavioral techniques. Classes consisted of modeling and role-playing, group problem-solving, food prep demonstrations, food tasting, and grocery store tours. Advised by a dietitian, in keeping with the recommendations of the American Diabetics Association. Participants maintained monthly activity logs for their choice of physical activities (walking, water aerobics, softball, volleyball, community farming/gardening, cleaning local cemetery) with a group or on their own. Goal was to increase energy expenditure by 700-1000 kcal per week and to reduce fat and alcohol intake and increase fiber intake.	On average, participants attended 25% of available nutrition classes over the first 6 months and 17% over the subsequent 6 months.	Minimal intervention: Monthly group meetings facilitated by community member to discuss community lifestyle. Local speakers discussed Pima culture and history. Received printed material on healthy eating and exercise.
Nicklas, 2014[277] (Balance after Baby)	IG1	Web-based lifestyle modification program involving core modules tailored from DPP for postpartum women with recent gestational diabetes mellitus (GDM). Program emphasized dietary choices that would transition readily from pregnancy GDM diet and recommended increasing PA to ≥150 min/week. Participants tracked diet and PA in logbooks and participated in telephone/email sessions with their lifestyle coach (LC). Participants watched one module/week for the first 12 weeks (and six optional modules). Website provided communication with LC, forms to enter goals, weekly weight, PA, shopping lists & recipes, menu planning tips, exchange lists, and PA education. Breastfeeding section contained 4 additional modules and a mechanism to contact a lactation consultant. Participants were encouraged to contact LC weekly for first 12 weeks. Subsequent biweekly sessions with LC for 12 more weeks and then monthly for the remainder of the program. Participants received body weight scales, measuring cups/spoons, pedometers, and a local YMCA membership. Participants without regular computer access were provided with a laptop and Internet access.	Median 9/12 modules watched, with 33% of all 12 core modules at least once, and all participants watching at least 1 module. Median 7 (range 0-12 & 1 participant w/no contact) contacts w/LC over first 12 weeks, 4 (0-9) over second 12 weeks, and 2 (0-10) over last 6 months.	No intervention: Received diabetes prevention handout at recruitment

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Nilsen, 2011[327]	IGB1	Brief intervention given at pre-randomization advising to make small changes in lifestyle and weight; to increase consumption of fruit and vegetables; to exercise get at least 30 minutes a day; to lose at least 5% of weight; to reduce sugar and saturated fat consumption; to use oil as main source of fat; and to consume cod-liver oil daily. After randomization, participants consulted with the study physician, who utilized the elements of motivational interviewing techniques, at 6, 12 and 18 months. Participants also attended small group sessions (≤10 participants) one day (5 hours per day) each week for 6 weeks and one group session at 16 weeks. Group sessions emphasized educating participants on how to avoid diabetes and CAD with factual information about nutrition and physical activity, habit change, action plans, risk situations, and coping strategies. A variety of physical training was also offered. An individual 30-minutes consultation with a nurse or ergonomist completed the intervention one month after the last group session.	Group session attendance: 5.2 (mean) Final individual consult: 94%	Minimal intervention: Brief intervention given at pre-randomization advising to make small changes in lifestyle and weight, increase consumption of fruit and vegetables, exercise at least 30 minutes a day, lose at least 5% of weight, reduce sugar and saturated fat consumption, use oil as main source of fat, and consume cod-liver oil daily. After randomization, participants consulted with the study physician, who utilized the elements of motivational interviewing techniques, at 6, 12 and 18 months and otherwise received care from their PCP as usual.
O'Brien, 2017[321] (PREVENT-DM)	IGB1	Participants received a 24-session group-based intensive lifestyle intervention delivered by community health workers (referred to as Promotoras). The intervention was based on the Group Lifestyle Balance program, an evidence-based adaptation of DPP. The first 14 sessions occurred weekly, and the final ten sessions took place biweekly and then monthly. Each group session lasted approximately 90 minutes. The intervention used behavioral strategies such as goal setting, self-monitoring, stimulus control, and problem solving to achieve modest weight loss (5%-7% of initial body weight) by improving dietary patterns (decreasing fat and calorie consumption). The community health workers and participants spent the first half of each session reviewing goals from the previous session, and engaging in a facilitated discussion about their experience meeting those goals. The second half of each session involved new content and helping participants set the following week's goals. Participants were instructed to record their daily dietary intake and physical activity in weekly logs. Participants were provided with a digital scale, pedometer, measuring cups, and logs for tracking dietary intake and physical activity. The community health worker reviewed participants' completed logs at each session, providing feedback and accountability for health behavior changes.	Participants attended an average of 14.2 (SD=8.4, 59.2%) of the 24 sessions. Three participants (9.1%) in the intervention group did not attend any of the lifestyle sessions, and 23 (69.6%) attended at least nine sessions.	Usual care: Educational materials on diabetes prevention from the National Diabetes Education Program and described those materials briefly during quarterly visits.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Ockene, 2012[278] (LLDPP)	IG1	Culturally tailored DPP-modified intervention. Three individual sessions (first was 1 hour and last 2 were 30 minutes each in participant's home) and 13 group sessions (first was 1.5 hours and remaining were 1 hour in senior center) culturally tailored and literacy-sensitive included dietary goals to decrease caloric density by increasing volume and satiety with vegetables, fiber, fruit, and water intake; and encouraged to consume several smaller meals throughout the day. Participants used a picture-based food guide that classified foods into 3 colors to identify the dietary quality foods with regard to glycemic index, sodium, and saturated fat content. Sessions also included hands-on activities such as healthy cooking and portion size demonstrations and practiced walking with pedometers. The physical activity goal emphasized walking and recommended 4000 steps/day. Participants received a pedometer and information on safe places for walking and exercise in the community. Simple goal-setting and self-monitoring worksheets were provided for easy recording based on DPP.	Attendance of sessions: Median = 6 out of 13 group sessions Median = 8 out of 16 individual and group sessions First group session, 60% Last group session, 20%	No intervention
Pacanowski, 2015[279]	IG1	Participants invited to educational presentation about evidence-based strategies for weight loss with an emphasis on self-selection of strategies to meet individual needs. Presentation concluded with an explanation of the Caloric Titration Method (CTM) intervention. The CTM intervention provides feedback of an individual's weight trends over time. Weight loss is directed by small decrements, equivalent to 1% of starting body weight. Once 8 weight measurements have been entered, a green line appears 1% below the user's current weight to show the target weight. After the user reaches and maintains the target weight, for 8 days, the green line is reduced by another 1% on the cart. This procedure continued until a maximum of 10% loss is reached, at which time they would maintain this loss during the second year of the trial. Participants were provided a typical bathroom scale and asked to weigh daily, under consistent circumstances, first thing in the morning. Making small changes, amounting to or averaging 100 kcal deficits per day, was encouraged (e.g., skipping dessert a few times per week; using a meal replacement for lunch 3x a week; abstaining from snacking most days of the week). Participants entered their weight daily through study website and were permitted to do anything they wished to lose weight in addition to using the CTM. CTM provides visual feedback of an individual's weight trends over time, encouraging slow weight loss and prompting participants when 10% weight loss goal has been achieved. During year 2, participants were encouraged to continue weighing themselves and entering	On average, more than 4 weights per week were entered in the web-based program	Waitlist: Educational session on evidence-based strategies for weight loss with an emphasis on self-selection of strategies to meet individual needs and to do anything they would normally do to lose weight. After 1 year, control participants received the CTM intervention, scale, and instructions.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
		their weight and to maintain their weight loss or continue losing weight if they wished.		
Parikh, 2010[280] (HEED)	IG1	Eight 90-min group workshops over 10 weeks lead by lay leaders. Topics included diabetes prevention, finding and affording healthy foods, meal planning, physical activity, label reading, and portion control. Received brief verbal and written information about prediabetes and results of all their screening tests that could be shared with clinicians.	Low attendance at intervention classes; authors note that weekly classes may have been too onerous	Waitlist: Waitlist for 1 year. Received brief verbal and written information about prediabetes and results of all their screening tests that could be shared with clinicians.
Patrick, 2011[281]	IG1	Intervention consisted of three components: an initial computerized assessment to tailor recommendations for behavioral targets, weekly Web-based learning activities, and individualized feedback on their progress. Intervention was designed to improve diet and PA in five areas: (a) increased fruit and vegetable intake to five to nine or more servings per day; (b) increased consumption of whole grain products to more than or equal to three servings per day; (c) decreased saturated fat intake to ≤20 g per day through the use of strategies such as substitution, reducing portion size, decreasing frequency, or changing cooking methods; (d) increasing steps per day to at least 10,000 on at least 5 days/week; and (e) strength training at least two times per week targeting at least two body areas (upper body, core, lower body). Intervention focused on small, incremental improvements over time. Participants permitted to choose which behaviors to work on each week and encouraged to take a printed copy of their goals to their PCP to discuss their weight loss goals. Over 12 months, participants completed weekly Web-based activities, including learning about and applying theoretically derived behavior change skills and reading about diet and PA topics. Personalized graphical feedback provided weekly and displayed improvements and instances where behaviors fell below previously attained levels. Participants had an opportunity to e-mail a question to study experts (dietitian, PA expert, clinical psychologist). Participants were also given pedometers to self-monitor daily steps and were encouraged to input data on website to assist with goal setting.	On average participants logged on to website: 23.4 weeks (SD=16.7) to set weekly step goals, and those in the highest tertile set goals on average of 43 weeks (SD=7.2).	Waitlist: Given access to alternate website containing general health information for men.

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Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Penn, 2009[283] (EDIPS-Newcastle)	IG1	Total of 23 (30 min) individual advice sessions (4 in first 3 months and the rest every 3 months up to 5 years which included standard health promotion advice. Participants were also invited to group sessions (# attended and minutes are not reported), e.g., 'cook and eat' events. They also received a regular quarterly newsletter. The newsletter contained: healthy eating recipes, nutritional information, suggestions for local walks, and exercise options. The tailored individual dietary advice and counseling (based on 3-day food dairies, regular weight and waist measurements) included individual plan for behavior change, with the aim of achieving: >50% total dietary energy intake from carbohydrate, reduced total and saturated fat intake with <30% total dietary energy from fat, increased fiber intake, and weight loss to achieve BMI <25 kg/m2. Diaries were used in motivational feedback and to tailored goals for physical activity. Participants were encouraged to increase physical activity to 30 minutes of moderate aerobic physical activity per day. In addition to individual and group activities, participants received written leaflets on healthy eating and physical activity and an information pack detailing facilities (some offering up 80% discounts) and opportunities for physical activity in their community and the opportunity to meet with a trainer and take part in an induction session.	NR	Usual care: Offered standard health promotion advice and written leaflets on healthy eating and physical activity
Phelan, 2017[330]	IGB1	Standard WIC Supplemental Nutrition Program (≥5 visits during the first postpartum year) with nutritional counseling with general support/referrals as needed, general support, and food vouchers. In addition to WIC program, received an internet-based weight control program. Calorie goals (1200 to 1800 kcal/day + 300 kcal if breastfeeding), and physical activity goals (gradually increased to 30+ min/day most days). Program website (in English and Spanish) included: guidance and resources, automated feedback, weekly structured lessons, food/activity diary, weight tracker, instructional and inspirational videos, and a message board. Four weekly text message notifications of motivation, support, and feedback. Website promoted at regular WIC visits. Participants unwilling to use web diaries were provided with paper diaries or encouraged to use alternative tracking resources. Provided with a scale and were told to expect weight loss of 0.5 to 1 kg per week until reaching a 10% weight loss goal or return to pre-pregnancy weight. Monthly 60-minute face-to-face group sessions with study interventionists at WIC clinics introduced new weight loss topics, further reinforced messages of the online program, provided opportunities to problem-solve barriers to weight loss, and provided additional support and education on selected topics. Study newsletters every two months	Mean (SD) weekly logins= 74.0 (111.0) Mean (SD) monthly logins= 6.0 (9.3) 12 participants never logged into study website. Mean (SD) attendance at monthly group meetings (range= 0-12): 4.4 (2.7)/37% of expected visit attendance	Minimal intervention: Standard WIC Supplemental Nutrition Program (≥5 visits during the first postpartum year) with nutritional counseling with general support/referrals as needed, general support, and food vouchers. In addition, attended a brief study orientation, and received study newsletters every two months with basic information about weight control, exercise, nutrition, and wellness.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
		with basic information about weight control, exercise, nutrition, and wellness. Provided with info on adherence to logging onto the website and attending groups to encourage participation. Adherence to the behavior goals was reinforced through allocation of "diaper points", which could be redeemed to obtain diapers or other tangible incentives.		
Puhkala, 2015[286]	IG1	Monthly lifestyle counseling for 12 months focusing on diet, physical activity and sleep. Counseling consisted of six individual face-to-face contacts (60 minutes each) and seven telephone contacts (30 minutes each). At each session, individual goals for diet, physical activity and sleep were set and based on participant's preferences, abilities and experience. Dietary targets were to improve meal frequency, increase the consumption of fruit and vegetables (with the help of a "plate model"), improve fat quality, and reduce low-fiber, rapidly absorbed carbohydrates. The goal of physical activity counseling was to add 4000 steps – approximating 30 minutes of moderate-intensity walking (39) – to the daily baseline on five self-selected days of the week with the help of a pedometer. The sleep target was ≥6 hours of sleep per 24 hours. In addition, the participants had a log book of their own to monitor their daily accomplishment of their dietary, physical activity and sleep goals. At 13 months, counseling (last session) was on maintenance - how to continue with goals.	Between 1-11 months: Participation rate, 98%. 10.8 sessions attended out of 11 (allocated).	Waitlist: After 12 months, participants had two face-to-face contacts lifestyle counseling and three telephone contacts in the first three months (months 12 to 15). Counseling sessions were on how to achieve their dietary, physical activity and sleep goals.
Rock, 2007[289]	IG1	Participants were referred to a conveniently located community-based Jenny Craig facility. They received all program materials, including prepackaged food, free of charge. Program included weekly one-on-one contacts with counselor/consultant with F/U phone and e-mail contacts and website/message board availability. Prescribed energy reduced diet that included prepackaged prepared food items (determined by client preferences) provided at weekly sessions. When participant was halfway to goal weight, a transition to prepackaged foods 5 days a week was recommended. When goal weight was achieved a meal plan based on regular (non-JC) food was implemented. Counseling included increasing physical activity with specific goal-setting and follow-through that were determined on the basis of readiness, capabilities, and preferences of the client. The goal was 30 mins of physical activity on 5 or more days of the week. Program used written materials and compact discs that promoted cognitive restructuring and increased physical activity and videotapes to facilitate structured exercise activities.	NR	Minimal intervention: Consultation at baseline and again at 16 weeks, with dietician (discussion of participant's anthropometric data and concepts of healthy weight and energy balance), who also provided publicly available print material that describe dietary and physical activity guidelines to promote weight loss and maintenance. In addition, specific sample meal plans and recommendations to increase physical activity were provided. At followup consultation, progress was reviewed and concepts and strategies were discussed. An energy intake level to achieve a weight loss of 10% over a 6 month period was prescribed involving a deficit of 500-1000 kcal/day.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Rock, 2015[288] (ENERGY)	IG1	Intervention began with an intensive phase that consisted of four months of weekly one hour group sessions facilitated by staff with backgrounds in dietetics, psychology, and/or exercise physiology; sessions tapered to every other week for 2 months. From six months onward, groups met monthly for the remainder of the year. Group program supported by personalized guidance delivered by phone and/or email to individualize feedback, goal-setting, planning, and follow-through for behavioral goals. Goal of dietary guidance was to promote a reduction in energy intake, aiming for a deficit of 500-1,000 kcal a day relative to expenditure. Physical activity goal was an average of at least 60 min/day of purposeful exercise at a moderate level of intensity. Goal was for each participant to have 14-16 (10-15 min) calls or messages in the first study year and a total of 24-38 calls or messages over 24 months. Tailored print newsletters were provided quarterly from 6-24 months. Content of intervention specifically tailored for breast cancer (BC) survivors (info specific to BC-related problems/symptoms) provided.	NR	Minimal intervention: Provided publicly available weight management resources & materials, individualized diet counseling at baseline & 6 months, PA recommendations. Also received monthly calls and/or emails from study coordinator and were invited to attend optional info seminars on aspects of healthy living bimonthly during first yr.
Rodriguez-Cristobal, 2017[329] (IMOAP)	IGB1	PCP visits every three months with advice on lifestyle changes, physical activity, hypocaloric diet (1,200-1,500 kcal), and anthropometric measurements. Participants received 60-minute nurse-delivered group motivational intervention session every 15 days, at the initial weeks 1-12 of the intervention, following LEARN (Lifestyle, Exercise, Attitudes, relationships and Nutrition) program and then monthly at weeks 13-32, following the instructions of the Weight Maintenance Survival Guide program. During weeks 1-4, the interventions raised awareness among the participants of the benefits of changing their habits with the intention of moving them from the "pre-contemplation" to the "contemplation" stage through exploring fears and doubts, providing strategies and tools to overcome past failures, and promoting desire to change. During sessions 5-12, participants were moved to the "determination" stage, which involved reinforcing motivation and positive behaviors, building support, and developing strategies. Sessions 13-32 addressed ongoing support and maintenance.	NR	Usual care: Participants had PCP visits every three months, which comprised advice on lifestyle changes, physical activity, hypocaloric diet containing 1,200-1,500 kcal, and anthropometric measurements.

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Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Rosas, 2015[290] (VAFO)	IG1	Case management intervention based on DPP and Heart to Heart trial tailored to local population. Intervention consisted of 12 group sessions (2 hours) and 4 individual (30 min) sessions in the intensive phase (12 months) followed by 3 group sessions and 1 individual session in the maintenance phase (months 13-24). Key intervention components included motivational interviewing, building self-management and goal setting skills, proving hands-on cooking and physical activity demonstrations, fostering self-efficacy, leveraging group-based social support, identifying community resource, and coordinating with primary care providers. Take-home items included pedometers, exercise CDs, and free weights. Individual sessions focused on individualized goal setting based on the patient's stage of behavior change, problem solving, medical and social service referrals.	Mean # group sessions attended: 12 (75.0%) of 16. 82% completed all 4 individual sessions.	Usual care: Routine primary care followup appointments with potential for referral to lifestyle counseling within a specialized diabetes clinic.
	IG2	Case management intervention based on DPP and Heart to Heart trial tailored to local population. Intervention consisted of 12 group sessions (2 hours) and 4 individual (30 min) sessions in the intensive phase (12 months) followed by 3 group sessions and 1 individual session in the maintenance phase (months 13-24). Key intervention components included motivational interviewing, building self-management and goal setting skills, proving hands-on cooking and physical activity demonstrations, fostering self-efficacy, leveraging group-based social support, identifying community resource, and coordinating with primary care providers. Take-home items included pedometers, exercise CDs, and free weights. Individual sessions focused on individualized goal setting based on the patient's stage of behavior change, problem solving, medical and social service referrals. Participants also received 5 community health worker (CHW) home visits in the intensive phase and 2 CHW visits in the maintenance phase. Visits were semi-structured to allow the CHW to facilitate behavioral changes relevant to participant and their household, family, and neighborhood.	Mean # group sessions attended: 10.5 (75.0%) of 16. 82% completed all 4 individual sessions.71% completed all 7 home visits.	Usual care: Routine primary care followup appointments with potential for referral to lifestyle counseling within a specialized diabetes clinic.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Ross, 2012[291] (PROACTIVE)	IG1	Health educators (HE) delivered individually tailored counseling using motivational interviewing. Phase 1 (1-6 months) (15 sessions): During first 6 weeks, participants attended 8 one-on-one hour-long sessions with a HE in which an exercise plan was designed to allow participants to gradually progress to ~45 mins of moderate daily PA. During subsequent 14 weeks, participants met w/the HE every 2 weeks for 60 min, reviewed participant's PA log, food diary, and behavioral goals and introduced the Mediterranean food pattern. Participants were expected to reach the 5% WC reduction goal by the end of this phase. Phase 2 (7-12 months) (6 sessions): Following 5% reduction of WC, participants entered the maintenance phase in which they were encouraged by HE to continue the program as per the fundamental principles (45-60 mins of PA/day and healthy eating patterns). Phase 3 (months 13-24) (12 sessions): Participants continued to meet with HE for 12 additional sessions (duration based on WC measurements and PA level) and maintenance issues were discussed. Those meeting study targets met w/the HE bimonthly for 30 min. Those not achieving goals saw the HE for 60 min sessions to continue to build PA and healthy eating behaviors into their routine.	73.5% of sessions attended (73.4% in men and 73.9% in women) and ranged from 0% (n=3) to 100% (n=35); 127 attended at least 90% of sessions	Usual care: Patients received advice from their physicians regarding lifestyle as a strategy for obesity reduction and continued to meet with their physician according to their usual schedule. Physicians were asked not to change their routine counseling approach.
Shapiro, 2012[293] (Text4Diet)	IG1	Participants received text messages (involving tips, facts, motivation, messages requesting answers to knowledge questions, or self-monitoring data on weight and steps) 4 times/day for 12 months. Texts included portion control pictures and weight/step graphical feedback over time. Participants were requested to report PA (step count) daily and weight weekly (via text or through study website), and were provided personalized feedback on progress including graphic displays of weight progress and a daily pedometer goal for the upcoming week. Daily pedometer calculated by averaging the daily steps from the previous week and adding 750 until they reached a daily average of 12,000 steps recommended for weight loss. After 12,000 steps were reached, the focus changed to encourage increased PA time or work at a faster pace, also relevant for weight loss. Participants also received weekly encouragement regarding their weight change beginning at month 3. Monthly e-newsletters with diet and PA information.	60% responded to knowledge-testing texts, 98% responded to query regarding pedometer steps and 88% responded to query about weight	Minimal intervention: Monthly e-newsletters w/diet and PA information.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Silva, 2009[295]	IG1	30 weekly/bi-monthly 120-min group sessions (groups of 25-30 participants) for approximately one year following the basic tenants of self-determination theory. Primary targets of the intervention included increasing PA, adopting a diet consistent with a moderate energy deficit (300-400 kcal/day), and establishing exercise and eating patterns that would support weight maintenance. Cognitive and behavioral aspects such as identify personal resistances, overcoming lapses, establishing adequate goals, and implementing self-monitoring were emphasized. Intervention sessions covered topics such as emotional and external eating, its detection and prevention, as well as improving body acceptance and body image. The main focus was on increasing competence and internal regulation toward exercise and weight control by providing participants with adequate structure and a range of options to choose from, supporting their autonomous decisions, and encouraging participants to explore their own motivations for treatment and define the personal goals. Each participant received a workbook to complement the face-to-face intervention.	79% attended >80% sessions	Attention control: Control participants received 29 group sessions over 1 year on a general health curriculum based on several 3-6 week long education topics (nutrition, stress management, self-care, communication skills). Followed by a one year follow up with no intervention.
Stevens, 1993[300] (TOHP I)	IG1	Participants attended an individual counseling session followed by 14 weekly 90 minute group sessions (intensive phase) followed by monthly group meetings (extended intervention). Sessions presented information basic nutrition, social eating, self-management techniques, exercise demonstrations, supervised exercise, and relapse prevention. Participants reviewed progress and made plans for the next week. During the extended intervention participants had the option of monthly group sessions, group weigh-in session, individual weigh-in sessions, and individual counseling sessions according to individual needs. Food diaries were kept for the first 14 weeks and reviewed by nutrition staff who provided comments. Participants were asked to make a moderate reduction in total energy intake with the goal of achieving gradual weight loss not to exceed 0.9 kg (2 lb.) a week with intake to not to fall below 1200 kcal. After reaching weight loss goal they were asked to adjust intake to maintain weight. Participants were encouraged maintain a graph of weight change from baseline and record daily exercise time as a bar graph. Participants were encouraged to increase activity, principally through walking at least 20 minutes 3 times per week. As intervention progressed, they were asked to adopt moderate exercise of 4 to 5 days per week between 30-45 minutes with an intensity of 40-55% of heart rate reserve.	>90% attendance if include make up meetings; down to 40% attendance of regular meetings by end of study	Usual care: Control group received usual care. They were weighed at BL, 3, 6, 12, and 18 months.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Stevens, 2001[301] (TOHP II)	IG1	Four main phases of the intervention beginning with a preintensive phase consisting of one individual counseling session. The intensive phase followed with 14 weekly group meetings led by dietitians or health educators focused on core knowledge and skills for weight loss. After this 14-week intensive phase, the transitional phase consisted of participants attending six biweekly group meetings and then monthly group meetings. Beginning in the 18th month, participants were offered optional individual counseling sessions and special group sessions focused on selected weight loss topics. Program covered issues including behavioral self-management, nutrition education, information on PA, social support, self-monitoring (food diaries and graphs of PA), goal-setting with action plans, strategies for situations that trigger problem eating. Dietary intervention focused on reducing caloric intake by decreasing consumption of excess fat, sugar, and alcohol and included daily food diaries. Physical activity goal was to gradually increase moderate intensity activity to 30-45 min per day, four to five days per week.	81% of participants attended at least half of sessions during first 6 months and 64% attended at least 80% of sessions; median number of sessions in 1st 6 months was 12; between 6 and 18 months, median number of sessions was 11 (1/2 of expected rate); between 18-36 months, median number of sessions was 7.5.	Usual care: Not described

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Svetkey, 2015[302] (CITY)	IG1	Participants attended series of 6 weekly 2 hour group sessions followed by monthly 1:1 coaching calls from an interventionist for the remainder of 24 months. Targeted goals and behaviors included moderate calorie restriction, healthy dietary pattern (based on Dietary Approaches to Stop Hypertension [DASH] dietary pattern), ≥180 min/week of moderate PA, limited alcohol intake, and frequent self-monitoring of weight, diet, and PA. Outline of group sessions included: progress check, lifestyle behavior discussions, setting a personal goal and action planning around achieving the goal. Monthly 20 min. calls were driven by participants' specific needs and progress. Participants were encouraged to perform self-monitoring through apps provided on study-provided cell phone.	Use of at least 1 commercially available weight loss app during study: 50.0% for IG1 For n=113 (94% of participants in IG1 @ 12 months): Self-weighing, mean times/week (SD): 1.3 (1.4) # interactions w/CITY app, mean person/day (SD): 0.8 (1.1) % contacts completed (SD): 92.3 (0.8) For n=108 (90% of participants in IG1 @ 24 months): Self-weighing, mean times/week (SD): 1.0 (1.2) # interactions w/CITY app, mean person/day (SD): 0.4 (0.6) % contacts completed (SD): 87.8 (21.2)	Waitlist: Participants were given health education materials at the time of randomization. After 24 months, CG offered a delayed intervention consisting of 6 weekly group sessions.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
	IG2	Participants received a smart phone, which was used for intervention delivery and self-monitoring. Intervention delivered using an investigator-designed smartphone app, which included goal setting, challenge games, and social support through a "buddy system" that allowed exchange of pre-determined messages to a randomly assigned buddy participant. Targeted goals and behaviors included moderate calorie restriction, healthy dietary pattern (based on Dietary Approaches to Stop Hypertension [DASH] dietary pattern), ≥180 min/week of moderate PA, limited alcohol intake, and frequent self-monitoring of weight, diet, and PA. Self-management behaviors were regularly and frequently prompted by the app according to a protocol-driven schedule. Tailoring occurred mainly via setting personal goals. Self-monitoring was achieved by using smartphone to track weight, dietary intake, and PA with frequent prompts to self-monitor and feedback on the results.	Use of at least 1 commercially available weight loss app during study: 30.0% for IG2 For n=115 (94% of participants in IG2 @ 12 months): Self-weighing, mean times/week (SD): 3.3 (1.9) # interactions w/CITY app, mean person/day (SD): 1.5 (1.4) For n=105 (86% of participants in IG2 @ 24 months): Self-weighing, mean times/week (SD): 2.1 (1.7) # interactions w/CITY app, mean person/day (SD): 0.7 (0.7)	Waitlist: Participants were given health education materials at the time of randomization. After 24 months, CG offered a delayed intervention consisting of 6 weekly group sessions.
Thomas, 2017[322]	IGB1	Participants received 12 months of access to Weight Watchers Online (WWO) at no cost and were instructed to access WWO via their PCs, but could access resources for racking daily food intake and physical activity (PA), and weekly tracking of body weight via a mobile application for smartphones and tablets. The WWO program used the PointsPlus dietary plan and tracking system and the activity PointsPlus PA tracking system, both aimed at fostering a healthy diet, increased PA, and gradual weight loss. Participants recorded their food and beverage consumption using this system, which assigned a PointsPlus value to each item. Upon first accessing the WWO system, participants entered their weight, height, and PA level (sedentary to very active). This information was used to set an individualized daily PointsPlus dietary goal. By recording PA, participants could accrue activity PointsPlus values to spend on food. Participants also received an ActiveLink PA tracking device, a thumb-sized device containing an accelerometer that can be worn on the waist, chest, or wrist, and in combination with accompanying software, monitors PA. The ActiveLink could be connected to a PC to upload data to the WWO platform, which	Engagement (0=never; 1=1-3 times per month; 2=once per week; 3=several days per week; 4=daily; 5=multiple times per day): Tracking diet using a PC: 1.1 (0.7-1.4) Tracking diet using mobile app: 0.5 (0.3-0.8) Tracking exercise using a PC: 1.2 (0.9-1.5) Tracking exercise using the mobile app: 0.3 (0.1-0.5)	Minimal intervention: Participants received weekly online newsletters for three months, then monthly for six months. The newsletters contained general education information on the benefits of losing weight and healthy eating and physical activity habits.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
		converted estimates of PA into activity PointsPlus values. The ActiveLink software also provided participants with PA goals based on their current PA level and encouraging messages as they monitored their progress toward goals.	Tracking weight using a PC: 0.9 (0.6-1.1) Tracking weight using the mobile app: 0.4 (0.2-0.7) Getting information on changing diet: 0.8 (0.6-1.1) Getting information on changing exercise: 0.8 (0.6-1.0) Getting information on changing other behaviors: 0.8 (0.6-1.1) Wearing the ActiveLink device: 2.3 (1.8-2.7) Accessing ActiveLink resources on Web: 1.4 (1.1-1.8)	
	IGB2	Participants received 12 months of access to Weight Watchers Online (WWO) at no cost and were instructed to access WWO via their PCs, but could access resources for racking daily food intake and physical activity (PA), and weekly tracking of body weight via a mobile application for smartphones and tablets. The WWO program used the PointsPlus dietary plan and tracking system and the activity PointsPlus PA tracking system, both aimed at fostering a healthy diet, increased PA, and gradual weight loss. Participants recorded their food and beverage consumption using this system, which assigned a PointsPlus value to each item. Upon first accessing the WWO system, participants entered their weight, height, and PA level (sedentary to very active). This information was used to set an individualized daily PointsPlus dietary goal. By recording PA, participants could accrue activity PointsPlus values to spend on food.	Engagement (0=never; 1=1-3 times per month; 2=once per week; 3=several days per week; 4=daily; 5=multiple times per day): Tracking diet using a PC: 0.8 (0.5-1.2) Tracking diet using mobile app: 0.5 (0.3-0.8) Tracking exercise using a PC: 0.5 (0.2-0.8) Tracking exercise using the mobile app: 0.4 (0.2-0.7) Tracking weight using a PC: 0.6 (0.4-0.9) Tracking weight using the mobile app: 0.4 (0.2-0.6)	Minimal intervention: Participants received weekly online newsletters for three months, then monthly for six months. The newsletters contained general education information on the benefits of losing weight and healthy eating and physical activity habits.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
			Getting information on changing diet: 0.5 (0.2-0.7) Getting information on changing exercise: 0.5 (0.3-0.8) Getting information on changing other behaviors: 0.5 (0.3-0.8)	
Tsai, 2010[305]	IG1	Quarterly PCP visits (weight management was ~2-3 min) and 1-2 pg. handouts developed by the Weight-Control Information Network or the National Institutes of Health) (provided to both IG and CG). They also received a calorie counter, a pedometer, and sample meal plan. Participants received a series of 8 brief (15-20 min) individual sessions w/MA @ weeks 0, 2, 4, 8, 12, 16, 20, and 24 in which DPP materials were used. Participants instructed to restrict dietary intake (1,200-1,500 kcal/day if <250 lb. or 1,800 kcal/day if ≥250 lb.), keep daily records of intake, and to gradually increase PA to 175 min/week. Patients were weighed at each visit and food and PA records were reviewed.	Mean (SD) attendance for MA visits: 5.9 (0.5) & 50% of patients attended all 8 visits	Minimal intervention: Four quarterly PCP visits (2-3 mins on weight management) and 1-2 pg. handouts developed by the Weight-Control Information Network or the National Institutes of Health). They also received a calorie counter, a pedometer, and sample meal plan. PCPs instructed to encourage participants to lose weight using the materials provided, but did not offer specific behavioral strategies for weight management

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Tuomilehto, 2001[306] (Finnish DPS)	IG1	Seven 30-60-min face-to-face individual counseling sessions with the study nutritionist at weeks 0, 1–2, and 5–6 and at months 3, 4, 6, and 9 during the first year and every 3 months thereafter for 1-6 years (median intervention duration = 4 years). Participants were given detailed advice about how to achieve the intervention goals of a weight loss of >5%, total fat intake of <30% of energy, saturated fat intake of <10% energy, fiber intake of 15 g/1000 kcal, and moderate exercise for >30 min/day. The dietary advice was based on 3-day food records that were completed four times a year. The seven sessions in the first year had a preplanned topic (e.g., diabetes risk factors, saturated fat, fiber, physical activity, and problem solving), but the discussions were individualized, focusing on specific individual problems. Printed material was used to illustrate the message and to serve as a reminder at home. Endurance exercise was recommended to increase aerobic capacity and cardiorespiratory fitness. Supervised, progressive, individually tailored circuit-type moderate intensity resistance training sessions to improve the functional capacity and strength of the large muscle groups of the upper and lower body were also offered free of charge two times a week. In addition, there were optional group sessions, expert lectures, low-fat cooking lessons, visits to local supermarkets, and between-visit phone calls and letters. Subjects were encouraged to make intermediate goals for themselves by thinking about practical things they could try to change. (e.g., instead of an abstract goal such as “increase fiber intake,” a practical goal would be “eat a slice of rye bread on every meal”). Weight was measured at every visit, and a weight chart was drawn. The participants were also encouraged to measure and record their weight at home on a regular basis. After 6 months, the use of a very-low-calorie diet for 2-5 weeks or as a substitute for one to two meals per day was considered, if preferred by the participant, to boost weight loss (48 participants took part in this option).	During 1st year, rate of participation in supervised exercise sessions varied from 50% to 85%. Median number of sessions over the course of the intervention was 20.48 participants chose to engage in a 2-5 week very low calorie diet phase to boost weight reduction.	Minimal intervention: At baseline and annual followup visits, general oral and written information about diet and exercise (2-page leaflet). One 30-60 min nontailored or group session at BL and annual visits with general information about reducing weight, increasing PA, and improving diet. Visit also included print materials & completion of a 3 day food diary, which illustrated food portion sizes.
van Wier, 2011[308] (ALIFE@WORK)	IG1	Received self-help brochures about overweight, diet, PA and had access to a lifestyle web-based intervention program consisting of 10 modules. Modules, accessible through interactive and personalized study website, provided info on nutrition and PA and explained behavior modification strategies (self-monitoring, goal-setting). Upon completion of each module, participants contacted by their personal counselor (2 dietitians & 2 PA scientists) by e-mail. Program emphasized sustainable lifestyle changes rather than WL. No diet or exercise prescription was given, but participants were asked to set their own behavioral goals toward the Dutch dietary and PA guidelines.	Median (IQR) sessions attended: 3 (0-8). 18% attended all web-based sessions. 43% attended 2-8 web-based sessions. 13% attended only 1 web-based session.	Minimal intervention: Received self-help brochures about WL, diet, PA

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
	IG2	Received self-help brochures about overweight, diet, PA and had access to a lifestyle intervention program consisting of 10 modules. Modules, accessible through a workbook, provided info on nutrition and PA and explained behavior modification strategies (self-monitoring, goal-setting). Upon completion of each module, participants contacted by their personal counselor (2 dietitians & 2 PA scientists) by phone. Program emphasized sustainable lifestyle changes rather than WL. No diet or exercise prescription was given, but participants were asked to set their own behavioral goals toward the Dutch dietary and PA guidelines.	Median (IQR) phone sessions attended: 4 (1 to 10). 34% attended all phone sessions.	Minimal intervention: Received self-help brochures about WL, diet, PA
von Gruenigen, 2012[310] (SUCCEED)	IG1	Participants attended 16 1-hour group sessions over six months (10 weekly followed by 6 biweekly) in which PA, nutrition, and improving diet quality and behavior modification were discussed. Participants were weighed in private at beginning of each session and weekly food/PA records were reviewed. Intervention followed a step-wise, phased approach with short-term goals. Nutritional component included improving diet quality by increasing fruits, vegetables, lean protein, whole grains, and low fat diary intake, while reducing saturated fat, simple carbohydrates and low nutrient-high calorie foods. Additional topics addressed were grocery shopping, portion sizes, meal planning, food labels, and social eating. Focus was on lifestyle changes rather than caloric restriction. At first session, RD provided individualized weight loss goals. PA goals were 150 min/week for months 1-2, 225 min/week for months 3-4, and 300 min/week for months 5-6. Participants provided w/pedometers, 3 lb. hand and adjustable ankle weights, and heart rate monitors. Individual counseling w/PCP occurred @ months 3, 6, and 9 with the purpose of augmenting group sessions & providing individualized counseling. After 6 months, registered dietitian provided additional feedback/support via newsletters, phone, and email regarding dietary & PA suggestions.	31 (75.6%) attended 14 or more of the 16 sessions; mean adherence was 84.1%	Usual care: Received informational brochure on healthy eating & PA and PCP visits regarding general health concerns, review of meds and comorbidities.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Wadden, 2011[206] (POWER-UP)	IG1	Participants whose weight was less than 113.4 kg were prescribed a balanced diet of 1200 to 1500 kcal per day (1500 to 1800 kcal per day for participants who weight 113.4 or more), which consisted of approximately 15 to 20% kcal from protein, 20 to 35% kcal from fat, and the remainder from carbohydrate. All participants instructed to gradually increase their PA to 180 min/week and were given a pedometer, a calorie-counting book, and handouts from Aim for a Healthy Weight. Attended quarterly 10-15 min PCP visits, at which they reviewed their health status and were provided handouts from Aim for a Healthy Weight. In addition, participants attended monthly visits with a medical assistant (referred to as lifestyle coach [LC]), who delivered abbreviated DPP treatment. Participants attended 14 LC visits in year 1, followed by 12 LC visits in year 2. During month 1, this included 2 counseling visits to learn how record food and calorie intake in diaries provided. Visits began with a weigh-in and then a review of food intake, PA and other goals prescribed in monthly handouts. In year 2, they were permitted, every other month, to complete counseling visits by telephone (although <5% of visits were made by telephone).	Attended mean (SE) 69.0% (29.1) of 8 scheduled PCP visits and 56.1% (28.8) of 25 coaching visits	Usual care: 8 quarterly 5-7 min PCP visits to review participant's weight change and to discuss information in the “Aim for a Healthy Weight” handouts. Same dietary and PA goals as IG.
Whelton, 1998[326] (TONE)	IGB1	Participants received either weight loss intervention (n=147) or weight loss intervention plus sodium reduction (n=147). The TONE interventions consisted of three phases (intensive, extended, and maintenance). During the 4-month intensive phase, individuals met weekly (16 sessions total) with their interventionist counselor; three group and one individual sessions took place each month. Over the following three months, participants met in biweekly group sessions as part of the extended phase. During the maintenance phase, participants met monthly in group sessions (2 sets of three group sessions), followed by biweekly contacts (combination of group, individual, telephone, mail) and special tailoring if necessary. Participants were provided with information and motivation around calorie control, the basics of a sound diet, how to increase activity, exercise precautions, self-efficacy and commitment to the trial, self-monitoring of calories, eating behaviors and pulse rate, management of eating behaviors and situations, relapse prevention, hands-on food preparation and group exercise, overcoming barriers, food and PA records with feedback. Participants in the weight loss plus sodium reduction group received the same weight loss intervention, as well as information on low-sodium food patterns, self-monitoring of sodium patterns, and tasting and preparing low sodium foods. Participants had a goal of achieving and maintaining a 24-hour dietary intake of ≤80 mmol.	NR	Minimal intervention: Participants received either usual care (n=147) or sodium reduction (n=144). Usual care participants received no study-related counseling in lifestyle change techniques, but were invited to meetings on topics unrelated to the goals of the trial. The sodium reduction intervention consisted of three phases (intensive, extended, and maintenance). During the 4-month intensive phase, individuals met weekly with their interventionist counselor; three group and one individual sessions took place each month. Over the followin three months, participants met in biweekly group sessions as part of the extended phase. During the maintenance phase, participants met monthly in group sessions. The sessions covered low-sodium food patterns; the basics of a sound diet; self-efficacy; self-monitoring of sodium intake; eating

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
				behaviors; management of eating behaviors and situations; relapse prevention; and assistance in overcoming barriers to adherence.
Wing, 1998[314]	IG1	Attended weekly group meetings for the first 6 months and biweekly for subsequent 6 months, focused on behavioral strategies to modify dietary intake and exercise behavior. Two 6-week refresher courses were held during year 2. Group meeting focused on behavioral strategies to help modify intake and nutrition information related to a low-calorie, low-fat regimen. Participants asked to follow 800-1,000 kcal/day diet with 20% of calories from fat for weeks 1-8; the diet was gradually made more flexible over the course of the program, with calorie goals adjusted to 1,200-1,500 kcal/day at week 16. Participants provided w/meal plans and shopping lists and encouraged to self-monitor daily intake for 6 months and periodically thereafter. Self-monitoring diaries were reviewed weekly by nutritionist and individualized feedback was provided. For PA meetings, lectures on topics related to changing exercise behavior were provided and participants took a 50- to 60-min walk w/therapist. During weeks 1-10, a second supervised walk session was available weekly. Participants encouraged to gradually increase PA to 1,500 kcal/week and then biweekly incremental increases of 250 kcal/week, based on self-reported PA levels.	Attended 29.0% of sessions and 29.0% of refresher (year 2) sessions	Minimal intervention: Provided with a self-help behavioral manual (info on dietary, PA, and behavioral strategies for weight control) and were encouraged to lose weight and exercise on their own.
	IG2	Attended weekly group meetings for the first 6 months and biweekly for subsequent 6 months, focused on behavioral strategies to modify dietary intake. Two 6-week refresher courses were held during year 2. Group meeting focused on behavioral strategies to help modify intake and nutrition information related to a low-calorie, low-fat regimen. Participants asked to follow 800-1,000 kcal/day diet with 20% of calories from fat for weeks 1-8; the diet was gradually made more flexible over the course of the program, with calorie goals adjusted to 1,200-1,500 kcal/day at week 16. Participants provided w/meal plans and shopping lists and encouraged to self-monitor daily intake for 6 months and periodically thereafter. Self-monitoring diaries were reviewed weekly by nutritionist and individualized feedback was provided.	Attended 37.0% of sessions and 36.0% of refresher (year 2) sessions	Minimal intervention: Provided with a self-help behavioral manual (info on dietary, PA, and behavioral strategies for weight control) and were encouraged to lose weight and exercise on their own.

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
	IG3	Attended weekly group meetings for the first 6 months and biweekly for subsequent 6 months, focused on behavioral strategies to modify physical activity. Two 6-week refresher courses were held during year 2. Group lectures related to on topics related to changing exercise behavior and participants took a 50- to 60-min walk w/therapist. During weeks 1-10, a second supervised walk session was available weekly. Participants encouraged to gradually increase PA to 1,500 kcal/week and then biweekly incremental increases of 250 kcal/week, based on self-reported PA levels.	Attended 16.0% of sessions and 15.0% of refresher (year 2) sessions	Minimal intervention: Provided with a self-help behavioral manual (info on dietary, PA, and behavioral strategies for weight control) and were encouraged to lose weight and exercise on their own.
Wylie-Rosett, 2001[315]	IG1	Intervention utilized a cognitive behavioral approach for tailoring goals. Participants received a workbook and were provided access to a computer program written to guide them through the workbook and tailored behavioral goals based on prior computer use and their responses to questions in the baseline questionnaires. The program addressed nutrition, fitness, and psychobehavioral content. For each content area, participants could access info and guidance regarding weight loss (via text, animation, graphics, interactive quizzes, and video clips). It program used an algorithm to rate participants' scores for target behaviors and tailor recommendations based on stages of change. At the end of each session, the program promoted participants to continue with/modify their weight loss goals before next program session in which those goals would be evaluated. Participants were instructed to log on weekly for the first 3 months and monthly thereafter. Staff consultation was also provided, in the form of 6 closed-group sessions and ≤18 phone/face-to-face consultations w/a registered dietitian, which served to reinforce program content.	67.0% completed ≥50% of workbook activities	Minimal intervention: Received workbook as a standalone (do-it-yourself) program with self-help sheets
	IG2	Intervention utilized a cognitive behavioral approach for tailoring goals. Participants received a workbook and were provided access to a computer program written to guide them through the workbook and tailor behavioral goals based on prior computer use and their responses to questions in the baseline questionnaires. The program addressed nutrition, fitness, and psychobehavioral content. For each content area, participants could access info and guidance regarding weight loss (via text, animation, graphics, interactive quizzes, and video clips). It program used an algorithm to rate participants' scores for target behaviors and tailor recommendations based on TTM. At the end of each session, the program promoted participants to continue with/modify their weight loss goals before next program session in which those goals would be evaluated. Participants were instructed to log on weekly for the first 3 months and monthly thereafter.	36.1% completed ≥50% of workbook activities	Minimal intervention: Received workbook as a standalone (do-it-yourself) program with self-help sheets

Appendix F Table 1. Detailed Intervention Characteristics for Behavior-Based Weight Loss

Author, Year (Study Name)	Arm	Detailed description	Adherence	CG
Yeh, 2016[316]	IG1	DPP curriculum adapted for Chinese participants. Modifications from DPP included reorganizing the 16-session core curriculum, including more information about Asian diabetes risk disparity, following each session with a physical activity session (e.g., walking group or tai chi), inviting family members to attend sessions, providing measuring cups, as well as culturally and linguistically tailoring. Intervention consisted of 12 biweekly core sessions for the first 6 months and 6 monthly followup sessions. Sessions were conducted in Mandarin or Cantonese by trained lifestyle coaches. Each session lasted 90-120-min.	Overall attendance for 6-month core sessions: 89.2% (NR if this is average percent of sessions or average persons attended) and 55.8% percent at 6-monthly post-core sessions	Minimal intervention: Quarterly mailings of diabetes prevention information

* Study included only for analysis of potential harms

Abbreviations: 10TT = Ten Top Tips; ADAPT = Activity, Diet and Blood Pressure Trial; CAMWEL = Camden Weight Loss; CG = control group; CHARMS = Community Health and Risk-reduction for Metabolic Syndrome; CITY = Cell Phone Intervention for You; DAMES = Daughters And Mothers Against Breast Cancer; DEPLOY = Diabetes Education & Prevention with a Lifestyle Intervention offered at the YMCA; DPP = Diabetes Prevention Program; DPS = Diabetes Prevention Study; EDIPS = European Diabetes Prevention Study; EHR = electronic health record; E-LITE = Evaluation of Lifestyle Interventions to Treat Elevated Cardiometabolic Risk in Primary Care; ENERGY = Exercise and Nutrition to Enhance Recovery and Good Health for You; FFIT = Football Fans in Training; HEED = Project Help Educate to Eliminate Diabetes; HELP PD = Healthy Partnerships to Prevent Diabetes; HOT = Hypertension Optimal Treatment; IG = intervention group; IMOAP = Group motivational intervention in overweight/obese patients in primary prevention of cardiovascular disease in the primary healthcare area; IQR = interquartile range; LLDPP = Lawrence Latino Diabetes Prevention Project; MA = medical assistant; min = minute(s); NHLBI = National Heart, Lung, and Blood Institute; NHS = National Health Service (UK); NR = not reported; OR = odds ratio; ORBIT = Obesity Reduction Black Intervention; PA = physical activity; PCP = primary care provider; PODOSA = Prevention of Diabetes and Obesity in South Asians; POWER = Practice Based Opportunities for Weight Reduction; POWER-UP = Practice-based Opportunities for Weight Reduction at the University of Pennsylvania; PREDIAS = Prevention of Diabetes Self-Management Program; PREVENT-DM = The Promotora Effectiveness Versus Metformin Trial; PROACTIVE = Prevention and Reduction of Obesity through Active Learning; PROOF = Prevention of Knee Osteoarthritis in Overweight Females; RAPID-YDPP = Reaching Out to Prevent Increases in Diabetes - YMCA model for Diabetes Prevention Program; REACH = Reasonable Eating and Activity to Change Health; SCOP = Saku Control Obesity Program; SD = standard deviation; SE = standard error; SHED-IT = Self-Help, Exercise, and Diet using Information Technology; SLIM = Study on lifestyle-intervention and impaired glucose tolerance Maastricht; SMART = Social Mobile Approaches to Reduce weighT; SUCCEED = Survivors of Uterine Cancer Empowered by Exercise and Healthy Diet; TOHP = Trials of Hypertension Prevention Phase; TONE = Group motivational intervention in overweight/obese patients in primary prevention of cardiovascular disease in the primary healthcare area; UK = United Kingdom; VAFO = Vivamos Activos Fair Oaks; WC = waist circumference; WL = weight loss; WOMAN = Women on the Move through Activity and Nutrition; WRAP = Weight-loss programme referrals for adults in primary care

Appendix F Table 2. Intervention Details for Behavior-Based Weight Loss Maintenance Trials

Author, Year (Study Name)	Arm	Weight Loss Intervention (all arms)	Maintenance Intervention	Adherence	Control
Cussler, 2008[233] (HW4L)	IG1	Intervention: Weekly group meetings over 4 months with the intervention team in 6 groups of about 26 participants/group for 150 min/session. Participants were encouraged to produce small but lasting changes in eating and physical activity patterns, leading to a moderate daily energy deficit (–1260–2090 kJ/d (300–500 kcal/d)). A weight loss of ~0.5 kg a week was targeted and individualized goals for energy intake (EI) and expenditure were provided to all participants. Weight was monitored weekly. The intervention comprised four components of behavioral change: physical activity, nutrition and healthy eating, social support, and the mind/body connection. Required WL to enter MN: None	Maintenance portion included two 2-hour training sessions on how to navigate & track data for the website, which hosted communication tools, progress monitoring tools (body weight, PA, dietary intake, "mind-body" logs), curriculum materials, dietary and PA information, links to other websites of interest. Participants entered their data in four Internet logs: weight, physical activity, dietary intake, and "your week" (open-ended comments on and reactions to one's weight maintenance experience). Participants organized and ran support groups & these groups were encouraged to meet once per week.	71.2-100% of participant logged into different parts of website; 32.7% contacted each other at least once a week; articles were accessed by 78.8% of participants at least once a week	No intervention: No further contact with study staff except for testing after the 4-month weight loss program, but were permitted to continue to meet with their group and practice the learned principles.
Pekkarinen, 2015[282]	IG1	Intervention: During the first week patients ate normally and kept a diary. Patients used VLCDD during study weeks 2-11, followed by a 2 week refeeding phase. Patients had weekly sessions during 17 week weight loss phase based on LEARN (1.5 hours), which included goal-setting, portion education, and relapse prevention. Participants were advised to use a pedometer. Towards the end, focus was set on the importance of continuous self-monitoring. Required WL to enter MN: None	The 12 month maintenance phase involved 1.5 hour monthly sessions comprising of 1-2 themes (dietary choices/intake, social support, goal-setting, problem-solving, self-confidence, and PA) and including two supervised PA sessions led by physiotherapist.	The 68 subjects who participated in the maintenance phase attended a mean 6.4 (SD 3.3) of the 12 sessions.	No intervention: No intervention during maintenance

Appendix F Table 2. Intervention Details for Behavior-Based Weight Loss Maintenance Trials

Author, Year (Study Name)	Arm	Weight Loss Intervention (all arms)	Maintenance Intervention	Adherence	Control
Perri, 1988[284]	IG1	Intervention: 20-week intervention focused on weight loss consisting of twenty 2-hour weekly group sessions. The weight loss portion of the intervention included counseling focused on self-control for weight loss and goals and supervised exercise sessions to increase physical activity to 80 minutes per week. Required WL to enter MN: None	After the 20 week weight loss phase, the maintenance program consisted of 26 biweekly group counseling sessions with a therapist (length of sessions NR). Counseling sessions consisted of weigh-ins, reviews of self-monitoring data, and therapist-led problem solving of difficulties in maintaining habit changes. In addition, this group received a social influence program and a physical activity maintenance program. The social influence program included monetary group contingencies for program adherence and continued weight loss, active client participation in preparing and delivering lectures on maintaining weight loss, and instructions on how to provide peer support for weight loss through ongoing telephone contacts and peer group meetings. The physical activity maintenance program consisted of a new set of exercise goals for the posttreatment period and supervised exercise sessions during the biweekly treatment sessions. The prescribed dose of physical activity increased from 80 minutes per week (4x20 min sessions) to 180 minutes per week (6x30 min sessions).	Across all 4 intervention groups, participants attended 66.8% of 26 scheduled sessions (M=17.38, SD=6.84); IG3 attended significantly greater number of maintenance sessions than IG2 (21.05 and 14.83, respectively: p<0.05)	No intervention: No intervention during maintenance
	IG2		After the 20 week weight loss phase, the maintenance program consisted of 26 biweekly group counseling sessions with a therapist (length of sessions NR). Counseling sessions consisted of weigh-ins, reviews of self-monitoring data, and therapist-led problem solving of difficulties in maintaining habit changes. In addition, this group received a physical activity maintenance program consisting of a new set of exercise goals for the posttreatment period and supervised exercise sessions during the biweekly treatment sessions. The prescribed dose of physical activity increased from 80 minutes per week (4x20 min sessions) to 180 minutes per week (6x30 min sessions).	Across all 4 intervention groups, participants attended 66.8% of 26 scheduled sessions (M=17.38, SD=6.84); IG3 attended significantly greater number of maintenance sessions than IG2 (21.05 and 14.83, respectively: p<0.05)	

Appendix F Table 2. Intervention Details for Behavior-Based Weight Loss Maintenance Trials

Author, Year (Study Name)	Arm	Weight Loss Intervention (all arms)	Maintenance Intervention	Adherence	Control
	IG3		After the 20 week weight loss phase, the maintenance program consisted of 26 biweekly group counseling sessions with a therapist (length of sessions NR). Counseling sessions consisted of weigh-ins, reviews of self-monitoring data, and therapist-led problem solving of difficulties in maintaining habit changes. In addition, this group received a social influence program including monetary group contingencies for program adherence and continued weight loss, active client participation in preparing and delivering lectures on maintaining weight loss, and instructions on how to provide peer support for weight loss through ongoing telephone contacts and peer group meetings.	Across all 4 intervention groups, participants attended 66.8% of 26 scheduled sessions (M=17.38, SD=6.84); IG3 attended significantly greater number of maintenance sessions than IG2 (21.05 and 14.83, respectively: p<0.05)	
	IG4		After the 20 week weight loss phase, the maintenance program consisted of 26 biweekly group counseling sessions with a therapist (length of sessions NR). Counseling sessions consisted of weigh-ins, reviews of self-monitoring data, and therapist-led problem solving of difficulties in maintaining habit changes. Participants were asked to maintain their physical activity levels at 80 minutes per week.	Across all 4 intervention groups, participants attended 66.8% of 26 scheduled sessions (M=17.38, SD=6.84); IG3 attended significantly greater number of maintenance sessions than IG2 (21.05 and 14.83, respectively: p<0.05)	

Appendix F Table 2. Intervention Details for Behavior-Based Weight Loss Maintenance Trials

Author, Year (Study Name)	Arm	Weight Loss Intervention (all arms)	Maintenance Intervention	Adherence	Control
Sherwood, 2013[294] (Keep It Off)	IG1	Intervention: None. Required WL to enter MN: ≥ 10% WL in past year	Maintenance phase 1: 10 biweekly 20 min phone coaching sessions focusing on developing key behaviors and skills necessary for WLM, including helping participants appreciate the benefits of their achieved weight loss. Subsequently frequency of calls reduced to monthly and bimonthly 15 min. calls. Participants worked through Keep It Off coursebook in the phone coaching calls with a coach and were provided with logbooks where weekly weight was reported for the duration of the study. Participants encouraged to self-monitor energy intake, weight, and to work toward 60-90 mins of PA most days of the week. Maintenance phase 2: 8 monthly and 6 bimonthly calls, weekly reporting of weight, and bimonthly weight graphs and tailored letters beginning at month 8. As calls decreased in frequency, the intervention built on the Relapse Prevention model in which participants submitted weekly weights to their phone coach and received bimonthly tailored feedback reports based on whether they were maintaining, losing or gaining weight. Small incentives provided with brief letters tailored to patient weight status. Participants who gained weight received additional outreach calls to problem solve regarding weight gain reversal strategies.	Core 10 Sessions n (%): 10: 176 (85.2%) 1-9: 28 (13.4%) 0: 3 (1.4%) Monthly Sessions n (%): 8: 162 (77.5%) 4-7: 11 (5.3%) 0: 31 (14.8%) Bimonthly Sessions n (%): >5: 123 (58.8%) 1-4: 38 (18.2%) 0: 48 (23.0%)	Minimal intervention: 2-session phone course (~20 minutes each) to teach participants about WLM strategies. Participants also received coursebook and logbook.

Appendix F Table 2. Intervention Details for Behavior-Based Weight Loss Maintenance Trials

Author, Year (Study Name)	Arm	Weight Loss Intervention (all arms)	Maintenance Intervention	Adherence	Control
Simpson, 2015[296] (WILMA)	IG1	Intervention: None Required WL to enter MN: ≥ 5% WL in past year	Six 1-hour individually tailored motivational interviewing sessions during the first 3 months followed by 9 20-min telephone sessions during the remaining 9 months. Motivational interviewing content included topics comprised of self-monitoring, goal-setting and implementation intentions, habits, emotional eating and coping with relapse, diet, PA, barriers to maintenance, social support, and self-efficacy. Diet and physical activity were discussed in the MI sessions in line with current government guidance. Participants were encouraged to reflect on their values, goals and current behavior and to develop their own goals and techniques for implementing and maintaining behaviors. Participants in the intervention groups were encouraged by researchers at their baseline assessments to self-monitor by weighing themselves weekly and MIPs encouraged the concept of self-monitoring generally. Participants were able to record all self-monitoring activity, including diet, physical activity, other markers of successful maintenance (e.g. clothes fitting better), goals set at sessions and implementation intentions, in a diary provided by the study team (paper-based and brief online version); however, completion was optional. Diaries provided to participants were intended for their personal use only and were not collected by the study team for outcome assessment. However, participants were asked to record their weekly weight and send this information to the study team via the study website or by text, e-mail or telephone. MIPs kept a written record of each face-to-face and telephone session (including goal-setting and implementation intentions) using the appropriate case report form (CRF) and this information was collected by the study team. MIPs also completed a brief written summary of the session for the participant to take away.	83.3% (95% CI [70.0 - 92.0]) attended at least 5 of 6 face to face sessions. 80.4% received at least 1 phone call. 19.6% received all 9 phone calls.	Usual care: Usual care plus pamphlet advising on healthy eating and lifestyle.

Appendix F Table 2. Intervention Details for Behavior-Based Weight Loss Maintenance Trials

Author, Year (Study Name)	Arm	Weight Loss Intervention (all arms)	Maintenance Intervention	Adherence	Control
	IG2		Two 1-hour individually tailored motivational interviewing sessions spaced two weeks apart followed by two 20-min telephone sessions at 6 and 12 months. Motivational interviewing content included topics comprised of self-monitoring, goal-setting and implementation intentions, habits, emotional eating and coping with relapse, diet, PA, barriers to maintenance, social support, and self-efficacy. Diet and physical activity were discussed in the MI sessions in line with current government guidance. Participants were encouraged to reflect on their values, goals and current behavior and to develop their own goals and techniques for implementing and maintaining behaviors. Participants in the intervention groups were encouraged by researchers at their baseline assessments to self-monitor by weighing themselves weekly and MIPs encouraged the concept of self-monitoring generally. Participants were able to record all self-monitoring activity, including diet, physical activity, other markers of successful maintenance (e.g. clothes fitting better), goals set at sessions and implementation intentions, in a diary provided by the study team (paper-based and brief online version); however, completion was optional. Diaries provided to participants were intended for their personal use only and were not collected by the study team for outcome assessment. However, participants were asked to record their weekly weight and send this information to the study team via the study website or by text, e-mail or telephone. MIPs kept a written record of each face-to-face and telephone session (including goal-setting and implementation intentions) using the appropriate case report form (CRF) and this information was collected by the study team. MIPs also completed a brief written summary of the session for the participant to take away.	90.7% (95% CI [79.0 - 97.0]) attended both face to face sessions. 72.1% received at least 1 phone call. 55.8% received both phone calls.	

Appendix F Table 2. Intervention Details for Behavior-Based Weight Loss Maintenance Trials

Author, Year (Study Name)	Arm	Weight Loss Intervention (all arms)	Maintenance Intervention	Adherence	Control
Svetkey, 2008[303] (WLM)	IG1	Intervention: 20 weekly group sessions (1.5 to 2 hours) over approximately 6 months. Intervention goals were for participants to reach 180 minutes per week of moderate physical activity (typically walking); reduce caloric intake; adopt the Dietary Approaches to Stop Hypertension dietary pattern; and lose approximately 1 to 2 lb per week. Participants were taught to keep food and physical activity self-monitoring records and to calculate caloric intake. Required WL to enter MN:≥ 4 kg during WL phase	Maintenance portion included monthly person-to-person phone contact guidance and support for 5 -15 minutes each month; every-4th month, a 45-60 individual face-to-face contact. Each contact began with self-reported or measured weight (for face-to-face contacts), review of progress, number of days a food diary was kept, frequency of weighing, average minutes of exercise, progress on additional goals and action plans, and problem-solving. Contacts provided opportunities to discuss barriers to weight loss maintenance and plans to overcome those barriers. Intervention reinforced key theoretical constructs (motivation, support, problem solving, relapse prevention). Encouraged to continue adherence to recommended dietary pattern and increase moderate physical activity to at least 225 min per week. Phase 3: At 30 months, 40% (n=98) of participants were re-randomized to ongoing contact (4 weekly group sessions followed by monthly phone contacts, and general content as in Phase 2). Of the remaining IG1 participants, 40% received no additional contact during this phase. The remaining participants 19% (n=47) were not re-randomized, and did not receive any further contact.	Phase 2: 91% Phase 3: median contact completion 77%	Minimal intervention: Received printed life-style guidelines with diet and physical activity recommendations at randomization, and met briefly with a study interventionist after 12-month data collection visit. No further instructions or visits for remainder of study.
	IG2		Maintenance portion included unlimited access to website designed to support WL maintenance. Encouraged to log in at least 1x/week to interactive website and required to enter current weight and encouraged to use the web site for self-monitoring of physical activity and caloric intake. Web site's interactive features allowed participants to set personal goals and action plans and to graph personal data over time. Web-modules addressed problem solving and motivation, and a bulletin board facilitated social support but not in-person counseling. Intervention reinforced key theoretical constructs (motivation, support, problem solving, relapse prevention). If participants missed a scheduled contact they were sent email reminders followed by automated and personal calls if required. Encouraged to continue adherence to recommended dietary pattern and increase moderate physical activity to at least 225 min per week.	Website contact (overall): 77% Consistent use (login and weight entry 26 of the 28 months): 60.9% Some use (login and weight entry 14 to 25 of 28 months): 17.5 % Minimal use (all others): 21.6% Log-ins: Median #: 107 (86 with content in addition to weight entry)	

Appendix F Table 2. Intervention Details for Behavior-Based Weight Loss Maintenance Trials

Author, Year (Study Name)	Arm	Weight Loss Intervention (all arms)	Maintenance Intervention	Adherence	Control
Voils, 2017[309]	IG1	Intervention: Biweekly group meetings for 16 weeks (8 sessions total) focused on calorie and fat restriction. It included education and strategies including goal setting and self-monitoring of dietary intake and physical activity. Required WL to enter MN: ≥4 kg during WL phase	The (group-based) 42-week intervention, followed by 14 weeks of no contact, included 3 group visits and 8 individual telephone calls. During weeks 2-12, delivery mode alternated between in-person group visits and individual telephone calls on a biweekly basis. Group sessions occurred at weeks 2, 6, and 10 and focused on introducing participants to the definition of weight maintenance, customized daily calorie goals (updated to reflect weight loss), self-monitoring of weight. A 3-lb threshold was suggested for monitoring relapse, and physical activity recommendations were introduced. Participants were engaged in discussion about specific social support strategies, including positive reinforcement, participant, and discussion/sharing; participants were encouraged to bring a support person with themselves to the second meeting. Participants received a handout with suggested support behaviors in an attempt to shift social support from the group and the interventionist to participants' social networks. The last meeting focused on relapse prevention, in which participants encouraged to generate strategies to deal with potential difficult situations and prevent lapse. Individual phone sessions occurred at weeks 4, 8, 12, 16, 20, 24, 32, and 40 and had a standardized structure focusing on satisfaction with outcomes, relapse-prevention planning, self-monitoring, and social support. Participants reviewed "before" and "after" photos and were asked to discuss outcomes of weight loss as a source of motivation. Participants also specified frequency of weighing, and identified a primary social support person to share their weight maintenance plans with. The frequency of group sessions and individual phone sessions decreased over time from biweekly, to monthly, to bimonthly.	Participants attended mean (SD) 2.07 (1.06) of 3 group sessions and participated in mean (SD) 7.34 (1.43) of 8 phone calls	Usual care: Participants received no further contact from study staff except for assessment visits, but could enroll in both MOVE! (orientation session + 10 weekly drop-in group sessions covering nutrition, PA, and weight management behaviors), TeleMOVE! (interactive voice responses system that patients are encouraged to call ≥82 of 90 days), a telephone lifestyle coaching program, and may request one-time referral to registered dietitian. Participants with type 2 diabetes could attend a 1-time diabetes education class addressing nutrition among other topics.

Appendix F Table 2. Intervention Details for Behavior-Based Weight Loss Maintenance Trials

Author, Year (Study Name)	Arm	Weight Loss Intervention (all arms)	Maintenance Intervention	Adherence	Control
Wing, 2006[313] (STOP)	IG1	Intervention: None Required WL to enter MN: ≥ 10% WL in past 2 years	Participants given a scale and introduced to a weight-monitoring system based on color zones and were asked to submit their weight weekly through an automated phone system. Those who reported maintaining their weight, defined as gain of <1.4 kg over their starting weight, were in the green zone and were provided immediate reinforcement w/positive automated messages and also received small green gifts monthly to foster development of self-reinforcement skills. Participants with weight gains of 1.4-2.2 kg were in the yellow zone and were instructed to use problem-solving skills to bring their weight back to the green zone. Participants with weight gain of ≥ 2.3 kg were in the red zone and were encouraged to restart active weight-loss efforts and to use a toolkit provided at the start of the program that included their own weight-loss success story, self-monitoring diaries, book providing info on calories and fat, pedometer, and cans of meal-replacement product. Red zone participants also offered counseling by phone. All participants were encouraged to practice eating and exercise behaviors and attended weekly meetings over the first month, followed by monthly meetings over the remaining 18 months.	78.7% of sessions attended from baseline to 6 months, 53.5% from 7-12 months, and 41.5% from 13-18 months	Minimal intervention: Received a quarterly newsletter w/info about diet, exercise, and weight control.

Appendix F Table 2. Intervention Details for Behavior-Based Weight Loss Maintenance Trials

Author, Year (Study Name)	Arm	Weight Loss Intervention (all arms)	Maintenance Intervention	Adherence	Control
	IG2		Participants provided with a laptop and an Internet connection, as well as technical support. Participants attended an introductory session designed to teach them how to use the laptop and had access to a STOP Regain message board and website where treatment lessons and weekly tips were posted. Participants also given a scale and introduced to a weight-monitoring system based on color zones and were asked to submit their weight weekly through a web-based form. Those who reported maintaining their weight, defined as gain of <1.4 kg over their starting weight, were in the green zone and were provided immediate reinforcement w/positive automated messages and also received small green gifts monthly to foster development of self-reinforcement skills. Participants with weight gains of 1.4-2.2 kg were in the yellow zone and were instructed to use problem-solving skills to bring their weight back to the green zone. Participants with weight gain of ≥ 2.3 kg were in the red zone and were encouraged to restart active weight-loss efforts and to use a toolkit provided at the start of the program that included their own weight-loss success story, self-monitoring diaries, book providing info on calories and fat, pedometer, and cans of meal-replacement product. Red zone participants also offered counseling by email. All participants were encouraged to practice eating and exercise behaviors and attended weekly group chat-room meetings over the first month, followed by monthly chat-room meetings over the remaining 18 months.	65.7% of sessions attended from baseline to 6 months, 41.2% from 7-12 months, and 34.2% from 13-18 months	

Appendix F Table 2. Intervention Details for Behavior-Based Weight Loss Maintenance Trials

Author, Year (Study Name)	Arm	Weight Loss Intervention (all arms)	Maintenance Intervention	Adherence	Control
Young, 2017[317]	IG1	Intervention: Provided with the SHED-IT weight loss program, which was self-administered and included DVD, logbooks, and motivational messaging. Required WL to enter MN:≥ 4kg during WL phase	SHED-IT WLM Program: Participants received a weight loss handbook, weight loss logbook, weekly emails (including video messages), biweekly text messages, resistance training handbook, and a digiwalker SW200 pedometer and a Gymstick (a portable device with elastic resistance bands). The program placed specific emphasis on key behaviors associated with successful weight loss maintenance, including increasing moderate-to-vigorous PA to at least 300 min/week; limiting intake of energy-dense, nutrient poor discretionary foods; eating breakfast regularly; eating more fruit and vegetables; and watching less than 2 hr of TV/day. Participants were advised to continue self-monitoring their diet and activity at least 2 days/week. Participants were not encouraged to lose weight, but were advised to continue weekly weigh-ins and to revert to weight loss strategies if they regained ≥2.5 kg during WLM phase. Intervention was "gender tailored."	Read handbook at least once: 98% Read most/all emails: 73% Watched most/all videos: 50%	No intervention: Participants in "self-help" group did not receive any of the WLM materials.

Abbreviations: IG = intervention group; HW4L = Healthy Weight for Life; kg = kilogram; M = mean; MI = motivational interviewing; MIP = motivational interviewing practitioner; min = minute(s); MN = maintenance; NR = not reported; PA = physical activity; SD = standard deviation; STOP = Study to Prevent Regain; WILMA = Weight Loss Maintenance in Adults; WL = weight loss; WLM = Weight Loss Maintenance

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
Ackermann, 2008[214]	Weight [% change]	12	IG1	29	NA	-6.0 (-8.3 to -3.8)	33	NA	-1.8 (-3.9 to 0.3)	-4.20 (-7.15 to -1.25); p=0.008
	BMI [% change]	12	IG1	29	NA	-6.7 (-9.1 to -4.4)	33	NA	-1.4 (-3.6 to 0.8)	-5.30 (-8.39 to -2.21); p=0.002
	Weight [kg]	12	IG1	29	94.5 (16.4)	-5.7 (NR)	33	90.9 (17.3)	-1.6 (NR)	-4.10 (NR); p=NR
Ackermann, 2015[215]	Weight [kg]	12	IG1	257	103.0 (25.6)	-2.5 (NR)	252	101.7 (25.4)	-0.2 (NR)	-2.30 (-3.40 to -1.10); p<0.001
Ahern, 2017[323]	WC [cm]	12	IG1	528	110.0 (12.7)	-7.3 (-8.2 to -6.4)	210	110.0 (11.9)	-3.2 (-4.4 to -1.9)	-4.05 (-5.54 to -2.56); p=<0.0001
	WC [cm]	12	IG2	528	111.0 (12.4)	-5.2 (-6.0 to -4.3)	210	110.0 (11.9)	-3.2 (-4.4 to -1.9)	-2.12 (-3.59 to -0.65); p=0.0048
	WC [cm]	24	IG1	528	110.0 (12.7)	-5.6 (-6.5 to -4.7)	210	110.0 (11.9)	-3.6 (-5.1 to -2.2)	-1.98 (-3.56 to -0.41); p=0.0137
	WC [cm]	24	IG2	528	111.0 (12.4)	-4.4 (-5.3 to -3.4)	210	110.0 (11.9)	-3.6 (-5.1 to -2.2)	-0.27 (-2.27 to 0.83); p=0.365
	Weight [kg]	12	IG1	528	95.7 (16.4)	-6.8 (-7.6 to -5.9)	211	96.1 (16.4)	-3.3 (-4.6 to -1.9)	-3.50 (-5.07 to -1.93); p=NR
	Weight [kg]	12	IG2	528	96.6 (17.9)	-4.8 (-5.4 to -4.1)	211	96.1 (16.4)	-3.3 (-4.6 to -1.9)	-1.61 (-2.48 to -0.38); p=0.0105
	Weight [kg]	24	IG1	528	95.7 (16.4)	-4.3 (-5.2 to -3.4)	211	96.1 (16.4)	-2.3 (-3.7 to -0.9)	-1.99 (-3.66 to -0.32); p=NR
	Weight [kg]	24	IG2	528	96.6 (NR)	-3.0 (-3.7 to -2.3)	211	96.1 (16.4)	-2.3 (-3.7 to -0.9)	-0.74 (-2.45 to 0.77); p=0.338
Anderson, 2014[217]	Weight [% change]	12	IG1	163	NA	-3.9 (-4.8 to -3.0)	166	NA	-0.8 (-1.5 to -0.2)	-3.04 (-3.92 to -2.16); p=NR
	BMI [kg/m2]	12	IG1	148	31.0 (4.5)	-1.2 (-1.5 to -0.9)	157	30.4 (3.9)	-0.3 (-0.5 to -0.1)	-0.92 (-1.20 to -0.64); p<0.001
	WC [cm]	12	IG1	145	104.7 (10.9)	-4.9 (-5.8 to -4.0)	157	103.9 (10.9)	-2.2 (-2.8 to -1.5)	-2.68 (-3.62 to -1.74); p<0.001
	Weight [kg]	12	IG1	148	90.2 (14.9)	-3.5 (-4.3 to -2.7)	157	88.4 (14.3)	-0.8 (-1.4 to -0.2)	-2.69 (-3.67 to -1.70); p<0.001
Appel, 2011[219]	Weight [% change]	12	IG1	123	NA	-5.5 (-6.9 to -4.1)	108	NA	-1.3 (-2.3 to -0.3)	-4.20 (-5.80 to -2.50); p<0.001
	Weight [% change]	12	IG2	124	NA	-6.0 (-7.4 to -4.6)	108	NA	-1.3 (-2.3 to -0.3)	-4.70 (-6.40 to -3.00); p<0.001
	Weight [% change]	24	IG1	133	NA	-5.2 (-6.6 to -3.8)	129	NA	-1.1 (-2.3 to 0.1)	-4.20 (-6.10 to -2.30); p<0.001
	Weight [% change]	24	IG2	132	NA	-4.9 (-6.5 to -3.3)	129	NA	-1.1 (-2.3 to 0.1)	-3.90 (-5.80 to -1.90); p<0.001

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	BMI [kg/m2]	12	IG1	123	36.8 (16.4)	-1.8 (-2.2 to -1.4)	108	36.8 (4.7)	-0.4 (-0.8 to -0.0)	-1.40 (-1.90 to -0.80); p<0.001
	BMI [kg/m2]	12	IG2	124	36.1 (4.7)	-1.9 (-2.3 to -1.5)	108	36.8 (4.7)	-0.4 (-0.8 to -0.0)	-1.50 (-2.10 to -0.90); p<0.001
	BMI [kg/m2]	24	IG1	133	36.8 (16.4)	-1.7 (-2.3 to -1.1)	129	36.8 (4.7)	-0.4 (-0.8 to -0.0)	-1.30 (-2.10 to -0.60); p<0.001
	BMI [kg/m2]	24	IG2	132	36.1 (4.7)	-1.7 (-2.3 to -1.1)	129	36.8 (4.7)	-0.4 (-0.8 to -0.0)	-1.30 (-2.00 to -0.60); p<0.001
	WC [cm]	24	IG1	119	118.3 (14.1)	-6.3 (-7.9 to -4.7)	107	118.5 (12.9)	-3.4 (-4.8 to -2.0)	-2.80 (-4.80 to -0.90); p=0.005
	WC [cm]	24	IG2	119	117.8 (13.0)	-6.7 (-8.5 to -4.9)	107	118.5 (12.9)	-3.4 (-4.8 to -2.0)	-3.30 (-5.40 to -1.20); p=0.003
	Weight [kg]	12	IG1	123	104.9 (18.8)	-5.4 (-6.8 to -4.0)	108	104.2 (15.3)	-1.1 (-2.1 to -0.1)	-4.30 (-5.90 to -2.60); p<0.001
	Weight [kg]	12	IG2	124	102.5 (14.1)	-5.7 (-7.1 to -4.3)	108	104.2 (15.3)	-1.1 (-2.1 to -0.1)	-4.50 (-6.10 to -2.90); p<0.001
	Weight [kg]	24	IG1	133	104.9 (18.8)	-5.1 (-6.7 to -3.5)	129	104.2 (15.3)	-0.8 (-2.2 to 0.6)	-4.30 (-6.30 to -2.30); p<0.001
	Weight [kg]	24	IG2	132	102.5 (14.1)	-4.5 (-5.9 to -3.1)	129	104.2 (15.3)	-0.8 (-2.2 to 0.6)	-3.80 (-5.60 to -1.90); p<0.001
Aveyard, 2016[221]	Weight [kg]	12	IG1	940	97.1 (15.5)	-2.4 (-2.8 to -2.0)	942	98.3 (17.6)	-1.0 (-1.4 to -0.7)	-1.43 (-1.97 to -0.89); p<0.0001
Beeken, 2017[318]	BMI [kg/m2]	12	IG1	143	Median: 35.0 (IQR: 32.6 to 38.7)	-0.8 (-1.1 to -0.5)	152	Median: 34.8 (IQR: 32.6 to 39.4)	-0.8 (-1.1 to -0.5)	0.00 (-0.63 to 0.63); p=NR
	BMI [kg/m2]	18	IG1	126	Median: 35.0 (IQR: 32.6 to 38.7)	-0.8 (-1.1 to -0.4)	127	Median: 34.8 (IQR: 32.6 to 39.4)	-1.2 (-1.7 to -0.7)	0.46 (-0.41 to 1.33); p=NR
	BMI [kg/m2]	24	IG1	143	Median: 35.0 (IQR: 32.6 to 38.7)	-0.7 (-1.1 to -0.4)	149	Median: 34.8 (IQR: 32.6 to 39.4)	-1.1 (-1.5 to -0.6)	0.34 (-0.47 to 1.15); p=NR
	WC [cm]	12	IG1	143	Median: 111.3 (IQR:	-1.8 (-3.0 to -0.6)	152	Median: 112.0 (IQR:	-2.3 (-3.7 to -0.9)	0.52 (-1.33 to 2.37); p=NR

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
					103.0 to 120.0)			104.0 to 118.0)		
	WC [cm]	18	IG1	126	Median: 111.3 (IQR: 103.0 to 120.0)	-2.0 (-3.4 to -0.6)	127	Median: 112.0 (IQR: 104.0 to 118.0)	-2.3 (-3.9 to -0.7)	0.30 (-1.83 to 2.43); p=NR
	WC [cm]	24	IG1	143	Median: 111.3 (IQR: 103.0 to 120.0)	-2.7 (-3.9 to -1.4)	149	Median: 112.0 (IQR: 104.0 to 118.0)	-2.3 (-3.7 to -1.0)	-0.33 (-2.17 to 1.51); p=NR
	Weight [kg]	12	IG1	143	100.4 (17.0)	-2.4 (-3.3 to -1.5)	152	101.2 (17.5)	-2.3 (-3.1 to -1.5)	-0.06 (-1.25 to 1.13); p=NR
	Weight [kg]	18	IG1	126	100.4 (17.0)	-2.0 (-2.9 to -1.2)	127	101.2 (17.5)	-3.3 (-4.6 to -2.0)	1.18 (-0.41 to 2.77); p=NR
	Weight [kg]	24	IG1	143	100.4 (17.0)	-2.2 (-3.1 to -1.2)	149	101.2 (17.5)	-3.0 (-4.1 to -1.8)	0.75 (-0.73 to 2.24); p=NR
Bennett, 2012[224]	BMI [kg/m2]	12	IG1	180	37.0 (5.0)	-0.5 (-0.8 to -0.3)	185	37.0 (5.2)	-0.1 (-0.4 to 0.1)	-0.42 (-0.80 to -0.03); p=NR
	BMI [kg/m2]	18	IG1	180	37.0 (5.0)	-0.5 (-0.8 to -0.2)	185	37.0 (5.2)	-0.2 (-0.4 to 0.1)	-0.35 (-0.75 to 0.06); p=NR
	BMI [kg/m2]	24	IG1	180	37.0 (5.0)	-0.6 (-0.9 to -0.3)	185	37.0 (5.2)	-0.2 (-0.5 to 0.1)	-0.38 (-0.75 to -0.00); p=NR
	Weight [kg]	12	IG1	180	99.7 (16.3)	-1.4 (-2.1 to -0.6)	185	100.6 (18.7)	-0.3 (-1.0 to 0.4)	-1.05 (-2.09 to -0.01); p=NR
	Weight [kg]	18	IG1	180	99.7 (16.3)	-1.3 (-2.1 to -0.5)	185	100.6 (18.7)	-0.3 (-1.1 to 0.4)	-0.95 (-2.03 to 0.14); p=NR
	Weight [kg]	24	IG1	180	99.7 (16.3)	-1.5 (-2.3 to -0.8)	185	100.6 (18.7)	-0.5 (-1.2 to 0.2)	-1.03 (-2.03 to -0.03); p=NR
Bhopal, 2014[225]	BMI [kg/m2]	12	IG1	84	30.6 (5.0)	-0.4 (-0.9 to 0.1)	83	30.5 (4.6)	-0.1 (-0.5 to 0.3)	-0.31 (-0.96 to 0.34); p=NR
	BMI [kg/m2]	24	IG1	84	30.6 (5.0)	-0.3 (-0.8 to 0.2)	83	30.5 (4.6)	0.1 (-0.4 to 0.5)	-0.36 (-1.03 to 0.31); p=NR
	BMI [kg/m2]	36	IG1	84	30.6 (5.0)	-0.4 (-0.9 to 0.1)	83	30.5 (4.6)	0.2 (-0.3 to 0.6)	-0.60 (-1.06 to -0.14); p=0.0112
	WC [cm]	12	IG1	84	102.7 (11.2)	-1.1 (-3.5 to 1.3)	83	103.3 (11.0)	0.2 (-2.3 to 2.6)	-1.33 (-4.76 to 2.10); p=NR
	WC [cm]	24	IG1	84	102.7 (11.2)	-0.7 (-3.0 to 1.7)	83	103.3 (11.0)	0.2 (-2.2 to 2.6)	-0.82 (-4.20 to 2.56); p=NR

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	WC [cm]	36	IG1	84	102.7 (11.2)	-2.2 (-4.6 to 0.2)	83	103.3 (11.0)	-0.4 (-2.8 to 2.0)	-1.89 (-3.27 to -0.52); p=0.0072
	Waist-to-hip ratio	12	IG1	84	1.0 (0.1)	0.0 (-0.0 to 0.0)	83	1.0 (0.1)	0.0 (-0.0 to 0.0)	-0.01 (-0.03 to 0.01); p=NR
	Waist-to-hip ratio	24	IG1	84	1.0 (0.1)	0.0 (-0.0 to 0.0)	83	1.0 (0.1)	0.0 (-0.0 to 0.0)	-0.01 (-0.03 to 0.01); p=NR
	Waist-to-hip ratio	36	IG1	84	1.0 (0.1)	0.0 (-0.0 to 0.0)	83	1.0 (0.1)	0.0 (-0.0 to 0.0)	0.00 (-0.01 to 0.01); p=0.6756
	Weight [kg]	12	IG1	84	79.8 (16.2)	-0.9 (-2.5 to 0.6)	83	80.7 (15.0)	-0.3 (-1.8 to 1.1)	-0.63 (-2.74 to 1.48); p=NR
	Weight [kg]	24	IG1	84	79.8 (16.2)	-0.7 (-2.2 to 0.9)	83	80.7 (15.0)	0.3 (-1.2 to 1.7)	-0.96 (-3.07 to 1.15); p=NR
	Weight [kg]	36	IG1	84	79.8 (16.2)	-1.0 (-2.6 to 0.6)	83	80.7 (15.0)	0.3 (-1.2 to 1.8)	-1.64 (-2.83 to -0.44); p=0.0076
Burke, 2005[228]	WC [cm]	16	IG1	106	96.6 (9.3)	-5.0 (-6.8 to -3.2)	98	93.7 (8.9)	-1.9 (-3.8 to -0.0)	-3.10 (-5.67 to -0.53); p<0.001
	Weight [kg]	16	IG1	106	86.7 (12.4)	-3.9 (-5.0 to -2.8)	98	84.2 (10.9)	-1.4 (-2.4 to -0.4)	-2.50 (-3.97 to -1.03); p<0.001
Cadmus-Bertram, 2016[229]	Weight [% change]	12	IG1	59	NA	-3.7 (-5.1 to -2.3)	29	NA	-1.3 (-2.8 to 0.2)	-2.40 (-4.46 to -0.34); p=0.003
	Weight [kg]	12	IG1	59	84.9 (12.1)	-2.9 (-4.0 to -1.8)	29	85.3 (13.4)	-1.2 (-2.6 to 0.2)	-1.70 (-3.47 to 0.07); p=0.059
Chirionos, 2016[230]	Weight [% change]	12	IG1	60	NA	2.7 (NR)	60	NA	-0.5 (NR)	3.23 (NR); p=NR
	WC [cm]	12	IG1	60	104.6 (9.1)	-0.8 (NR)	60	105.2 (9.2)	-1.1 (NR)	0.29 (NR); p=NS, NR
	Weight [kg]	12	IG1	60	87.8 (12.9)	-2.4 (NR)	60	88.0 (13.0)	-0.5 (NR)	-1.82 (NR); p=NR, NS
Christian, 2011[231]	WC [cm]	12	IG1	133	116.7 (14.9)	-2.2 (-4.2 to 0.1)	130	113.8 (14.7)	1.5 (-1.0 to 4.1)	-3.70 (-6.98 to -0.42); p=0.01
	Weight [kg]	12	IG1	133	93.9 (19.9)	-1.5 (-2.4 to -0.6)	130	92.0 (22.6)	0.1 (-0.5 to 0.9)	-1.65 (-3.85 to 0.56); p=0.002
Cohen, 1991[232]	Weight [kg]	12	IG1	15	91.8 (NR)	-0.9 (-2.9 to 1.1)	15	91.7 (NR)	1.3 (-0.2 to 2.8)	-2.18 (-4.71 to 0.35); p<0.10
de Vos, 2014[234]	BMI [kg/m2]	12	IG1	203	32.2 (4.1)	-0.2 (NR)	204	32.5 (4.5)	0.3 (NR)	-0.20 (NR); p=0.007
	Weight [kg]	12	IG1	187	88.2 (12.9)	-0.6 (-1.4 to 0.2)	181	89.2 (13.6)	0.6 (-0.2 to 1.4)	-1.22 (-2.09 to -0.35); p=0.014
	Weight [kg]	18	IG1	184	88.2 (12.9)	NR	177	89.2 (13.6)	NR	-1.11 (-1.99 to -0.22); p=NR

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [kg]	24	IG1	184	88.2 (12.9)	NR	177	89.2 (13.6)	NR	-0.99 (-1.91 to -0.07); p=NR
	Weight [kg]	30	IG1	184	88.2 (12.9)	NR	177	89.2 (13.6)	NR	-0.87 (-1.84 to 0.10); p=NR
	Weight [kg]	80	IG1	130	88.2 (12.9)	NR	117	89.2 (13.6)	NR	-0.11 (-2.00 to 1.77); p=NR
Demark-Wahnefried, 2014[235]	BMI [kg/m2]	12	IG1	23	31.6 (3.4)	-0.9 (-2.1 to 0.3)	18	30.7 (2.6)	-0.3 (-0.8 to 0.2)	-0.54 (-1.86 to 0.78); p=0.03
	BMI [kg/m2]	12	IG2	23	30.8 (3.3)	-0.7 (-1.4 to -0.1)	18	30.7 (2.6)	-0.3 (-0.8 to 0.2)	-0.41 (-1.25 to 0.43); p=0.40
	WC [cm]	12	IG1	23	97.4 (8.9)	-6.5 (-9.2 to -3.8)	18	94.7 (8.8)	-1.0 (-2.7 to 0.7)	-5.50 (-8.73 to -2.27); p=0.004
	WC [cm]	12	IG2	23	96.1 (10.5)	-3.7 (-5.9 to -1.5)	18	94.7 (8.8)	-1.0 (-2.7 to 0.7)	-2.70 (-5.49 to 0.09); p=0.12
	Weight [kg]	12	IG1	23	83.2 (8.8)	-3.8 (-5.7 to -1.8)	18	81.6 (9.3)	-0.9 (-2.2 to 0.5)	-2.90 (-5.29 to -0.51); p=0.04
	Weight [kg]	12	IG2	23	82.6 (13.4)	-2.1 (-3.8 to -0.3)	18	81.6 (9.3)	-0.9 (-2.2 to 0.5)	-1.22 (-3.45 to 1.01); p=0.35
Eaton, 2016[237]	Weight [kg]	12	IG1	106	103.8 (21.0)	-5.4 (-6.9 to -3.9)	105	102.8 (20.9)	-3.8 (-5.3 to -2.3)	-1.60 (-3.72 to 0.52); p=0.10
	Weight [kg]	18	IG1	106	103.8 (21.0)	-4.4 (-5.9 to -2.9)	105	102.8 (20.9)	-4.3 (-5.8 to -2.8)	-0.10 (-2.22 to 2.02); p=0.87
	Weight [kg]	24	IG1	106	103.8 (21.0)	-4.1 (-5.6 to -2.6)	105	102.8 (20.9)	-4.0 (-5.5 to -2.5)	-0.10 (-2.22 to 2.02); p=0.89
Fischer, 2016[319]	Weight [kg]	12	IG1	78	88.4 (19.1)	-1.2 (-2.5 to 0.1)	79	91.4 (18.0)	-0.3 (-1.2 to 0.7)	-0.95 (-2.54 to 0.63); p=0.05
Fitzgibbon, 2010[240]	BMI [kg/m2]	18	IG1	93	38.9 (5.5)	-0.9 (-1.4 to -0.3)	97	39.7 (5.9)	0.2 (-0.2 to 0.6)	-1.13 (-1.83 to -0.43); p=0.002
	Weight [kg]	18	IG1	93	104.6 (15.8)	-2.3 (-3.8 to -0.8)	97	105.6 (18.1)	0.5 (-0.6 to 1.6)	-2.59 (-4.40 to -0.78); p=0.005
Godino, 2016[242]	BMI [kg/m2]	12	IG1	202	28.9 (2.8)	NR	202	29.0 (2.7)	NR	-0.49 (-0.81 to -0.16); p=0.004
	BMI [kg/m2]	18	IG1	202	28.9 (2.8)	NR	202	29.0 (2.7)	NR	-0.24 (-0.59 to 0.11); p=0.185
	BMI [kg/m2]	24	IG1	202	28.9 (2.8)	NR	202	29.0 (2.7)	NR	-0.28 (-0.71 to 0.15); p=0.201
	WC [cm]	12	IG1	202	87.5 (8.8)	NR	202	88.0 (9.1)	NR	-0.73 (-1.56 to 0.09); p=0.082
	WC [cm]	18	IG1	202	87.5 (8.8)	NR	202	88.0 (9.1)	NR	-0.46 (-1.41 to 0.49); p=0.338

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	WC [cm]	24	IG1	202	87.5 (8.8)	NR	202	88.0 (9.1)	NR	-0.98 (-2.06 to 0.96); p=0.075
	Weight [kg]	12	IG1	202	80.8 (12.7)	NR	202	81.3 (13.2)	NR	-1.33 (-2.30 to -0.35); p=0.008
	Weight [kg]	18	IG1	202	80.8 (12.7)	NR	202	81.3 (13.2)	NR	-0.67 (-1.69 to 0.35); p=0.20
	Weight [kg]	24	IG1	202	80.8 (12.7)	NR	202	81.3 (13.2)	NR	-0.79 (-2.02 to 0.43); p=0.204
Greaves, 2015[243]	BMI [kg/m2]	12	IG1	55	33.0 (3.2)	NR	53	32.3 (3.0)	NR	-0.51 (-1.28 to 0.26); p=NR
	WC [cm]	12	IG1	55	110.0 (10.7)	NR	53	110.0 (8.8)	NR	-2.18 (-4.43 to 0.06); p=0.06
	Weight [kg]	12	IG1	55	96.6 (14.0)	-3.7 (-5.0 to -2.3)	53	97.6 (12.8)	-1.9 (-3.7 to -0.1)	-1.85 (-4.08 to 0.38); p=0.103
Haapala, 2009[245]	Weight [% change]	12	IG1	42	NA	-5.4 (-7.2 to -3.6)	40	NA	-1.3 (-3.3 to 0.7)	-4.10 (-6.77 to -1.43); p=0.003
	WC [cm]	12	IG1	62	98.5 (10.3)	-4.5 (-5.8 to -3.2)	62	96.6 (10.4)	-1.6 (-2.7 to -0.5)	-2.90 (-4.63 to -1.17); p=NR
	Weight [kg]	12	IG1	62	87.5 (12.6)	-3.1 (-4.3 to -1.9)	62	86.4 (12.5)	-0.7 (-1.9 to 0.5)	-2.40 (-4.09 to -0.71); p=NR
Hunt, 2014[249]	Weight [% change]	12	IG1	329	NA	-5.0 (-5.7 to -4.2)	347	NA	-0.5 (-1.0 to -0.0)	-4.36 (-5.08 to -3.64); p<0.0001
	BMI [kg/m2]	12	IG1	333	35.5 (5.1)	-1.8 (-2.1 to -1.5)	355	35.1 (4.8)	-0.2 (-0.4 to -0.0)	-1.56 (-1.82 to -1.29); p<0.0001
	Body fat [%]	12	IG1	271	31.8 (5.7)	-2.2 (-2.9 to -1.6)	312	31.5 (5.2)	0.0 (-0.4 to 0.4)	-2.15 (-2.78 to -1.52); p<0.0001
	WC [cm]	12	IG1	318	118.7 (12.3)	-7.3 (-8.2 to -6.5)	353	118.0 (11.1)	-2.0 (-2.6 to -1.5)	-5.12 (-5.97 to -4.27); p<0.0001
	Weight [kg]	12	IG1	333	110.3 (17.9)	-5.6 (-6.4 to -4.7)	355	108.7 (16.6)	-0.6 (-1.1 to -0.0)	-4.94 (-5.94 to -3.95); p<0.0001
Huseinovic, 2016[250]	Weight [% change]	12	IG1	44	NA	Median: -11.6 (NR)	45	NA	Median: -5.1 (NR)	NR; p<0.01
	BMI [kg/m2]	12	IG1	44	31.8 (4.0)	-3.3 (-3.8 to -2.8)	45	31.6 (3.4)	-2.0 (-2.8 to -1.2)	-1.30 (-2.21 to -0.39); p=0.005
	Body fat [%]	12	IG1	44	45.7 (4.3)	-5.7 (-6.7 to -4.7)	45	45.9 (4.2)	-3.5 (-4.7 to -2.3)	-2.20 (-3.76 to -0.64); p=0.008
	Hip circumfer-ence [cm]	12	IG1	44	116.1 (7.7)	-6.7 (-7.9 to -5.5)	45	114.5 (6.7)	-3.6 (-5.3 to -1.9)	-3.10 (-5.18 to -1.02); p=0.006
	WC [cm]	12	IG1	44	98.8 (11.4)	-9.9 (-11.4 to -8.4)	45	96.8 (11.2)	-7.4 (-9.1 to -5.7)	-2.50 (-4.81 to -0.19); p=0.028

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [kg]	12	IG1	44	90.0 (13.7)	-9.3 (-10.7 to -7.9)	45	86.6 (11.5)	-5.6 (-7.7 to -3.5)	-3.70 (-6.26 to -1.14); p=0.004
Jakicic, 2011[251]	Weight [% change]	18	IG1	88	NA	-1.2 (-2.4 to -0.0)	84	NA	-0.7 (-1.7 to 0.3)	-0.50 (-2.03 to 1.03); p=NS, NR
	Weight [% change]	18	IG2	76	NA	-0.9 (-2.0 to 0.2)	84	NA	-0.7 (-1.7 to 0.3)	-0.20 (-1.64 to 1.24); p=NS, NR
	BMI [kg/m2]	12	IG1	88	27.0 (1.6)	-0.5 (-0.7 to -0.3)	84	27.1 (1.7)	-0.4 (-0.6 to -0.2)	-0.10 (-0.39 to 0.19); p=NR
	BMI [kg/m2]	12	IG2	76	27.2 (1.8)	-0.3 (-0.5 to -0.1)	84	27.1 (1.7)	-0.4 (-0.6 to -0.2)	0.10 (-0.19 to 0.39); p=NS, NR
	BMI [kg/m2]	18	IG1	88	27.0 (1.6)	-0.3 (-0.5 to -0.1)	84	27.1 (1.7)	-0.2 (-0.4 to -0.0)	-0.10 (-0.42 to 0.22); p=NS, NR
	BMI [kg/m2]	18	IG2	76	27.2 (1.8)	-0.3 (-0.5 to -0.1)	84	27.1 (1.7)	-0.2 (-0.4 to -0.0)	-0.10 (-0.38 to 0.18); p=NS, NR
	Body fat [%]	12	IG1	88	33.0 (4.1)	-0.7 (-1.2 to -0.2)	84	33.7 (4.4)	-0.5 (-1.0 to 0.0)	-0.20 (-0.90 to 0.50); p=NR
	Body fat [%]	12	IG2	76	33.5 (4.1)	-0.2 (-0.7 to 0.3)	84	33.7 (4.4)	-0.5 (-1.0 to 0.0)	0.30 (-0.43 to 1.03); p=NS, NR
	Body fat [%]	18	IG1	88	33.0 (4.1)	-0.7 (-1.2 to -0.2)	84	33.7 (4.4)	-0.5 (-1.0 to 0.0)	-0.20 (-0.92 to 0.52); p=NS, NR
	Body fat [%]	18	IG2	76	33.5 (4.1)	-0.2 (-0.7 to 0.3)	84	33.7 (4.4)	-0.5 (-1.0 to 0.0)	0.30 (-0.40 to 1.00); p=NS, NR
	WC [cm]	12	IG1	88	90.5 (8.4)	-2.7 (-4.7 to -0.7)	84	89.3 (8.8)	-1.2 (-3.1 to 0.7)	-1.50 (-4.20 to 1.20); p=NR
	WC [cm]	12	IG2	76	91.4 (7.9)	-1.2 (-3.1 to 0.7)	84	89.3 (8.8)	-1.2 (-3.1 to 0.7)	0.00 (-2.66 to 2.66); p=NS, NR
	WC [cm]	18	IG1	88	90.5 (8.4)	-1.1 (-3.0 to 0.8)	84	89.3 (8.8)	-0.9 (-2.8 to 1.0)	-0.20 (-2.91 to 2.51); p=NS, NR
	WC [cm]	18	IG2	76	91.4 (7.9)	-0.8 (-2.8 to 1.2)	84	89.3 (8.8)	-0.9 (-2.8 to 1.0)	0.10 (-2.62 to 2.82); p=NS, NR
	Weight [kg]	12	IG1	88	74.3 (8.2)	-1.3 (-2.1 to -0.5)	84	73.7 (8.0)	-0.9 (-1.7 to -0.1)	-0.40 (-1.53 to 0.73); p=NS, NR
	Weight [kg]	12	IG2	76	74.2 (8.4)	-0.7 (-1.5 to 0.1)	84	73.7 (8.0)	-0.9 (-1.7 to -0.1)	0.20 (-0.97 to 1.37); p=NS, NR
	Weight [kg]	18	IG1	88	74.3 (8.2)	-1.3 (-2.1 to -0.5)	84	73.7 (8.0)	-0.9 (-1.7 to -0.1)	-0.40 (-1.53 to 0.73); p=NS, NR
	Weight [kg]	18	IG2	76	74.2 (8.4)	-0.7 (-1.6 to 0.2)	84	73.7 (8.0)	-0.9 (-1.7 to -0.1)	0.20 (-0.98 to 1.38); p=NS, NR
Jansson, 2013[252]	Weight [kg]	12	IG1	45	97.7 (13.7)	-2.5 (-4.0 to -1.0)	49	95.0 (13.4)	-0.8 (-2.3 to 0.8)	-1.70 (-3.80 to 0.40); p=0.108

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
Jebb, 2011[253]	WC [cm]	12	IG1	377	100.0 (9.2)	-4.1 (-4.7 to -3.4)	395	99.9 (9.3)	-2.3 (-2.8 to -1.8)	-1.72 (-2.56 to -0.88); p=0.0001
	Weight [kg]	12	IG1	377	86.9 (11.6)	-4.1 (-4.7 to -3.5)	395	86.5 (11.5)	-1.8 (-2.1 to -1.4)	-2.29 (-2.99 to -1.58); p<0.0001
Jeffery, 1993[254]	BMI [kg/m2]	12	IG1	34	31.3 (NR)	-3.0 (NR)	28	30.9 (NR)	-0.5 (NR)	-2.47 (NR); p=NR
	BMI [kg/m2]	12	IG2	36	30.7 (NR)	-3.2 (NR)	28	30.9 (NR)	-0.5 (NR)	-2.70 (NR); p=NR
	BMI [kg/m2]	12	IG3	35	30.8 (NR)	-1.9 (NR)	28	30.9 (NR)	-0.5 (NR)	-1.35 (NR); p=NR
	BMI [kg/m2]	12	IG4	26	30.9 (NR)	-2.0 (NR)	28	30.9 (NR)	-0.5 (NR)	-1.45 (NR); p=NR
	BMI [kg/m2]	18	IG1	34	31.3 (NR)	-2.3 (NR)	28	30.9 (NR)	-0.2 (NR)	-2.10 (NR); p=NR
	BMI [kg/m2]	18	IG2	36	30.7 (NR)	-2.5 (NR)	28	30.9 (NR)	-0.2 (NR)	-2.28 (NR); p=NR
	BMI [kg/m2]	18	IG3	35	30.8 (NR)	-1.5 (NR)	28	30.9 (NR)	-0.2 (NR)	-1.28 (NR); p=NR
	BMI [kg/m2]	18	IG4	26	30.9 (NR)	-1.8 (NR)	28	30.9 (NR)	-0.2 (NR)	-1.54 (NR); p=NR
	Weight [kg]	12	IG1	34	91.1 (NR)	-8.7 (NR)	27	88.2 (NR)	-1.4 (NR)	-7.30 (NR); p=NR
	Weight [kg]	12	IG2	34	88.1 (NR)	-8.7 (NR)	27	88.2 (NR)	-1.4 (NR)	-7.30 (NR); p=NR
	Weight [kg]	12	IG3	34	92.3 (NR)	-6.0 (NR)	27	88.2 (NR)	-1.4 (NR)	-4.60 (NR); p=NR
	Weight [kg]	12	IG4	24	89.4 (NR)	-5.8 (NR)	27	88.2 (NR)	-1.4 (NR)	-4.40 (NR); p=NR
	Weight [kg]	18	IG1	34	91.1 (NR)	-6.8 (NR)	27	88.2 (NR)	-0.5 (NR)	-6.30 (NR); p=NR
	Weight [kg]	18	IG2	34	88.1 (NR)	-6.6 (NR)	27	88.2 (NR)	-0.5 (NR)	-6.10 (NR); p=NR
	Weight [kg]	18	IG3	34	92.3 (NR)	-4.9 (NR)	27	88.2 (NR)	-0.5 (NR)	-4.40 (NR); p=NR
	Weight [kg]	18	IG4	24	89.4 (NR)	-5.5 (NR)	27	88.2 (NR)	-0.5 (NR)	-5.00 (NR); p=NR
	Weight [kg]	30	IG1	41	91.1 (NR)	-1.6 (NR)	40	88.2 (NR)	0.6 (NR)	-2.20 (-4.73 to 0.33); p=NR
	Weight [kg]	30	IG2	40	88.1 (NR)	-2.2 (NR)	40	88.2 (NR)	0.6 (NR)	-2.80 (-5.42 to -0.18); p=NR

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [kg]	30	IG3	41	92.3 (NR)	-1.6 (NR)	40	88.2 (NR)	0.6 (NR)	-2.20 (-4.55 to 0.15); p=NR
	Weight [kg]	30	IG4	40	89.4 (NR)	-1.4 (NR)	40	88.2 (NR)	0.6 (NR)	-2.00 (-4.77 to 0.77); p=NR
Jolly, 2011[255]	Weight [% change]	12	IG1	100	NA	NR	100	NA	NR	-1.65 (-3.45 to 0.16); p=0.500
	Weight [% change]	12	IG2	100	NA	NR	100	NA	NR	-2.96 (-4.47 to -0.91); p=0.022
	Weight [% change]	12	IG3	100	NA	NR	100	NA	NR	-0.98 (-2.78 to 0.81); p=1.000
	Weight [% change]	12	IG4	100	NA	NR	100	NA	NR	-1.41 (-3.21 to 0.38); p=0.861
	Weight [% change]	12	IG5	70	NA	NR	100	NA	NR	-0.12 (-2.09 to 1.86); p=1.000
	Weight [% change]	12	IG6	70	NA	NR	100	NA	NR	-0.05 (-2.08 to 1.99); p=1.000
	Weight [% change]	12	IG7	100	NA	NR	100	NA	NR	-1.66 (-3.45 to 0.12); p=0.474
	BMI [kg/m2]	12	IG1	100	33.8 (3.9)	-0.7 (-1.0 to -0.3)	100	33.9 (4.4)	-0.4 (-0.8 to -0.1)	-0.22 (-0.71 to 0.27); p=NR
	BMI [kg/m2]	12	IG2	100	34.0 (3.9)	-1.2 (-1.7 to -0.7)	100	33.9 (4.4)	-0.4 (-0.8 to -0.1)	-0.72 (-1.33 to -0.11); p=NR
	BMI [kg/m2]	12	IG3	100	33.8 (3.8)	-0.7 (-1.0 to -0.4)	100	33.9 (4.4)	-0.4 (-0.8 to -0.1)	-0.26 (-0.72 to 0.20); p=NR
	BMI [kg/m2]	12	IG4	100	33.4 (3.5)	-0.8 (-1.1 to -0.3)	100	33.9 (4.4)	-0.4 (-0.8 to -0.1)	-0.30 (-0.83 to 0.23); p=NR
	BMI [kg/m2]	12	IG5	70	33.1 (3.5)	-0.3 (-0.7 to 0.1)	100	33.9 (4.4)	-0.4 (-0.8 to -0.1)	0.13 (-0.40 to 0.66); p=NR
	BMI [kg/m2]	12	IG6	70	33.4 (3.5)	-0.3 (-0.7 to 0.0)	100	33.9 (4.4)	-0.4 (-0.8 to -0.1)	0.14 (-0.35 to 0.63); p=NR
	BMI [kg/m2]	12	IG7	100	33.4 (3.4)	-0.9 (-1.3 to -0.5)	100	33.9 (4.4)	-0.4 (-0.8 to -0.1)	-0.45 (-0.98 to 0.08); p=NR
	Weight [kg]	12	IG1	100	95.5 (17.9)	-2.5 (-3.6 to -1.3)	100	93.1 (15.1)	-1.1 (-2.1 to -0.1)	-1.65 (-3.33 to 0.04); p=0.386
	Weight [kg]	12	IG2	100	93.5 (14.1)	-3.5 (-4.8 to -2.1)	100	93.1 (15.1)	-1.1 (-2.1 to -0.1)	-2.49 (-4.15 to -0.83); p=0.024
	Weight [kg]	12	IG3	100	94.3 (13.4)	-1.9 (-2.9 to -0.9)	100	93.1 (15.1)	-1.1 (-2.1 to -0.1)	-0.90 (-2.57 to 0.77); p=1.000
	Weight [kg]	12	IG4	100	93.7 (13.7)	-2.1 (-3.4 to -0.9)	100	93.1 (15.1)	-1.1 (-2.1 to -0.1)	-1.35 (-3.03 to 0.33); p=0.798

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [kg]	12	IG5	70	92.0 (14.8)	-0.8 (-2.0 to 0.4)	100	93.1 (15.1)	-1.1 (-2.1 to -0.1)	0.12 (-1.96 to 1.72); p=1.000
	Weight [kg]	12	IG6	70	92.8 (13.7)	-0.7 (-1.7 to 0.4)	100	93.1 (15.1)	-1.1 (-2.1 to -0.1)	0.06 (-1.84 to 1.96); p=1.000
	Weight [kg]	12	IG7	100	91.7 (12.5)	-2.2 (-3.4 to -0.9)	100	93.1 (15.1)	-1.1 (-2.1 to -0.1)	-1.47 (-3.13 to 0.20); p=0.591
Jones, 1999[256]	Weight [kg]	12	IG1	51	97.0 (18.0)	-1.6 (NR)	51	92.0 (18.0)	-1.3 (NR)	-0.33 (NR); p>0.05
	Weight [kg]	18	IG1	51	97.0 (18.0)	-1.8 (NR)	51	92.0 (18.0)	-1.4 (NR)	-0.38 (NR); p>0.05
	Weight [kg]	24	IG1	51	97.0 (18.0)	-1.7 (NR)	51	92.0 (18.0)	-2.0 (NR)	0.25 (NR); p>0.05
	Weight [kg]	30	IG1	51	97.0 (18.0)	-1.3 (NR)	51	92.0 (18.0)	-2.2 (NR)	0.96 (NR); p>0.05
Kanke, 2015[257]	WC [cm]	12	IG1	29	Median: 94.0 (IQR: 91.8 to 98.0)	Median: 0.0 (-3.5 to 1.5)	21	Median: 95.0 (IQR: 92.0 to 97.5)	Median: -1.2 (-2.8 to 1.0)	NR; p=NS, NR
	Weight [kg]	12	IG1	29	Median: 71.8 (IQR: 67.3 to 82.4)	Median: -0.8 (-2.5 to 1.0)	21	Median: 74.1 (IQR: 68.1 to 77.4)	Median: 0.2 (-2.4 to 0.8)	NR; p=0.68
Katula, 2011[258]	Weight [% change]	12	IG1	151	NA	-7.2 (-8.3 to -6.1)	150	NA	-1.3 (-2.1 to -0.6)	-6.11 (-6.97 to -5.25); p<0.001
	Weight [% change]	18	IG1	151	NA	-5.8 (-7.0 to -4.6)	150	NA	-0.9 (-1.9 to 0.1)	-4.89 (-6.46 to -3.32); p=NR
	Weight [% change]	24	IG1	151	NA	-5.4 (-6.7 to -4.1)	150	NA	-0.6 (-1.6 to 0.5)	-4.82 (-6.50 to -3.14); p=NR
	BMI [kg/m2]	12	IG1	151	32.8 (3.9)	-2.3 (-2.6 to -2.0)	150	32.6 (4.2)	-0.6 (-0.9 to -0.3)	-1.72 (-2.16 to -1.28); p=NR
	BMI [kg/m2]	18	IG1	151	32.8 (3.9)	-2.1 (-2.4 to -1.8)	150	32.6 (4.2)	-0.8 (-1.1 to -0.4)	-1.34 (-1.79 to -0.89); p=NR
	BMI [kg/m2]	24	IG1	151	32.8 (3.9)	-1.9 (-2.2 to -1.6)	150	32.6 (4.2)	-0.4 (-0.7 to -0.1)	-1.51 (-1.96 to -1.06); p=NR
	WC [cm]	12	IG1	151	104.9 (9.3)	-5.7 (-7.4 to -4.1)	150	104.4 (10.7)	-0.9 (-2.6 to 0.8)	-4.79 (-7.17 to -2.41); p=NR
	WC [cm]	24	IG1	151	104.9 (9.3)	-4.0 (-5.7 to -2.3)	150	104.4 (10.7)	-0.3 (-2.1 to 1.4)	-3.69 (-6.11 to -1.27); p=NR

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [kg]	12	IG1	151	94.4 (14.7)	-6.9 (-8.0 to -5.8)	150	93.0 (16.2)	-2.1 (-3.3 to -0.9)	-4.85 (-6.46 to -3.24); p=NR
	Weight [kg]	18	IG1	151	94.4 (14.7)	-6.0 (-7.2 to -4.9)	150	93.0 (16.2)	-2.1 (-3.3 to -0.9)	-3.96 (-5.63 to -2.29); p=NR
	Weight [kg]	24	IG1	151	94.4 (14.7)	-5.6 (-6.7 to -4.4)	150	93.0 (16.2)	-0.8 (-2.0 to 0.4)	-4.78 (-6.45 to -3.11); p=NR
Knowler, 2002[205]	BMI [kg/m2]	12	IG1	1026	33.9 (6.8)	-2.4 (-2.5 to -2.3)	1027	34.2 (6.7)	-0.2 (-0.3 to -0.0)	-2.27 (-2.44 to -2.10); p=NR
	WC [cm]	12	IG1	1026	105.1 (14.8)	-6.4 (-6.7 to -6.0)	1027	105.2 (14.3)	-0.7 (-1.1 to -0.3)	-5.67 (-6.20 to -5.14); p=NR
	Waist-to-hip ratio	12	IG1	1026	0.9 (0.1)	-0.0 (-0.0 to -0.0)	1027	0.9 (0.1)	-0.0 (-0.0 to -0.0)	-0.02 (-0.02 to -0.02); p=NR
	Weight [kg]	12	IG1	1026	94.1 (20.8)	-6.8 (-7.1 to -6.4)	1027	94.3 (20.2)	-0.4 (-0.8 to -0.1)	-6.34 (-6.81 to -5.87); p=NR
Kuller, 2012[261]	BMI [kg/m2]	48	IG1	222	30.6 (3.8)	-1.1 (-1.3 to -0.9)	232	30.9 (3.8)	0.0 (-0.2 to 0.2)	-1.10 (-1.44 to -0.76); p=0.0004
	WC [cm]	18	IG1	208	105.5 (11.2)	-9.8 (-10.8 to -8.8)	213	106.3 (11.4)	-3.6 (-4.4 to -2.8)	-6.20 (-7.55 to -4.85); p<0.05
	WC [cm]	30	IG1	207	105.5 (11.2)	-8.3 (-9.4 to -7.2)	211	106.3 (11.2)	-2.8 (-3.6 to -2.0)	-5.50 (-6.89 to -4.11); p<0.05
	WC [cm]	48	IG1	215	105.5 (11.2)	-7.7 (-8.8 to -6.6)	228	106.3 (11.2)	-4.3 (-5.2 to -3.4)	-3.40 (-4.84 to -1.96); p<0.05
	Weight [kg]	18	IG1	208	81.2 (11.5)	-7.8 (-8.8 to -6.8)	213	82.2 (11.8)	-1.6 (-2.3 to -0.9)	-6.20 (-7.42 to -4.98); p<0.05
	Weight [kg]	30	IG1	208	81.2 (11.5)	-5.7 (-6.7 to -4.7)	212	82.2 (11.8)	-0.4 (-1.1 to 0.3)	-5.30 (-6.55 to -4.05); p<0.05
	Weight [kg]	48	IG1	216	81.2 (11.5)	-3.4 (-4.4 to -2.4)	230	82.2 (11.8)	-0.2 (-0.9 to 0.5)	-3.20 (-4.40 to -2.00); p=0.000
Kumanyika, 2012[328]	Weight [kg]	12	IG1	89	100.7 (18.7)	-1.6 (-2.7 to -0.5)	98	101.6 (20.9)	-0.6 (-1.5 to 0.2)	-0.98 (-2.33 to 0.36); p=0.15
Kulzer, 2009[262]	Weight [% change]	12	IG1	91	NA	-4.0 (-5.1 to -2.9)	91	NA	-1.6 (-2.4 to -0.8)	-2.40 (-3.79 to -1.01); p=0.002
	BMI [kg/m2]	12	IG1	91	31.0 (4.7)	-1.3 (-1.6 to -1.0)	91	32.0 (5.7)	-0.5 (-0.8 to -0.2)	-0.80 (-1.25 to -0.35); p=0.002
	WC [cm]	12	IG1	91	106.8 (13.7)	-4.1 (-5.3 to -2.9)	91	106.3 (13.7)	-0.4 (-1.7 to 0.9)	-3.70 (-5.47 to -1.93); p=0.001
	Weight [kg]	12	IG1	91	92.1 (16.5)	-3.8 (-4.9 to -2.7)	91	93.6 (19.3)	-1.4 (-2.2 to -0.6)	-2.40 (-3.75 to -1.05); p=0.001
Little, 2016[264]	Weight [kg]	12	IG1	221	102.4 (16.9)	-3.8 (-4.8 to -2.9)	227	104.4 (21.1)	-2.6 (-3.8 to -1.5)	-0.37 (-1.66 to 0.92); p=0.556

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [kg]	12	IG2	218	102.9 (18.3)	-3.2 (-4.3 to -2.1)	227	104.4 (21.1)	-2.6 (-3.8 to -1.5)	-0.58 (-1.88 to 0.72); p=0.375
Logue, 2005[324]	WC [cm]	12	IG1	329	NR	-2.0 (-2.6 to -1.4)	336	NR	-2.0 (-2.6 to -1.5)	0.05 (-0.76 to 0.86); p=NS, NR
	WC [cm]	18	IG1	329	NR	-1.3 (-1.9 to -0.8)	336	NR	-2.4 (-3.1 to -1.8)	1.08 (0.22 to 1.94); p=NS, NR
	WC [cm]	24	IG1	329	NR	-1.9 (-2.4 to -1.3)	336	NR	-1.8 (-2.4 to -1.3)	-0.04 (-0.84 to 0.76); p=0.57
	Weight [kg]	12	IG1	329	NR	-1.4 (-1.8 to -1.1)	336	NR	-0.9 (-1.3 to -0.6)	-0.52 (-1.02 to -0.02); p=NS, NR
	Weight [kg]	18	IG1	329	NR	-0.2 (-0.6 to 0.2)	336	NR	-0.4 (-0.8 to -0.1)	0.23 (-0.31 to 0.77); p=NS, NR
	Weight [kg]	24	IG1	329	NR	-0.4 (-1.1 to 0.4)	336	NR	-0.2 (-1.0 to 0.7)	0.23 (-1.40 to 0.90); p=0.50
Luley, 2014[265]	Weight [% change]	12	IG1	58	NA	-7.2 (-8.7 to -5.6)	60	NA	-2.5 (-4.0 to -0.9)	-4.70 (-7.40 to -2.10); p<0.001
	Weight [% change]	12	IG2	60	NA	-10.3 (-11.8 to -8.7)	60	NA	-2.5 (-4.0 to -0.9)	-7.80 (-10.50 to -5.10); p<0.001
	BMI [kg/m2]	12	IG1	58	33.3 (5.8)	-2.3 (-2.9 to -1.8)	60	32.6 (4.9)	-0.8 (-1.3 to -0.3)	-1.50 (-2.50 to -0.60); p<0.001
	BMI [kg/m2]	12	IG2	60	34.0 (4.9)	-3.7 (-4.2 to -3.1)	60	32.6 (4.9)	-0.8 (-1.3 to -0.3)	-2.90 (-3.80 to -2.00); p<0.001
	WC [cm]	12	IG1	58	109.8 (11.8)	-9.3 (-11.2 to -7.4)	60	107.9 (13.1)	-4.1 (-6.0 to -2.2)	-5.20 (-8.50 to -1.90); p=0.001
	WC [cm]	12	IG2	60	111.8 (11.8)	-11.3 (-13.2 to -9.4)	60	107.9 (13.1)	-4.1 (-6.0 to -2.2)	-7.20 (-10.50 to -4.00); p<0.001
	Weight [kg]	12	IG1	58	97.8 (16.3)	-7.3 (-8.9 to -5.6)	60	96.1 (19.7)	-2.7 (-4.4 to -1.1)	-4.50 (-7.40 to -1.70); p<0.001
	Weight [kg]	12	IG2	60	104.8 (18.5)	-11.0 (-12.7 to -9.4)	60	96.1 (19.7)	-2.7 (-4.4 to -1.1)	-8.30 (-11.10 to -5.40); p<0.001
Ma, 2013[266]	Weight [% change]	15	IG1	79	NA	-6.6 (-8.4 to -4.8)	81	NA	-2.6 (-4.4 to -0.8)	-4.00 (-6.49 to -1.51); p<0.001
	Weight [% change]	15	IG2	81	NA	-5.0 (-6.8 to -3.2)	81	NA	-2.6 (-4.4 to -0.8)	-2.40 (-4.89 to 0.09); p=0.008
	BMI [kg/m2]	15	IG1	79	32.4 (6.3)	-2.2 (-2.8 to -1.6)	81	32.0 (5.4)	-0.9 (-1.5 to -0.3)	-1.30 (-2.13 to -0.47); p<0.001
	BMI [kg/m2]	15	IG2	81	31.7 (4.7)	-1.6 (-2.2 to -1.0)	81	32.0 (5.4)	-0.9 (-1.5 to -0.3)	-0.70 (-1.53 to 0.13); p=0.02
	BMI [kg/m2]	24	IG1	79	32.4 (6.3)	-1.9 (-2.5 to -1.3)	81	32.0 (48.6)	-0.9 (-1.5 to -0.3)	-1.00 (-1.83 to -0.17); p=0.001
	BMI [kg/m2]	24	IG2	81	31.7 (4.7)	-1.6 (-2.2 to -1.0)	81	32.0 (48.6)	-0.9 (-1.5 to -0.3)	-0.70 (-1.53 to 0.13); p=0.03
	WC [cm]	15	IG1	79	106.2 (11.6)	-5.8 (-7.8 to -3.8)	81	106.8 (12.7)	-2.2 (-4.4 to -0.0)	-3.60 (-6.51 to -0.69); p<0.001
	WC [cm]	15	IG2	81	105.9 (11.5)	-4.9 (-6.9 to -2.9)	81	106.8 (12.7)	-2.2 (-4.4 to -0.0)	-2.70 (-5.61 to 0.21); p<0.001

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [kg]	15	IG1	79	95.3 (18.0)	-6.3 (-8.1 to -4.5)	81	92.6 (18.1)	-2.4 (-2.4 to -2.4)	-3.90 (-5.66 to -2.14); p<0.001
	Weight [kg]	15	IG2	81	93.6 (17.1)	-4.5 (-6.3 to -2.7)	81	92.6 (18.1)	-2.4 (-2.4 to -2.4)	-2.10 (-3.86 to -0.34); p=0.02
	Weight [kg]	24	IG1	79	95.3 (18.0)	-5.4 (-7.2 to -3.6)	81	92.6 (18.1)	-2.4 (-4.2 to -0.6)	-3.00 (-5.49 to -0.51); p=NR
	Weight [kg]	24	IG2	81	93.6 (17.1)	-4.5 (-6.3 to -2.7)	81	92.6 (18.1)	-2.4 (-4.2 to -0.6)	-2.10 (-4.59 to 0.39); p=NR
Marrero, 2016[267]	Weight [% change]	12	IG1	94	NA	-5.6 (-6.8 to -4.3)	81	NA	-0.2 (-1.5 to 1.1)	-5.30 (-7.12 to -3.48); p<0.001
	BMI [kg/m2]	12	IG1	94	36.9 (7.3)	-2.1 (-2.5 to -1.6)	81	36.7 (7.0)	-0.1 (-0.6 to 0.4)	-1.99 (-2.66 to -1.32); p<0.001
	Weight [kg]	12	IG1	94	100.9 (10.6)	-5.5 (-6.7 to -4.3)	81	100.0 (10.6)	-0.2 (-1.6 to 1.1)	-5.30 (-7.14 to -3.46); p<0.001
Martin, 2008[269]	Weight [kg]	12	IG1	68	101.2 (20.6)	-1.4 (-2.3 to -0.5)	69	103.4 (18.0)	-0.2 (-1.0 to 0.7)	-1.22 (-2.64 to 0.20); p=0.10
	Weight [kg]	18	IG1	68	101.2 (20.6)	-0.5 (-1.3 to 0.3)	69	103.4 (18.0)	0.1 (-0.8 to 1.0)	-0.56 (-1.94 to 0.82); p=0.39
Mensink, 2003[325]	BMI [kg/m2]	12	IG1	40	29.8 (3.7)	-1.1 (-1.5 to -0.7)	48	29.3 (3.1)	-0.1 (-0.5 to 0.3)	-1.00 (-1.55 to -0.45); p=<0.01
	BMI [kg/m2]	24	IG1	40	29.8 (3.7)	-0.8 (-1.2 to -0.3)	48	29.3 (3.1)	0.0 (-0.3 to 0.4)	-0.80 (-1.35 to -0.25); p=<0.01
	Body fat [%]	12	IG1	40	NR	-1.7 (-2.3 to -1.1)	48	NR	-0.7 (-1.3 to -0.1)	-1.00 (-1.83 to -0.17); p=<0.05
	Body fat [%]	24	IG1	40	NR	-1.0 (-1.6 to -0.3)	48	NR	-0.5 (-1.1 to 0.0)	-0.50 (-1.33 to 0.33); p=NR, NS
	WC [cm]	12	IG1	40	102.4 (11.1)	-3.8 (-5.0 to -2.6)	48	102.3 (8.4)	-1.2 (-2.4 to -0.0)	-2.60 (-4.26 to -0.94); p=<0.01
	WC [cm]	24	IG1	40	102.4 (11.1)	-1.9 (-3.4 to -0.5)	48	102.3 (8.4)	-0.6 (-1.8 to 0.6)	-1.30 (-3.11 to 0.51); p=NR, NS
	Waist-to-hip ratio	12	IG1	40	1.0 (0.1)	-0.0 (-0.0 to 0.0)	48	1.0 (0.1)	0.0 (-0.0 to 0.0)	-0.01 (-0.04 to 0.02); p=NR, NS
	Waist-to-hip ratio	24	IG1	40	1.0 (0.1)	0.0 (-0.0 to 0.0)	48	1.0 (0.1)	0.0 (-0.0 to 0.0)	0.00 (-0.03 to 0.03); p=NR, NS
	Weight [kg]	12	IG1	40	86.0 (14.1)	-3.1 (-4.3 to -1.9)	48	83.7 (11.5)	-0.2 (-1.2 to 0.8)	-2.90 (-4.43 to -1.37); p=<0.01
	Weight [kg]	24	IG1	40	86.0 (1.9)	-2.4 (-3.7 to -1.0)	48	83.7 (11.5)	-0.1 (-1.0 to 0.9)	-2.30 (-3.99 to -0.61); p=<0.01
Mitsui, 2008[270]	BMI [kg/m2]	12	IG1	22	24.8 (2.2)	-1.1 (-1.5 to -0.7)	21	25.6 (2.5)	-0.1 (-0.6 to 0.4)	-1.00 (-1.66 to -0.34); p>0.05

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	WC [cm]	12	IG1	22	92.7 (5.1)	-2.9 (-5.3 to -0.5)	21	94.9 (6.2)	0.8 (-2.1 to 3.7)	-3.70 (-7.46 to 0.06); p=0.0071
Moore, 2003[271]	BMI [kg/m2]	12	IG1	279	37.0 (5.7)	-0.1 (NR)	286	36.9 (5.8)	-0.1 (NR)	0.00 (-1.00 to 1.00); p=0.96
	BMI [kg/m2]	18	IG1	256	37.0 (5.7)	0.1 (NR)	275	36.9 (5.8)	0.0 (NR)	0.10 (-1.00 to 1.10); p=0.90
	Weight [kg]	12	IG1	279	100.8 (18.1)	-0.5 (NR)	286	100.2 (17.4)	-0.9 (NR)	1.00 (-1.90 to 3.90); p=0.5
	Weight [kg]	18	IG1	256	100.8 (18.1)	0.0 (NR)	275	100.2 (17.4)	-0.7 (NR)	1.30 (-1.80 to 4.40); p=0.4
Morgan, 2011[272]	Weight [% change]	12	IG1	34	NA	-6.1 (NR)	31	NA	-3.4 (NR)	-2.70 (NR); p>0.05
	BMI [kg/m2]	12	IG1	34	30.6 (2.7)	-1.7 (-2.4 to -1.0)	31	30.5 (3.0)	-0.9 (-1.7 to -0.2)	-0.70 (-1.70 to 0.30); p=0.332
	WC [cm]	12	IG1	34	102.8 (6.8)	-5.8 (-7.9 to -3.6)	31	103.4 (8.3)	-3.8 (-6.1 to -1.6)	-1.90 (-5.00 to 1.10); p=0.630
	Weight [kg]	12	IG1	34	99.1 (12.2)	-5.3 (-7.5 to -3.0)	31	99.2 (13.7)	-3.1 (-5.4 to -0.7)	-2.20 (-5.50 to 1.05); p=0.408
Nakade, 2012[274]	BMI [kg/m2]	12	IG1	115	30.3 (2.7)	-1.7 (-1.9 to -1.5)	111	30.8 (3.4)	-0.1 (-0.4 to 0.2)	-1.60 (-1.98 to -1.22); p=NR
	BMI [kg/m2]	12	IG1	58	29.8 (2.3)	-1.7 (-2.0 to -1.4)	55	30.5 (3.7)	-0.0 (-0.5 to 0.4)	-1.66 (-2.21 to -1.11); p<0.01
	BMI [kg/m2]	12	IG1	57	30.9 (3.0)	-1.6 (-2.0 to -1.2)	56	31.1 (3.1)	-0.1 (-0.5 to 0.3)	-1.50 (-2.03 to -0.97); p<0.01
	Body fat [%]	12	IG1	58	28.4 (3.6)	-1.7 (-2.2 to -1.2)	55	29.3 (4.8)	0.4 (-0.2 to 1.0)	-2.10 (-2.90 to -1.30); p<0.11
	Body fat [%]	12	IG1	115	33.9 (7.2)	-1.8 (-2.4 to -1.2)	111	35.6 (8.0)	0.1 (-0.6 to 0.8)	-1.90 (-2.80 to -1.00); p=NR
	Body fat [%]	12	IG1	57	39.5 (5.4)	-2.0 (-2.7 to -1.3)	56	41.7 (5.4)	-0.1 (-0.8 to 0.6)	-1.90 (-2.84 to -0.96); p<0.01
	WC [cm]	12	IG1	58	100.0 (6.4)	-4.1 (-5.9 to -2.3)	55	102.0 (8.8)	1.0 (-1.4 to 3.4)	-5.10 (-8.07 to -2.13); p<0.01
	WC [cm]	12	IG1	57	103.0 (7.9)	-3.8 (-6.1 to -1.5)	56	104.0 (8.9)	0.0 (-2.3 to 2.3)	-3.80 (-7.05 to -0.55); p<0.01
	WC [cm]	12	IG1	115	101.5 (7.3)	-4.0 (-5.5 to -2.5)	111	103.0 (8.9)	0.5 (-1.2 to 2.2)	-4.50 (-6.71 to -2.29); p=NR
	Weight [kg]	12	IG1	115	79.3 (9.7)	-4.5 (-5.3 to -3.7)	111	80.9 (12.5)	0.1 (-1.0 to 1.2)	-4.60 (-5.94 to -3.26); p=NR
	Weight [kg]	12	IG1	58	84.1 (8.4)	-5.0 (-6.0 to -4.0)	55	87.0 (11.7)	0.1 (-1.4 to 1.6)	-5.10 (-6.86 to -3.34); p<0.01

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [kg]	12	IG1	57	74.4 (8.5)	-3.9 (-4.9 to -2.9)	56	75.0 (10.2)	-0.2 (-1.4 to 1.0)	-3.70 (-5.32 to -2.08); p<0.01
Nanchahal, 2012[275]	Weight [% change]	12	IG1	103	NA	-2.6 (-3.7 to -1.5)	114	NA	-1.4 (-2.4 to -0.4)	-0.79 (-2.37 to 0.79); p=0.33
	BMI [kg/m2]	12	IG1	103	33.9 (5.6)	-0.8 (-1.2 to -0.4)	114	33.0 (5.4)	-0.5 (-0.8 to -0.1)	0.34 (-0.18 to 0.85); p=0.20
	Body fat [%]	12	IG1	101	39.4 (8.1)	-0.7 (-1.3 to -0.2)	111	38.9 (7.8)	-0.2 (-1.0 to 0.6)	-0.71 (-1.71 to 0.28); p=0.16
	WC [cm]	12	IG1	100	107.6 (12.8)	-3.4 (-4.9 to -1.8)	112	105.8 (13.0)	-1.5 (-2.6 to -0.4)	-1.22 (-3.10 to 0.66); p=0.20
	Weight [kg]	12	IG1	103	93.7 (18.4)	-2.4 (-3.5 to -1.3)	114	91.0 (18.1)	-1.3 (-2.2 to -0.4)	-0.70 (-2.17 to 0.76); p=0.35
Narayan, 1998[276]	BMI [kg/m2]	6	IG1	48	Median: 36.5 (Range: 24.1 to 59.9)	Median: 0.3 (NR)	47	Median: 33.2 (Range: 20.2 to 55.8)	Median: 0.2 (NR)	NR; p=0.39
	BMI [kg/m2]	12	IG1	48	Median: 36.5 (Range: 24.1 to 59.9)	Median: 0.9 (NR)	47	Median: 33.2 (Range: 20.2 to 55.8)	Median: 0.5 (NR)	NR; p=0.11
	WC [cm]	6	IG1	48	Median: 116.0 (Range: 87.0 to 161.0)	Median: 0.1 (NR)	47	Median: 110.0 (Range: 85.0 to 163.0)	Median: -1.5 (NR)	NR; p=0.64
	WC [cm]	12	IG1	48	Median: 116.0 (Range: 87.0 to 161.0)	Median: 0.1 (NR)	47	Median: 110.0 (Range: 85.0 to 163.0)	Median: -2.1 (NR)	NR; p=0.48
	Weight [kg]	12	IG1	48	Median: 96.4 (Range: 59.4 to 159.1)	Median: 2.5 (NR)	47	Median: 89.3 (Range: 59.2 to 184.8)	Median: 0.8 (NR)	NR; p=0.06
Nicklas, 2014[277]	BMI [kg/m2]	12	IG1	36	31.2 (5.8)	-1.1 (-1.9 to -0.4)	39	31.6 (5.5)	0.2 (-0.5 to 0.9)	-1.30 (-2.30 to -0.32); p=0.029
	Weight [kg]	12	IG1	36	82.9 (17.3)	-2.8 (-4.8 to -0.7)	39	84.2 (19.0)	0.5 (-1.4 to 2.4)	-3.30 (-6.00 to -0.60); p=0.022

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
Nilsen, 2011[327]	BMI [kg/m2]	18	IG1	93	37.0 (6.0)	-0.8 (-1.3 to -0.3)	89	35.8 (6.0)	-1.0 (-1.6 to -0.4)	0.20 (-0.58 to 0.98); p=NS, NR
	WC [cm]	18	IG1	93	118.0 (15.0)	-2.0 (-5.0 to 1.0)	89	119.0 (14.0)	-4.0 (-7.0 to -1.0)	2.00 (-2.22 to 6.22); p=NS, NR
	Weight [kg]	18	IG1	93	110.5 (22.0)	-2.5 (-4.4 to -0.6)	89	111.7 (22.0)	-3.0 (-5.1 to -0.9)	0.50 (-2.37 to 3.37); p=NS, NR
O'Brien, 2017[321]	BMI [kg/m2]	12	IG1	30	34.4 (7.9)	-1.6 (-2.3 to -1.0)	28	32.2 (5.7)	0.3 (-0.3 to 1.0)	-2.00 (-3.00 to -0.90); p=<0.001
	Waist Circumfere-nce [cm]	12	IG1	30	101.4 (13.0)	-4.0 (-5.5 to -2.6)	28	94.9 (9.8)	-0.2 (-1.7 to 1.3)	-3.80 (-6.40 to -1.30); p=0.001
	Weight [kg]	12	IG1	30	85.4 (23.0)	-4.0 (-5.5 to -2.6)	28	78.2 (15.0)	0.8 (-0.8 to 2.3)	-4.80 (-7.30 to -2.20); p=<0.001
	Weight [% change]	12	IG1	30	NR	-5.0 (-6.8 to -3.2)	28	NR	0.9 (-0.9 to 2.8)	-6.00 (-9.10 to -2.80); p=<0.001
Ockene, 2012[278]	BMI [kg/m2]	12	IG1	147	33.6 (5.1)	Median: -0.4 (-0.8 to -0.3)	142	34.2 (5.9)	Median: 0.1 (-0.2 to 0.4)	Effect: -0.46 (-0.76 to -0.14); p=0.004
	Weight [kg]	12	IG1	147	86.3 (14.5)	Median: -2.5 (-4.0 to -1.5)	142	86.7 (16.5)	Median: 0.6 (-1.1 to 2.0)	Effect: -1.13 (-4.25 to -0.75); p=0.004
Pacanowski, 2015[279]	Weight [% change]	12	IG1	70	NA	-2.7 (-4.1 to -1.3)	65	NA	-0.5 (-1.7 to 0.7)	-2.20 (-4.01 to -0.39); p=NR
	Weight [kg]	12	IG1	81	94.3 (17.0)	-2.1 (-3.3 to -0.9)	67	93.1 (17.9)	-0.4 (-1.5 to 0.7)	-1.70 (-3.31 to -0.09); p=0.037
Parikh, 2010[280]	Weight [% change]	12	IG1	50	NA	3.3 (NR)	49	NA	1.4 (NR)	1.90 (NR); p<0.05
	WC [cm]	12	IG1	35	15.7 (1.6)	-0.5 (-0.9 to -0.2)	37	15.4 (1.6)	0.0 (-0.4 to 0.5)	-0.55 (-1.10 to -0.00); p=0.05
	Weight [kg]	12	IG1	50	78.9 (17.7)	-2.5 (NR)	49	73.5 (12.2)	-1.0 (NR)	-1.45 (NR); p<0.05
Patrick, 2011[281]	BMI [kg/m2]	12	IG1	217	34.2 (4.2)	-0.4 (-0.7 to -0.1)	224	34.3 (4.0)	-0.1 (-0.3 to 0.1)	-0.27 (-0.54 to 0.00); p=0.053
	WC [cm]	12	IG1	217	113.7 (11.0)	-1.6 (-3.1 to -0.1)	224	112.9 (11.1)	-1.3 (-2.8 to 0.2)	-0.29 (-1.16 to 0.58); p=0.516
	Weight [kg]	12	IG1	217	104.7 (15.3)	-0.9 (-1.8 to 0.0)	224	104.6 (15.3)	-0.2 (-1.1 to 0.7)	-0.69 (-1.52 to 0.14); p=0.101
Penn, 2009[283]	Weight [kg]	12	IG1	51	93.4 (16.0)	-2.3 (NR)	51	90.6 (12.5)	0.0 (NR)	-2.50 (-4.20 to 0.70); p=0.007
Phelan, 2017[330]	WC [cm]	12	IG1	174	LSM: 99.7 (95% CI: 96.5 to 102.9)	LSM: -4.0 (-5.1 to -2.9)	193	LSM: 98.8 (95% CI: 96.0 to 101.7)	LSM: -1.2 (-2.2 to -0.2)	LSM: -2.80 (-4.30 to -1.30); p=<0.001

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [kg]	12	IG1	174	82.5 (33.7)	-3.2 (-4.1 to -2.4)	193	82.4 (32.6)	-0.9 (-1.7 to -0.1)	-2.30 (-3.50 to -1.10); p=<0.001
	Weight [% change]	12	IG1	174	NR	NR	193	NR	NR	LSM: -3.10 (-4.60 to -1.60); p=<0.002
Puhkala, 2015[286]	WC [cm]	12	IG1	47	113.8 (9.5)	-4.7 (-6.4 to -3.0)	48	114.9 (10.3)	-0.1 (-1.1 to 0.9)	-4.70 (-6.60 to -2.70); p<0.05
	WC [cm]	24	IG1	37	113.8 (9.5)	-4.5 (-6.9 to -2.1)	43	114.9 (10.3)	-4.4 (-6.0 to -2.8)	-0.20 (-3.10 to 2.80); p=NS, NR
	Weight [kg]	12	IG1	47	105.8 (16.3)	-3.4 (-5.3 to -1.5)	48	106.7 (16.4)	0.7 (-0.4 to 1.8)	-4.00 (-6.20 to -1.90); p<0.05
	Weight [kg]	24	IG1	37	105.8 (16.3)	-3.1 (-6.0 to -0.2)	43	106.7 (16.4)	-2.5 (-4.3 to -0.7)	-0.50 (-3.80 to 2.90); p=NS, NR
Rock, 2007[289]	Weight [% change]	12	IG1	35	NR	-7.1 (-10.7 to -3.5)	35	NR	-0.7 (-2.7 to 1.3)	-6.40 (-10.49 to -2.31); p<0.01
	Hip circumfere-nce [cm]	12	IG1	35	123.5 (9.1)	-6.2 (-8.8 to -3.6)	35	120.0 (6.5)	-0.3 (-2.0 to 1.4)	-5.90 (-8.97 to -2.83); p<0.01
	WC [cm]	12	IG1	35	113.0 (10.6)	-8.2 (-11.7 to -4.7)	35	110.2 (11.6)	-0.2 (-2.5 to 2.1)	-8.00 (-12.18 to -3.82); p<0.01
	Weight [kg]	12	IG1	35	94.4 (12.2)	-6.6 (-10.0 to -3.2)	35	89.6 (9.4)	-0.7 (-2.5 to 1.1)	-5.90 (-9.74 to -2.06); p<0.01
Rock, 2015[288]	Weight [% change]	12	IG1	297	NA	-6.0 (-6.8 to -5.2)	288	NA	-1.5 (-2.3 to -0.7)	-4.50 (-5.61 to -3.39); p<0.001
	Weight [% change]	18	IG1	278	NA	-4.7 (-5.5 to -3.9)	262	NA	-1.1 (-1.9 to -0.3)	-3.60 (-4.71 to -2.49); p<0.001
	Weight [% change]	24	IG1	300	NA	-3.7 (-4.5 to -2.9)	287	NA	-1.3 (-2.1 to -0.5)	-2.40 (-3.51 to -1.29); p<0.001
	BMI [kg/m2]	12	IG1	297	31.6 (5.6)	-1.9 (-2.2 to -1.6)	288	31.4 (3.7)	-0.5 (-0.8 to -0.2)	-1.40 (-1.79 to -1.01); p=0.003
	BMI [kg/m2]	18	IG1	278	31.6 (5.6)	-1.6 (-1.9 to -1.3)	262	31.4 (3.7)	-0.6 (-0.9 to -0.3)	-1.00 (-1.39 to -0.61); p=0.03
	BMI [kg/m2]	24	IG1	300	31.6 (5.6)	-1.3 (-1.6 to -1.0)	287	31.4 (3.7)	-0.4 (-0.7 to -0.1)	-0.90 (-1.29 to -0.51); p=0.14
	WC [cm]	12	IG1	275	104.9 (13.0)	-7.1 (-8.6 to -5.6)	247	103.5 (13.1)	-3.1 (-4.6 to -1.6)	-4.00 (-6.11 to -1.89); p=0.004
	WC [cm]	24	IG1	272	104.9 (13.0)	-5.5 (-7.0 to -4.0)	259	103.5 (13.1)	-3.1 (-4.6 to -1.6)	-2.40 (-4.49 to -0.31); p=0.21
	Weight [kg]	12	IG1	297	85.0 (14.8)	-5.3 (-6.1 to -4.5)	288	84.7 (13.1)	-1.2 (-2.0 to -0.4)	-4.10 (-5.19 to -3.01); p=0.003
	Weight [kg]	18	IG1	278	85.0 (14.8)	-4.4 (-5.2 to -3.6)	262	84.7 (13.1)	-1.2 (-2.0 to -0.4)	-3.20 (-4.30 to -2.10); p=0.02

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [kg]	24	IG1	300	85.0 (14.8)	-3.6 (-4.4 to -2.8)	287	84.7 (13.1)	-1.2 (-2.0 to -0.4)	-2.40 (-3.49 to -1.31); p=0.13
Rodriguez-Cristobal, 2017[329]	Weight [kg]	12	IG1	283	85.5 (13.9)	-1.8 (-2.6 to -1.0)	302	87.1 (14.5)	-1.3 (-1.5 to -1.1)	-0.50 (-1.54 to 0.54); p=NS, NR
Rosas, 2015[290]	Weight [% change]	12	IG1	84	NA	-0.01 (-0.03 to 0.00)	41	NA	-0.01 (-0.03 to 0.01)	0.00 (-0.02 to 0.02); p=0.96
	Weight [% change]	12	IG2	82	NA	-0.02 (-0.04 to -0.01)	41	NA	-0.01 (-0.03 to 0.01)	-0.01 (-0.03 to 0.01); p=0.92
	Weight [% change]	24	IG1	84	NA	-0.01 (-0.2 to 0.01)	41	NA	0.0 (-0.03 to 0.02)	-0.01 (-0.12 to 0.10); p=0.92
	Weight [% change]	24	IG2	82	NA	-0.02 (-0.03 to 0.00)	41	NA	0.0 (-0.03 to 0.02)	-0.02 (-0.05 to 0.01); p=0.72
	BMI [kg/m2]	12	IG1	84	36.0 (5.7)	-0.6 (-1.0 to -0.1)	41	34.9 (4.4)	-0.3 (-0.8 to 0.3)	-0.30 (-1.00 to 0.40); p=0.39
	BMI [kg/m2]	12	IG2	82	35.5 (5.1)	-0.7 (-1.1 to -0.3)	41	34.9 (4.4)	-0.3 (-0.8 to 0.3)	-0.40 (-1.07 to 0.27); p=0.20
	BMI [kg/m2]	24	IG1	84	36.0 (5.7)	-0.4 (-1.0 to 0.2)	41	34.9 (4.4)	-0.2 (-1.1 to 0.7)	-0.20 (-1.26 to 0.86); p=0.67
	BMI [kg/m2]	24	IG2	82	35.5 (5.1)	-0.4 (-0.9 to 0.2)	41	34.9 (4.4)	-0.2 (-1.1 to 0.7)	-0.20 (-1.23 to 0.83); p=0.72
	WC [cm]	12	IG1	84	NR	-1.5 (-2.2 to -0.8)	41	NR	-1.3 (-2.2 to -0.4)	-0.20 (-1.32 to 0.92); p=0.76
	WC [cm]	12	IG2	82	NR	-0.6 (-1.4 to 0.2)	41	NR	-1.3 (-2.2 to -0.4)	0.70 (-0.48 to 1.88); p=0.26
	WC [cm]	24	IG1	84	NR	-1.4 (-2.1 to -0.7)	41	NR	-0.7 (-1.7 to 0.2)	-0.70 (-1.86 to 0.46); p=0.24
	WC [cm]	24	IG2	82	NR	-0.8 (-1.5 to -0.1)	41	NR	-0.7 (-1.7 to 0.2)	-0.10 (-1.26 to 1.06); p=0.95
	Weight [kg]	12	IG1	84	89.3 (NR)	-1.4 (-2.4 to -0.3)	41	88.6 (NR)	-0.7 (-2.2 to 0.8)	-0.70 (-2.49 to 1.09); p=0.49
	Weight [kg]	12	IG2	82	89.3 (NR)	-1.9 (-2.9 to -0.9)	41	88.6 (NR)	-0.7 (-2.2 to 0.8)	-1.20 (-2.97 to 0.57); p=0.21
	Weight [kg]	24	IG1	84	89.3 (NR)	-1.0 (-2.4 to 1.0)	41	88.6 (NR)	-0.6 (-2.8 to 1.5)	-0.40 (-3.09 to 2.29); p=0.78
	Weight [kg]	24	IG2	82	89.3 (NR)	-1.0 (-2.4 to 0.4)	41	88.6 (NR)	-0.6 (-2.8 to 1.5)	-0.40 (-2.91 to 2.11); p=0.76
Ross, 2012[291]	BMI [kg/m2]	12	IG1	249	32.6 (4.6)	-0.8 (-1.1 to -0.6)	241	32.1 (4.5)	-0.3 (-0.5 to -0.0)	-0.57 (-0.93 to -0.21); p=0.001
	BMI [kg/m2]	18	IG1	249	32.6 (4.6)	-0.6 (-0.9 to -0.3)	241	32.1 (4.5)	-0.3 (-0.5 to 0.0)	-0.34 (-0.76 to 0.08); p=0.10
	BMI [kg/m2]	24	IG1	249	32.6 (4.6)	-0.5 (-0.8 to -0.1)	241	32.1 (4.5)	-0.2 (-0.5 to 0.1)	-0.23 (-0.66 to 0.20); p=0.26
	Body fat [%]	12	IG1	249	37.6 (4.7)	-1.2 (-1.6 to -0.8)	241	37.5 (4.7)	-0.3 (-0.7 to 0.1)	-0.88 (-1.43 to -0.33); p=0.001

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Body fat [%]	18	IG1	249	37.6 (4.7)	-0.7 (-1.2 to -0.2)	241	37.5 (4.7)	-0.3 (-0.8 to 0.1)	-0.35 (-0.99 to 0.29); p=0.13
	Body fat [%]	24	IG1	249	37.6 (4.7)	-0.7 (-1.1 to -0.2)	241	37.5 (4.7)	-0.2 (-0.6 to 0.2)	-0.47 (-1.05 to 0.11); p=0.10
	WC [cm]	12	IG1	249	109.1 (11.0)	-2.5 (-3.3 to -1.7)	241	108.0 (10.9)	-0.9 (-1.7 to -0.1)	-1.60 (-2.71 to -0.49); p=0.001
	WC [cm]	18	IG1	249	109.1 (11.0)	-1.8 (-2.6 to -1.0)	241	108.0 (10.9)	-0.4 (-1.2 to 0.4)	-1.40 (-2.51 to -0.29); p=0.10
	WC [cm]	24	IG1	249	109.1 (11.0)	-0.9 (-1.7 to -0.1)	241	108.0 (10.9)	0.2 (-0.6 to 1.0)	-1.10 (-2.21 to 0.01); p=0.05
	Weight [kg]	12	IG1	249	94.2 (13.6)	-2.4 (-3.1 to -1.7)	241	92.3 (13.5)	-0.9 (-1.6 to -0.1)	-1.56 (-2.53 to -0.59); p=0.002
	Weight [kg]	18	IG1	249	94.2 (13.6)	-1.7 (-2.5 to -0.9)	241	92.3 (13.5)	-0.7 (-1.5 to 0.1)	-0.97 (-2.12 to 0.18); p=0.08
	Weight [kg]	24	IG1	249	94.2 (13.6)	-1.2 (-2.0 to -0.4)	241	92.3 (13.5)	-0.6 (-1.4 to 0.2)	-0.58 (-1.73 to 0.57); p=0.33
Shapiro, 2012[293]	Weight [% change]	12	IG1	81	NR	-1.8 (-1.8 to -1.8)	89	NR	-0.8 (-0.8 to -0.8)	-1.00 (-1.02 to -0.98); p=0.394
	Weight [kg]	12	IG1	81	91.6 (17.2)	-1.7 (-2.8 to -0.5)	89	92.9 (17.9)	-1.0 (-1.9 to -0.1)	-0.62 (-2.10 to 0.86); p=0.12
Silva, 2009[295]	Weight [% change]	12	IG1	123	NA	-6.6 (-7.7 to -5.6)	116	NA	-1.3 (-2.1 to -0.6)	-5.30 (-6.62 to -3.98); p<0.001
	BMI [kg/m2]	12	IG1	115	31.7 (4.2)	-2.3 (-2.6 to -2.0)	93	31.3 (4.0)	0.7 (0.3 to 1.1)	-3.00 (-3.52 to -2.48); p<0.001
	Body fat [%]	12	IG1	115	43.7 (4.9)	-6.9 (-8.3 to -5.5)	93	44.1 (4.9)	-2.5 (-4.0 to -1.0)	-4.40 (-6.50 to -2.30); p<0.001
	Weight [kg]	12	IG1	123	82.1 (11.9)	-5.5 (NR)	116	81.5 (12.1)	-1.1 (NR)	4.40 (NR); p<0.001
Stevens, 1993[300]	Weight [kg]	18	IG1	293	90.2 (13.3)	-3.8 (-4.5 to -3.1)	235	89.3 (13.0)	0.1 (-0.4 to 0.6)	-3.90 (-4.77 to -3.03); p<0.01
Stevens, 2001[301]	Weight [kg]	18	IG1	545	93.4 (14.1)	-2.0 (-2.5 to -1.5)	551	93.6 (13.5)	0.7 (0.4 to 1.6)	-2.70 (-3.30 to -2.10); p<0.001
	Weight [kg]	36	IG1	547	93.4 (14.1)	-0.2 (-0.7 to 0.3)	554	93.6 (13.5)	1.8 (1.3 to 2.2)	-1.90 (-2.60 to -1.30); p<0.001
Svetkey, 2015[302]	Weight [% change]	12	IG1	120	NA	-3.5 (NR)	123	NA	-2.1 (NR)	-1.36 (-3.14 to 0.42); p=NR
	Weight [% change]	12	IG2	122	NA	-1.3 (NR)	123	NA	-2.1 (NR)	0.80 (-0.98 to 2.57); p=NR
	Weight [% change]	24	IG1	120	NA	-2.5 (NR)	123	NA	-1.2 (NR)	-1.26 (-3.13 to 0.62); p=NR

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [% change]	24	IG2	122	NR	-0.9 (NR)	123	NA	-1.2 (NR)	0.33 (-1.54 to 2.20); p=NR
	Weight [kg]	12	IG1	120	99.3 (23.4)	-3.6 (NR)	123	101.3 (22.6)	-2.3 (NR)	-1.33 (-3.19 to 0.53); p=NS, NR
	Weight [kg]	12	IG2	122	102.4 (25.2)	-1.5 (NR)	123	101.3 (22.6)	-2.3 (NR)	0.77 (-1.08 to 2.63); p=NS, NR
	Weight [kg]	24	IG1	120	99.3 (23.4)	-2.5 (NR)	123	101.3 (22.6)	-1.4 (NR)	-1.00 (-2.91 to 0.90); p=NS, NR
	Weight [kg]	24	IG2	122	102.4 (25.2)	-1.0 (NR)	123	101.3 (22.6)	-1.4 (NR)	0.46 (-1.45 to 2.35); p=NS, NR
Thomas, 2017[322]	Weight [kg]	12	IG1	91	91.9 (14.1)	-1.6 (-2.6 to -0.6)	86	88.8 (13.8)	-1.2 (-2.3 to -0.2)	-0.40 (-1.85 to 1.05); p=NS, NR
	Weight [kg]	12	IG2	94	93.4 (14.0)	-2.1 (-3.0 to -1.1)	86	88.8 (13.8)	-1.2 (-2.3 to -0.2)	-0.90 (-2.32 to 0.52); p=NS, NR
Tsai, 2010[305]	WC [cm]	12	IG1	24	17.0 (2.1)	-0.0 (-0.6 to 0.5)	26	17.8 (2.2)	-0.1 (-0.6 to 0.3)	0.08 (-0.63 to 0.79); p=0.09
	Weight [kg]	12	IG1	22	97.0 (16.7)	-2.3 (-4.1 to -0.5)	25	103.1 (17.8)	-1.1 (-2.7 to 0.5)	-1.20 (-3.56 to 1.16); p=0.31
Tuomilehto, 2001[306]	Weight [% change]	12	IG1	256	NA	-4.7 (-5.0 to -4.4)	250	NA	0.9 (-1.0 to -0.8)	-5.60 (-6.44 to -4.76); p<0.001
	Weight [% change]	36	IG1	231	NA	-4.0 (-4.7 to -3.3)	203	NA	-1.1 (-2.0 to -0.2)	-2.90 (-4.03 to -1.77); p<0.0001
	BMI [kg/m2]	12	IG1	256	31.3 (4.6)	-1.6 (-1.8 to -1.4)	250	31.0 (4.5)	-0.4 (-0.6 to -0.2)	-1.20 (-1.47 to -0.93); p<0.0001
	BMI [kg/m2]	36	IG1	231	31.3 (4.6)	-1.3 (-1.5 to -1.1)	203	31.0 (4.5)	-0.3 (-0.6 to -0.0)	-1.00 (-1.37 to -0.63); p<0.0001
	WC [cm]	12	IG1	256	102.0 (11.0)	-4.4 (-5.1 to -3.9)	250	100.5 (10.9)	-1.3 (-1.9 to -0.7)	-3.10 (-3.97 to -2.23); p<0.0001
	WC [cm]	24	IG1	256	102.0 (11.0)	-4.2 (-4.9 to -3.5)	250	100.5 (10.9)	-1.3 (-2.0 to -0.6)	-2.90 (-3.82 to -1.98); p=0.0000
	WC [cm]	36	IG1	231	102.0 (11.0)	-3.3 (-4.0 to -2.6)	203	100.5 (10.9)	-1.2 (-2.0 to -0.4)	-2.10 (-3.19 to -1.01); p=0.0005
	Weight [kg]	12	IG1	256	86.7 (14.0)	-4.2 (-4.8 to -3.6)	250	85.5 (14.4)	-0.8 (-1.3 to -0.3)	-3.40 (-4.18 to -2.62); p=0.0001
	Weight [kg]	24	IG1	256	86.7 (14.0)	-3.5 (-4.2 to -2.8)	250	85.5 (14.4)	-0.8 (-1.4 to -0.2)	-2.70 (-3.57 to -1.83); p=0.0001
	Weight [kg]	36	IG1	231	86.7 (14.0)	-3.5 (-4.2 to -2.8)	203	85.5 (14.4)	-0.9 (-1.6 to -0.2)	-2.60 (-3.59 to -1.61); p<0.0001
van Wier, 2011[308]	WC [cm]	24	IG1	241	101.5 (9.9)	-2.1 (-3.4 to -0.8)	241	101.3 (9.1)	-1.8 (-3.0 to -0.6)	-0.30 (-1.30 to 0.80); p=0.598

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Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	WC [cm]	24	IG2	252	102.4 (9.7)	-2.6 (-3.8 to -1.4)	241	101.3 (9.1)	-1.8 (-3.0 to -0.6)	-0.70 (-1.70 to 0.40); p=0.199
	Weight [kg]	24	IG1	450	92.9 (14.4)	-1.9 (-2.5 to -1.3)	448	93.0 (13.4)	-1.0 (-1.6 to -0.4)	-0.90 (-2.00 to 0.30); p=0.112
	Weight [kg]	24	IG2	453	93.6 (14.0)	-1.5 (-2.1 to -0.9)	448	93.0 (13.4)	-1.0 (-1.6 to -0.4)	-0.40 (-1.40 to 0.70); p=0.448
von Gruenigen, 2012[310]	Weight [% change]	12	IG1	41	NA	-3.0 (NR)	34	NA	1.4 (NR)	-4.40 (NR); p<0.001
	BMI [kg/m2]	12	IG1	41	36.4 (5.5)	-1.3 (-1.9 to -0.7)	34	36.5 (9.6)	0.3 (-0.5 to 1.1)	-1.60 (-2.59 to -0.61); p=0.119
	WC [cm]	12	IG1	41	16.6 (1.9)	-0.4 (-1.0 to 0.2)	34	16.4 (2.3)	-0.3 (-1.1 to 0.5)	-0.24 (-0.43 to -0.06); p=0.011
	Weight [kg]	12	IG1	41	95.7 (19.0)	-3.0 (-5.7 to -0.3)	34	94.0 (23.0)	1.4 (-2.3 to 5.1)	-4.60 (-5.80 to -3.50); p<0.001
Wadden, 2011[206]	Weight [% change]	12	IG1	131	NA	-3.5 (-4.7 to -2.3)	130	NA	-2.1 (-3.3 to -0.9)	-1.40 (-3.06 to 0.26); p=0.08
	Weight [% change]	18	IG1	131	NA	-3.1 (-4.5 to -1.7)	130	NA	-1.7 (-3.1 to -0.3)	-1.40 (-3.34 to 0.54); p=0.10
	Weight [% change]	24	IG1	131	NA	-2.9 (-4.3 to -1.5)	130	NA	-1.6 (-2.8 to -0.4)	-1.30 (-3.11 to 0.51); p=0.12
	BMI [kg/m2]	12	IG1	131	38.5 (4.6)	-1.3 (-1.7 to -0.9)	130	39.0 (4.8)	-0.8 (-1.2 to -0.4)	-0.50 (-1.05 to 0.05); p=0.18
	BMI [kg/m2]	18	IG1	131	38.5 (4.6)	-1.1 (-1.5 to -0.7)	130	39.0 (4.8)	-0.7 (-1.1 to -0.3)	-0.40 (-0.95 to 0.15); p=0.17
	BMI [kg/m2]	24	IG1	131	38.5 (4.6)	-0.9 (-1.3 to -0.5)	130	39.0 (4.8)	-0.6 (-1.0 to -0.2)	-0.30 (-0.85 to 0.25); p=0.27
	WC [cm]	12	IG1	131	117.1 (11.9)	-4.6 (-5.8 to -3.4)	130	119.8 (13.9)	-3.2 (-4.4 to -2.0)	-1.40 (-3.06 to 0.26); p=0.089
	WC [cm]	24	IG1	131	117.1 (136.2)	-4.0 (-5.4 to -2.6)	130	119.8 (158.5)	-2.3 (-3.7 to -0.9)	-1.70 (-3.64 to 0.24); p=0.056
	Weight [kg]	12	IG1	131	106.3 (17.3)	-3.4 (-4.6 to -2.2)	130	111.2 (20.0)	-2.3 (-3.5 to -1.1)	-1.10 (-2.76 to 0.56); p=0.23
	Weight [kg]	18	IG1	131	106.3 (17.3)	-3.0 (-4.4 to -1.6)	130	111.2 (20.0)	-1.9 (-3.3 to -0.5)	-1.10 (-3.04 to 0.84); p=0.22
	Weight [kg]	24	IG1	131	106.3 (17.3)	-2.9 (-4.3 to -1.5)	130	111.2 (20.0)	-1.7 (-3.1 to -0.3)	-1.20 (-3.14 to 0.74); p=0.22
Whelton, 1998[326]	Weight [kg]	12	IG1	294	86.5 (10.0)	-4.7 (-5.0 to -4.4)	291	87.0 (10.5)	-1.1 (-1.4 to -0.9)	-3.60 (-3.99 to -3.21); p=NR
	Weight [kg]	18	IG1	294	86.5 (10.0)	-4.4 (-4.6 to -4.1)	291	87.0 (10.5)	-0.8 (-1.1 to -0.6)	-3.60 (-4.30 to -2.80); p=<0.001

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Weight [kg]	30	IG1	294	86.5 (10.0)	-4.7 (-5.2 to -4.2)	291	87.0 (10.5)	-0.9 (-1.3 to -0.5)	-3.90 (-5.10 to -2.70); p=<0.001
Wing, 1998[314]	BMI [kg/m2]	12	IG1	30	35.7 (4.1)	-2.7 (-3.9 to -1.5)	29	36.0 (5.4)	-0.2 (-0.8 to 0.4)	-2.50 (-3.86 to -1.14); p<0.001
	BMI [kg/m2]	12	IG2	33	36.1 (4.1)	-2.0 (-2.9 to -1.1)	29	36.0 (5.4)	-0.2 (-0.8 to 0.4)	-1.80 (-2.85 to -0.75); p=NS, NR
	BMI [kg/m2]	12	IG3	28	36.0 (3.7)	-0.1 (-0.8 to 0.6)	29	36.0 (5.4)	-0.2 (-0.8 to 0.4)	0.10 (-0.81 to 1.01); p=NS, NR
	BMI [kg/m2]	24	IG1	32	35.7 (4.1)	-0.8 (-1.8 to 0.2)	31	36.0 (5.4)	-0.1 (-0.7 to 0.5)	-0.70 (-1.90 to 0.50); p=NS, NR
	BMI [kg/m2]	24	IG2	35	36.1 (4.1)	-0.8 (-1.7 to 0.1)	31	36.0 (5.4)	-0.1 (-0.7 to 0.5)	-0.70 (-1.80 to 0.40); p=NS, NR
	BMI [kg/m2]	24	IG3	31	36.0 (3.7)	0.4 (-0.2 to 1.0)	31	36.0 (5.4)	-0.1 (-0.7 to 0.5)	0.50 (-0.35 to 1.35); p=NS, NR
	Waist-to-hip ratio	24	IG1	32	0.9 (0.1)	-0.03 (-0.05 to -0.01)	31	0.9 (0.1)	-0.02 (-0.04 to 0.00)	-0.01 (-0.03 to 0.01); p=NS, NR
	Waist-to-hip ratio	24	IG2	35	0.1 (0.0)	-0.03 (-0.05 to -0.01)	31	0.9 (0.1)	-0.02 (-0.04 to 0.00)	-0.01 (-0.04 to 0.02); p=NS, NR
	Waist-to-hip ratio	24	IG3	31	0.1 (0.0)	-0.02 (-0.04 to 0.00)	31	0.9 (0.1)	-0.02 (-0.04 to -0.00)	0.00 (-0.02 to 0.02); p=NS, NR
	Weight [kg]	12	IG1	30	98.7 (15.9)	-7.4 (-10.9 to -3.9)	29	97.4 (16.0)	-0.3 (-1.9 to 1.3)	-7.10 (-10.94 to -3.26); p<0.001
	Weight [kg]	12	IG2	33	99.6 (13.0)	-5.5 (-7.9 to -3.1)	29	97.4 (16.0)	-0.3 (-1.9 to 1.3)	-5.20 (-8.07 to -2.33); p=NS, NR
	Weight [kg]	12	IG3	28	99.3 (15.3)	-0.4 (-2.2 to 1.4)	29	97.4 (16.0)	-0.3 (-1.9 to 1.3)	-0.10 (-2.52 to 2.32); p=NS, NR
	Weight [kg]	24	IG1	32	98.7 (15.9)	-2.5 (-5.4 to 0.4)	31	97.4 (16.0)	-0.3 (-1.9 to 1.3)	-2.20 (-5.51 to 1.11); p=NS, NR
	Weight [kg]	24	IG2	35	99.6 (13.0)	-2.1 (-4.6 to 0.4)	31	97.4 (16.0)	-0.3 (-1.9 to 1.3)	-1.80 (-4.77 to 1.17); p=NS, NR
	Weight [kg]	24	IG3	31	99.3 (15.3)	1.0 (-0.7 to 2.7)	31	97.4 (16.0)	-0.3 (-1.9 to 1.3)	1.30 (-0.99 to 3.59); p=NS, NR
Wylie-Rosett, 2001[315]	Weight [% change]	12	IG1	194	NA	-3.5 (-4.5 to -2.5)	97	NA	-0.9 (-2.0 to 0.2)	-2.60 (-4.03 to -1.17); p=NR
	Weight [% change]	12	IG2	183	NA	-2.2 (-3.1 to -1.3)	97	NA	-0.9 (-2.0 to 0.2)	-1.30 (-2.72 to 0.12); p=NR
	BMI [kg/m2]	12	IG1	194	35.2 (99.9)	-1.2 (-1.6 to -0.8)	97	36.5 (64.6)	-0.4 (-0.8 to 0.0)	-0.80 (-1.36 to -0.24); p=NR
	BMI [kg/m2]	12	IG2	183	35.7 (102.9)	-0.8 (-1.1 to -0.5)	97	36.5 (64.6)	-0.4 (-0.8 to 0.0)	-0.40 (-0.93 to 0.13); p=NR

Appendix G Table 1. Detailed Results for Weight Loss-Related Outcomes for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
	Body fat [%]	12	IG1	194	39.7 (124.4)	-1.2 (-1.8 to -0.7)	97	40.1 (84.0)	-0.0 (-0.9 to 0.9)	-1.23 (-2.27 to -0.19); p=NR
	Body fat [%]	12	IG2	183	39.8 (109.1)	-0.2 (-0.7 to 0.4)	97	40.1 (84.0)	-0.0 (-0.9 to 0.9)	-0.16 (-1.19 to 0.87); p=NR
	WC [cm]	12	IG1	194	16.1 (36.3)	-0.3 (-0.4 to -0.1)	97	16.9 (25.4)	-0.1 (-0.2 to 0.1)	-0.19 (-0.43 to 0.04); p=NR
	WC [cm]	12	IG2	183	16.2 (36.9)	-0.1 (-0.3 to 0.0)	97	16.9 (25.4)	-0.1 (-0.2 to 0.1)	-0.08 (-0.31 to 0.15); p=NR
	Weight [kg]	12	IG1	194	96.1 (302.4)	-3.4 (-4.4 to -2.3)	97	100.1 (222.7)	-1.0 (-2.1 to 0.1)	-2.36 (-3.87 to -0.84); p=0.02
	Weight [kg]	12	IG2	183	96.7 (306.5)	-2.1 (-3.0 to -1.2)	97	100.1 (222.7)	-1.0 (-2.1 to 0.1)	-1.13 (-2.57 to 0.31); p=NS, NR
Yeh, 2016[316]	Weight [% change]	12	IG1	30	NA	-3.3 (-4.7 to -1.9)	28	NA	0.3 (-0.9 to 1.5)	-3.60 (-5.41 to -1.79); p=0.0003
	BMI [% change]	12	IG1	30	NA	-3.2 (-5.7 to -0.7)	28	NA	-0.3 (-3.0 to 2.4)	-2.90 (-6.64 to 0.84); p=NR, NS
	Body fat [% change]	12	IG1	30	NA	-7.0 (-10.5 to -3.5)	28	NA	-1.6 (-4.5 to 1.3)	-5.40 (-9.99 to -0.81); p<0.05
	WC [% change]	12	IG1	30	NA	-2.4 (-5.1 to 0.3)	28	NA	1.9 (-0.6 to 4.4)	-4.30 (-8.04 to -0.56); p<0.05

*Study-reported adjusted between group difference if available; otherwise, calculated unadjusted between group difference. P-value is study-reported.

Abbreviations: BMI = body mass index; CI = confidence interval; cm = centimeters; FU = followup; kg = kilograms; mos = months; NR = not reported; NS = not statistically significant; SD = standard deviation; WC = waist circumference

Appendix G Table 2. Detailed Results for Meeting Weight Loss Goals for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome	FU, mos	IG	IG N	IG n (%)	CG N	CG n (%)	Calculated RR (95% CI); study-reported p-value
Ackermann, 2015[215]	≥5% Wt loss	12	IG1	213	69 (32.4%)	217	29 (13.4%)	2.42 (1.64 to 3.58); p<0.001
Ahern, 2017[323]	≥5% Wt loss	12	IG1	528	30 (57.0%)	211	53 (25.0%)	2.27 (1.78 to 2.90); p=NR
	≥5% Wt loss	12	IG2	528	222 (42.0%)	211	53 (25.0%)	1.67 (1.30 to 2.16); p=NR
	≥5% Wt loss	24	IG1	528	206 (39.0%)	211	46 (22.0%)	1.79 (1.36 to 2.36); p=NR
	≥5% Wt loss	24	IG2	528	143 (27.0%)	211	46 (22.0%)	1.24 (0.93 to 1.66); p=NR
	≥10% Wt loss	12	IG1	528	158 (30.0%)	211	19 (9.0%)	3.32 (2.12 to 5.20); p=NR
	≥10% Wt loss	12	IG2	528	79 (15.0%)	211	19 (9.0%)	1.66 (1.03 to 2.67); p=NR
	≥10% Wt loss	24	IG1	528	95 (18.0%)	211	19 (9.0%)	2.00 (1.25 to 3.18); p=NR
	≥10% Wt loss	24	IG2	528	63 (12.0%)	211	19 (9.0%)	1.33 (0.81 to 2.16); p=NR
Anderson, 2014[217]	≥5% Wt loss	12	IG1	163	59 (36.0%)	166	20 (12.0%)	3.12 (1.92 to 5.07)*; p=NR
	≥7% Wt loss	12	IG1	163	36 (22.0%)	166	15 (9.0%)	2.50 (1.40 to 4.48)*; p=NR
Appel, 2011[219]	≥5% Wt loss	24	IG1	133	55 (41.4%)	128	24 (18.8%)	2.21 (1.46 to 3.34); p<0.001
	≥5% Wt loss	24	IG2	131	50 (38.2%)	128	24 (18.8%)	2.04 (1.34 to 3.10); p<0.001
	≥10% Wt loss	24	IG1	133	26 (19.5%)	128	11 (8.6%)	2.27 (1.17 to 4.41); p=0.01
	≥10% Wt loss	24	IG2	131	24 (18.3%)	128	11 (8.6%)	2.13 (1.09 to 4.17); p=0.02
Aveyard, 2016[221]	≥5% Wt loss	12	IG1	940	238 (25.0%)	942	131 (14.0%)	1.82 (1.50 to 2.21); p<0.0001
	≥10% Wt loss	12	IG1	940	117 (12.0%)	942	53 (6.0%)	2.21 (1.62 to 3.02); p<0.0001
Beeken, 2017[318]	≥5% Wt loss	12	IG1	143	36 (25.2%)	152	44 (28.9%)	0.89 (0.54 to 1.47); p=NR
	≥5% Wt loss	18	IG1	126	29 (23.0%)	127	40 (31.5%)	0.74 (0.44 to 1.27); p=NR
	≥5% Wt loss	24	IG1	143	38 (26.6%)	149	39 (26.2%)	1.04 (0.63 to 1.73); p=NR
Bennett, 2012[224]	≥5% Wt loss	24	IG1	180	36 (20.0%)	185	36 (19.5%)	1.03 (0.68 to 1.55); p=NR
Bhopal, 2014[225]	≥5% Wt loss	36	IG1	84	21 (25.0%)	83	4 (5.0%)	5.19 (1.86 to 14.46); p=0.0052
Christian, 2011[231]	≥5% Wt loss	12	IG1	133	35 (26.3%)	130	11 (8.5%)	2.93 (0.87 to 9.93); p=0.001
	≥10% Wt loss	12	IG1	133	10 (7.5%)	130	3 (2.3%)	2.93 (0.32 to 26.84); p=0.024
de Vos, 2014[234]	≥5% Wt loss	12	IG1	187	35 (18.7%)	181	20 (11.0%)	1.69 (1.02 to 2.82); p=0.027
	≥5% Wt loss	18	IG1	184	23 (12.6%)	177	22 (12.6%)	1.01 (0.58 to 1.74); p=NR
	≥5% Wt loss	24	IG1	184	22 (12.1%)	177	22 (12.3%)	0.96 (0.55 to 1.67); p=NR
	≥5% Wt loss	30	IG1	184	27 (14.7%)	177	36 (20.3%)	0.72 (0.46 to 1.14); p=0.10
	≥5% Wt loss	80	IG1	130	21 (16.3%)	117	25 (21.3%)	0.76 (0.45 to 1.28); p=NR
Demark-Wahnefried, 2014[235]	≥5% Wt loss	12	IG1	23	9 (39.1%)	18	5 (27.8%)	1.41 (0.57 to 3.47); p=NS
	≥5% Wt loss	12	IG2	23	5 (21.7%)	18	5 (27.8%)	0.78 (0.27 to 2.29); p=NS
Eaton, 2016[237]	≥5% Wt loss	12	IG1	106	51 (47.8%)	105	12 (11.6%)	4.21 (2.39 to 7.43); p<0.01
	≥5% Wt loss	18	IG1	106	33 (31.4%)	105	28 (26.7%)	1.17 (0.76 to 1.79); p=0.64
	≥5% Wt loss	24	IG1	106	35 (33.3%)	105	26 (24.6%)	1.33 (0.87 to 2.05); p=0.39
Fischer, 2016[319]	≥5% Wt loss	12	IG1	78	15 (19.0%)	79	11 (14.0%)	1.38 (0.68 to 2.82); p=NR, NS
Fitzgibbon, 2010[240]	≥5% Wt loss	18	IG1	93	22 (24.0%)	97	12 (12.0%)	1.91 (1.00 to 3.64); p=0.04
Godino, 2016[242]	≥5% Wt loss	12	IG1	202	NR	202	NR	0.03 (-0.01 to 0.07)†; p=0.093
	≥5% Wt loss	18	IG1	202	NR	202	NR	0.03 (-0.02 to 0.07)†; p=NR
	≥5% Wt loss	24	IG1	202	NR	202	NR	0.02 (-0.05 to 0.82)†; p=0.612
	≥10% Wt loss	12	IG1	202	NR	202	NR	-0.00 (-0.02 to 0.02)†; p=0.917
	≥10% Wt loss	18	IG1	202	NR	202	NR	0.00 (-0.02 to 0.03)†; p=0.765

Appendix G Table 2. Detailed Results for Meeting Weight Loss Goals for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome	FU, mos	IG	IG N	IG n (%)	CG N	CG n (%)	Calculated RR (95% CI); study-reported p-value
	≥10% Wt loss	24	IG1	202	NR	202	NR	0.02 (-0.03 to 0.06)†; p=0.452
Haapala, 2009[245]	≥5% Wt loss	12	IG1	62	19 (30.6%)	62	8 (12.9%)	2.38 (1.12 to 5.01); p=NR
	≥10% Wt loss	12	IG1	62	10 (16.1%)	62	4 (6.5%)	2.50 (0.83 to 7.55); p=NR
Hunt, 2014[249]	≥5% Wt loss	12	IG1	333	130 (39.0%)	355	40 (11.0%)	3.47 (2.51 to 4.78); p=NR*
Huseinovic, 2016[250]	≥10% Wt loss	12	IG1	44	26 (59.0%)	45	14 (31.0%)	1.90 (1.15 to 3.13); p=0.011
Jansson, 2013[252]	≥5% Wt loss	12	IG1	45	12 (26.7%)	49	9 (18.4%)	1.45 (0.68 to 3.12); p=0.335
Jebb, 2011[253]	≥5% Wt loss	12	IG1	377	173 (46.0%)	395	91 (23.0%)	1.99 (1.61 to 2.46); p=NR
	≥10% Wt loss	12	IG1	377	91 (24.0%)	395	32 (8.0%)	2.98 (2.04 to 4.35); p=NR
Jolly, 2011[255]	≥5% Wt loss	12	IG1	100	21 (21.0%)	100	17 (17.0%)	1.39 (0.66 to 2.93)*; p=NR
	≥5% Wt loss	12	IG2	100	31 (31.0%)	100	17 (17.0%)	2.10 (1.03 to 4.28)*; p=NR
	≥5% Wt loss	12	IG3	100	21 (21.0%)	100	17 (17.0%)	1.22 (0.57 to 2.60)*; p=NR
	≥5% Wt loss	12	IG4	100	26 (26.0%)	100	17 (17.0%)	1.81 (0.87 to 3.74)*; p=NR
	≥5% Wt loss	12	IG5	70	11 (15.7%)	100	17 (17.0%)	0.94 (0.40 to 2.22)*; p=NR
	≥5% Wt loss	12	IG6	70	10 (14.3%)	100	17 (17.0%)	0.95 (0.39 to 2.30)*; p=NR
	≥5% Wt loss	12	IG7	100	28 (28.0%)	100	17 (17.0%)	2.01 (0.98 to 4.11)*; p=NR
Katula, 2011[258]	≥5% Wt loss	12	IG1	151	79 (52.3%)	150	25 (16.7%)	3.14 (2.13 to 4.63); p<0.001
	≥5% Wt loss	24	IG1	151	59 (39.1%)	150	20 (13.3%)	2.93 (1.86 to 4.61); p<0.001
	≥10% Wt loss	12	IG1	151	41 (27.1%)	150	2 (1.3%)	20.36 (5.02 to 82.68); p=NR
	≥10% Wt loss	24	IG1	151	27 (17.9%)	150	7 (4.7%)	3.83 (1.72 to 8.53); p=NR
Kuller, 2012[261]	≥10% Wt loss	18	IG1	215	90 (42.0%)	223	20 (9.0%)	4.67 (2.99 to 7.30); p<0.05
	≥10% Wt loss	30	IG1	215	67 (31.0%)	223	20 (9.0%)	3.47 (2.19 to 5.52); p<0.05
	≥10% Wt loss	48	IG1	215	45 (21.0%)	223	18 (8.0%)	2.59 (1.55 to 4.33); p<0.05
Kumanyika, 2012[328]	≥5% Wt loss	12	IG1	89	20 (22.5%)	98	10 (10.2%)	2.20 (1.09 to 4.45); p=0.022
Little, 2016[264]	≥5% Wt loss	12	IG1	269	78 (29.2%)	279	58 (20.8%)	1.56 (0.96 to 2.51)*; p=0.070
	≥5% Wt loss	12	IG2	270	87 (32.4%)	279	58 (20.8%)	1.82 (1.21 to 2.74)*; p=0.004
Luley, 2014[265]	≥5% Wt loss	12	IG1	52	35 (68.0%)	40	13 (32.0%)	2.07 (1.27 to 3.36); p=NR
	≥5% Wt loss	12	IG2	49	40 (82.0%)	40	13 (32.0%)	2.51 (1.58 to 4.00); p=NR
	≥10% Wt loss	12	IG1	52	22 (43.0%)	40	3 (8.0%)	5.64 (1.82 to 17.53); p=NR
	≥10% Wt loss	12	IG2	49	28 (57.0%)	40	3 (8.0%)	7.62 (2.50 to 23.24); p=NR
	≥15% Wt loss	12	IG1	52	10 (19.0%)	40	2 (5.0%)	3.85 (0.89 to 16.58); p=NR
	≥15% Wt loss	12	IG2	49	21 (43.0%)	40	2 (5.0%)	8.57 (2.14 to 34.38); p=NR
Ma, 2013[266]	≥5% Wt loss	15	IG1	79	43 (54.8%)	81	20 (24.6%)	2.20 (1.43 to 3.39); p<0.001
	≥5% Wt loss	15	IG2	81	38 (46.9%)	81	20 (24.6%)	1.90 (1.22 to 2.97); p=0.007
	≥7% Wt loss	15	IG1	79	31 (38.8%)	81	12 (14.7%)	2.65 (1.47 to 4.78); p=0.004
	≥7% Wt loss	15	IG2	81	30 (37.6%)	81	12 (14.7%)	2.50 (1.38 to 4.53); p=0.006
	≥7% Wt loss	24	IG1	79	36 (45.0%)	81	14 (17.0%)	2.64 (1.55 to 4.50); p=0.003
	≥7% Wt loss	24	IG2	81	24 (29.7%)	81	14 (17.0%)	1.71 (0.96 to 3.07); p=0.14
	≥10% Wt loss	15	IG1	79	17 (21.8%)	81	3 (3.5%)	5.81 (1.77 to 19.05); p=0.003
	≥10% Wt loss	15	IG2	81	14 (17.2%)	81	3 (3.5%)	4.67 (1.39 to 15.62); p=0.01
Martin, 2008[269]	≥5% Wt loss	12	IG1	68	7 (10.0%)	69	8 (11.0%)	0.85 (0.28 to 2.60); p=0.81
	≥5% Wt loss	18	IG1	68	5 (7.0%)	69	8 (12.0%)	0.68 (0.20 to 2.26); p=0.40

Appendix G Table 2. Detailed Results for Meeting Weight Loss Goals for Behavior-Based Weight Loss Interventions, by Author

Author, Year	Outcome	FU, mos	IG	IG N	IG n (%)	CG N	CG n (%)	Calculated RR (95% CI); study-reported p-value
Morgan, 2011[272]	≥5% Wt loss	12	IG1	34	20 (57.7%)	31	9 (30.0%)	2.03 (1.09 to 3.76); p=0.062
Nanchahal, 2012[275]	≥5% Wt loss	12	IG1	191	62 (32.7%)	190	39 (20.4%)	1.58 (1.12 to 2.24); p=0.04
Nilsen, 2011[327]	≥5% Wt loss	18	IG1	93	26 (28.0%)	89	32 (36.0%)	0.78 (0.51 to 1.19); p=NS, NR
O'Brien, 2017[321]	≥5% Wt loss	12	IG1	30	15 (50.0%)	28	2 (7.1%)	7.00 (1.76 to 27.90); p=<0.001
Pacanowski, 2015[279]	≥5% Wt loss	12	IG1	70	20 (28.6%)	65	7 (10.8%)	2.65 (1.20 to 5.86); p=0.01
	≥10% Wt loss	12	IG1	70	6 (8.6%)	65	3 (4.6%)	1.86 (0.48 to 7.12); p=0.50
Parikh, 2010[280]	≥5% Wt loss	12	IG1	47	16 (34.0%)	43	6 (14.0%)	2.44 (1.05 to 5.66); p=0.03
Phelan, 2017[330]	≥5% Wt loss	12	IG1	152	67 (44.1%)	172	56 (32.6%)	1.33 (0.93 to 1.91); p=0.005
	≥10% Wt loss	12	IG1	152	35 (23.0%)	172	23 (13.4%)	1.70 (0.92 to 3.14); p=0.007
Puhkala, 2015[286]	≥5% Wt loss	12	IG1	47	6 (12.8%)	48	3 (6.2%)	2.04 (0.54 to 7.69); p=0.3
	≥5% Wt loss	24	IG1	37	9 (24.3%)	43	13 (30.2%)	0.80 (0.39 to 1.67); p=NR
	≥10% Wt loss	12	IG1	47	6 (12.8%)	48	0 (0.0%)	NR; p=0.01
	≥10% Wt loss	24	IG1	37	4 (10.8%)	43	3 (7.0%)	1.55 (0.37 to 6.48); p=NS, NR
Rock, 2015[288]	≥5% Wt loss	12	IG1	297	164 (55.0%)	288	64 (22.0%)	2.48 (1.96 to 3.16); p=NR
	≥5% Wt loss	24	IG1	300	135 (45.0%)	287	69 (24.0%)	1.87 (1.47 to 2.38); p=NR
	≥10% Wt loss	12	IG1	297	77 (26.0%)	288	23 (8.0%)	3.25 (2.10 to 5.02); p=NR
	≥10% Wt loss	24	IG1	300	48 (16.0%)	287	29 (10.0%)	1.58 (1.03 to 2.44); p=NR
Rodriguez-Cristobal, 2017[329]	≥5% Wt loss	12	IG1	283	64 (22.6%)	302	50 (16.6%)	1.40 (0.91 to 2.16); p=0.009
	≥10% Wt loss	12	IG1	283	19 (6.7%)	302	12 (4.0%)	1.68 (0.67 to 4.22); p=0.15
Silva, 2009[295]	≥5% Wt loss	12	IG1	114	70 (61.0%)	111	18 (16.0%)	3.79 (2.42 to 5.92); p<0.001
	≥5% Wt loss	24	IG1	114	51 (45.0%)	111	21 (19.0%)	2.36 (1.53 to 3.66); p<0.001
	≥10% Wt loss	12	IG1	114	33 (29.0%)	111	4 (4.0%)	8.03 (2.94 to 21.93); p<0.001
	≥10% Wt loss	24	IG1	114	21 (18.0%)	111	9 (8.0%)	2.27 (1.09 to 4.74); p<0.001
Svetkey, 2015[302]	≥5% Wt loss	24	IG1	120	33 (27.5%)	123	27 (22.0%)	1.25 (0.81 to 1.95); p=NS, NR
	≥5% Wt loss	24	IG2	122	31 (25.5%)	123	27 (22.0%)	1.16 (0.74 to 1.82); p=NS, NR
Thomas, 2017[322]	≥5% Wt loss	12	IG1	91	13 (14.3%)	86	11 (12.9%)	1.12 (0.53 to 2.36); p=>0.10
	≥5% Wt loss	12	IG2	94	24 (25.5%)	86	11 (12.9%)	2.00 (1.04 to 3.83); p=0.04
Tsai, 2010[305]	≥5% Wt loss	12	IG1	22	4 (18.0%)	25	3 (12.0%)	1.52 (0.38 to 6.04); p=0.55
Tuomilehto, 2001[306]	≥5% Wt loss	12	IG1	265	114 (43.0%)	257	33 (13.0%)	3.35 (2.37 to 4.74); p=0.001
van Wier, 2011[308]	≥5% Wt loss	24	IG1	450	101 (22.4%)	448	71 (15.9%)	1.42 (1.08 to 1.86); p=0.053
	≥5% Wt loss	24	IG2	453	100 (22.1%)	448	71 (15.9%)	1.39 (1.06 to 1.83); p=0.032
Wadden, 2011[206]	≥5% Wt loss	12	IG1	131	38 (29.0%)	130	32 (24.6%)	1.18 (0.79 to 1.76); p=NS, NR
	≥5% Wt loss	24	IG1	131	34 (26.0%)	130	28 (21.5%)	1.21 (0.78 to 1.87); p=NS, NR
	≥10% Wt loss	12	IG1	131	14 (10.7%)	130	5 (3.9%)	2.78 (1.03 to 7.49); p=0.04
	≥10% Wt loss	24	IG1	131	13 (9.9%)	130	8 (6.2%)	1.61 (0.69 to 3.76); p=NS, NR
Whelton, 1998[326]	≥5% Wt loss§	18	IG1	NR	NR (42.0%)	NR	NR (11.0%)	NR; p=NR
	≥5% Wt loss§	30	IG1	NR	NR (44.0%)	NR	NR (13.0%)	NR; p=NR
Wylie-Rosett, 2001[315]	≥5% Wt loss	12	IG1	194	31 (16.0%)	97	15 (15.5%)	1.03 (0.59 to 1.82); p=NR
	≥5% Wt loss	12	IG2	183	23 (12.6%)	97	15 (15.5%)	0.81 (0.45 to 1.48); p=NR

*Study-reported risk ratio

†Study-reported difference in proportion

Appendix G Table 2. Detailed Results for Meeting Weight Loss Goals for Behavior-Based Weight Loss Interventions, by Author

Abbreviations: CI = confidence interval; cm = centimeters; FU = followup; mos = months; NR = not reported; NS = not statistically significant; RR = risk ratio; Wt = weight

Appendix G Table 3. Detailed Results for Weight Maintenance Outcomes for Behavior-Based Weight Maintenance Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) change during WL	IG Mean (SD) at MN rand	IG Mean change during MN (95% CI)	CG N	CG Mean (SD) change during WL	CG Mean (SD) at MN rand	CG Mean change during MN (95% CI)	Between-group difference in mean change (95% CI)*
Cussler, 2008[233]	BMI [kg/m2]	12	IG1	66	-1.9 (1.4)	29.1 (NR)	1.3 (0.9 to 1.7)	69	-1.9 (1.4)	28.5 (NR)	0.9 (0.5 to 1.3)	0.40 (-0.22 to 1.02); p=NR
	Body fat [%]	12	IG1	66	-3.6 (3.3)	41.2 (NR)	0.1 (-0.8 to 1.0)	69	-3.3 (3.0)	43.7 (NR)	0.2 (-0.7 to 1.1)	-0.10 (-1.35 to 1.15); p=NR, NS
	Weight [kg]	12	IG1	66	-5.3 (3.6)	79.3 (NR)	0.4 (-0.8 to 1.6)	69	-5.2 (3.8)	77.6 (NR)	0.6 (-0.3 to 1.5)	-0.20 (-1.73 to 1.33); p=NR, NS
Pekkarinen, 2015[282]	Weight [% change]	12	IG1	100	-12.1 (6.1)	NA	6.4 (4.9 to 7.9)	99	-12.9 (6.1)	NA	7.1 (5.6 to 8.6)	-0.70 (-2.82 to 1.42); p=0.71
	Weight [% change]	24	IG1	100	-12.1 (6.1)	NA	9.2 (7.5 to 10.8)	99	-12.9 (6.1)	NA	9.4 (7.7 to 11.1)	-0.20 (-2.57 to 2.17); p=0.71
	BMI [kg/m2]	12	IG1	100	-5 (NR)	36.4 (6.7)	2.6 (2.0 to 3.2)	99	-5.4 (NR)	36.7 (5.9)	3.0 (2.4 to 3.6)	-0.40 (-1.24 to 0.44); p=0.43
	BMI [kg/m2]	24	IG1	100	-5 (NR)	36.4 (6.7)	3.7 (3.1 to 4.3)	99	-5.4 (NR)	36.7 (5.9)	4.0 (3.3 to 4.7)	-0.30 (-1.18 to 0.58); p=NR
	Weight [kg]	12	IG1	100	-14 (NR)	103.8 (22.3)	7.5 (5.5 to 9.5)	99	-15.6 (NR)	105.0 (22.0)	8.8 (6.6 to 11.0)	-1.30 (-4.30 to 1.70); p=0.53
	Weight [kg]	24	IG1	100	-14 (NR)	103.8 (22.3)	10.6 (8.6 to 12.6)	99	-15.6 (NR)	105.0 (22.0)	11.6 (9.2 to 14.0)	-1.00 (-4.11 to 2.11); p=NR
Perri, 1988[284]	Weight [kg]	12	IG1	19	-13.7 (5.8)	NR	-2.0 (-6.2 to 2.2)	16	-10.8 (7.6)	NR	5.1 (3.5 to 6.8)	-7.16 (-11.68 to -2.64); p<0.01
	Weight [kg]	12	IG2	18	-13.1 (4.8)	NR	0.1 (-1.7 to 1.9)	16	-10.8 (7.6)	NR	5.1 (3.5 to 6.8)	-5.05 (-7.48 to -2.62); p<0.01
	Weight [kg]	12	IG3	19	-11.3 (3.1)	NR	-2.0 (-4.2 to 0.1)	16	-10.8 (7.6)	NR	5.1 (3.5 to 6.8)	-7.14 (-9.84 to -4.44); p<0.01
	Weight [kg]	12	IG4	19	-13.2 (5.3)	NR	0.3 (-3.3 to 3.9)	16	-10.8 (7.6)	NR	5.1 (3.5 to 6.8)	-4.84 (-8.78 to -0.90); p<0.01
	Weight [kg]	18	IG1	19	-13.7 (5.8)	NR	0.1 (-4.5 to 4.7)	16	-10.8 (7.6)	NR	7.2 (5.5 to 8.9)	-7.07 (-11.95 to -2.19); p<0.01
	Weight [kg]	18	IG2	18	-13.1 (4.8)	NR	3.9 (2.5 to 5.3)	16	-10.8 (7.6)	NR	7.2 (5.5 to 8.9)	-3.29 (-5.43 to -1.15); p<0.01
	Weight [kg]	18	IG3	19	-11.3 (3.1)	NR	2.9 (0.7 to 5.1)	16	-10.8 (7.6)	NR	7.2 (5.5 to 8.9)	-4.29 (-7.04 to -1.54); p<0.01
	Weight [kg]	18	IG4	19	-13.2 (5.3)	NR	1.8 (-1.7 to 5.2)	16	-10.8 (7.6)	NR	7.2 (5.5 to 8.9)	-5.44 (-9.27 to -1.61); p<0.01
Sherwood, 2013[294]	Weight [kg]	12	IG1	209	NR (≥10%)†	80.1 (15.7)	0.8 (-0.0 to 1.6)	210	NR (≥10%)†	79.4 (16.4)	2.4 (1.6 to 3.2)	-1.63 (-2.80 to -0.47); p=0.005
	Weight [kg]	18	IG1	209	NR (≥10%)†	80.1 (15.7)	2.1 (1.2 to 3.0)	210	NR (≥10%)†	79.4 (16.4)	3.8 (2.8 to 4.7)	-1.68 (-3.02 to -0.34); p=NR
	Weight [kg]	24	IG1	209	NR (≥10%)†	80.1 (15.7)	3.1 (2.0 to 4.2)	210	NR (≥10%)†	79.4 (16.4)	4.8 (3.7 to 5.8)	-1.68 (-3.16 to -0.19); p=0.028

Appendix G Table 3. Detailed Results for Weight Maintenance Outcomes for Behavior-Based Weight Maintenance Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) change during WL	IG Mean (SD) at MN rand	IG Mean change during MN (95% CI)	CG N	CG Mean (SD) change during WL	CG Mean (SD) at MN rand	CG Mean change during MN (95% CI)	Between-group difference in mean change (95% CI)*
Simpson, 2015[296]	BMI [kg/m2]	12	IG1	45	NR	34.4 (6.2)	-1.1 (-1.9 to -0.3)	51	NR	33.3 (5.2)	-0.3 (-0.9 to 0.3)	-0.96 (-2.16 to 0.23); p=NR
	BMI [kg/m2]	12	IG2	43	NR	34.8 (6.2)	-1.4 (-2.2 to -0.6)	51	NR	33.3 (5.2)	-0.3 (-0.9 to 0.3)	-0.21 (-1.44 to 1.03); p=NR
	WC [cm]	12	IG1	45	NR	104.3 (15.5)	-1.5 (-6.2 to 3.2)	51	NR	102.5 (12.0)	0.2 (-3.5 to 3.9)	-0.84 (-4.21 to 2.59); p=NR
	WC [cm]	12	IG2	43	NR	105.4 (14.1)	-2.2 (-6.3 to 1.9)	51	NR	102.5 (12.0)	0.2 (-3.5 to 3.9)	0.15 (-3.34 to 3.65); p=NR
	Weight [kg]	12	IG1	45	NR (≥5%)‡	92.5 (20.0)	-2.4 (-5.1 to 0.3)	51	NR (≥5%)‡	90.2 (15.4)	-0.6 (-2.7 to 1.5)	-2.82 (-6.09 to 0.45); p=NR
	Weight [kg]	12	IG2	43	NR (≥5%)‡	93.8 (17.7)	-2.2 (-4.5 to 0.1)	51	NR (≥5%)‡	90.2 (15.4)	-0.6 (-2.7 to 1.5)	-0.70 (-4.10 to 2.70); p=NR
Svetkey, 2008[303]	Weight [% change]	30	IG1	341	NR	NA	NR	341	NR	NA	NR	LSM: -1.80 (NR); p<0.001
	Weight [% change]	30	IG2	347	NR	NA	NR	341	NR	NA	NR	LSM: -0.40 (NR); p=0.5
	Weight [kg]	12	IG1	341	-8.3 (4.2)	88.7 (16.9)	NR	341	-8.5 (4.0)	87.4 (15.3)	NR	LSM: -1.60 (NR); p<0.001
	Weight [kg]	12	IG2	347	-8.6 (4.5)	88.6 (15.4)	NR	341	-8.5 (4.0)	87.4 (15.3)	NR	LSM: -1.00 (NR); p=0.005
	Weight [kg]	18	IG1	341	-8.3 (4.2)	88.7 (16.9)	NR	341	-8.5 (4.0)	87.4 (15.3)	NR	LSM: -1.80 (NR); p<0.001
	Weight [kg]	18	IG2	347	-8.6 (4.5)	88.6 (15.4)	NR	341	-8.5 (4.0)	87.4 (15.3)	NR	LSM: -1.10 (NR); p=0.003
	Weight [kg]	24	IG1	341	-8.3 (4.2)	88.7 (16.9)	NR	341	-8.5 (4.0)	87.4 (15.3)	NR	LSM: -2.00 (NR); p<0.001
	Weight [kg]	24	IG2	347	-8.6 (4.5)	88.6 (15.4)	NR	341	-8.5 (4.0)	87.4 (15.3)	NR	LSM: -0.90 (NR); p=0.045
	Weight [kg]	30	IG1	341	-8.3 (4.2)	88.7 (16.9)	LSM: 4.0 (3.4 to 4.6)	342	-8.5 (4.0)	87.4 (15.3)	LSM: 5.5 (4.9 to 6.1)	LSM: -1.50 (-2.40 to -0.60); p=0.001
	Weight [kg]	30	IG2	347	-8.6 (4.5)	88.6 (15.4)	LSM: 5.2 (4.6 to 5.8)	342	-8.5 (4.0)	87.4 (15.3)	LSM: 5.5 (4.9 to 6.1)	LSM: -0.30 (-1.20 to 0.60); p=0.51
	Weight [kg]	60	IG1	342	-8.3 (4.2)	88.7 (16.9)	NR	342	-8.5 (4.0)	87.4 (15.3)	NR	-1.60 (-3.10 to -0.10); p=0.038
Voils, 2017[309]	WC [cm]	12	IG1	110	NR	110.5 (13.7)	NR	112	NR	113.0 (15.2)	NR	-0.55 (-1.32 to 0.21); p=0.153
	Weight [kg]	13	IG1	110	-7.2 (2.8)	102.1 (19.8)	0.8 (NR)	112	-7.2 (3.4)	105.0 (21.0)	2.4 (NR)	1.60 (0.07 to 3.13); p=0.04

Appendix G Table 3. Detailed Results for Weight Maintenance Outcomes for Behavior-Based Weight Maintenance Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG Mean (SD) change during WL	IG Mean (SD) at MN rand	IG Mean change during MN (95% CI)	CG N	CG Mean (SD) change during WL	CG Mean (SD) at MN rand	CG Mean change during MN (95% CI)	Between-group difference in mean change (95% CI)*
Wing, 2006[313]	Weight [kg]	12	IG1	105	-20.0 (11.6)	78.6 (17.1)	1.3 (0.2 to 2.4)	105	-18.6 (10.3)	78.8 (14.8)	3.0 (1.9 to 4.1)	-1.70 (-3.28 to -0.12); p=NR
	Weight [kg]	12	IG2	104	-19.1 (8.0)	76.0 (16.4)	3.1 (1.7 to 4.5)	105	-18.6 (10.3)	78.8 (14.8)	3.0 (1.9 to 4.1)	0.10 (-1.71 to 1.91); p=NS, NR
	Weight [kg]	18	IG1	105	-20.0 (11.6)	78.6 (17.1)	2.5 (1.2 to 3.8)	105	-18.6 (10.3)	78.8 (14.8)	4.9 (3.7 to 6.1)	2.40 (0.00 to 10.80); p=0.05
	Weight [kg]	18	IG2	104	-19.1 (8.0)	76.0 (16.4)	4.7 (3.0 to 6.4)	105	-18.6 (10.3)	78.8 (14.8)	4.9 (3.7 to 6.1)	0.20 (-4.90 to 5.90); p=1.00
Young, 2017[317]	BMI [kg/m2]	12	IG1	47	-2.3 (0.7)	30.8 (3.3)	0.3 (-0.0 to 0.7)	45	-2.3 (1.0)	30.6 (3.4)	0.7 (0.2 to 1.2)	-0.40 (-1.10 to 0.20); p=0.19
	BMI [kg/m2]	36	IG1	47	-2.3 (0.7)	30.8 (3.3)	1.2 (0.7 to 1.7)	45	-2.3 (1.0)	30.6 (3.4)	0.9 (0.4 to 1.4)	0.30 (-0.40 to 1.10); p=0.04
	Body fat [%]	12	IG1	47	-4.2 (2.7)	29.1 (6.0)	0.5 (-0.5 to 1.5)	45	-4.4 (2.8)	28.0 (6.8)	1.3 (0.3 to 2.4)	-0.90 (-2.30 to 0.60); p=0.23
	Body fat [%]	36	IG1	47	-4.2 (2.7)	29.1 (6.0)	1.7 (0.6 to 2.8)	45	-4.4 (2.8)	28.0 (6.8)	2.3 (1.1 to 3.5)	-0.60 (-2.20 to 1.00); p=0.57
	WC [cm]	12	IG1	47	-6.7 (2.7)	109.3 (9.1)	0.3 (-1.0 to 1.6)	45	-6.1 (3.7)	109.2 (12.3)	1.5 (0.1 to 3.0)	-1.20 (-3.20 to 0.70); p=0.22
	WC [cm]	36	IG1	47	-6.7 (2.7)	109.3 (9.1)	1.6 (-0.1 to 3.4)	45	-6.1 (3.7)	109.2 (12.3)	1.2 (-0.6 to 3.0)	0.40 (-2.10 to 2.90); p=0.18
	Weight [kg]	12	IG1	47	-7.3 (2.0)	98.1 (14.0)	0.8 (-0.8 to 2.3)	45	-7.4 (2.8)	98.5 (14.9)	2.4 (0.8 to 4.0)	-1.60 (-3.80 to 0.60); p=0.15
	Weight [kg]	36	IG1	47	-7.3 (2.0)	98.1 (14.0)	3.5 (1.8 to 5.2)	45	-7.4 (2.8)	98.5 (14.9)	3.0 (1.3 to 4.8)	0.50 (-1.90 to 2.90); p=0.07

* Study-reported adjusted between group difference in mean change reported if available; otherwise, calculated unadjusted between group difference
† Participants had to lose at least 10% of their baseline weight
‡ Participants had to lose at least 5% of their baseline weight
§ >4.5 kg

Abbreviations: BMI = body mass index; CG = control group; CI = confidence interval; cm = centimeters; FU = followup; IG = intervention group; kg = kilograms; kg/m^2 = kilogram per square meter; LSM = least squares mean; MN = maintenance; mos = months; NR = not reported; NS = not statistically significant; rand = randomization; SD = standard deviation; WC = waist circumference; WL = weight loss

Appendix G Table 4. Detailed Results for Meeting Weight Loss Goals for Behavior-Based Weight Loss Maintenance Interventions, by Author

Author, Year	Outcome [unit]	FU, mos	IG	IG N	IG n (%) at MN rand	IG n (%) Followup	CG N	CG n (%) at MN rand	CG n (%) Followup	Calculated RR (95% CI); study-reported p-value
Pekkarinen, 2015[282]	Maintenance of 5% weight loss [n]	12	IG1	100	89 (89.0%)	51 (52.0%)	99	89 (90.0%)	44 (44.0%)	1.15 (0.86 to 1.54); p=0.4
	Maintenance of 5% weight loss [n]	24	IG1	100	89 (89.0%)	32 (33.0%)	99	89 (90.0%)	34 (34.0%)	0.93 (0.63 to 1.38); p=0.77
Svetkey, 2008[303, 392]	Maintenance of 5% weight loss [n]	30	IG1	341	NR	144 (42.2%)	341	NR	116 (34.0%)	1.24 (1.02 to 1.51); p=0.02
	Maintenance of 5% weight loss [n]	30	IG2	347	NR	122 (35.2%)	341	NR	116 (34.0%)	1.03 (0.84 to 1.27); p=NR
	Maintenance of 5% weight loss [n]	60	IG1	194	NR	72 (37.0%)	218	NR	59 (27.0%)	1.37 (1.03 to 1.82); p=0.052
Young, 2017[317]	Maintenance of 5% weight loss [n]	36	IG1	47	NR	17 (36.0%)	45	NR	21 (47.0%)	0.78 (0.47 to 1.27); p=NR

Abbreviations: CG = control group; CI = confidence interval; FU = followup; IG = intervention group; MN = maintenance; mos = months; NR = not reported; NS = not statistically significant; rand = randomization; RR = risk ratio

Appendix G Table 5. Detailed Results for Weight Loss-Related Outcomes for Medication-Based Weight Loss Interventions, by Drug

Drug	Author, Year	Outcome [unit]	FU, mos	Dose	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
Liraglutide	Astrup, 2012[220]	WC [cm]	12	3.0mg QD	93	109.0 (8.3)	-7.8 (NR)	98	108.0 (10.0)	-3.0 (NR)	-4.70 (-7.10 to -2.40); p<0.0001
		Weight [kg]	12	3.0mg QD	93	97.5 (13.8)	-7.8 (NR)	98	97.3 (12.3)	-2.0 (NR)	-5.80 (-8.00 to -3.70); p<0.0001
	Pi-Sunyer, 2015[285]	Weight [% change]	13	3.0mg QD	2437	NA	-8.0 (-8.3 to -7.7)	1225	NA	-2.6 (-2.9 to -2.3)	-5.40 (-5.80 to -5.00); p<0.001
	le Roux, 2017[339]	Weight [% change]	36†	3.0mg QD	1472	NA	-6.1 (-6.5 to -5.7)	738	NA	-1.9 (-2.4 to -1.4)	-4.30 (-4.90 to -3.70); p<0.0001
		BMI [kg/m2]	13	3.0mg QD	2437	38.3 (6.4)	-3.0 (-3.1 to -2.9)	1225	38.3 (6.3)	-1.0 (-1.1 to -0.9)	-2.00 (-2.20 to -1.90); p<0.001
		BMI [kg/m2]	36†	3.0mg QD	1472	38.8 (6.4)	-2.4 (-2.5 to -2.3)	738	39.0 (6.3)	-0.7 (-0.9 to -0.5)	-1.70 (-1.90 to -1.40); p<0.0001
		WC [cm]	13	3.0mg QD	2437	115.0 (14.4)	-8.2 (-8.5 to -7.9)	1225	114.5 (14.3)	-3.9 (-4.3 to -3.5)	-4.20 (-4.70 to -3.70); p<0.001
		WC [cm]	36†	3.0mg QD	1472	116.5 (14.4)	-6.9 (-7.3 to -6.5)	738	116.7 (13.9)	-3.4 (-3.9 to -2.9)	-3.50 (-4.20 to -2.80); p<0.0001
		Weight [kg]	13	3.0mg QD	2437	106.2 (21.2)	-8.4 (-8.7 to -8.1)	1225	106.2 (21.7)	-2.8 (-3.2 to -2.4)	-5.60 (-6.00 to -5.10); p<0.001
		Weight [kg]	36†	3.0mg QD	1472	107.5 (21.6)	-6.5 (-6.9 to -6.1)	738	107.9 (21.8)	-2.0 (-2.5 to -1.5)	-4.60 (-5.30 to -3.90); p<0.0001
Lorcaserin hydrochloride	Fidler, 2011[173]	Weight [% change]	12	10mg BID	1561	NA	-5.8 (-6.1 to -5.5)	1541	NA	-2.8 (-3.1 to -2.5)	-3.00 (-3.44 to -2.56); p<0.001
		BMI [kg/m2]	12	10mg BID	1561	36.1 (4.3)	LSM: -2.1 (-2.2 to -2.0)	1541	36.0 (4.2)	LSM: -1.0 (-1.1 to -0.9)	NR; p<0.001
		Body fat [%]	12	10mg BID	85	44.5 (8.1)	LSM: -9.9 (-10.6 to -9.2)	69	45.0 (9.0)	LSM: -4.6 (-5.3 to -3.9)	NR; p<0.01
		WC [cm]	12	10mg BID	1561	108.9 (12.2)	LSM: -6.3 (-6.7 to -5.9)	1541	110.2 (12.5)	LSM: -4.1 (-4.5 to -3.7)	NR; p<0.001
		Weight [kg]	12	10mg BID	1561	100.3 (15.7)	LSM: -5.8 (-6.1 to -5.5)	1541	100.8 (16.2)	LSM: -2.9 (-3.2 to -2.6)	LSM: -2.90 (NR); p<0.001
	Smith, 2010[172]	Weight [% change]	12	10mg BID	1538	NA	-5.8 (-6.1 to -5.5)	1499	NA	-2.2 (-2.4 to -1.9)	-3.65 (-4.07 to -3.23); p<0.001
		BMI [kg/m2]	12	10mg BID	1538	36.2 (4.0)	-2.1 (-2.2 to -2.0)	1499	36.2 (4.0)	-0.8 (-0.9 to -0.7)	-1.31 (-1.46 to -1.16); p<0.001
		WC [cm]	12	10mg BID	1538	109.6 (12.0)	-6.8 (-7.2 to -6.4)	1499	109.2 (12.0)	-3.9 (-4.3 to -3.5)	-2.90 (-3.45 to -2.35); p<0.001
		Weight [kg]	12	10mg BID	1538	100.4 (16.0)	-5.8 (-6.2 to -5.4)	1499	99.7 (15.9)	-2.2 (-2.4 to -2.0)	-3.60 (-4.04 to -3.16); p<0.001

Appendix G Table 5. Detailed Results for Weight Loss-Related Outcomes for Medication-Based Weight Loss Interventions, by Drug

Drug	Author, Year	Outcome [unit]	FU, mos	Dose	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
Nal-Bup	Apovian, 2013[218]	Weight [% change]	13	16/180mg TID	702	NA	LSM: -6.4 (SE: 0.3)	456	NA	LSM: -1.2 (SE: 0.3)	NR; p<0.001
		WC [cm]	13	16/180mg TID	702	109.0 (11.8)	LSM: -6.7 (-7.3 to -6.1)	456	108.6 (11.8)	LSM: -2.1 (-3.1 to -1.1)	NR; p<0.001
		Weight [kg]	13	16/180mg TID	702	100.3 (16.6)	LSM: -6.2 (-6.6 to -5.8)	456	99.2 (15.9)	LSM: -1.3 (-1.9 to -0.7)	NR; p<0.001
	Greenway, 2010[244]	Weight [% change]	13	16/180mg TID	471	NA	LSM: -6.1 (SE: 0.3)	511	NA	LSM: -1.3 (SE: 0.3)	NR; p=0.0079
		WC [cm]	13	16/180mg TID	471	108.8 (11.3)	LSM: -6.2 (-7.1 to -5.4)	511	110.0 (12.2)	LSM: -2.5 (-3.3 to -1.6)	NR; p<0.0001
		Weight [kg]	13	16/180mg TID	471	99.7 (15.9)	LSM: -6.1 (-6.7 to -5.5)	511	99.5 (14.3)	LSM: -1.4 (-2.0 to -0.8)	NR; p<0.0001
	Wadden, 2011[311]	Weight [% change]	12	16/180mg TID	482	NA	LSM: -9.1 (SE: 0.4)	193	NA	LSM: -5.1 (SE: 0.6)	NR; p<0.001
		WC [cm]	12	16/180mg TID	482	109.3 (11.4)	-10.2 (-10.9 to -9.0)	193	109.0 (11.8)	-7.0 (-8.3 to -5.3)	-3.20 (-4.98 to -1.42); p<0.001
Orlistat	Broom, 2002[227]	Weight [% change]	12	120mg TID	259	NA	-5.8 (-6.7 to -4.9)	263	NA	-2.3 (-3.0 to -1.6)	-3.50 (-4.71 to -2.29); p<0.0001
		WC [cm]	12	120mg TID	259	107.8 (15.6)	-6.0 (NR)	263	108.6 (16.4)	-2.6 (NR)	-3.39 (NR); p<0.0001
		Weight [kg]	12	120mg TID	259	100.9 (20.5)	-5.8 (-6.8 to -4.8)	263	101.8 (19.8)	-2.3 (-3.1 to -1.5)	-3.50 (-4.79 to -2.21); p<0.0001
	Davidson, 1999[160]	Weight [kg]	12	120mg TID	657	100.7 (15.4)	-8.8 (-9.5 to -8.0)	223	100.6 (13.4)	-5.8 (-7.1 to -4.5)	-2.95 (-4.45 to -1.45); p<0.001
	Derosa, 2003[236]	BMI [kg/m2]	12	120mg TID	25	32.0 (1.3)	-3.0 (-3.2 to -2.8)	23	31.7 (1.0)	-2.1 (-2.3 to -1.9)	-0.90 (-1.20 to -0.60); p=NR
		WC [cm]	12	120mg TID	25	100.8 (5.3)	-3.0 (-3.4 to -2.6)	23	102.3 (6.2)	-2.4 (-2.6 to -2.2)	-0.60 (-1.02 to -0.18); p=NR
		Weight [kg]	12	120mg TID	25	94.2 (9.8)	-8.6 (-9.0 to -8.2)	23	95.3 (10.2)	-7.6 (-7.9 to -7.3)	-1.00 (-1.49 to -0.51); p=NR
	Finer, 2000[239]	Weight [% change]	12	120mg TID	110	NA	-8.5 (NR)	108	NA	-5.4 (NR)	-3.10 (NR); p=0.016
		Weight [kg]	12	120mg TID	110	97.9 (12.9)	LSM: -3.3 (NR)	108	98.4 (15.0)	LSM: -1.3 (NR)	LSM: -1.99 (-3.60 to -0.38); p=0.016
	Hauptman, 2000[246]	Weight [% change]	12	120mg TID	210	NA	-7.9 (-9.4 to -6.4)	212	NA	-4.2 (-5.4 to -3.0)	-3.70 (-5.64 to -1.76); p<0.001
		Weight [kg]	12	120mg TID	210	100.5 (14.2)	-7.9 (-9.1 to -6.8)	212	101.8 (14.6)	-4.1 (-5.2 to -3.0)	-3.80 (-5.37 to -2.23); p=0.001
		Weight [kg]	12	60mg TID	213	100.4 (14.6)	-7.1 (-8.1 to -6.0)	212	101.8 (14.6)	-4.1 (-5.2 to -3.0)	-2.94 (-4.46 to -1.42); p=0.001

Appendix G Table 5. Detailed Results for Weight Loss-Related Outcomes for Medication-Based Weight Loss Interventions, by Drug

Drug	Author, Year	Outcome [unit]	FU, mos	Dose	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
		Weight [kg]	18	120mg TID	210	100.5 (14.2)	-6.2 (-7.4 to -5.0)	212	101.8 (14.6)	-2.9 (-4.0 to -1.8)	-3.29 (-4.94 to -1.64); p=0.001
		Weight [kg]	18	60mg TID	213	100.4 (14.6)	-5.8 (-6.8 to -4.8)	212	101.8 (14.6)	-2.9 (-4.0 to -1.8)	-2.85 (-4.36 to -1.34); p=0.001
		Weight [kg]	24	120mg TID	210	100.5 (14.2)	-5.0 (-6.5 to -3.6)	212	101.8 (14.6)	-1.6 (-2.9 to -0.4)	-3.37 (-5.25 to -1.49); p=0.001
		Weight [kg]	24	60mg TID	213	100.4 (14.6)	-4.5 (-5.7 to -3.3)	212	101.8 (14.6)	-1.6 (-2.9 to -0.4)	-2.81 (-4.51 to -1.11); p=0.001
	Krempf, 2003[260]	Weight [% change]	12	120mg TID	346	NA	LSM: -6.3 (SE: 0.5)	350	NA	LSM: -3.6 (SE: 0.5)	NR; p<0.001
		Weight [% change]	18	120mg TID	346	NA	LSM: -5.4 (SE: 0.6)	350	NA	LSM: -2.6 (SE: 0.5)	NR; p<0.001
		BMI [kg/m2]	12	120mg TID	346	36.0 (5.6)	NR	350	36.2 (5.6)	NR	LSM: -1.00 (-1.59 to -0.41); p=NR
		BMI [kg/m2]	18	120mg TID	346	36.0 (5.6)	LSM: -2.3 (-2.9 to -1.7)	350	36.2 (5.6)	LSM: -1.0 (-1.6 to -0.4)	LSM: -1.30 (-2.08 to -0.52); p=0.001
		Body fat [kg], (Impedance meter)	12	120mg TID	258	44.5 (11.2)	NR	220	44.7 (11.2)	NR	LSM: -3.10 (-4.67 to -1.53); p=NR
		Body fat [kg], (Impedance meter)	18	120mg TID	219	44.5 (11.2)	LSM: -5.5 (-6.9 to -4.1)	191	44.7 (11.2)	LSM: -1.7 (-3.1 to -0.3)	LSM: -3.80 (-5.56 to -2.04); p<0.0001
		Percent Obese [n]	18	120mg TID	224	NR	NR	197	NR	NR	NR; p=0.046
		WC [cm]	18	120mg TID	346	105.6 (14.9)	LSM: -5.3 (-6.7 to -3.9)	350	106.5 (15.0)	LSM: -3.5 (-4.9 to -2.1)	NR; p<0.05
		Weight [kg]	12	120mg TID	346	97.0 (16.7)	LSM: -6.3 (-7.3 to -5.3)	350	97.5 (16.8)	LSM: -3.3 (-4.3 to -2.3)	NR; p<0.0001
		Weight [kg]	18	120mg TID	346	97.0 (16.7)	LSM: -5.3 (-6.3 to -4.3)	350	97.5 (16.8)	LSM: -2.4 (-3.4 to -1.4)	NR; p<0.0001
	Lindgarde, 2000[263]	Weight [% change]	12	120mg TID	190	NA	-5.9 (-6.7 to -5.1)	186	NA	-4.6 (-5.4 to -3.8)	-1.30 (-2.40 to -0.20); p<0.05
		HC [cm]	12	120mg TID	190	115.0 (8.2)	-4.2 (NR)	186	115.0 (8.5)	-3.2 (NR)	-1.00 (NR); p>0.05
		WC [cm]	12	120mg TID	190	106.0 (10.8)	-4.8 (NR)	186	106.0 (11.0)	-4.1 (NR)	-0.70 (NR); p>0.05
		Waist-to-hip ratio [proportion]	12	120mg TID	190	NR	-0.011 (NR)	186	NR	-0.008 (NR)	NR; p>0.05

Appendix G Table 5. Detailed Results for Weight Loss-Related Outcomes for Medication-Based Weight Loss Interventions, by Drug

Drug	Author, Year	Outcome [unit]	FU, mos	Dose	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
		Weight [kg]	12	120mg TID	190	96.1 (13.7)	-5.6 (-6.3 to -4.9)	186	95.9 (13.5)	-4.3 (-5.1 to -3.5)	-1.30 (-2.43 to -0.17); p<0.05
	Rossner, 2000[292]	Weight [% change]	12	120mg TID	242	NA	-9.7 (-10.5 to -8.9)	237	NA	-6.6 (-7.5 to -5.7)	-3.10 (-4.27 to -1.93); p<0.001
		Weight [% change]	12	60mg TID	239	NA	-8.6 (-9.5 to -7.7)	237	NA	-6.6 (-7.5 to -5.7)	-2.00 (-3.23 to -0.77); p<0.001
		Weight [% change]	24	120mg TID	242	NA	-7.6 (-8.5 to -6.7)	237	NA	-4.5 (-5.5 to -3.5)	-3.10 (-4.41 to -1.79); p<0.001
		Weight [% change]	24	60mg TID	239	NA	-6.8 (-7.8 to -5.8)	237	NA	-4.5 (-5.5 to -3.5)	-2.30 (-3.70 to -0.90); p=0.005
		WC [cm]	12	120mg TID	242	NR	-6.2 (NR)	237	NR	-4.7 (NR)	-1.50 (NR); p=NR, NS
		WC [cm]	12	60mg TID	239	NR	-6.0 (NR)	237	NR	-4.7 (NR)	-1.30 (NR); p=NR, NS
		WC [cm]	24	120mg TID	242	NR	-5.1 (NR)	237	NR	-3.1 (NR)	-2.00 (NR); p<0.05
		WC [cm]	24	60mg TID	239	NR	-4.7 (NR)	237	NR	-3.1 (NR)	-1.60 (NR); p=NR
		Weight [kg]	12	120mg TID	242	96.7 (13.8)	-9.4 (-10.2 to -8.6)	237	97.7 (14.6)	-6.4 (-7.3 to -5.5)	-3.00 (-4.17 to -1.83); p<0.001
		Weight [kg]	12	60mg TID	239	99.1 (14.3)	-8.5 (-9.4 to -7.6)	237	97.7 (14.6)	-6.4 (-7.3 to -5.5)	-2.10 (-3.36 to -0.84); p<0.001
		Weight [kg]	24	120mg TID	242	96.7 (13.8)	-7.4 (-8.3 to -6.5)	237	97.7 (14.6)	-4.3 (-5.2 to -3.4)	-3.10 (-4.40 to -1.80); p<0.001
		Weight [kg]	24	60mg TID	239	99.1 (14.3)	-6.6 (-7.7 to -5.5)	237	97.7 (14.6)	-4.3 (-5.2 to -3.4)	-2.30 (-3.71 to -0.89); p=0.005
	Sjostrom, 1998[297]	Weight [% change]	12	120mg TID	343	NA	-10.2 (NR)	340	NA	-6.1 (NR)	-4.10 (NR); p<0.001
		Weight [kg]	12	120mg TID	343	99.1 (NR)	-10.3 (NR)	340	99.8 (NR)	-6.1 (NR)	-4.20 (NR); p<0.001
	Swinburn, 2005[304]	WC [cm]	12	120mg TID	170	112.4 (12.8)	-5.1 (-6.2 to -4.0)	169	114.8 (13.1)	-1.9 (-2.5 to -1.3)	-3.20 (-4.43 to -1.97); p=0.001
		Weight [kg]	12	120mg TID	170	103.3 (17.8)	-4.7 (-5.9 to -3.5)	169	106.9 (17.8)	-0.9 (-1.5 to -0.3)	-3.80 (-5.12 to -2.48); p=0.001
	Torgerson, 2004[161]	WC [cm]	12	120mg TID	1640	115.0 (10.4)	-9.6 (NR)	1637	115.4 (10.4)	-7.0 (NR)	-2.60 (NR); p<0.01
		WC [cm]	48	120mg TID	1640	115.0 (10.4)	-6.4 (NR)	1637	115.4 (10.4)	-4.4 (NR)	-2.00 (NR); p<0.01
		Weight [kg]	12	120mg TID	1640	110.4 (16.3)	-10.6 (NR)	1637	110.6 (16.5)	-6.2 (NR)	-4.40 (NR); p<0.001
		Weight [kg]	48	120mg TID	1640	110.4 (16.3)	-5.8 (NR)	1637	110.6 (16.5)	-3.0 (NR)	LSM: -2.70 (NR); p<0.001

Appendix G Table 5. Detailed Results for Weight Loss-Related Outcomes for Medication-Based Weight Loss Interventions, by Drug

Drug	Author, Year	Outcome [unit]	FU, mos	Dose	IG N	IG Mean (SD) BL	IG Mean change (95% CI)	CG N	CG Mean (SD) BL	CG Mean change (95% CI)	Between-group difference in mean change (95% CI)*
Phen-Top	Allison, 2012[216]	Weight [% change]	12	15/92mg QD	498	NA	LSM: -10.9 (SE: 0.4)	498	NA	LSM: -1.5 (SE: 0.4)	NR; p<0.0001
		WC [cm]	12	15/92mg QD	498	120.1 (14.6)	LSM: -10.9 (-11.8 to -10.0)	498	120.5 (13.9)	LSM: -3.1 (-4.0 to -2.2)	NR; p<0.0001
	Gadde, 2011[241]	Weight [% change]	13	15/92mg QD	981	NA	LSM: -9.8 (SE: 0.3)	979	NA	LSM: -1.2 (SE: 0.3)	NR; p<0.0001
		Weight [% change]	13	7.5/46mg QD	488	NA	LSM: -7.8 (SE: 0.4)	979	NA	LSM: -1.2 (SE: 0.3)	NR; p<0.0001
		WC [cm]	13	15/92mg QD	981	113.2 (12.2)	LSM: -9.2 (-9.8 to -8.6)	979	113.4 (12.2)	LSM: -2.4 (-3.0 to -1.8)	NR; p<0.0001
		WC [cm]	13	7.5/46mg QD	488	112.6 (12.5)	LSM: -7.6 (-8.4 to -6.9)	979	113.4 (12.2)	LSM: -2.4 (-3.0 to -1.8)	NR; p<0.0001
		Weight [kg]	13	15/92mg QD	981	103.0 (17.6)	LSM: -10.2 (-10.8 to -9.7)	979	103.3 (18.1)	LSM: -1.4 (-2.0 to -0.8)	NR; p<0.0001
		Weight [kg]	13	7.5/46mg QD	488	102.6 (18.2)	LSM: -8.1 (-8.9 to -7.4)	979	103.3 (18.1)	LSM: -1.4 (-2.0 to -0.8)	NR; p<0.0001

* Study-reported adjusted between group difference in mean change reported if available; otherwise, calculated unadjusted between group difference.
† Individuals with prediabetes at baseline only

Abbreviations: BID = twice a day; BL = baseline; BMI = body mass index; CG = control group; CI = confidence interval; cm = centimeters; FU = followup; HC = hip circumference; IG = intervention group; kg = kilograms; kg/m^2 = kilogram per square meter; LSM = least squares mean; mg = milligram; mos = months; QD = once a day; Nal-Bup = Naltrexone HCL and bupropion HCL; NA = not applicable; NR = not reported; NS = not statistically significant; Phen-Top = Phentermine-topiramate extended release; QD = once a day; SD = standard deviation; TID = three times a day; WC = waist circumference

Appendix G Table 6. Detailed Results for Meeting Weight Loss Goals for Medication-Based Weight Loss Interventions, by Drug

Drug	Author, Year	Dose	Outcome	FU, mos	IG N	IG n (%)	CG N	CG n (%)	Calculated RR (95% CI); study-reported p-value
Liraglutide	Astrup, 2012[220]	3.0mg QD	≥5% Wt loss	12	93	73 (78.5%)	98	28 (28.6%)	2.75 (1.97 to 3.82); p=0.001
		3.0mg QD	≥10% Wt loss	12	93	37 (39.8%)	98	10 (10.2%)	3.90 (2.06 to 7.38); p=0.0001
	Pi-Sunyer, 2015[285]	3.0mg QD	≥5% Wt loss	13	2437	1540 (63.2%)	1225	332 (27.1%)	OR: 4.80 (4.10 to 5.60); p<0.001
		3.0mg QD	≥5% Wt loss	36	1467	728 (49.6%)	734	174 (23.7%)	OR: 3.20 (2.60 to 3.90); p<0.0001
	le Roux, 2017[339]	3.0mg QD	≥10% Wt loss	13	2437	807 (33.1%)	1225	130 (10.6%)	OR: 4.30 (3.50 to 5.30); p<0.001
		3.0mg QD	≥10% Wt loss	36*	1467	364 (24.8%)	734	73 (9.9%)	OR: 3.10 (2.30 to 4.10); p<0.0001
		3.0mg QD	≥15% Wt loss	13	2437	351 (14.4%)	1225	43 (3.5%)	4.10 (3.01 to 5.59); p=NR
		3.0mg QD	≥15% Wt loss	36*	1467	161 (11.0%)	734	23 (3.1%)	OR: 4.00 (2.60 to 6.30); p<0.0001
Lorcaserin hydrochloride	Fidler, 2011[173]	10mg BID	≥5% Wt loss	12	1561	737 (47.2%)	1541	385 (25.0%)	1.89 (1.71 to 2.09); p<0.001
		10mg BID	≥10% Wt loss	12	1561	353 (22.6%)	1541	150 (9.7%)	2.32 (1.95 to 2.77); p<0.001
	Smith, 2010[172]	10mg BID	≥5% Wt loss	12	1538	731 (47.5%)	1499	304 (20.3%)	2.34 (2.09 to 2.62); p<0.001
		10mg BID	≥10% Wt loss	12	1538	348 (22.6%)	1499	115 (7.7%)	2.95 (2.42 to 3.60); p<0.001
Nal-Bup	Apovian, 2013[218]	16/180mg TID	≥5% Wt loss	13	702	354 (50.5%)	456	78 (17.1%)	2.95 (2.38 to 3.66); p<0.001
		16/180mg TID	≥10% Wt loss	13	702	199 (28.3%)	456	26 (5.7%)	4.97 (3.36 to 7.35); p<0.001
		16/180mg TID	≥15% Wt loss	13	702	95 (13.5%)	456	11 (2.4%)	5.61 (3.04 to 10.36); p<0.001
	Greenway, 2010[244]	16/180mg TID	≥5% Wt loss	13	471	226 (48.0%)	511	84 (16.0%)	2.92 (2.35 to 3.63); p=0.0099
		16/180mg TID	≥10% Wt loss	13	471	116 (25.0%)	511	38 (7.0%)	3.31 (2.35 to 4.67); p<0.0001
		16/180mg TID	≥15% Wt loss	13	471	56 (12.0%)	511	10 (2.0%)	6.08 (3.14 to 11.77); p<0.0001
	Wadden, 2011[311]	16/180mg TID	≥5% Wt loss	12	482	320 (66.4%)	193	82 (42.5%)	1.56 (1.31 to 1.86); p<0.001
		16/180mg TID	≥10% Wt loss	12	482	200 (41.5%)	193	39 (20.2%)	2.05 (1.52 to 2.77); p<0.001
		16/180mg TID	≥15% Wt loss	12	482	140 (29.1%)	193	21 (10.9%)	2.67 (1.74 to 4.09); p<0.001
Orlistat	Broom, 2002[227]	120mg TID	≥5% Wt loss	12	259	144 (55.6%)	263	64 (24.3%)	2.28 (1.80 to 2.90); p<0.0001
		120mg TID	≥10% Wt loss	12	259	51 (19.7%)	263	29 (11.0%)	1.79 (1.17 to 2.72)†; p=NS, NR
	Davidson, 1999[160]	120mg TID	≥5% Wt loss	12	657	432 (65.7%)	223	97 (43.6%)	1.51 (1.29 to 1.77); p<0.01
	Finer, 2000[239]	120mg TID	≥5% Wt loss	12	110	38 (35.0%)	108	23 (21.0%)	1.62 (1.04 to 2.53); p=0.02
		120mg TID	≥10% Wt loss	12	110	18 (16.0%)	108	6 (6.0%)	2.95 (1.22 to 7.14); p=0.02
	Hauptman, 2000[246]	120mg TID	≥5% Wt loss	12	210	106 (50.5%)	212	65 (30.7%)	1.65 (1.29 to 2.10); p<0.001
		60mg TID	≥5% Wt loss	12	213	104 (48.8%)	212	65 (30.7%)	1.59 (1.25 to 2.03); p<0.001
		120mg TID	≥5% Wt loss	24	210	72 (34.3%)	212	51 (24.1%)	1.43 (1.05 to 1.93); p=0.02
		60mg TID	≥5% Wt loss	24	213	72 (33.8%)	212	51 (24.1%)	1.41 (1.04 to 1.90); p=0.03
		120mg TID	≥10% Wt loss	12	210	60 (28.6%)	212	24 (11.3%)	2.52 (1.64 to 3.89); p<0.001
		60mg TID	≥10% Wt loss	12	213	52 (24.4%)	212	24 (11.3%)	2.16 (1.38 to 3.36); p<0.001
		120mg TID	≥10% Wt loss	24	210	39 (18.6%)	212	14 (6.6%)	2.81 (1.57 to 5.02); p<0.001
		60mg TID	≥10% Wt loss	24	213	31 (14.6%)	212	14 (6.6%)	2.20 (1.21 to 4.02); p<0.008
	Krempf, 2003[260]	120mg TID	≥5% Wt loss	12	258	170 (65.9%)	220	102 (46.4%)	1.42 (1.20 to 1.68); p<0.0001
		120mg TID	≥5% Wt loss	18	223	130 (58.3%)	196	74 (37.8%)	1.54 (1.25 to 1.91); p<0.0001
		120mg TID	≥10% Wt loss	12	258	85 (32.9%)	220	54 (24.5%)	1.34 (1.00 to 1.79); p=0.04
		120mg TID	≥10% Wt loss	18	223	75 (33.6%)	196	33 (16.8%)	2.00 (1.39 to 2.87); p<0.0001

Appendix G Table 6. Detailed Results for Meeting Weight Loss Goals for Medication-Based Weight Loss Interventions, by Drug

Drug	Author, Year	Dose	Outcome	FU, mos	IG N	IG n (%)	CG N	CG n (%)	Calculated RR (95% CI); study-reported p-value
	Lindgarde, 2000[263]	120mg TID	≥5% Wt loss	12	190	103 (54.2%)	186	76 (40.9%)	1.33 (1.07 to 1.65); p<0.001
		120mg TID	≥10% Wt loss	12	190	36 (19.2%)	186	27 (14.6%)	1.31 (0.83 to 2.06); p=0.05
	Rossner, 2000[292]	120mg TID	≥5% Wt loss	12	242	152 (62.7%)	237	104 (43.8%)	1.43 (1.20 to 1.70); p<0.001
		60mg TID	≥5% Wt loss	12	239	152 (63.4%)	237	104 (43.8%)	1.45 (1.22 to 1.72); p=NR
		120mg TID	≥5% Wt loss	24	242	160 (66.1%)	237	90 (38.0%)	1.74 (1.45 to 2.10); p<0.001
		60mg TID	≥5% Wt loss	24	239	135 (56.3%)	237	90 (38.0%)	1.49 (1.22 to 1.81); p=NR
		120mg TID	≥10% Wt loss	12	242	93 (38.3%)	237	45 (18.8%)	2.02 (1.49 to 2.75); p<0.001
		60mg TID	≥10% Wt loss	12	239	75 (31.2%)	237	45 (18.8%)	1.65 (1.20 to 2.28); p=0.002
		120mg TID	≥10% Wt loss	24	242	68 (28.2%)	237	44 (18.6%)	1.51 (1.08 to 2.11); p<0.05
		60mg TID	≥10% Wt loss	24	239	69 (29.0%)	237	44 (18.6%)	1.56 (1.11 to 2.17); p<0.05
	Sjostrom, 1998[297]	120mg TID	≥5% Wt loss	12	343	235 (68.5%)	340	167 (49.2%)	1.39 (1.23 to 1.59); p=NR
		120mg TID	≥10% Wt loss	12	343	133 (38.8%)	340	60 (17.7%)	2.20 (1.69 to 2.86); p=NR
	Torgerson, 2004[161]	120mg TID	≥5% Wt loss	12	1640	1194 (72.8%)	1637	738 (45.1%)	1.61 (1.52 to 1.72); p<0.001
		120mg TID	≥5% Wt loss	48	850	449 (52.8%)	564	210 (37.3%)	1.42 (1.25 to 1.61); p<0.001
		120mg TID	≥10% Wt loss	12	1640	672 (41.0%)	1637	340 (20.8%)	1.97 (1.77 to 2.20); p<0.001
		120mg TID	≥10% Wt loss	48	850	223 (26.2%)	564	88 (15.6%)	1.68 (1.35 to 2.10); p<0.001
Phen-Top	Allison, 2012[216]	15/92mg QD	≥5% Wt loss	12	498	332 (66.7%)	498	86 (17.3%)	3.86 (3.15 to 4.72); p<0.0001
		15/92mg QD	≥10% Wt loss	12	498	235 (47.2%)	498	37 (7.4%)	6.35 (4.60 to 8.78); p<0.0001
		15/92mg QD	≥15% Wt loss	12	498	161 (32.3%)	498	17 (3.4%)	9.47 (5.84 to 15.37); p<0.0001
	Gadde, 2011[241]	15/92mg QD	≥5% Wt loss	13	981	687 (70.0%)	979	204 (20.8%)	OR: 9.00 (7.30 to 11.10); p<0.0001
		7.5/46mg QD	≥5% Wt loss	13	488	303 (62.1%)	979	204 (20.8%)	OR: 6.30 (4.90 to 8.00); p<0.0001
		15/92mg QD	≥10% Wt loss	13	981	467 (47.6%)	979	72 (7.4%)	OR: 11.70 (8.90 to 15.40); p<0.0001
		7.5/46mg QD	≥10% Wt loss	13	488	182 (37.3%)	979	72 (7.4%)	OR: 7.60 (5.60 to 10.20); p<0.0001

* Individuals with prediabetes at baseline only
† Calculated RR and CI

Abbreviations: BID = twice a day; BL = baseline; CG = control group; CI = confidence interval; FU = followup; IG = intervention group; mg = milligrams; mos = months; Nal-Bup = Naltrexone HCL and bupropion HCL; NR = not reported; NS = not statistically significant; OR = odds ratio; Phen-Top = Phentermine-topiramate extended release; QD = once a day; RR = risk ratio; TID = three times a day; Wt = weight

Appendix G Table 7. Detailed Results for Weight Maintenance Outcomes for Medication-based Weight Maintenance Interventions, By Drug

Drug	Author, Year	Dose	Outcome [unit]	FU, mos	IG N	IG Mean (SD) change during WL	IG Mean (SD) at MN rand	IG Mean change during MN (95% CI)	CG N	CG Mean (SD) change during WL	CG Mean (SD) at MN rand	CG Mean change during MN (95% CI)	Between-group difference in mean change (95% CI)*
Liraglutide	Wadden, 2013[312]	3.0mg QD	Weight [% change]	13	207	-5.9 (0.9)	NA	-6.2 (7.3)	206	-6.0 (0.9)	NA	-0.2 (7.0)	-6.10 (-7.50 to -4.60); p<0.0001
		3.0mg QD	Weight [% change]	16	207	-5.9 (0.9)	NA	-4.1 (8.2)	206	-6.0 (0.9)	NA	0.3 (7.7)	-4.20 (-6.00 to -2.40); p<0.0001
		3.0mg QD	BMI [kg/m2]	13	207	-2.3 (0.5)	36.0 (5.9)	-2.1 (-2.5 to -1.7)	206	-2.2 (0.5)	35.2 (5.9)	0.0 (-0.3 to 0.3)	-2.10 (-2.50 to -1.60); p<0.0001
		3.0mg QD	WC [cm]	13	207	-5.0 (5.1)	109.4 (15.3)	-4.7 (-5.7 to -3.7)	206	-4.9 (4.9)	107.8 (15.2)	-1.2 (-2.1 to -0.3)	-3.50 (-4.80 to -2.20); p<0.0001
		3.0mg QD	Weight [kg]	13	207	-6.3 (1.5)	100.4 (20.8)	-6.0 (-7.0 to -5.0)	206	-6.3 (1.6)	98.7 (21.2)	-0.1 (-1.0 to 0.8)	-5.90 (-7.30 to -4.40); p=<0.0001
Orlistat	Hill, 1999[247]	120mg TID	Weight [% change]	12	113	-11.0 (3.0)	NA	2.8 (1.9 to 3.8)	121	-11.4 (3.3)	NA	4.9 (3.6 to 6.3)	-2.11 (-3.80 to -0.42); p<0.001
		60mg TID	Weight [% change]	12	116	-10.8 (3.2)	NA	4.2 (3.2 to 5.2)	121	-11.4 (3.3)	NA	4.9 (3.6 to 6.3)	-0.78 (-2.47 to 0.91); p=NR
		120mg TID	Weight [kg]	12	113	-9.9 (2.9)	NR	2.6 (2.0 to 3.2)	121	-10.3 (3.4)	NR	4.4 (3.6 to 5.2)	-1.78 (-2.81 to -0.75); p<0.001
		60mg TID	Weight [kg]	12	116	-10.0 (3.1)	NR	3.8 (3.3 to 4.4)	121	-10.3 (3.4)	NR	4.4 (3.6 to 5.2)	-0.56 (-1.55 to 0.43); p=NR, NS
	Richelsen, 2007[287]	120mg TID	WC [cm]	18	153	-12.0 (NR)	107 (NR)	0.0 (NR)	156	-12.0 (NR)	107 (NR)	3.0 (NR)	-3.00 (NR); p=NR
		120mg TID	WC [cm]	36	153	-12.0 (NR)	107 (NR)	4.3 (NR)	156	-12.0 (NR)	107 (NR)	6.6 (NR)	-2.30 (NR); p=0.032
		120mg TID	Weight [kg]	18	153	-14.5 (NR)	96.2 (NR)	2.8 (NR)	156	-14.3 (NR)	97.6 (NR)	4.7 (NR)	-1.90 (NR); p=NR
		120mg TID	Weight [kg]	36	153	-14.5 (NR)	96.2 (NR)	5.1 (NR)	156	-14.3 (NR)	97.6 (NR)	7.1 (NR)	-2.00 (NR); p=0.028

* Study-reported adjusted between group difference in mean change reported if available; otherwise, calculated unadjusted between group difference.

Abbreviations: CG = control group; CI = confidence interval; FU = followup; IG = intervention group; kg = kilograms; mg = milligrams; mos = months; MN = maintenance; NA = not applicable; NR = not reported; NS = not statistically significant; rand = randomization; QD = once a day; rand = randomization; SD = standard deviation; TID = three times a day; WC = waist circumference; WL = weight loss

Appendix G Table 8. Detailed Results for Meeting Weight Maintenance Goals for Medication-Based Weight Loss Maintenance Interventions, by Drug

Drug	Author, Year	Dose	Outcome [unit]	FU, mos	IG N	IG N(%) at MN rand	IG N (%) FU	CG N	CG N(%) at MN rand	CG N (%) FU	Calculated RR (95% CI)*
Liraglutide	Wadden, 2013[312]	3.0mg QD	Maintenance of 5% weight loss [n]	13	207	207 (100%)	105 (50.5%)	206	206 (100%)	45 (21.8%)	OR: 3.90 (2.40 to 6.10); p=<0.0001
		3.0mg QD	Maintenance of 10% weight loss [n]	13	207	NR	54 (26.1%)	206	NR	13 (6.3%)	OR: 5.30 (2.80 to 10.10); p=<0.0001
Orlistat	Richelsen, 2007[287]	120mg TID	Maintenance of 5% weight loss [n]	12	153	153 (100%)	130 (85.0%)	156	156 (100%)	112 (72.0%)	1.18 (1.05 to 1.33); p=<0.001
		120mg TID	Maintenance of 5% weight loss [n]	36	153	153 (100%)	102 (67.0%)	156	156 (100%)	87 (56.0%)	1.20 (1.00 to 1.43); p=<0.05
		120mg TID	Maintenance of 10% weight loss [n]	36	153	NR	52 (34.0%)	156	NR	45 (29.0%)	1.18 (0.85 to 1.64); p=NS, NR

* Study-reported adjusted between group difference in mean change reported if available; otherwise, calculated unadjusted between group difference.

Abbreviations: CG = control group; CI = confidence interval; FU = followup; IG = intervention group; mg = milligrams; mos = months; NR = not reported; NS = not statistically significant; rand = randomization; QD = once a day; rand = randomization; RR = risk ratio; TID = three times a day

Appendix H. Ongoing Studies

Study Reference Trial Identifier	Study Name	Location	Estimated N	Description	2017 Status
http://dx.doi.org/10.1155/2014/245347	Long-Term Effect of Interactive Online Dietician Weight Loss Advice in General Practice (LIVA)	Denmark	340	To evaluate the impact of a complex intervention using face-to-face contact with trained dieticians combined with interactive online support and follow-up, as compared with usual care, on BMI and metabolic risk factors.	Ongoing: No Est. Completion Date.
NCT01967797	5As Framework of Obesity Management (5AsT)	Canada	255	The 5AsT trial will provide a wide range of insights into current practices, knowledge gaps and barriers that limit obesity management in primary practice.	Ongoing: Est. Completion Date Dec 2016 No Results Published
ISRCTN14657176	NULevel	UK	288	The primary aim of NULevel is to evaluate the effectiveness of an inexpensive, scalable, technology-assisted, behavioural intervention for reducing weight regain among obese adults after initial weight loss.	Completed. No Published Results Yet.
ISRCTN52341938	Lighten Up weight maintenance study (LIMIT)	UK	560	The primary aim of this study is to evaluate the effectiveness and cost effectiveness of a brief behavioral intervention delivered by non-specialist staff to promote regular self-weighing to prevent weight regain after intentional weight loss.	Completed. No Published Results Yet.
ISRCTN88405328	NoHoW: Evidence-based ICT Tools For Weight Loss Maintenance	Denmark, Portugal, UK	1600	To evaluate the effectiveness of evidence-based information and communications technology behavior change tools for weight loss maintenance in overweight/obese adults after clinically significant weight loss.	Ongoing: Est. Completion Date Dec 2020
NCT01542671	Tailored Lifestyle Intervention in Obese Adults Within Primary Care Practice - Choose to Lose (CTL)	US	200	The primary objective of the study is to evaluate the effectiveness of tailored lifestyle intervention in primary care by comparing changes in the primary measure of weight and body mass index (BMI) and secondarily: physical activity (PA), fat calories consumed, and fruit/vegetable servings within the two arms (intervention and control) of the study.	Completed. No Published Results Yet.
NCT02829229	Community-based Obesity Treatment in African American Women After Childbirth	US	300	The purpose of this study is to determine the effect of the community-based obesity treatment (PP), compared to usual care (UC), on changes in maternal weight over 12 months.	Ongoing: Estimated Completion Date Jun 2020

Appendix H. Ongoing Studies

Study Reference Trial Identifier	Study Name	Location	Estimated N	Description	2017 Status
NCT02561221	Promoting Successful Weight Loss in Primary Care in Louisiana (PROPEL)	US	1080	The primary aim of this trial is to develop and test the effectiveness of a 24 month, patient-centered, pragmatic and scalable obesity treatment program delivered within primary care, inclusive of an underserved population. Half of the participants will receive a behavioral intervention delivered in a primary care setting and half of the participants will receive usual care.	Ongoing: Estimated Completion Date Jun 2019
NCT02963935	Effect and Safety of Liraglutide 3.0 mg as an Adjunct to Intensive Behaviour Therapy for Obesity in a Non-specialist Setting (SCALE™ IBT)	US	282	The purpose of the trial is to investigate the effect and safety of liraglutide 3.0 mg as an adjunct to intensive behaviour therapy for obesity in a non-specialist setting (IBT-CMS: Intensive Behaviour Therapy for obesity in a primary care setting according to Centers for Medicare & Medicaid Services (CMS) visit schedule).	Ongoing: Est. Completion Date Jun 2018
NCT03038620	Impact of Liraglutide 3.0 on Body Fat Distribution	US	356	This study is a clinical study to investigate the efficacy of liraglutide compared to placebo in reducing visceral adiposity measured by MRI in overweight or obese subjects at high risk for cardiovascular disease after 40 weeks on-treatment.	Ongoing: Est. Completion Date Dec 2020
NCT02019264	A Study to Evaluate the Effect of Long-term Treatment With BELVIQ (Lorcaserin HCl) on the Incidence of Major Adverse Cardiovascular Events and Conversion to Type 2 Diabetes Mellitus in Obese and Overweight Subjects With Cardiovascular Disease or Multiple Cardiovascular Risk Factors	US, Australia, Bahamas, Canada, Chile, Mexico, New Zealand, Poland	1200	To evaluate the effect of long-term treatment with BELVIQ (Lorcaserin HCL) on the incidence of major adverse cardiovascular events and conversion to type 2 diabetes mellitus in obese and overweight subjects with cardiovascular disease or multiple cardiovascular risk factors.	Ongoing: Est. Completion Date Nov 2018
NCT02400359	Lorcaserin in Obesity: Identification of CNS Targets Using fMRI	US	40	The purpose of this protocol is to investigate the effect of treatment with the study drug, called lorcaserin on centers of the brain that control appetite and food intake, as well as lorcaserin's other metabolic effects.	Ongoing: Est. Completion Date Dec 2018

Appendix H. Ongoing Studies

Study Reference Trial Identifier	Study Name	Location	Estimated N	Description	2017 Status
NCT01480466	Use of Electronic Health Records for Addressing Overweight and Obesity in Primary Care	US	65278	The objectives of the proposed research are to develop and evaluate a set of tools within electronic health records (EHRs) to assist primary care clinicians with the diagnosis and treatment of overweight and obesity and to help patients manage their weight.	Completed. No Published Results Yet.
ACTRN12615000114549	Do Making Habits or Breaking Habits Influence Weight Loss and Weight Loss Maintenance: A Randomised Controlled Trial	Australia	75	The primary purpose of this study is to investigate the effectiveness of 2 weight management interventions which focus on habitual behavior and assess whether we can maintain weight loss for at least 12 months if habits are altered.	Completed. No Published Results Yet.
ACTRN12612000997853	Living Well after Breast Cancer	Australia	160	The purpose of this study is to evaluate a 12-month telephone-delivered weight loss program, as compared to usual care, for women who have recently completed primary treatment for breast cancer.	Ongoing: No Est. Completion Date
NCT03006328	The GEM (Goals for Eating and Moving) Study (GEM)	US	384	Test the impact of the GEM intervention on weight change, and clinical and behavioral outcomes.	Ongoing: Est. Completion Date Sep 2017
NCT01946191	Computer-Based Weight Maintenance in Primary Care (MAINTAIN-PC)	US	194	The purpose of this study is to test whether online tracking tools and weight maintenance coaching visits for patients and real-time electronic progress reports for primary care providers (PCPs) [Continued Coaching (CC)] will support more successful weight maintenance than online tracking tools alone [Tracking Only (TO)] in a group of primary care patients who have lost ≥ 5% of their body weight.	Ongoing: Est. Completion Date Sep 2017
NCT01795248	The Impact of Liraglutide on Glucose Tolerance and the Risk of Type 2 Diabetes in Women With Previous Pregnancy-induced Diabetes	Denmark	100	To examine the effect of the type 2 diabetes medicine, liraglutide (Victoza), in women with previous gestational diabetes with the aim of reducing the risk of developing type 2 diabetes.	Ongoing: Est. Completion Date Aug 2020
NCT03032731	Trial of a New Online Programme for Physical Activity and Healthy Eating	UK	60	To investigate the efficacy of a self-directed, website-based intervention to promote physical activity and healthy dietary behaviors.	Ongoing: Est. Completion Date Oct 2017

Appendix H. Ongoing Studies

Study Reference Trial Identifier	Study Name	Location	Estimated N	Description	2017 Status
NCT03163264	The Move Toward Your Goals Intervention (MTG)	US	520	To explore the feasibility and impact of a technology-assisted intervention on intermediate, behavioral, and weight loss outcomes at 3, 6 and 12 months post-intervention when compared to enhanced usual care.	Ongoing: Est. Completion Date Mar 2020
NCT03203655	Text Based Mobile Technology and Weight Loss	US	40	To test the efficacy of a culturally sensitive and linguistically appropriate internet and mobile-based weight loss therapy in obese Hispanic/Latino women.	Ongoing: Est. Completion Date Dec 2017