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Effectiveness of Weight Loss Interventions for Obese Older Adults

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Abstract

Objective—The consequences of obesity among older adults are significant, yet few obesity interventions target this group. Unfamiliarity with weight loss intervention effectiveness and concerns that weight loss negatively affects older adults may be inhibiting targeting this group. This paper reviews the evidence on intentional weight loss and effective weight loss interventions for obese older adults to help dispel concerns and guide health promotion practice.

Data Source—PubMed articles.

Study Inclusion and Exclusion Criteria—Randomized controlled trials examining behavioral and pharmaceutical weight loss strategies with 1-year follow-up targeting obese (body mass index ≥ 30) older adults (mean age ≥ 60 years), and studies with quasi-experimental designs examining surgical weight loss strategies targeting older adults were examined.

Data Extraction—Abstracts were reviewed for study objective relevancy, with relevant articles extracted and reviewed.

Data Synthesis—Data were inserted into an analysis matrix.

Results—Evidence indicates behavioral strategies are effective in producing significant (all $p < .05$) weight loss without significant risk to obese older adults, but effectiveness evidence for surgical and pharmaceutical strategies for obese older adults is lacking, primarily because this group has not been targeted in trials or analyses did not isolate this group.

Conclusion—These findings support the promotion of intentional weight loss among obese older adults and provide guidance to health promotion practitioners on effective weight loss interventions to use with this group.

Keywords

Obesity; Older Adults; Weight Loss Interventions; Prevention Research

OBJECTIVE

U.S. obesity (body mass index [BMI] ≥ 30) rates have increased dramatically in recent years,¹⁻³ including among older adults (aged ≥ 60 years).² Obesity rates for older males and females increased from 8.4% and 23.6%, respectively, in 1960–1961⁴ to 37.1% and 33.6%, respectively, in 2007–2008.² Obesity in this group is associated with a number of chronic conditions and some cancers,⁵ cognitive^{6,7} and functional^{8,9} decline, and increased nursing home admission.¹⁰ The number of older adults impacted by obesity will be magnified with the aging of the U.S. population,¹¹ leading to significant challenges for the U.S. health care and long-term care delivery systems.¹²

U.S. guidelines recommend that all adults be screened for obesity by health care providers and that weight loss counseling be offered to obese adults.¹³ Additionally, a previous review of the treatment of obesity among older adults found positive evidence of behavioral lifestyle change interventions promoting beneficial weight loss among obese older adults. Despite these recommendations and evidence, only 44.5% of obese 60- to 69-year-olds and 32.4% of obese ≥ 70 -year-olds receive weight loss counseling from their physician.¹⁴ Furthermore, community and policy-related obesity prevention and intervention initiatives primarily target children and nonelderly adults.

Low rates of physician weight loss counseling and few community weight loss initiatives targeting older adults may be due to unfamiliarity with the evidence on the effectiveness of weight loss interventions among this group, as well as concerns that weight loss by older adults results in negative outcomes, such as poor nutritional intake, bone density loss/fractures, frailty/sarcopenia, and mortality. However, evidence exists to show that intentional and structured weight loss among obese older adults can result in positive health benefits, warranting its prescription. Therefore, the purpose of this paper is to review the evidence on intentional weight loss and safe and effective weight loss interventions for obese older adults in order to help dispel concerns regarding weight loss among this group. Findings should encourage public health and health care practitioners to change their practice in terms of those they target for their obesity prevention and intervention efforts.

BACKGROUND ON CONCERNS SURROUNDING WEIGHT LOSS AMONG OLDER ADULTS

Health care providers and public health professionals may not be inclined to recommend weight loss to their older obese patients/clients because of concerns related to weight loss intention, appropriate nutritional intake, bone density loss/fractures, frailty/sarcopenia, and mortality.

Weight Loss Intention

Unintentional weight loss is typically the result of a serious underlying disease¹⁵ and has been linked to frailty,¹⁶ functional decline,¹⁷ and mortality.¹⁸ For example, a study of 938 noninstitutionalized older adults (≥ 65 years) found that unintentional weight loss, regardless of baseline BMI, was significantly associated with mobility and functional limitations, after controlling for demographics, health behaviors, and comorbidities.¹⁷ Other research indicated that, after controlling for age and gender, nursing home residents (≥ 55 years) who lost at least 5% of their weight over 1 month were 5.1 times more likely to die within 1 year than residents who did not experience a weight loss.¹⁸

Nutrient Intake

The aging process can affect the body's ability to acquire important macronutrients and micronutrients. For example, postmenopause estrogen reduction can affect calcium absorption, and poor skin and reduced sun exposure can affect vitamin D levels in older adults.¹⁹ Reduced-caloric diets, if not properly balanced, can affect the intake of important nutrients, exacerbating the age-related declines in those nutrients. Thus, weight loss diets for older adults need to be structured to meet their nutritional requirements.²⁰

Bone Density/Fractures

Bone density loss is part of the normal aging process.²¹ Low bone density can lead to osteoporosis and fractures. Overall weight can affect bone density in older adults, as evidenced by the Framingham Study. In an analysis of the osteoporosis cohort of the Framingham Study (n = 1132), total body weight was significantly associated with bone density for women, but less so for men, leading the authors to conclude that weight load on the skeleton is important for bone density.²²

Research has shown that unintentional and intentional weight loss can increase the risk for hip bone density loss and hip fracture among older women. Ensrud et al.²³ examined data on ~10,000 older women in the Osteoporotic Fractures Study. Older women who lost weight, regardless of intention, had significantly higher rates of hip bone loss compared to those who did not lose weight. Hip fracture risk was significantly higher for older women with intentional compared to unintentional weight loss. Analysis of a subgroup of women who were enrolled in the Trial of Nonpharmacologic Interventions in the Elderly (TONE) found that prescribed weight loss was significantly associated with a decrease in total body bone density, after controlling for baseline characteristics and intervention arm assignment.²⁴ A randomized controlled trial (RCT) evaluating the effect of diet and exercise on bone metabolism and density among frail and obese older adults (n = 27) found that the intervention, which produced a 10% reduction in body weight, was associated with significant declines in bone density and bone mineral content at the hip, trochanter, and intertrochanter (but not at the spine or total body).²⁵

Frailty/Sarcopenia

Sarcopenia is the age-related loss of lean muscle mass. It is associated with frailty and weakness, which in turn can lead to injury, functional decline, hospitalization, and institutionalization.^{26,27} More recently, the term sarcopenic obesity has been coined to describe the coexistence of excessive body fat and low muscle mass, although some suggest the definition should be revised to include coexistence of obesity and loss of muscle strength (not just loss of muscle mass).²⁸

There is concern that weight loss among older adults will result in the loss of lean muscle mass, accelerating sarcopenia and associated negative consequences. Evidence from the Health, Aging, and Body Composition Study supports this concern. In that study, body composition, demographic, lifestyle and health data were collected on 2163 older adults over 4 years. Analyses, which controlled for baseline body composition and weight change, revealed that weight loss in men (but not women) resulted in significantly greater lean muscle loss (5.8% of lean mass lost with weight loss) than was gained with weight gain (2.0% lean mass gained with weight gain). The authors noted that diet-associated weight cycling in older adults might result in more sarcopenia than if weight had remained stable.²⁹ A meta-analysis examining the effects of reduced-calorie weight loss interventions targeting overweight older adults found that 1.5 to 3 kg of lean mass was lost through reduced calories intervention (but those in reduced calories plus exercise intervention lost less lean mass).³⁰

Mortality

Several studies suggest weight loss increases mortality risk.^{5,18,31} One study of 4714 community-dwelling older adults found that, after controlling for demographics, smoking history, medication use, waist circumference, and mobility level, older adults who lost 5% of their weight had significantly higher mortality risk within 3 years than those with no weight change, but found no difference in mortality risk between those who gained 5% of their weight and those with no weight change.³² However, studies showing associations between weight loss and mortality among obese older adults often do not account for weight loss intention, and this has been criticized in the literature.^{5,33,34} Only a few studies specifically examine weight loss intention and mortality among obese older adults, with results indicating that if weight loss is intentional, there is not an increased mortality risk.³⁴⁻³⁶ Indeed, one study analyzing 8-year follow-up data from the Arthritis, Diet, and Activity Promotion Trial (ADAPT) found that intentional weight loss among obese older adults randomized to the intervention was associated with a lower mortality risk compared to those randomized to the control group.³⁶

METHODS

The purpose of this review was to examine the evidence on intentional weight loss and safe and effective weight loss interventions for obese older adults, updating previous reviews³⁷ by including more recently published research (through July 2010).

Data Source

PubMed, the biomedical and life sciences literature database of the U.S. National Library of Medicine, was searched for articles published through July 2010, using a combination of key terms related to obesity, older adults, and weight loss.

Study Inclusion and Exclusion Criteria

Studies examining weight loss strategies were restricted to RCTs examining behavioral/lifestyle and pharmaceutical weight loss strategies that had a follow-up period of at least 1 year and either targeted only older adults (aged ≥ 60 years) (n = 4), reported study results for older adults (aged 60–85 years) separately (n = 1), or had a mean age of study population of 60 years (n = 4). Detailed information about age of participants of the behavioral/lifestyle trials included in this review is shown in Table 1. Because of ethical considerations in conducting weight loss surgery RCTs, the review of studies examining surgical weight loss strategies included those with quasi-experimental designs targeting older adults or including older adults in the study population. Only English-language studies were included.

Data Extraction

The steps taken to locate, screen, and include/exclude studies for this review are as follows. First, to locate studies, PubMed was searched for articles using a combination of key terms such as obesity, obese, older adults, elderly, intentional and unintentional weight loss, behavioral weight loss interventions, bariatric surgery, and weight loss medications. The abstracts of all articles identified through this search were then read to screen for relevancy to study objectives and criteria. Those abstracts that met the specified inclusion criteria were retained for detailed review and data synthesis. A further review of the bibliographies of the articles undergoing detailed review was used to identify any additional articles that likely met the specified inclusion criteria. The abstracts of these additional articles were then reviewed for relevancy to study objectives and criteria, followed by a detailed review and data synthesis.

Data Synthesis

Data from studies on behavioral weight loss intervention RCTs were extracted from articles and placed in a matrix for synthesis (see Table 2). Data from studies on weight loss surgery and weight loss medications and supplements were synthesized directly from articles given the limited number found.

RESULTS

Strategies to achieve weight loss include behavioral/lifestyle changes (e.g., reduced caloric intake, increased physical activity), weight loss surgery, and weight loss medication.

Behavioral/Lifestyle Changes

Table 1 describes the age-related characteristics of the 10 identified behavioral/lifestyle weight loss intervention RCTs that targeted older adults or that analyzed older adult outcomes. Eight of the 10 trials produced significant ($p < .05$) weight loss among older adults (specific weight loss amounts are listed in Table 2). Indeed, older adults may be more responsive to such interventions than younger adults, as demonstrated by the Diabetes Prevention Program (DPP) Trial. In that trial, older adults in the DPP lifestyle arm lost significantly more weight at 1 year than younger persons in the trial (60–85 years = -6.4 kg, 45–59 years = -5.0 kg, 25–44 years = -4.1 kg), and a significantly higher percentage of older adults reached the weight loss goal of 7% of body weight by 1 year (60–85 years = 55%, 45–59 years = 39%, 25–44 years = 33%).⁴² As with most of the lifestyle interventions, the DPP lifestyle arm involved a reduced-calorie, low-fat diet coupled with moderate physical activity. Physical activity offers particular advantages for weight loss maintenance rather than weight loss. However, inclusion of physical activity as part of a weight loss plan may also improve physical function among older adults, as shown in the ADAPT study.^{43,44}

Four of the trials provided data on intervention-related adverse outcomes. In two trials (DPP and Reach to Enhance Wellness [RENEW]), several participants reported some discomfort (gastrointestinal or musculoskeletal problems) during the trials; however, in both of these trials there was no statistical difference in occurrence of these adverse outcomes by study arm.^{42,45} Both the Diet & Exercise Intervention trial and the TONE Trial reported a decrease in bone mineral density (BMD) associated with randomization to the intervention arm. In the Diet & Exercise Intervention trial, significant decreases in BMD and bone mineral content at the trochanter, intertrochanter, and hip were observed among those in the intervention arm.²⁵ A substudy within the TONE trial found a significant positive association between weight loss and BMD loss.⁴⁶

Weight Loss Surgery

The literature search for studies of bariatric surgery among older adults (≥ 60 years) did not identify any RCTs. However, the search did identify a recent systematic review of bariatric surgery studies not limited to a specific age population. That review covered 23 RCTs and 3 large cohort studies comparing surgical and nonsurgical weight loss options. The authors of that review concluded that bariatric surgery is more effective for weight loss than nonsurgical options; however, they noted that the limited number of studies that included persons ≥ 60 years makes it difficult to generalize findings to older adults.⁴⁷

However, a few other studies provide some indications of the outcomes older adults may experience with bariatric surgery. An observational study using hospital discharge data on 49,275 persons who underwent bariatric surgery found that older adults (≥ 60 years, $n = 1339$) had significantly longer hospital stays and significantly more in-hospital

complications (e.g., bleeding, wound infection) than younger adults; but the observed-to-expected mortality ratio for older adults compared to younger adults was not significantly different after adjusting for preexisting conditions and was low, leading the authors to conclude that bariatric surgery was a safe option for older adults.⁴⁸ Another study found similar results: obese (mean BMI = 48.1) older adults (> 65 years, n = 197) who underwent bariatric surgery in one Midwestern hospital experienced low rates of major in-hospital complications (6.1%) and mortality (0%) at 30 days and mortality at 1 year (1.3%) but were able to achieve a 55% body weight loss and report significant improvements in quality of life at 1 year.⁴⁹

These two studies also examined differences in outcomes based on the type of bariatric surgery procedure—gastric bypass, lap band, or gastroplasty. Gastric bypass was the most common method used with older adults.^{48,49} No surgery-associated in-hospital deaths were reported by either study regardless of the type of bariatric surgery, and only two deaths (1.3%) were reported by year 1 for older adults who underwent gastric bypass.^{48,49} These studies provide some modest evidence that bariatric surgery is a safe and effective weight loss strategy for older adults; however, additional research using more rigorous evaluation methods is warranted.

Weight Loss Medications

There is one medication, orlistat, which currently has U.S. Food and Drug Administration (FDA) approval for the long-term treatment of obesity in the United States. At least one new weight loss medication (rimonabant) is under FDA consideration, and another weight loss medication—Meridia (sibutramine)—was recently withdrawn from the U.S. market after the drug was found to be associated with increased risk of heart attack and stroke.⁵⁰

No RCTs of orlistat use in older adults were identified in the literature. Most of the identified orlistat RCTs excluded older adults.⁵¹⁻⁵³ However, several orlistat trials did not impose an upper age limit.⁵⁴⁻⁵⁷ These trials showed that orlistat was effective in producing weight loss during the treatment phase and in limiting weight regain during the maintenance phase, with few serious adverse events reported. Therefore, evidence exists to show the efficacy of orlistat for weight loss in obese adults. However, the lack of results specific to older adults in these trials limits the ability to conclude whether orlistat is effective and safe as a weight loss treatment option for older adults. A low-dose version of orlistat (Alli) received FDA approval for over-the-counter purchase. No known RCTs have assessed the use of over-the-counter orlistat in older adults, making it impossible to draw conclusions on the use of over-the-counter orlistat in an older adult population.⁵⁸

Beyond low-dose orlistat, there are a variety of dietary supplements available over the counter that purport to prompt weight loss. Use of these supplements is common in the United States,⁵⁹ despite these products' lacking FDA approval. However, no RCTs of dietary supplements for weight loss targeting older adults were identified in the literature. Nevertheless, a systematic literature review of the effectiveness of these dietary weight loss supplements found the evidence for their use unconvincing and recommended they not be used.⁶⁰ Use of prescription or over-the-counter weight loss medications or dietary supplements in older adults is cautioned given the limited data supporting their use in this population. In addition, special considerations related to poly-pharmacy should be taken into account when considering use of these antiobesity products in older adults given their high rate of prescription drug use.

Benefits of Intentional Weight Loss Among Older Adults

A recent meta-analysis assessed the effect of weight loss interventions on health outcomes in older adults. Nine RCTs for obese older adults (mean age 60 years) with 1-year follow-up periods identified in the literature from 1966 to 2008 were included in that meta-analysis. The authors concluded that modest weight loss did not produce significant clinical improvements in cholesterol levels at 1 year and that conclusions regarding other outcomes (e.g., blood pressure, glycemic control, quality of life) were not possible because of insufficient data to conduct the meta-analysis.⁶¹ However, when the results of the trials are examined individually by this present review, evidence of significant improvements in many health outcomes is observed. Table 2 lists the nine RCTs included in that meta-analysis, plus one other trial using the same inclusion criteria that was not included in the review because it was published after 2008. In 8 of those 10 RCTs, older adults achieved significant weight loss. A range of health outcomes (e.g., cholesterol levels, blood pressure, and function) were measured in those trials, but their inclusion as outcome measures varied greatly across the trials. However, in eight trials, some significant health outcomes were observed (e.g., lowering the risk of cardiovascular events [TONE⁴⁶] and diabetes [DPP⁴²] or increasing function [ADAPT^{43,44} and RENEW⁴⁵]). Two trials observed loss of bone density,^{25,46} which raises concern about increasing fracture risk among older adults (>60 years), who are already at increased risk for fractures. However, data on actual fractures among those who lost weight have not been reported, making it difficult to assess actual associated risk. Furthermore, it should be noted that obese older adults (aged 70–79 years) likely to be prescribed weight loss (e.g., those having higher fat mass) are more likely to have higher lean mass and bone density,⁶² making potential losses in these areas due to intentional weight loss less of a concern.

At What BMI Level Should Older Adults Be Prescribed Weight Loss, and How Much Should They Lose?

As noted above, current clinical guidelines recommend that overweight adults with risk factors and all obese adults⁶³ be advised to lose weight, but professional associations have recommended that only obese older adults with risk factors be advised to lose weight.⁵ Because questions exist as to what is actually an optimal BMI for older adults (age >65 years),⁶⁴ questions remain as to the threshold for weight loss recommendations for obese older adults.

Determining an optimal BMI level for weight loss is complex, as it depends on the risks associated with specific BMI levels, which are not clearly established for older adults. Based on analysis of data from >11,500 older women, the optimal BMI for the lowest risk of diabetes, hypertension, heart disease, and hospital admissions was 18.5 to 24.9 (the normal BMI range) whereas the optimal BMI for the lowest mortality risk was 25 to 27 (the overweight BMI range).⁶⁵ A more recent review of published results from 11 studies with large samples and long follow-up periods found that the BMI range at which the mortality risk was lowest for older adults ranged from 24 to 35, with most studies showing the lowest mortality risk at BMIs ranging from 27 to 30.⁶⁶

Given these findings of a higher optimal BMI for lowering mortality risk among older adults, weight loss for overweight older adults may not be as advisable as it is in younger adults. However, weight loss among older adults with BMIs >30 appears advisable, with medical examinations and nutritional assessments recommended before initiating weight loss efforts.^{5,67}

As noted above and shown in Table 2, small weight reductions in obese older adults are associated with positive health benefits. Weight reductions that are associated with positive

health benefits ranged from 1.3 to 6.4 kg. Percentage body weight loss that produced positive health benefits ranged from 4.9% to 10.0%. Interventions in these trials ranged from a brief computer intervention plus counseling repeated at 3 months⁶⁸ to weekly group sessions for 1 year,²⁵ which may account for the different outcomes, as longer interventions are associated with greater weight loss.⁶⁹

CONCLUSION

Rates of obesity among all age groups in the U.S. population are increasing.^{1,2} Obesity prevention and treatment efforts have been primarily focused on nonelderly adults and children. Yet, obesity produces significant negative consequences for older adults, including functional decline,^{8,9} increased rates of comorbidities,^{5,70} health services use, and institutionalization.^{10,71} The impact of these consequences on the individual and society is great.⁷² Nevertheless, health care providers and public health professionals may not be adequately addressing this group. Unfamiliarity with the risks and benefits of weight loss in obese older adults may have led to the reluctance to take action in this area. However, this review identified 10 RCTs testing behavioral interventions using dietary change and physical activity and targeting obese older adults. Although the multicomponent nature of these interventions makes it impossible to isolate the impact of dietary change, exercise, or weight per se (a limitation of any multicomponent behavioral intervention), results from the majority of these trials (8 of 10 RCTs) suggest modest intentional weight loss among this group is associated with significant health and quality of life improvements with few risks. The potential risks of intentional weight loss, including loss of bone density, may be addressed with moderate physical activity that includes resistance training⁷³ as well as with nutritional supplements (e.g., vitamin D).²⁰

Additionally, this review identified several studies that indicate bariatric surgery may also offer an appropriate intervention to address obesity among obese older adults; however, the evidence on this method is not as strong as evidence on the behavioral or lifestyle interventions. Finally, no evidence was found that supports the use of weight loss medications with obese older adults.

This review indicates prescribed weight loss produces desirable health benefits for older adults and therefore supports improved efforts to address the obesity epidemic among the growing number of older adults in the United States. Specifically, this review suggests health care providers and public health professionals should consider changing their practice and target obese older adults (along with obese nonelderly adults and children) who may benefit from intentional weight loss interventions. For example, as previously noted, rates of weight loss counseling for obese older adults by health care providers are significantly below recommended levels.¹⁴ As such, this review may provide health care providers with needed information on appropriate obesity interventions to recommend to their obese patients.

Older adults are mentioned just once in the Surgeon General's Vision for a Healthy and Fit Nation, and that was in the statement that communities should "create healthier environments for all its citizens, from infants to older adults" (older adult age not defined in the report).⁷⁴ Although the CDC-recommended strategies listed in the Vision report can apply to all adults, including older adults, specific strategies should be developed to target obese older adults. Support should also be provided for the development and transfer of evidence-based weight loss programs in locations frequented by older adults, such as senior centers.⁷⁵ In addition, weight loss trials should include older adults so risks and benefits can be fully defined, and the concerns surrounding weight loss among older adults can be resolved.

Obesity is affecting all ages of the U.S. population. Modest weight loss among obese individuals, regardless of age, can produce significant health benefits and reduce societal burden. The health care, public health, and public policy sectors should equally address the burden of obesity across the age spectrum in the United States.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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SO WHAT? Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

Significant efforts have been made to address the obesity epidemic. However, few efforts target obese older adults (age ≥ 60 years), suggesting an unfamiliarity by public health and health care practitioners with evidence on the effectiveness of weight loss interventions among this group and concerns over negative weight loss consequences in obese older adults.

What does this article add?

This review compiles evidence on the benefits of and methods for intentional weight loss by obese older adults, providing practitioners with ready access to information to guide their practice for obesity treatment among this group.

What are the implications for health promotion practice or research?

This review indicates structured modest weight loss through diet and exercise for obese older adults are associated with positive health benefits with few risks and should prompt practitioners to target this group for obesity prevention and treatment.

Table 1
Age-Related Eligibility Criteria of Behavioral/Lifestyle Trials*

Trial	Trial Age-Related Eligibility Criteria, y	Participant Average Age, y
ADAPT ^{43,44}	60	Average age of 4 study arms: C, 69.0 ± 0.1 Tx1, 68.0 ± 0.7 Tx2, 69.0 ± 0.8 Tx3, 69.0 ± 0.8
Brief Dietary Counseling Intervention ³⁸	40	Average age of 2 study arms: C, 63.1 ± 12.1 Tx, 61.7 ± 10.3
DPP ⁴²	Substudy of older adults categorized older adults as 60–85	Average age of older adult group in 3 arms: 66.0 (SD or 95% CI not provided)
Diet & Exercise Intervention ²⁵	65	Average age of 2 study arms: C, 71.1 ± 5.1 Tx, 69.4 ± 4.6
Intensive Dietetic Intervention ³⁹	<75	Average age of 2 study arms and overall: C, 63.5 ± 10.9 Tx, 57.8 ± 13.5 Total, 60.6 ± 12.5
PATH ⁴⁰	50–75	Average age of 2 study arms: C, 60.6 (95% CI 59.1–62.1) Tx, 61 (95% CI 59.6–62.5)
POWER ⁶⁸	45	Average age of 3 study arms: C, 62.4 ± 9.5 Tx1, 58.9 ± 7.8 Tx2, 59.7 ± 8.6
RENEW ⁴⁵	65	Average age of 2 study arms: C, 73.0 ± 5 Tx, 73.1 ± 5.1
TONE ⁴⁶	60–80	Average age for 4 study arms targeting overweight participants: C, 66.0 ± 4 Tx1, 66.0 ± 4 Tx2, 66.0 ± 5 Tx3, 66.0 ± 4
Women's Lifestyle Health Trial ⁴¹	Postmenopausal women, no specific age criterion	Average age of 2 study arms: C, 64.0 ± 10 Tx, 63.0 ± 11

* ADAPT indicates Arthritis, Diet, and Activity Promotion Trial; C, Control; Tx, Treatment; DPP, Diabetes Prevention Program; CI, confidence interval; PATH, Physical Activity for Total Health; POWER, Pounds Off With Empowerment; RENEW, Reach to Enhance Wellness; TONE, Trial of Nonpharmacologic Interventions in the Elderly.

Table 2
Effects of Weight Loss Intervention Trials for Older Adults*

	Participants	Intervention	Follow-up	Weight Loss [†]	Other Health Outcomes*	Adverse Outcomes
ADAPT ^{43,44}	n = 316 Mean age = 69 y Mean BMI = 34	Randomization to diet only (D), exercise only (E), diet + exercise (D + E), or control	18 mo	Sig decrease in weight in D (4.9%) and D + E (5.7%) groups	Sig improvement in walking, stair climb time, physical function score, & knee pain for D + E group, no difference in joint space; mortality rate was sig lower for interventions compared to control	None reported
Brief Dietary Counseling Intervention ³⁸	n = 206 Mean age = 62 y Mean BMI = 30.3	Randomization to brief dietary counseling intervention or usual care control	12 mo	No sig change in BMI (weight not reported)	Sig improvement in serum cholesterol; no sig change in HbA1c	None reported
DPP ⁴²	n = 646 older adults of 3234 DPP participants Mean age = 66 y Mean BMI = 30.5	Randomization to IL, diabetes prevention medication, or control	3.2 y	Sig WL of 6.4 kg	Lowered diabetes risk of among older adults in IL by 55%; IL more effective with increasing age	Infrequent gastrointestinal, musculoskeletal, and hospitalization but no difference by group
Diet & Exercise Intervention ²⁵	n = 27 Mean age = 70 y Mean BMI = 39	Randomization to diet & exercise program or control	12 mo	Sig WL of 10%	Sig improvements in strength	Sig decrease in BMD and BMC at trochanter, intertrochanter, and hip
Intensive Dietetic Intervention ³⁹	n = 75 Mean age = 61 y Mean BMI = 31.6	Randomization to weekly sessions for 3 mo or control of brief dietetic session every 6 mo	12 mo	No change in weight	No sig change in HbA1c or BP but borderline sig change in cholesterol level	None reported
PATH ⁴⁰	n = 173 Mean age = 61 y Mean BMI = 30.5	Randomization to facility or home-based exercise or stretching (control)	12 mo	Sig WL of 1.3 kg among exercisers	Sig reduced body fat, waist circumference, and hip circumference; sig improvement in maximum oxygen consumption	None reported
POWER ⁶⁸	n = 152 Mean age = 60 y Mean BMI = 36.7	Randomization to IL, reduced time lifestyle or control	12 mo	Sig WL of 2.2 kg for IL	None reported at 12 mo	None reported
RENEW ⁴⁵	n = 641 Mean age = 73 y Mean BMI = 29	Randomization to yearlong diet and exercise program vs. delayed intervention control	12 mo	Sig WL of 2.1 kg	Sig less decline in physical and lower extremity function scores; sig improvement in physical activity, dietary behaviors, and QOL	Several exercise-related adverse events report, but no difference by group
TONE ⁴⁶	n = 585 obese out of 875 TONE	Randomization to RS, RC, RSC, or control	30 mo	Sig WL of 3.5–4.5 kg (5.6% change) compared	Sig lower risk of high BP, medication-controlled BP, or CV event in	Substudy of 67 women found sig association between WL and BMD

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Participants	Intervention	Follow-up	Weight Loss [‡]	Other Health Outcomes [*]	Adverse Outcomes
participants Mean age = 66 y Mean BMI = 31			to those not assigned to weight loss	intervention groups compared to control	loss
Women's Lifestyle Heart Trial ⁴¹ n = 28 Mean age = 64 y Mean BMI = 32	Randomization to comprehensive lifestyle program including vegetarian diet, prescribed exercise, and stress management vs. usual care control	24 mo	Sig decrease in BMI	Sig decrease in chest pain frequency; borderline sig improvement in total/HDL cholesterol, systolic BP, chest pain duration, and Framingham risk score	None reported

^{*} ADAPT indicates Arthritis, Diet, and Activity Promotion Trial; BMI, body mass index; sig, significant ($p < 0.05$); HbA1c, glycosylated hemoglobin; DPP, Diabetes Prevention Program; IL, intensive lifestyle; WL, weight loss; BMD, bone mineral density; BMC, bone mineral content; BP, blood pressure; PATH, Physical Activity for Total Health; POWER, Pounds Off With Empowerment; RENEW, Reach to Enhance Wellness; QOL, quality of life; TONE, Trial of Nonpharmacologic Interventions in the Elderly; RS, reduced sodium; RC, reduced calorie; RSC, reduced sodium and calorie; CV, cardiovascular; HDL, high density lipoprotein.

[‡] Outcomes are from baseline to follow-up period listed in follow-up column of table.