Authors' objectives
To examine the long-term weight-loss maintenance of individuals completing a structured weight-loss programme.

Searching
MEDLINE was searched from 1970 to 1999. The reference lists of identified studies and relevant literature reviews were also scanned.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) and uncontrolled observational studies were included.

Specific interventions included in the review
Studies of structured weight loss programmes carried out in the United States were included. Self-help activities were excluded. Thirteen of the included studies used very low energy diets (VLEDs; median length of treatment 22 weeks) and 14 used a hypoenergetic balanced diet (HBD; median length of treatment 12 weeks). One study used both VLEDs and HBDs.

Participants included in the review
Participants who had completed a structured weight-loss programme were included. One study of children of diabetic parents was excluded for not being representative of the general population. The mean age of participants in the included studies ranged from 31 to 59 years (median 45 years). Most studies included both men and women, with a predominance of women; 3 studies included women only while one included men only. The average initial body weights ranged from 74 to 121 kg for women and from 100 to 148 kg for men, with average initial weight losses ranging from 3.5 to 37.9 kg and from 6.2 to 44.2 kg, respectively.

Outcomes assessed in the review
Only studies reporting follow-up weights with variance estimates for 2 years or more were included. The primary outcome measures were weight-loss maintenance (kg), weight-loss maintenance as a percentage of initial weight loss (% weight-loss maintenance), and weight-loss as percentage of initial body weight (reduced weight). Follow-up was assessed at years 1, 2, 3, 4 and 5.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
No formal assessment of quality was undertaken.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction. The extracted data included: citation details, gender of participants, mean age, type of diet, length of treatment, initial weight, weight loss, follow-up points, percentage of participants available for follow-up, and self-reported weight. The summary results of all reported values were recorded. Weight-loss maintenance, percentage weight-loss maintenance and reduced weight were calculated.
Methods of synthesis
How were the studies combined?
The studies were combined in a meta-analysis using a fixed-effect model.

How were differences between studies investigated?
The statistical homogeneity of results across the studies was assessed. Analysis of variance was used for subgroup analysis (gender, diet and extent of exercise). A regression model for each of the outcomes was produced using the independent variables of follow-up at each year, diet and gender.

Results of the review
Twenty-nine studies (n=4,298) were included. The authors stated that 3 studies included some randomisation and the majority of the studies were observational, but further details were not provided.

There was significant heterogeneity (p<0.0001) when all the studies were combined. The heterogeneity appeared to be related to the combination of gender and diet; subgroup analysis showed homogeneity for women and VLEDs at most years of follow-up. Despite the heterogeneity, the data for all participants were pooled (average 4.5 years follow-up; 13 studies). Weight-loss maintenance was 3.00 kg (95% confidence interval, CI: 2.54, 3.45), the percentage weight-loss maintenance was 23.40% (95% CI: 20.4, 26.4), and the reduced weight was 3.15% (95% CI: 2.69, 3.62).

For studies providing follow-up for 4 to 5 years, VLEDs (4 studies) were associated with significantly greater weight-loss maintenance than HBDs (8 studies): weight-loss maintenance was 7.05 kg (95% CI: 6.04, 8.06) versus 1.99 kg (95% CI: 1.47, 2.51); percentage weight-loss maintenance was 29.40% (95% CI: 25.2, 33.6) versus 17.8% (95% CI: 13.4, 22.2); and reduced weight was 6.59% (95% CI: 5.65, 7.54) versus 2.11% (95% CI: 1.56, 2.65).

Four VLED studies reported a weight loss of 20 kg or greater, while 5 HBD studies reported a weight loss of less than 10 kg. An initial weight loss of at least 20 kg was associated with significantly greater weight-loss maintenance.

There were no differences between men and women on any of the 3 outcome measures at years 1 to 5, and no significant differences between men and women when the type of diet was taken into consideration.

Groups with higher amounts of exercise were significantly more successful in maintaining their weight loss than groups with lower amounts of physical activity (average 2.7 years follow-up, 6 studies). For groups with higher and lower amounts of physical activity, respectively, weight-loss maintenance was 14.99 kg (95% CI: 13.48, 16.49) versus 7.47 kg (95% CI: 6.29, 8.66); percentage weight loss was 53.80% (95% CI: 48.4, 59.2) versus 27.20% (95% CI: 22.8, 31.6); reduced weight was 12.49% (95% CI: 11.24, 13.74) versus 6.66% (95% CI: 5.61, 7.71).

A weighted regression model found that 3 variables (follow-up at each year, diet and gender) explained 61.6, 61.7 and 50.0% of the variance of weight maintained, reduced weight and weight-loss maintenance, respectively.

Authors' conclusions
The average, maintained weight-loss 5 years after completing a structured weight-loss programme was greater than 3 kg and on average, the reduction in weight was greater than 3% of the initial body weight. Individuals maintained significantly more weight loss after VLEDs or a weight-loss of at least 20 kg than after HBDs or a weight loss of less than 10 kg.

CRD commentary
The authors set out a clearly defined review question with specified inclusion criteria. The literature search was restricted to one database and no attempt was made to identify unpublished studies. It is unlikely, therefore, that all the relevant research was identified. Publication bias was not assessed.

There was limited information on how some aspects of the review were conducted. A formal assessment of the methodological quality of the included studies was not reported and the possible impact of methodological bias was not systematically considered. An analysis of heterogeneity was carried out and the results of the review were,
generally, pooled appropriately. However, the authors reported an average maintained weight loss based on a pooling of all the studies, which was inappropriate given the heterogeneity they identified. The presentation of the results was confusing in terms of the number of years of follow-up, and it must be noted that the conclusions for 5 years’ follow-up are not based on 29 studies.

**Implications of the review for practice and research**

Practice: The authors did not state any implications for practice.

Research: The authors state that more research is required to enable individuals to maintain the lifestyle changes in physical activity and food choices necessary for successful weight maintenance.

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