

# Long-term weight loss maintenance<sup>1-4</sup>

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## ABSTRACT

There is a general perception that almost no one succeeds in long-term maintenance of weight loss. However, research has shown that  $\approx 20\%$  of overweight individuals are successful at long-term weight loss when defined as losing at least 10% of initial body weight and maintaining the loss for at least 1 y. The National Weight Control Registry provides information about the strategies used by successful weight loss maintainers to achieve and maintain long-term weight loss. National Weight Control Registry members have lost an average of 33 kg and maintained the loss for more than 5 y. To maintain their weight loss, members report engaging in high levels of physical activity ( $\approx 1$  h/d), eating a low-calorie, low-fat diet, eating breakfast regularly, self-monitoring weight, and maintaining a consistent eating pattern across weekdays and weekends. Moreover, weight loss maintenance may get easier over time; after individuals have successfully maintained their weight loss for 2–5 y, the chance of longer-term success greatly increases. Continued adherence to diet and exercise strategies, low levels of depression and disinhibition, and medical triggers for weight loss are also associated with long-term success. National Weight Control Registry members provide evidence that long-term weight loss maintenance is possible and help identify the specific approaches associated with long-term success. *Am J Clin Nutr* 2005;82(suppl):222S–5S.

**KEY WORDS** Weight maintenance, successful weight loss, weight regain, obesity, National Weight Control Registry

## SUCCESSFUL WEIGHT LOSS MAINTENANCE

The perception of the general public is that no one ever succeeds at long-term weight loss. This belief stems from Stunkard and McLaren-Hume's 1959 study of 100 obese individuals, which indicated that, 2 y after treatment, only 2% maintained a weight loss of 9.1 kg (20 lb) or more (1). More recently, a New England Journal of Medicine editorial titled *Losing Weight: An Ill-Fated New Year's Resolution* (2) echoed the same pessimistic message.

The purpose of this paper is to review the data on the prevalence of successful weight loss maintenance and then present some of the major findings from the National Weight Control Registry (NWCR), a database of more than 4000 individuals who have indeed been successful at long-term weight loss maintenance.

## DEFINING "SUCCESSFUL WEIGHT LOSS MAINTENANCE"

Wing and Hill (3) proposed that successful weight loss maintainers be defined as "individuals who have intentionally lost at

least 10% of their body weight and kept it off at least one year." Several aspects of this definition should be noted. First, the definition requires that the weight loss be intentional. Several recent studies indicate that unintentional weight loss occurs quite frequently and may have different causes and consequences than intentional weight loss (4, 5). Thus, it is important to include intentionality in the definition. The 10% criterion was suggested because weight losses of this magnitude can produce substantial improvements in risk factors for diabetes and heart disease. Although a 10% weight loss may not return an obese to a non-obese state, the health impact of a 10% weight loss is well documented (6). Finally, the 1-y duration criterion was proposed in keeping with the Institute of Medicine criteria (7). Clearly, the most successful individuals have maintained their weight loss longer than 1 y, but selecting this criterion may stimulate research on the factors that enable individuals who have maintained their weight loss for 1 y to maintain it through longer intervals.

## PREVALENCE OF SUCCESSFUL WEIGHT LOSS MAINTENANCE

There are very few studies that have used this definition to estimate the prevalence of successful weight loss maintenance. McGuire et al (8) reported results of a random digit dialing survey of 500 adults, 228 of whom were overweight or obese [body mass index (BMI)  $\geq 27$  kg/m<sup>2</sup>] at their maximum nonpregnant weight. Of these 228, 47 (20.6%) met the criteria for successful weight loss maintenance: they had intentionally lost at least 10% of their body weight and maintained it for at least 1 y. On average, these 47 individuals had lost  $20.7 \pm 14.4$  kg (45.5 lb;  $19.5 \pm 10.6\%$  from maximum weight) and kept it off for  $7.2 \pm 8.5$  y; 28 of the 47 had reduced to normal weight (BMI  $< 27$  kg/m<sup>2</sup>).

Survey data such as these have the perspective of a person's entire lifetime and thus may include many weight loss attempts, some which were successful and some unsuccessful. It is more typical to assess "success" during one specific weight loss bout. In standard behavioral weight loss programs, participants lose an average of 7–10% (7–10 kg) of their body weight at the end of the

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initial 6-mo treatment program and then maintain a weight loss of  $\approx 5$ – $6$  kg (5–6%) at 1-y follow-up. Only a few studies have followed participants for longer intervals; in these studies,  $\approx 13$ – $20\%$  maintain a weight loss of 5 kg or more at 5 y. In the Diabetes Prevention Program (9),  $\approx 1000$  overweight individuals with impaired glucose tolerance were randomly assigned to an intensive lifestyle intervention. The average weight loss of these participants was 7 kg (7%) at 6 mo; after 1 y, participants maintained a weight loss of  $\approx 6$  kg (6%), and, at 3 y, they maintained a weight loss of  $\approx 4$  kg (4%). At the end of the study (follow-up ranging from 1.8 to 4.6 y; mean, 2.8 y), 37% maintained a weight loss of 7% or more.

Thus, although the data are limited and the definitions varied across studies, it appears that  $\approx 20\%$  of overweight individuals are successful weight losers.

### THE NATIONAL WEIGHT CONTROL REGISTRY

Although it is often stated that no one ever succeeds in weight loss, we all know some people who have achieved this feat. In an effort to learn more about those individuals who have been successful at long-term weight loss, Wing and Hill (10) established the National Weight Control Registry in 1994. This registry is a self-selected population of more than 4000 individuals who are age 18 or older and have lost at least 13.6 kg (30 lb) and kept it off at least 1 y. Registry members are recruited primarily through newspaper and magazine articles. When individuals enroll in the registry, they are asked to complete a battery of questionnaires detailing how they originally lost the weight and how they now maintain this weight loss. They are subsequently followed annually to determine changes in their weight and their weight-related behaviors.

The demographic characteristics of registry members are as follows: 77% are women, 82% are college educated, 95% are Caucasian, and 64% are married. The average age at entry to the registry is 46.8 y. About one-half of registry members report having been overweight as a child, and almost 75% have one or two parents who are obese.

Participants self-report their current weight and their maximum weight. Previous studies suggest that such self-reported weights are fairly accurate (slightly underestimating actual weight) (11, 12). In the NWCR, participants are asked to identify a physician or weight loss counselor who can provide verification of the weight data. When, in a subgroup of participants, the information provided by participants was compared with that given by the professional, the self-report information was found to be very accurate.

Participants in the registry report having lost an average of 33 kg and have maintained the minimum weight loss (13.6 kg) for an average of 5.7 y. Thirteen percent have maintained this minimum weight loss for more than 10 y. The participants have reduced from a BMI of 36.7 kg/m<sup>2</sup> at their maximum to 25.1 kg/m<sup>2</sup> currently. Thus, by any criterion, these individuals are clearly extremely successful.

Previously, we reported information about the way in which registry participants lost their weight (10); interestingly, about one-half (55.4%) reported receiving some type of help with weight loss (commercial program, physician, nutritionist), whereas the others (44.6%) reported losing the weight entirely on their own. Eighty-nine percent reported using both diet and physical activity for weight loss; only 10% reported using diet only,

and 1% reported using exercise only for their weight loss. The most common dietary strategies for weight loss were to restrict certain foods (87.6%), limit quantities (44%), and count calories (43%). Approximately 25% counted fat grams, 20% used liquid formula, and 22% used an exchange system diet. Thus, there is variability in how the weight loss was achieved (except that it is almost always by diet plus physical activity).

The earliest publication regarding the registry documented the behaviors that the members ( $n = 784$ ) were using to maintain their weight loss (10). Three strategies were reported very consistently: consuming a low-calorie, low-fat diet, doing high levels of physical activity, and weighing themselves frequently. Recently, a fourth behavior was identified: consuming breakfast daily (13). Each of these behaviors is described below. Registry members reported eating 1381 kcal/d, with 24% of calories from fat. In interpreting their data, it is important to recognize that 55% of registry members report that they are still trying to lose weight and to consider that dietary intake is typically underestimated by 20–30%. Thus, registry members are probably eating closer to 1800 kcal/d. However, even with this adjustment, it is apparent that registry members maintain their weight loss by continuing to eat a low-calorie, low-fat diet.

More recently, we have examined other aspects of their diet. Of particular interest is the fact that 78% of registry members report eating breakfast every day of the week (13). Only 4% report never eating breakfast. The typical breakfast is cereal and fruit. Registry members also report consuming 2.5 meals/wk in restaurants and 0.74 meals/wk in fast food establishments.

Another characteristic of NWCR members is high levels of physical activity. Women in the registry reported expending an average of 2545 kcal/wk in physical activity, and men report an average of 3293 kcal/wk (10). These levels of activity would represent  $\approx 1$  h/d of moderate-intensity activity, such as brisk walking. The most common activity is walking, reported by 76% of the participants. Approximately 20% report weight lifting, 20% report cycling, and 18% report aerobics.

Registry members also reported frequent monitoring of their weight (10). More than 44% report weighing themselves at least once a day, and 31% report weighing themselves at least once a week. This frequent monitoring of weight would allow these individuals to catch small weight gains and hopefully initiate corrective behavior changes.

The vigilance regarding body weight can be seen as one aspect of the more general construct of cognitive restraint (ie, the degree of conscious control exerted over eating behaviors). Registry members are asked to complete the Three Factor Eating Inventory (14), which includes a measure of cognitive restraint. Registry members scored high on this measure (mean of 7.1), with levels similar to those seen in patients who have recently completed a treatment program for obesity, although not as high as eating-disordered patients. These findings suggest that successful weight loss maintainers continue to act like recently successful weight losers for many years after their weight loss.

### FACTORS ASSOCIATED WITH WEIGHT REGAIN

Registry participants are followed over time to identify variables related to continued success at weight loss and maintenance. Findings from the initial follow-up study (15) indicated that, after 1 y, 35% gained 2.3 kg (5 lbs) or more (7 kg on

**TABLE 1**

Duration of weight loss maintenance and 1-y risk of weight regain among successful weight losers<sup>1</sup>

Duration of weight loss maintenance	Odds ratio for gaining >2.3 kg (5 lb) vs maintaining
<2 y	1.00
2–4.9 y	0.42
≥5 y	0.29

<sup>1</sup>Source: Reference 15.

average), 59% continued to maintain their body weight, and 6% continued to lose weight.

Participants who regained weight (>2.3 kg) were compared with those who continued to maintain their body weight to examine whether there were any baseline characteristics that could distinguish the two groups. The single best predictor of risk of regain was how long participants had successfully maintained their weight loss (**Table 1**). Individuals who had kept their weight off for 2 y or more had markedly increased odds of continuing to maintain their weight over the following year. This finding is encouraging because it suggests that, if individuals can succeed at maintaining their weight loss for 2 y, they can reduce their risk of subsequent regain by nearly 50%.

Another predictor of successful weight loss maintenance was a lower level of dietary disinhibition, which is a measure of periodic loss of control of eating. Participants who had fewer problems with disinhibition [ie, scores <6 on the Eating Inventory subscale (14)] were 60% more likely to maintain their weight over 1 y. Similar findings were found for depression, with lower levels of depression related to greater odds of success. These findings point to the importance of both emotional regulation skills and control over eating in long-term successful weight loss.

Several key behavior changes that occurred over the year of follow-up also distinguished maintainers from regainers. Not surprisingly, those who regained weight reported significant decreases in their physical activity, increases in their percentage of calories from fat, and decreases in their dietary restraint. Thus, a large part of weight regain may be attributable to an inability to maintain healthy eating and exercise behaviors over time. The findings also underscore the importance of maintaining behavior changes in the long-term maintenance of weight loss.

### Triggering events

Another variable that has been examined in the registry is the presence of a “triggering event” leading to participants’ successful weight loss. Most registry participants reported a trigger for their weight loss (83%). Medical triggers were the most common (23%), followed by reaching an all time high in weight (21.3%), and seeing a picture or reflection of themselves in the mirror (12.7%).

Because medical triggers have been shown to promote long-term behavior change in other areas of behavioral medicine (16), we examined whether individuals who reported medical triggers were more successful than those who reported nonmedical triggers or no triggers. A medical trigger was defined broadly and included, for example, a doctor telling the participant to lose weight and/or a family member having a heart attack. Findings indicated that people who had medical reasons for weight loss

also had better initial weight losses and maintenance (17). Specifically, those who said they had a medical trigger lost 36 kg, whereas those who had no trigger (17.1%) or a nonmedical trigger (59.9%) lost 32 kg. Medical triggers were also associated with less regain over 2 y of follow-up. Those with medical triggers gained 4 kg (≈2 kg/y), whereas those with other or no medical triggers gained at a significantly faster rate, averaging 6 kg in both groups.

These findings are intriguing because they suggest that the period following a medical trigger may be an opportune time to initiate weight loss to optimize both initial and long-term weight loss outcomes.

### Dieting consistency

The topic of dieting consistency was also recently examined in the registry. Participants were asked whether they maintained the same diet regimen across the week and year, or if they tended to diet more strictly on weekdays and/or nonholidays (18). Few people said they dieted more strictly on the weekend compared with the rest of the week (2%) or during holidays compared with the rest of the year (3%). Most participants reported that their eating was the same on weekends and weekdays (59%) and on holidays/vacations and the rest of the year (45%). The remaining groups reported that they were stricter during the week than on weekends (39%) and during nonholiday times compared with holidays (52%).

We evaluated whether maintaining a consistent diet was related to subsequent weight regain after 2 y. Interestingly, results indicated that participants who reported a consistent diet across the week were 1.5 times more likely to maintain their weight within 5 lb over the subsequent year than participants who dieted more strictly on weekdays. A similar relationship emerged between dieting consistency across the year and subsequent weight regain; individuals who allowed themselves more flexibility on holidays had greater risk of weight regain. Allowing for flexibility in the diet may increase exposure to high-risk situations, creating more opportunity for loss of control. In contrast, individuals who maintain a consistent diet regimen across the week and year appear more likely to maintain their weight loss over time.

### Recovery from relapse

We also examined different patterns of weight change among registry participants followed over time. We were particularly interested in evaluating whether participants who gained weight between baseline and year 1 were able to recover over the subsequent year. We found that few people (11%) recovered from even minor lapses of 1–2 kg. Similarly, magnitude of weight regain at year 1 was the strongest predictor of outcome from year 0 to 2. Participants who gained the most weight at year 1 were the least likely to re-lose weight the following year, both when “recovery” was defined as a return to baseline weight or as re-losing at least 50% of the year 1 gain.

Although participants gained weight and recovery was uncommon, the regains were modest (average of 4 kg at 2 y), and the vast majority of participants (96%) remained >10% below their maximum lifetime weight, which is considered “successful” by current obesity treatment standards.


These findings, nonetheless, suggest that reversing weight regain appears most likely among individuals who have gained

the least amount of weight. Preventing small regains from turning into larger relapses appears critical to recovery among successful weight losers.

## SUMMARY

Results of random digit dial surveys indicate that  $\approx 20\%$  of people in the general population are successful at long-term weight loss maintenance. These data, along with findings from the National Weight Control Registry, underscore the fact that it is possible to achieve and maintain significant amounts of weight loss.

Findings from the registry suggest six key strategies for long-term success at weight loss: 1) engaging in high levels of physical activity; 2) eating a diet that is low in calories and fat; 3) eating breakfast; 4) self-monitoring weight on a regular basis; 5) maintaining a consistent eating pattern; and 6) catching “slips” before they turn into larger regains. Initiating weight loss after a medical event may also help facilitate long-term weight control.

Additional studies are needed to determine the factors responsible for registry participants’ apparent ability to adhere to these strategies for a long period of time in the context of a “toxic” environment that strongly encourages passive overeating and sedentary lifestyles. 

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