

Is weight cycling associated with adverse health outcomes?

Claire D Madigan¹, Toby Pavey^{2,4}, Amanda J Daley³, Kate Jolly³, Wendy J Brown⁴

¹ Nuffield Department of Primary Care Health Sciences, University of Oxford, Radcliffe Primary Care, Radcliffe Observatory Quarter, Woodstock Road, Oxford, OX2 6GG.

² School of Exercise and Nutrition Sciences, Queensland University of Technology, Queensland, Australia

³ Institute of Applied Health Research, University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK

⁴ School of Human Movement and Nutrition Sciences, University of Queensland, Australia

Corresponding author: Claire Madigan

Email: claire.madigan@phc.ox.ac.uk

Phone: +441865 289 340

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Abstract (250 words)

There is inconsistent evidence about the health effects of weight cycling. The aim was to examine the prevalence of weight cycling and evaluate weight change and mental health outcomes 12 years later. Data were from 10428 women in the mid-age cohort of The Australian Longitudinal Study of Women's Health, collected in 1998 and 2010. Women were asked how many times had they ever lost 5 kg on purpose and how many times had they regained this amount, and were categorised into four weight pattern groups. Generalised linear modelling was used to investigate relationships between weight cycling and weight change and mental health variables. In 1998 15% of the women were frequent weight cyclers (*FWC* three or more weight cycles), 23.6% were low frequency weight cyclers (1-2 weight cycles), and 14.8% reported only weight loss i.e. no weight cycling. Weight change was similar across weight pattern groups in women who were overweight or obese, however healthy weight *FWC* women gained more weight than healthy weight women who did not weight cycle. At follow-up there were no group differences in overall mental health scores but the *FWC* group had higher odds of depressive symptoms (adjusted OR 1.7; 95%CI 1.1 to 2.4) than the *NWC* group. Women with a history of weight cycling who are obese do not gain more weight than those who do not weight cycle and weight loss should be encouraged. However weight cycling is associated with depressive symptoms; weight management providers need to be aware of this increased risk, which is independent of BMI.

Key words: weight loss, weight management, weight regain, weight cycling, health

Introduction

The prevalence of overweight and obesity is concerning, with approximately 63% of the adult population of Australia classified as overweight or obese(1). The consequences of excess weight include increased risks of developing type 2 diabetes, cardiovascular disease, musculoskeletal problems and many cancers, leading to premature death(2-4). However losing at least 5% of initial body weight is associated with improvements in glycaemic control, blood pressure, triglycerides and HDL cholesterol(5-8). For these reasons it is recommended that people who are classified as overweight and obese should lose weight, using effective weight loss interventions (9-11). However, while interventions can result in clinically meaningful weight loss, weight regain is common, due to a combination of low adherence to weight control strategies and compensatory physiological mechanisms that influence weight regain(12, 13).

There are concerns that periods of intentional weight loss followed by unintentional weight gain, commonly described as weight cycling, are harmful for health(14, 15). Weight cycling has been associated with greater risk of mortality(14), and increased risk of developing chronic diseases such as stroke, heart disease, diabetes(16) and fractures(16, 17). It is hypothesised that the harmful effects are caused by a reduction in lean mass during weight loss that is not regained when weight is regained, with adverse effects on metabolism (18). However, a recent review concluded that the evidence that weight cycling is harmful for health is sparse(19). For example, some studies (16, 20) did not take intention to lose weight into account. This is important because weight loss due to illness could confound the association with adverse health outcomes. It is therefore important to consider the intentionality of weight loss, and whether weight is regained.

As the prevalence of obesity continues to increase, there may be more weight loss attempts, and therefore multiple cycles of weight loss and regain in adulthood. However, the prevalence of weight cycling in the general population is unclear. A cross sectional study in Finland found that 10% of women and 7% of men were classified as severe weight cyclers. In other words participants had lost ≥ 5 kg three times or more and regained the lost weight(21). However participants were only questioned about the last ten years, so these proportions could be conservative.

Although research has investigated relationships between weight cycling and physical health outcomes, few studies have examined the mental health sequelae of weight cycling(22). The Finnish study (above) found cross-sectional associations between weight cycling and poor mental health(21), which may reflect feelings of demoralisation and failure when weight is regained (23).

As women are more likely than men to report attempts at weight loss(24, 25), in this study we used data from the Australian Longitudinal Study of Women's Health (ALSWH) to examine: (1) the prevalence of weight cycling; (2) the characteristics of women who weight cycle, and of those with other weight patterns; and (3) whether weight cycling is associated with weight gain and mental health outcomes 12 years after reporting weight cycling.

Methods

The ALSWH is a prospective study of factors shaping the health and well-being of three cohorts of Australian women (born in 1973–1978, 1946–1951, and 1921–1926), recruited from the national health insurance database. The focus of this paper is on the 1946-1951 cohort who completed mailed surveys in 1996, 1998, 2001, 2004, 2007 and 2010. Women were aged 47-52 years in 1998 when data on the main variable of interest (weight cycling)

were collected. More details can be found at the study website(26). The study was approved by the Universities of Newcastle and Queensland Ethical Review Committees and all participating women provided informed consent.

Exposure variable

As there is no standardised definition of weight cycling, initial exploratory analyses were undertaken using responses from the following two questions: women were asked how many times (excluding pregnancy) had they ever lost 5 kg or more on purpose, *and* how many times they had ever gained 5 kg or more, which was previously lost on purpose. Responses (never, 1-2, 3-4, 5+ times) for each question were cross-tabulated and the number in each category was computed. Data from women who reported gaining 5 kg and never losing weight were removed from the analyses as the question asked how many times they had regained 5kg that was previously lost on purpose (n=307, 3% of the sample). Based on a previous study that examined the prevalence of weight cycling(21), responses were used to create the following weight cycling pattern categories:

- Non-weight cyclers (*NWC*): Women who reported having never lost or gained 5kg of weight.
- Weight losers (*WL*): Women who reported losing 5kg of weight and not regaining 5kg of weight.
- Low frequency weight cyclers (*LFWC*): Women who reported losing 5kg 1-2 times and regaining 5 kg 1-2 times, *and* women who reported losing weight three times or more but only regaining weight 1-2 times.

- Frequent weight cyclers (*FWC*): Those who reported losing 5 kg three or more times and regaining 5 kg three or more times.

Outcome variables

All three-outcome measures were assessed in 1998 and in 2010, with weight change calculated as the difference between weights reported in these two years. Weight (to the nearest kg) was reported at each survey. Health related quality of life (HRQL) was measured using the well-validated Medical Outcomes Study's Health Status survey short-form 36 (SF-36)(28). Four subscales (14 items) measure psychological HRQL: vitality, social functioning, mental health and role limitations from emotional problems. The mental health component summary score (MCSS) with factor structures validated using baseline ALSWH surveys, was used as a summary measure of these scales. Scores were standardized to range from 0-100, with the mean set at 50, with higher scores indicating more positive psychological well-being(29). The difference between the surveys was calculated to create the mental health change variable (MCSS). The Center for Epidemiologic Studies Depression Scale (CESD-10) was used to measure depressive symptoms in 1998 and 2010(30), with scores ≥ 10 indicating depressive symptoms(30).

Potential Confounders

Socio-demographic (partnership status, parity), behavioural (smoking, alcohol use, physical activity, use of laxatives, diuretics or diet pills) and health related variables (BMI, use of hormone replacement therapy (HRT), age at menopause, and an indicator of overall physical health, (the physical components summary score of the SF36, PCS)), which were indicated by previous work to be associated with either weight patterning group, weight change or psychological well-being, were selected as potential confounders. Data for all these variables

were from the 1998 survey, except parity, which was only measured in 1996. The variables were categorised as shown in Table 1.

BMI was calculated as weight (kg)/height² (m²), physical activity was assessed using questions developed for national surveillance of physical activity in Australia(34, 35),and women were categorised as meeting the minimal recommended amount of physical activity (500 MET min/week) or not. Women were asked whether they had used laxatives, diuretics or diet pills to control their weight as an indication of disordered eating.

Descriptive Data

Prevalence of chronic conditions was based on responses to a question that asked whether a doctor had diagnosed any of the obesity-related conditions shown in Table 1. Information about education, area of residence and age first dieted are reported.

Statistical analysis

Analyses were conducted in September 2017. Data were available for 12,388 women who completed the 1998 survey. Women were excluded if they had missing data needed to create the weight cycling variable (n=1960). Therefore data from 10,428 women were included in the descriptive analyses; 7512 of these women provided full data for all variables in the model for the predictive analysis of weight change. For the other health outcomes, data were available for 7,435 (MCSS) and 7,259 (CESD-10 depression scores) women. Baseline characteristics were summarised using descriptive statistics. Initial analyses were completed to assess whether each potential confounder was associated ($p < 0.05$) with both the independent (weight pattern group) and each of the dependent variables (weight change or MCSS or CESD-10 score > 10). Associations were examined using Chi², ANOVA and Pearson's correlation.

After this initial analyses the following confounders were associated with the independent and dependent variables:

Weight change: smoking, BMI and PCSS

MCSS: alcohol consumption, physical activity, BMI and PCSS

CESD-10: physical activity, smoking, alcohol consumption, BMI, PCSS and use of diuretics, laxatives or diet pills

Weight change and Mental Health Component Outcomes

Generalised Linear Modelling was used to explore the relationship between weight pattern group, weight change and mental health. For the both models, BMI was included as an interaction term and the confounders added as stated above. If the interaction of BMI was significant then estimates of mean changes and pairwise comparisons were made, stratified by BMI.

As BMI was a significant interaction term for the weight change model results are reported as mean weight change stratified by BMI. Additionally we report comparisons of mean change in weight between the *NWC* and *FWC* by BMI category. Results are reported as differences in mean MCSS change between the *NWC* (reference group) and other weight pattern groups, with associated 95% confidence intervals.

CESD-10 outcomes

Logistic generalised linear modelling was used to examine the association between weight pattern groups and CESD-10 scores (reference ≤ 10). The same methods as above were used to create the model. Results are reported as odd ratios with 95% confidence intervals.

All statistical analyses were conducted in SPSS version 24. P-values were based on two-sided tests and were considered statistically significant at $P < 0.05$.

BMI did not have a significant interaction in either mental health analyses.

Results

In 1998 the women were on average 49.5 (Standard Deviation [SD] 1.5) years of age, with a BMI of 26.3 (SD 5.4) kg/m². Approximately 46.2% had previously never lost or gained 5 kg of weight (*NWC*) and 14.8% reported losing 5 kg of weight and never regaining this (*WL*).

Almost one quarter (24.2%) of the women had either lost or gained 5 kg once or twice (*LFWC*), and 14.8% had both lost and gained 5 kg three times or more (*FWC*) (See Table 1).

Demographic, behavioural and health characteristics of the women are shown in Table 1.

The majority of the women had completed high school education, had at least one birth and lived in rural areas (due to intentional over-sampling of rural women for the ALSWH study).

Approximately 55% of the women had never smoked and the majority were low risk drinkers. Forty per cent of the women met recommended physical activity levels. The most common health condition was hypertension (18.9%); prevalence of the other conditions was less than 4%.

Baseline characteristics

Women in the *FWC* group were more likely to be ex-smokers, and had started dieting at a younger age (at least six years earlier) than women in the *NWC* group (See Table 1). Average BMI was higher in the *FWC* group, and a greater proportion of these participants were obese.

In 1998 the proportion of women with poor mental health scores was greater in women classified as *FWC* than in the other groups. There were similar patterns for the CESD-10

scores. In 1998 *FWC* women also had poorer physical function scores. The prevalence of using diuretics, laxatives or diet pills to control weight was higher in the *FWC* group, in which the prevalence of diabetes and hypertension were also higher than in the non-weight cyclers.

Weight change

On average the women gained 3.6 kg (SD 8.1) over 12 years. Average weight gain was highest in the *WL* group and lowest in the *FWC* group, although the differences were small (Table 2). As BMI category was a significant interaction term, we stratified these results by BMI (Table 3). Women classified as a healthy weight gained more weight than those classified as obese across weight pattern groups. In the stratified analyses, women classified as obese, weight gain was similar in the four weight pattern groups (Table 4). However among the healthy weight women, the *FWC* group gained more weight than the *NWC* group (difference 2.7 kg 95% CI 1.4 to 3.9).

Mental health

Overall, MCSS improved over 12 years, from 47.8 in 1998 to 50.5 in 2012. After adjusting for covariates, there were no significant indications of differences between the groups. The increase in MCSS scores was slightly higher in the *FWC* group than in the *NWC* group; this is however likely to reflect the lower baseline values in the *FWC* group. The odds for depressive symptoms were higher in the *LFWC* and *FWC* at 12 years follow-up, than in the *NWC*.

Discussion

There is conflicting evidence about weight cycling, weight gain and their association with physical and mental health outcomes. This study provides information about the prevalence of weight cycling in a population sample of women and associations with weight and mental health outcomes 12 years later. Approximately 15% of the women were classified as *FWC*; these women were on average obese, and started dieting at a younger age than the *NWC*. They may have been trying to lose weight for longer and thus had more frequent weight cycles. These patterns are typically seen in people who take part in weight loss trials, who often regain their lost weight(12). Almost one third of these women also reported using laxatives, diuretics and diet pills, which may have influenced their weight change patterns.

In this study, relationships between weight cycling and weight change varied by BMI category. Women classified as obese gained similar amounts of weight across the weight pattern groups, but among overweight women weight loss was lower in the *NWC* group. However healthy weight women who frequently weight cycled gained more weight than healthy weight women who never weight cycled. In contrast, data from the US Nurses' Health Study show that a history of weight cycling does not impede future weight loss or metabolism(38), but BMI differences were not investigated. The Prospective Studies Collaboration did not investigate weight cycling but they too found that there was a smaller increase in BMI over 13 years in those with BMI greater than 30 kg/m² than in those with BMI <30 kg/m² at baseline(39). However it was not clear whether participants in the Prospective Studies Collaboration had attempted weight control.

There were no differences in mental health changes between the weight pattern groups; all improved over 12 years. However odds of depressive symptoms were significantly higher in the *FWC* than in the *NWC* groups. The Nurses Health Study researchers have shown that women who were obese at baseline had higher odds of depression at follow-up (OR 1.11,

95% CI, 1.03–1.18)(41) but they have not specifically explored weight cycling and mental health outcomes. It was suggested by the Nurses Health Study researchers that the act of controlling weight could be more stressful than being obese, and that, if women have unsuccessful weight loss attempts this may lead to greater depressive symptoms. However it could also be that depressive symptoms could lead to weight gain.

The prevalence of weight cycling was marginally higher (by 5%) in this study than in a Finnish study that reported a prevalence of between 7 and 10% for weight cycling, using the same definition as we did(21). This is likely because the Finnish study asked about the last ten years whereas in our study we asked the women if they had *ever lost and gained weight*. The Finnish study also included men and a greater age range, which may explain some of the differences.

One previous study which defined weight cyclers as those that had lost ≥ 2.3 kg on five or more occasions, found that 49% of women and 52% of men were weight cyclers(42). These higher prevalence estimates are not surprising, given the low weight change criteria compared with the criteria used in this study. However, as in our study, weight cycling was not associated with weight gain six years later. In contrast, another study found that weight cycling (prevalence 4.1%) in the previous two years (defined as intentionally losing 5 kg and unintentionally gaining 5 kg) was associated with greater odds of weight gain(43). This could be due to a short follow-up of only two years and only a two year-period of weight cycling.

The cross-sectional Finnish study suggested there were some associations with poorer health for people who weight cycled. We found similar findings at baseline in that women classified as *FWC* had greater prevalence of diabetes and hypertension, poorer general mental health scores and higher depressive symptoms than *NWCs*. However this could also be explained by BMI, as the average BMI of the *FWC* group was obese.

Strengths and Limitations

The strengths of the study include the large representative sample of middle-aged women and the longitudinal study design. Although there is no consensus on the definition of weight cycling, to allow comparison we used a definition that has been used by others(21). This may have been conservative as there may be a dose response of greater number of weight cycles and/or greater weight change (and how quickly the weight is lost) and adverse associations with health. However, as our surveys were conducted every three years, these issues could not be investigated here. Limitations of the study design include a reliance on self-reported data, some missing data and the time between surveys. A validation study with a subsample of the ALSWH mid age cohort has shown good agreement between self-reported and measured weight (27). We also stratified by BMI which allowed further exploration of weight-cycling. In the future we may have prospective objective measures of weight, through smart scales, which could provide regular weights to enable us to precisely measure periods of weight loss and weight gain. However in the meantime weight cycling studies rely on self-reported weight losses and regain. Women were asked about their weight cycling in 1998 and were followed up over 12 years. As the prevalence of obesity has increased, it is likely that the prevalence of weight cycling is also higher now, but the weight cycling questions were not included in subsequent surveys, so we could not identify whether women continued to weight cycle during the follow-up period.

Summary

In summary, 15% of the women were classified as frequent weight cyclers. Among those in this group who were obese (45%) weight gain was similar in women who did and did not weight cycle. However healthy weight frequent weight cyclers gained almost 3kg more than the healthy weight non-weight cyclers. . However weight cycling was associated with

increased likelihood of depressive symptoms regardless of BMI, and weight management providers could address this.

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Table 1: Demographic, behavioural and health characteristics of the women in each weight pattern group in 1998* (*N (%) unless stated*)

	<i>NWC</i> <i>n=4820 (46.2%)</i>	<i>WL</i> <i>n=1540 (14.8%)</i>	<i>LFWC</i> <i>n=2465 (23.6 %)</i>	<i>FWC</i> <i>n=1603 (15.4%)</i>
Demographic variables				
Education				
High school or less	3197 (66.3)	989 (64.2)	1577 (64.0.)	979 (61.1)
Diploma/ apprenticeship	893 (18.5)	310 (20.1)	539 (21.9)	332 (20.7)
Degree/ higher degree	694 (14.4)	229 (14.9)	333 (13.5)	275 (17.2)
Missing	36 (0.7)	12 (0.8)	16 (0.6)	17 (1.1)
Parity				
At least one birth	4202 (87.2)	1359 (88.2)	2160 (87.6)	1411 (88.0)
Missing	270 (5.6)	67 (4.4)	102 (4.1)	59 (3.7)
Marital status				
Partnered	3983 (82.6)	1277 (82.9)	2053 (83.3)	1301(81.2)
Missing	39 (0.8)	9 (0.6)	8 (0.3)	5 (0.3)
Behavioural variables				
Smoking status				
Never smoked	2836 (58.8)	848 (55.1)	1334 (54.1)	830 (51.8)
Ex-smoker	1052 (21.8)	457 (29.7)	734 (29.8)	543 (33.9)
Smoker	901 (18.7)	227 (14.7)	387 (15.7)	224 (14.0)
Missing	31 (0.6)	8 (0.5)	10 (0.4)	6 (0.4)
Physical Activity				
Meeting recommendations	2625 (54.5)	913 (59.3)	1406 (57.0)	877 (54.7)
Missing	185 (3.8)	46 (3.0)	51 (2.1)	37 (2.3)
Alcohol				
Low risk	3829 (79.5)	2786 (81.4)	2021 (82.0)	1306 (81.9)
Non-drinker	690 (14.3)	186 (12.1)	276 (11.2))	193 (12.0)
Risky/high drinker	254 (5.3)	93 (6.0)	153 (6.2)	96 (6.0)
Missing	47 (1.0)	8 (0.5)	15 (0.6)	8 (0.5)
Age first dieted	31.0 (11.6)	29.1 (10.8)	29.5 (10.1)	23.2 (8.1)
Used laxatives, diuretics or diet pills to control weight	221 (4.6)	214 (13.9)	371 (15.0)	504 (31.4)
Health variables				
Mean BMI kg/m² (SD)	24.1 (4.1)	26.3 (5.1)	27.9 (5.2)	30.5 (5.8)
BMI Categories				

Underweight	127 (2.6)	13 (0.8)	14 (0.6)	1 (0.1)
Healthy weight	2892 (60.0)	692 (44.9)	712 (28.9)	237 (14.8)
Overweight	1058 (22.0)	474 (30.8)	937 (38.0)	568 (35.4)
Obese	376 (7.8)	281 (18.2)	653 (26.5)	698 (43.5)
Missing	367 (0.6)	80 (5.2)	149 (6.0)	99 (6.2)
Prevalence of chronic conditions				
Diabetes	118 (2.4)	58 (3.7)	87 (3.5)	75 (4.6)
Heart Disease	(88 (1.8)	26 (1.7)	62 (2.5)	46 (2.9)
Thrombosis	157 (3.3)	58 (3.8)	99 (4.0)	61 (3.8)
Stroke	34 (0.7)	14 (0.9)	21 (0.9)	13 (0.8)
Hypertension	695 (14.4)	320 (20.8)	523 (21.2)	430 (26.8)
Breast cancer	124 (2.6)	30 (1.9)	56 (2.3)	27 (1.7)
CESD				
score >10	1016 (21.1)	339 (22.0)	554 (22.5)	486 (30.3)
missing	97 (2.0)	28 (1.8)	31 (1.3)	25 (1.6)
SF36 mean (SD)				
Mental health component score	48.2 (12.1)	48.4 (12.4)	47.9 (12.0)	45.8 (13.3)
Physical health component score	49.6 (9.2)	49.4 (9.4)	48.6 (9.2)	47.6 (9.8)
HRT use at baseline	1075 (22.3)	341 (22.1)	574 (23.3)	366 (22.8)
HRT use at survey 6	535 (11.1)	171 (11.1)	285 (11.6)	184 (11.5)
Age at menopause mean (SD)	51.0 (4.6)	51.1 (4.8)	51.0 (4.9)	51.1 (4.9)

NWC= non weight cyclers, WL = weight losers, LWC= low weight cyclers, FWC= frequent weight cyclers

HRT = hormone replacement therapy, BMI = body mass index, CESD-10 = Centre for Epidemiological depression scale, SF36 = MOS 36 item short form survey.

*Except education and parity which were only assessed in 1996

Table 2: Changes in weight and mental health (1998 to 2010) and odds of depressive symptoms in 2010, by weight cycling category.

	<i>NWC</i>	<i>WL</i>	<i>LFWC</i>	<i>FWC</i>
Weight change mean (SD)				
Weight in 1998 kg	63.5 (10.7)	69.2.1 (13.4)	73.6 (13.7)	81.2 (15.8)
Weight in 2010 kg	66.9 (12.1)	73.5 (15.1)	77.4 (14.9)	84.0 (17.1)
Weight change kg	3.4 (6.9)	4.3 (8.6)	3.9 (8.3)	2.8 (10.6)
Mental health component scores mean (SD)				
Mental Health Component Score 1998	48.2 (12.1)	48.4 (12.4)	47.9 (12.0)	45.8 (13.3)
Mental Health Component Score 2010	51.3 (10.8)	50.8 (11.6)	50.2 (11.8)	49.1 (12.5)
Change in MCSS mean (SD)	2.8 (11.4)	1.9 (12.3)	1.8 (11.8)	2.8 (12.9)
Mean difference in change scores between the weight pattern groups (adjusted) mean (95% CI)*	Reference group	-0.1 (-1.2 to 1.0)	-1.0 (-2.0 to 0.1)	1.5 (-0.3 to 3.2)
CESD-10				
CESD-10 >10 1998 n (%)	1016 (21.5)	339 (22.4)	554 (22.8)	486 (30.8)
CESD-10 >10 2010 n (%)	591 (15.7)	200 (16.8)	370 (19.1)	298 (23.2)
Odds ratio of CESD score >10 (95% CI) (adjusted)+	1.0	1.1 (0.8 to 1.4)	1.5 (1.1 to 1.9)	1.7 (1.1 to 2.4)

Total number of participants dependent on outcome measure.

* Adjusted for alcohol consumption, BMI (interaction), physical component scores, physical activity,

+ Adjusted for meeting physical activity requirements, smoking, alcohol consumption, physical health component score and use of diuretics, laxatives or diet pills and BMI (interaction)

Table 3: Mean weight change by weight pattern group and BMI category

	Obese n=1458	Overweight n=2328	Healthy weight n=3618	Underweight n=108
FWC	0.8 (0.08 to 1.6)	4.5 (3.6 to 5.3)	6.3 (5.1 to 7.5)	—
LFWC	2.5 (1.7 to 3.4)	4.3 (3.6 to 5.0)	4.8 (4.1 to 5.6)	5.1 (-0.5 to 10.6)
WL	1.1 (-0.06 to 2.3)	5.9 (5.0 to 6.8)	4.6 (3.8 to 5.4)	4.6 (-0.3 to 9.6)
NWC	1.4 (0.3 to 2.5)	3.3 (2.6 to 4.0)	3.6 (3.1 to 4.2)	5.7 (4.0 to 7.5)

NWC= non weight cyclers, WL = weight losers, LWC= low weight cyclers, FWC= frequent weight cyclers

Adjusted for: smoking and physical health component scores.

Table 4: Mean difference in weight change by BMI category in the *NWC* groups compared to *FWC* groups.

	FWC obese	FWC overweight	FWC healthy weight
NWC obese	0.6 (-0.6 to 1.8)	-3.0 (-4.3 to -1.8)	-4.9 (-6.4 to 3.4)
NWC overweight	2.5 (1.6 to 3.4)	-1.2 (-2.1 to -0.2)	-3.0 (-4.3 to -1.7)
NWC healthy weight	2.8 (2.0 to 3.6)	-2.7 (-3.2 to -1.4)	-2.7 (-3.9 to -1.4)

NWC= non weight cyclers, WL = weight losers, LWC= low weight cyclers, FWC= frequent weight cyclers

Adjusted for: smoking and physical health component scores.

Highlights

- Women with obesity and whom weight cycle gain similar amounts of weight as those women who do not weight cycle.
- Women of a healthy weight who weight cycle gain more weight than women who do not weight cycle.
- Weight cycling is associated with greater depressive symptoms