Perceived weight status and risk of weight gain across life in US and UK adults

Eric Robinson, PhD[1], Jeffrey M. Hunger, MA[2] & Michael Daly, PhD [3,4]

[1] Institute of Psychology, Health & Society, University of Liverpool, Liverpool, UK

[2] Department of Psychological and Brain Sciences, University of California, Santa Barbara, US

[3] Behavioural Science Centre, Stirling Management School, University of Stirling, UK

[4] UCD Geary Institute, University College Dublin, Ireland

Correspondence: Eric Robinson, Institute of Psychology, Health & Society, University of Liverpool, L69 7ZA, UK. Email: eric.robinson@liv.ac.uk

Short title: Perceived weight status and weight gain

Word count: 3,638

Key words: obesity; weight misperceptions; obesity stigma; body image; self-fulfilling prophecy; weight stigma

Abstract

Background: Correctly identifying oneself as being overweight is presumed to be a prerequisite to successful weight management. The present research examined the effect that perceiving oneself as being 'overweight' has on risk of future weight gain in US and UK adults.

Methods: Data from three longitudinal studies; US National longitudinal study of adolescent health (Add Health) 2001/2002-2008/2009, UK National Child Development Study (NCDS) 1981- 2002/2004, and Midlife in the United States (MIDUS) 1995/1996-2004/2005, were used to examine the impact of perceiving oneself as being overweight on weight gain across adulthood in over 14,000 US and UK adults.

Results: Participants who perceived their weight status as being overweight were at an increased risk of subsequent weight gain. This effect was observed irrespective of weight status at baseline and whether weight status perceptions were accurate or inaccurate. In the MIDUS sample, perceiving oneself as being overweight was associated with over-eating in response to stress and this mediated the relationship between perceived overweight and weight gain.

Conclusions: Perceiving oneself as being 'overweight' is counter-intuitively associated with an *increased* risk of future weight gain among US and UK adults.

It is well recognised that both 'normal weight' and 'overweight' individuals' *perceived* versus *objective* weight status may differ. For example, some overweight individuals underestimate their actual weight status and do not identify that they are overweight (1, 2). Until now it has been presumed that the significant proportion of overweight individuals failing to recognise that they are 'overweight' is a cause for concern, because this may result in little motivation to modify diet or physical activity and attempt weight loss (3, 4).

Even though adiposity is common, many people possess discriminatory attitudes towards overweight individuals (5, 6). This is particularly concerning as perceived weight discrimination has been linked with subsequent weight gain (7, 8). As adiposity is a stigmatized condition, this is likely to cause psychological distress and promote maladaptive coping responses among individuals who identify themselves as being overweight (9, 10). Indeed, there is an emerging body of research showing that experimentally activating the stigma associated with being overweight can promote over-eating (11, 12), which could in turn promote weight gain.

We reason that perceiving oneself as being overweight could actually be detrimental to weight control in our current social climate. In line with this idea, recent studies have shown that overestimation of weight status amongst healthy weight adolescents is predictive of obesity in early adulthood (13, 14), an apparent form of 'self-fulfilling prophecy'. However, these studies focused on adolescence, a period when body misperception is particularly common (14-16). Whether and how perceived overweight contributes to weight gain across adulthood remains a crucial question for three reasons. Firstly, it is not clear whether overestimation of one's weight status is responsible for weight gain or whether self-identifying as 'overweight' is key, regardless of whether this belief is accurate or inaccurate.

Secondly, it is not known whether the effects identified in prior studies are restricted to the teenage years, a period of rapid change in body size, when inaccurate weight perception is common and when individuals may be particularly sensitive to body image concerns (14-16). Finally, if perceived overweight influences weight gain across life it is important to examine the mechanisms underlying this relationship.

The present research examined the effect that perceiving oneself as being 'overweight' has on risk of future weight gain by using longitudinal data from three large representative cohort studies of US and UK adults. Based on recent studies (13-16) we hypothesised that adults who identified their own weight status as being 'overweight' would be at an increased risk of future weight gain, irrespective of the accuracy of this perception. We also tested whether stress-induced overeating may be a factor explaining why identifying oneself as being overweight may promote weight gain (Study 3).

Study 1

Sample

Data were drawn from Waves 3 (2001/2002) and 4 (2008/2009) of the National Longitudinal Study of Adolescent Health (N = 3,899). Wave 3 was selected as baseline because participants had reached early adulthood by this wave (M_{age} = 21.82, SD = 1.81, range = 18-28). Extensive study information can be found in (17). See Table 1 for demographic and descriptive information of the study sample. Our analyses utilize the Add Health public-use data which is a randomly selected sample drawn from the main study sample consisting of half of the core study sample and half of the African-American oversample.

Measures

Participant height and weight was measured by a trained staff member during an in-home visit at both waves. This data was used to calculate body mass index (BMI; weight in kg/height in m^2). Participants also rated their perceived weight on a scale ranging from 1 (*very underweight*) to 5 (*very overweight*), with a midpoint of 3 (*about the right weight*). This variable was recoded to be a dichotomous self-perception of being overweight (i.e., perceived overweight: *4-5* vs. not: *1-3*). Additionally, we identified other measured variables which may confound the relationship between perceived overweight and weight gain, so we could control for these in analyses. Participants' sex, age, race/ethnicity, highest level of education completed, personal income, and chronic physical conditions were available (see 17) and adjusted for in analysis.

Results

Of the 3,899 participants, at baseline 40.7% perceived their weight as being overweight, whilst the remaining 59.3% did not perceive their weight as being overweight. Using SPSS 22 (as in all studies), OLS regression analysis was used to evaluate the relationship between self-perceived weight status at baseline and BMI at follow up, whilst adjusting for the potential confounding factors measured. Perceiving oneself as overweight (vs. not) was associated with an increased risk of weight gain during the seven year period ($B = 1.056$, $SE = .175$, $t = 6.036$, $p < .0001$). See Table 2 for full results. A model which adjusted for baseline BMI only showed that perceiving oneself as overweight (vs. not) was associated with an increase of approximately 0.9 BMI points from baseline to follow up.

We also examined whether the association between perceived overweight and weight gain was dependent on accuracy of perceived overweight status. In other words, we tested whether

the effect of perceived overweight on future weight gain was similar in participants who accurately perceived they were overweight (BMI ≥ 25.0 at baseline) and participants who overestimated their weight as being overweight (BMI < 25 at baseline). When included in the fully adjusted model, the interaction term between perceived overweight (levels: perceived overweight at baseline vs. not) and accuracy of overweight perception (levels: objective overweight at baseline vs. non overweight at baseline) was not significant and did not explain any further variance in weight gain (R^2 change = 0.0001, p = .23). Thus, the effect that perceived overweight had on weight gain was not dependent on whether participants' perceptions of overweight were accurate or inaccurate.

Study 2

Method overview

Having demonstrated a link between weight perception and weight gain in Study 1, we next used UK data from the National Child Development Study (NCDS) to test the robustness of this association in a different population (UK adults as opposed to US) and whilst accounting for a wider range of potential confounding variables. The NCDS contains rich information on childhood psychological, family environment and health characteristics, which we controlled for in analyses when examining the relationship between perceived weight status and subsequent weight gain. Early life characteristics such an adverse family environment, poor health, and low levels of intelligence and self-control have been shown to lead to subsequent weight gain. Whilst the determinants of perceived overweight are not currently known it is feasible that such childhood characteristics may also shape weight perceptions. Thus, an association between perceived overweight and subsequent weight gain may reflect the impact of these typically unobserved third variables. The NCDS sample allowed the robustness of

the link between perceived weight and weight gain to a broad set of previously measured potentially confounding factors to be estimated.

Sample and Measures

The NCDS is an ongoing longitudinal study following an initial cohort of 17,638 people born in Britain in a week in March, 1958. As part of the age 23 follow-up wave participants were asked to indicate whether they perceive their current weight as '…the right weight/underweight/slightly overweight or very overweight/don't know'). This variable was recoded to be a dichotomous self-perception of being overweight; perceived overweight ('*slightly overweight' or 'very overweight'*) vs. not. Perceived weight and self-reported height and weight information were available from 12,524 participants at age 23. The decline in sample size from the initial 17,638 participants in the perinatal survey was due to several factors including refusal of former participants to take part, a failure to make contact with survey participants, emigration, and death. The height and weight information provided at age 23 was used to calculate baseline BMI (M = 22.43, SD = 2.93). At age 45, 6,740 of the 12,524 participants with baseline perceived weight and BMI data took part in a biomedical survey. As well as the reasons cited above relating to attrition the decline in the sample size between ages 23 and 45 could be attributed to the more invasive nature of the biomedical survey which included providing blood samples and completing a series of medical tests. This resulted in a higher rate of refusal to participate than previous waves of NCDS (refusal rate at standard age 23 survey wave = 4.9%, refusal rate at age 45 biomedical wave = 15.2%). The NCDS biomedical survey allowed objective height and weight data to be collected from 6,740 participants by a trained researcher (M = 27.35, SD = 4.94), thus allowing the relationship between perceived weight status at baseline and weight gain over this period to be examined. See Table 1 for sample characteristics.

The NCDS contains numerous variables that have been shown to affect weight gain and could feasibly explain a link between weight perception and subsequent weight gain. These include demographic characteristics (Model 2: childhood socioeconomic status, education, and ethnicity), psychological characteristics (Model 3: intelligence, self-control, psychological distress), aspects of the home environment (Model 4: family difficulties, dwelling and regional factors), and early health (Model 5: birth weight, whether breastfed, weight at age 7, physician assessed conditions including limb defects and motor handicaps). In our first model we examined the effect of perceived overweight on weight gain whilst controlling for baseline BMI only. In subsequent models (see table 3) we included a progressively restrictive sets of potential confounding variables. All available from the NCDS sample which we considered could plausibly affect weight gain were included in the final analyses. In total 80 variables were utilised for the final regression model (Model 5), as displayed in Table 3.

Results: Of the 6,740 participants, at baseline 38.3% perceived their weight as being overweight, whilst the remaining 61.7% did not perceive their weight as being overweight. OLS regression analysis was used to test whether perceived weight status at baseline predicted BMI at follow up. Controlling for baseline BMI only, perceiving oneself as overweight (vs. not) at baseline was associated with an increased risk of weight gain across the follow up period ($B = .802$, $SE = .117$, $t = 7.26$, $p < .001$); approximately 0.8 BMI points. Including a progressively restrictive set of potential confounding variables did not diminish the size of this effect ($B = .824$, $SE = .118$, $t = 7.01$, $p < .001$). See Table 3. These analyses suggest that the association between perceived overweight status and weight gain identified

in Study 1 is unlikely to be due to unobserved confounding by psychological, health or environmental factors.

We again examined whether the association between perceived overweight and weight gain was dependent on accuracy of perceived overweight status at baseline. When included in the above model, the interaction term between perceived overweight and accuracy of overweight perception was significant (R^2 change = 0.001, p = .0002). Perceiving oneself as being overweight was predictive of future weight gain amongst participants who were a healthy weight at baseline (overestimation of weight status at baseline): B = .71, SE = .12, t = 5.8, p < .001. The effect of perceived overweight on weight gain amongst participants who were overweight at baseline (accurate perception of weight status at baseline) was also significant, but stronger: B = 2.1, SE = .35, t = 5.9, p < .001.

Study 3

Method overview

In Study 1 and 2 we found evidence that perceiving oneself as being overweight predicts weight gain over time. The aim of Study 3 was to replicate this association in a final independent sample and to test if, as hypothesised, stress induced over-eating may explain the association observed between perceived overweight and subsequent weight gain. Specifically, we expected that perceiving oneself as overweight would be associated with a tendency to over-eat in response to stress, which in turn would predict weight gain. Study 3 also allowed us to account for participants' experiences of appearance-based discrimination in analyses, as some research has suggested that experiencing appearance-based discrimination is predictive of weight gain (7-8) and this measure was not available in Study 1 or Study 2.

Sample

The sample were drawn from the Midlife in the United States (MIDUS) national longitudinal study of health and well-being (N = 3,372). Participants were English speaking adults, aged between 20 and 75 at baseline in 1995/1996 (M = 47.1, SD = 12.3) who were followed up 9-10 years later. Comprehensive details of the MIDUS study can be found in (18). See Table 1 for demographic and descriptive information of the study sample.

Measures

BMI was calculated using self-reported height and weight recorded during the MIDUS baseline and follow-up surveys. Levels of self-reported BMI in this sample corresponded closely with those recorded during a physical exam of a subset of 900 participants at follow-up ($r = .92$, $p<.001$). As in Study 1, participants rated their perceived weight on a scale from 1 (*very underweight*) to 5 (*very overweight*) which was recoded to be a dichotomous self-perception of the participants' overweight status; perceived overweight (*4-5*) vs. not (*1-3)*. To measure stress-induced eating, at baseline participants rated the extent to which they typically respond to stress by: (i) eating more than usual, or (ii) eating more favorite foods to enhance mood, on a scale from 1 = *a lot* to 4 = *not at all*. Participant responses to both questions correlated highly ($r = .82$, $p<.001$) and were reverse coded and summed so that high scores indicate the tendency to over-eat in response to stress. Analyses were adjusted for participants' age, sex, race/ethnicity, highest level of education completed, household income, number of chronic conditions, and whether the participant reported experiencing discrimination based on height, weight, or another aspect of their appearance (see 18 for measurement of these variables).

Results

Of the 3,372 participants, at baseline 67.0% perceived their weight as being overweight, whilst the remaining 33.0% did not perceive their weight as being overweight. OLS regression analysis was used to test whether perceived weight status at baseline predicted BMI at follow up. An analysis which adjusted for baseline BMI only, showed that perceiving oneself as overweight (vs. not) was associated with an increase of approximately 0.3 BMI points from baseline to follow up. Perceived overweight status also predicted weight gain over the 9-10 year follow up period (B =.376, SE =.134; t =2.81, p=.005) whilst adjusting for baseline BMI, experiences of discrimination, and the other potential confounding variables. See Table 4 for full results. Adjusting for stress-induced overeating in the fully adjusted model reduced the association between perceived overweight and weight gain to non-significance (B =.236, SE =.133; t =1.8, p=.07), explaining 37% of the association between perceived overweight at baseline and BMI at follow-up. Evidence for mediation was verified using non-parametric mediation analyses (19) with 10,000 bias-corrected bootstrapped samples (B =.137, SE =.028; z = 4.38, p<.001), whereby perceiving oneself as overweight was associated with a greater likelihood of over-eating in response to stress, which in turn predicted weight gain.

We again examined whether the association between perceived overweight and weight gain was dependent on accuracy of perceived overweight status at baseline. When included in the adjusted models, the interaction term between perceived overweight and accuracy of overweight perception was not significant and did not explain any further variance in weight gain (R^2 change = <0.001, p = .71), indicating that the effect that perceived overweight had on weight gain in Study 3 was not dependent on the accuracy of weight perceptions.

We also examined the possibility of reverse causation, whereby weight gain may lead to stress-induced eating which in turn may affect weight perceptions. Stress-induced eating was found to explain just 1% of the link between weight gain and changes in weight perception from baseline to follow-up, suggesting this reverse pathway is unlikely to explain the pattern of mediation observed in the current study.

Additional Results

For Tables detailing the percentage of participants in each study who accurately vs. inaccurately perceived overweight and the weight change according to accuracy of overweight perception please see **online supplemental materials 1**. We also include a test of the robustness of the findings across the three studies to the exclusion of underweight participants (3.4% of participants across the three samples) in the supplemental materials. Removing these participants led to a minimal reduction in the strength of the association between perceived weight and weight gain (under 5% on average across the three studies), and no change to the significance levels of the coefficients.

Finally, we tested whether gender interacted with baseline perceptions of overweight vs. not overweight to predict BMI at follow up. Across all three studies we found little evidence that the relationship between perceived overweight at baseline and BMI at follow up was moderated by gender (all ps > 0.05), suggesting that the effect that perceiving oneself as being overweight has on future weight gain was similar in both male and female adults.

Discussion

These are the first studies to examine whether accurately perceiving oneself as being 'overweight' is protective against or predictive of future weight gain across adulthood. We found consistent evidence that perceiving oneself as being overweight was associated with increased weight gain. We hypothesised that this effect may be observed because the derogation of adiposity in modern society could promote maladaptive coping responses, e.g., stress-induced overeating (9, 12), amongst self-perceived overweight individuals. In Study 3 we found that stress-induced eating statistically mediated the link between perceiving oneself as being overweight and further weight gain; individuals who identified themselves as being 'overweight' were more likely to report over-eating in response to stress and this predicted their subsequent weight gain. These findings are in line with recent suggestions that the stress associated with being part of a stigmatised group may be detrimental to health (20, 21).

Although we hypothesised that the stress associated with identifying oneself as being overweight may be a factor explaining our findings, it is also important to consider the potential confounding role of biological factors which increase how susceptibility a given individual may be to weight gain. For instance, factors under substantial genetic influence such as a low resting metabolic rate and high respiratory quotient can markedly contribute to weight gain and could potentially shape weight perceptions leading to a correlation between both variables (e.g. 22). Future studies could capitalize on twin samples to examine differences in the weight perceptions and subsequent weight gain whilst adjusting for the potential confounding role of genetic variation and consequent biological factors (e.g. 23). Furthermore, we cannot rule out the possibility of reverse causality, whereby those who experience weight gain or have a higher propensity for weight gain become more likely to engage in stress-induced eating (e.g. due to frustration linked to failed weight loss attempts or

difficulty in restricting food intake) and to then perceive themselves as being overweight. Whilst potential reverse causality pathways warrant further investigation, it is important to note our robustness tests in Study 3 failed to identify support for the possibility that stress-induced eating acts as a pathway between weight gain and changes in perceived overweight.

Although it is widely assumed that underestimation of weight status among overweight individuals may reduce the likelihood that such individuals will manage their body weight and is therefore a public health concern, this presumption has been made on limited evidence (2, 24). The present findings are of importance as they cast some doubt over this common assumption that overweight individuals who do not identify their weight as being above medically defined guidelines for a healthy weight are at a greater risk of weight gain (3, 24). We are not aware of any research that has examined the effect of correcting underestimation of weight status amongst overweight individuals, but an implication of our findings is that any public health intervention approaches to correct weight status misperceptions may need to carefully consider potential negative consequences of self-identifying as overweight.

Recent studies have shown that healthy weight and overweight adolescents who perceive their weight status as being overweight are more likely to become obese by early adulthood (13, 14). The present results are consistent with these conclusions, but extend these findings to adults and also show that it may not be weight status misperceptions per se that predict future weight gain, but simply whether a person identifies themselves as being an 'overweight' person. We found some evidence in our UK sample (Study 2) that the effect perceived overweight had on weight gain was particularly pronounced when this perception was accurate (i.e. when participants were overweight at baseline), although this finding was not observed consistently across all three studies.

A strength of the present research is that we replicated our observed effect in three nationally representative studies, with over 14,000 US and UK adults. Moreover, we were able to examine the association between perceived overweight and weight gain across both medium and longer-term (e.g. 22 years in Study 2) intervals. Across these studies we were also able to control for a large number of potential confounding variables, although further experimental work to increase confidence in causality will now be important. Study 2 relied on self-reported weight and height at baseline (although objective measurements were used at follow up) and Study 3 relied on self-reported data at baseline and follow-up. Given that self-reported data is likely to be prone to bias this is a limitation. However, the association between perceived overweight and weight gain was the same as when only objective weight and height data were used at baseline and follow up (Study 1). As discussed, a final limitation of our studies is that it is not possible to infer causality from the longitudinal findings observed. For example, in Study 3 it may be the case that a third unmeasured variable is responsible for the relationship that both perceived overweight and stress induced eating have with risk of future weight gain.

Conclusions

Perceiving oneself as being 'overweight' is counter-intuitively associated with an *increased* risk of future weight gain among US and UK adults.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Funding

This research received no external funding. ER was partly supported by the Wellcome Trust.

Contributions/Acknowledgements

All authors were responsible for the study design. M. Daly and J. Hunger were responsible for the analysis of the studies reported. All authors drafted and approved the final version of the manuscript.

References

1. Kuchler F, Variyam JN. Mistakes were made: misperception as a barrier to reducing overweight. *Int J Obes.* 2003; 27: 856-861.

2. Chang VW, Christakis NA. Extent and determinants of discrepancy between self-evaluations of weight status and clinical standards**.** *J Gen Intern Med.* 2001; 16:538-543

3. Duncan DT, Wolin KY, Scharoun-Lee M, Ding EL, Warner ET, Bennett GG. Does perception equal reality? Weight misperception in relation to weight-related attitudes and behaviours among overweight and obese US adults. *Int J Behav Nutr Phys Act.* 2011; 8: doi 10.1186/1479-5868-8-20.

4. Johnson F, Cooke L, Croker H, Wardle J. Changing perceptions of weight in Great Britain: comparison of two population surveys. *BMJ*. 2008; 337**:**a494.

5. Puhl RM, Heuer CA. The stigma of obesity: a review and update. *Obesity*. 2009; 17: 941-964.

6. Sabin JA, Marini M, Nosek BA. Implicit and explicit anti-fat bias among a large sample of medical doctors by BMI, race/ethnicity and gender. *PLoS ONE*. 2012; DOI: 10.1371/journal.pone.0048448.

7. Jackson SE, Beeken RJ, Wardle J. Perceived weight discrimination and changes in weight, waist circumference, and weight status. *Obesity*. 2015; in press.

8. Sutin AR, Terracciano A. Perceived Weight Discrimination and Obesity. *PLoS ONE*. 2013; 8(7): e70048. doi: 10.1371/journal.pone.0070048

9. Tomiyama AJ, Epel ES, McClatchey TM, Poelke G, Kemeny ME, McCoy SK, et al. Associations of weight stigma with cortisol and oxidative stress independent of adiposity. *Health Psychol*. 2014; 33: 862-867.

10. Hunger JM, Major B, Blodorn A, Miller C. Weighed down by stigma: How weight-based social identity threat influences weight gain and health. *Social Psychology and Personality Compass*. 2015; in press.

11. Schvey NA, Puhl RM, Brownell KD. The impact of weight stigma on caloric consumption. *Obesity*. 2011; 19: 1957–62.

12. Tomiyama AJ. Weight stigma is stressful: A review of evidence for the Cyclic Obesity/Weight-Based Stigma model. *Appetite.* 2014; 82: 8-15.

13. Liechty JM, Lee M-J. Body size estimation and other psychosocial risk factors for obesity onset among US adolescents: findings from a longitudinal population level study. *Int J Obes*. 2015; in press.

14. Sutin AR, Terracciano A. Body weight misperception in adolescence and incident obesity in young adulthood. *Psychol. Sci.* 2015; in press.

15. Maximova K, McGrath JJ, Barnett T, Loughlin J, Paradis G, Lambert M. Do you see what I see? Weight status misperception and exposure to obesity among children and adolescents. *Int J Obesity* 2008*;* 32: 1008-1015.

16. Foti K, Lowry R. Trends in perceived overweight status among overweight and nonoverweight adolescents. *Arch. Pediatr. Adolesc. Med* 2010; 164:636–642.

17. Harris KM, CT, Halpern E, Whitsel J, Hussey J, Tabor P, Entzel, et al. The National Longitudinal Study of Adolescent to Adult Health: Research Design. 2009. [WWW document]. URL: http://www.cpc.unc.edu/projects/addhealth/design.

18. Brim OG, Ryff CD, Kessler RC. The MIDUS national survey: An overview. In; How healthy are we? A national study of well-being at midlife (pp.1-36). Chicago: University of Chicago Press. 2004.

19. Hayes AF. PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [White paper]. 2012. Retrieved from http://www.afhayes.com/ public/process2012.pdf

20.Major B, Hunger JM, Bunyan D, Miller CT. The ironic effects of weight stigma. *J Exp Soc Psychol.* 2014; 51: 74-80.

21. Hunger JM, Major B. Weight stigma mediates the association between BMI and self-reported psychological and physical health. Health Psychology. 2015; in press.

22. Filozof C, Gonzalez C. Predictors of weight gain: the biological-behavioural debate. *Obes Revs*. 2000; 1: 21-26.

23. Lundborg P. The health returns to education what can we learn from twins? *J. Popul. Econ*. 26. 2013; 1: 673-701.

24. Brown I. Is self-identification as 'obese' really a public health solution? *BMJ Open* 2014; 4(11):e005561.

Table 1. *Descriptive Statistics for Participants in Studies 1-3*

	Study 1 (n=3,899)	Study 2 (n=6,740)	Study 3 (n=3,372)
Variable	M(SD) / %	M(SD) / %	M(SD) / %
BMI baseline (kg/m^2)	26.47 (6.18)	22.43 (2.93)	26.60 (5.13)
BMI follow-up (kg/m^2)	29.01 (7.29)	27.35 (4.94)	27.83 (5.64)
Perceived overweight (%)	40.7	38.25	66.96
Age (years)	21.79 (1.80)	23[a]	47.05 (12.3)
Female (%)	54.94	50.02	54.33
White (%)	63.35	98.6	94.60
Chronic conditions	.09 (.29)[b]	0.62 (1.10)[b]	2.30 (2.34)[b]
Education level	13.25 (1.98)[c]	----	7.18 (2.47)[d]
Income (USD)	12891.44 (12354.06)[e]	----	76309.16 (61298.99)[f]
Stress-induced eating	----	----	3.71 (1.85)[g]
Body discrimination	----	----	.11 (.34)[h]

[a] All participants were born in the same week and assessed at age 23.

[b] Study 1 chronic conditions = proportion of sample with a chronic condition, Study 2 = number of childhood health conditions, Study 3 = number of illnesses

[c] Ranging from 7 = *7th grade* to 22 = *5 or more years of graduate school*.

[d] Ranging from 0 = *No school* to 12 = *PhD/MD level education*.

[e] Personal income. Missing income data was replaced with the mean for the sample.

[f] Household income.

[g] See method of Study 3 in manuscript for measurement.

[h] Ranging from 0 = *No discrimination based on appearance* to 2 = *Experienced discrimination based on height/weight and other aspects of appearance.*

Table 2. *Study 1 Linear Regression Results for the Association between Perceived Overweight and Weight Gain.*

	B (SE)	t
Perceived overweight	1.06 (.18)	6.06***
Age	-.07 (.04)	-1.80*
Female	-.29 (.14)	-2.13*
White	-.53 (.14)	-3.83***
Education level[a]	-.10 (.03)	-3.04**
Personal income[b]	.00 (.00)	-.75
Chronic conditions	-.55 (.23)	-2.38*
Baseline BMI	.92 (.01)	66.92***

[a] Ranging from 7 = *7th grade* to 22 = *5 or more years of graduate school*.

[b] Mean income for the sample ($12891.44) was used when income data was unavailable.

* p < .05, ** p < .01, *** p < .001.

Table 3. *Study 2 Linear Regression Results for the Association between Perceived Overweight and Weight Gain*

Model[a]	Covariates	B (SE)	t
1	Body mass index measured at age 23	.802 (.111)	7.26***
2	+ Female, white, socioeconomic status at birth, highest educational level	.835 (.117)	7.12***
3	+ Intelligence (age 11), childhood self-control (age 7, 11), psychological distress (age 23)	.835 (.117)	7.11***
4	+ Family difficulties (13 items), mother/father age at birth, mother school leaving age, crowding in childhood home, region	.842 (.117)	7.18***
5	+ Birth weight, breast fed, relative weight (age 7), hearing problems, vision problems, teeth problems, childhood health conditions (36 conditions assessed at age 7[b])	.824 (.118)	7.01***

[a] Models are additive; each model includes variables from the previous model for a progressively restrictive test of the association between perceived weight and weight gain.

[b] Physician assessed health conditions gauged at age 7: Major handicap, disfiguring condition; mouth or palate abnormality; signs of past, present otitis media, pathological heart condition, any other sign of heart disease; other heart murmer; inguinal hernia; other hernia; eczema; cerebral palsy; tics habit spasm; congenital upper limb defect; any malfunction of upper limb; congenital lower limb defect; any malfunction of lower limb; general motor handicap; disfiguring condition; mental handicap; emotional maladjustment; abnormal head and neck; abnormal upper limb; abnormal lower limb; abnormal spine; abnormal respiratory system; abnormal alimentary system; abnormal urogenital system; abnormal heart; abnormal blood; abnormal skin; epileptic; other CNS condition; diabetes; skull deformity; spinabifida; other spinal disorder; talipes.

*** $p < .001$

Table 4. *Study 3 Linear Regression Results for the Association between Perceived Overweight and Body Mass Index in Models Before and After Adjustment for Stress-induced Eating.*

	B (SE)	t	B (SE)	t
Perceived overweight	.38 (.13)	2.81**	.24 (.13)	1.80
Stress-induced eating			.33 (.03)	10.62**
Age	-.05 (.00)	-11.22**	-.04 (.00)	-9.93**
Female	.01 (.11)	.10	-.31 (.11)	-2.75**
White	-.38 (.23)	-1.63	-.45 (.23)	-1.99*
Education level [a]	-.07 (.02)	-3.08**	-.08 (.02)	-3.76**
Household income	.00 (.00)	-.53	.00 (.00)	-.65
Chronic conditions	.05 (.02)	2.28*	.03 (.02)	1.23
Body discrimination[b]	.40 (.16)	2.50*	.30 (.16)	1.89
Baseline BMI	.90 (.01)	70.05**	.87 (.01)	67.27**

[a] Ranging from 0 = *No school* to 12 = *PhD/MD* level education.

[b] Ranging from 0 = *No discrimination based on appearance* to 2 = *Experienced discrimination based on height/weight and other aspects of appearance.*

* p < .05, ** p < .01, *** p < .001.

Table S1. *Study 1 Unadjusted Body Mass Index Changes between Wave III and Wave IV by Perceived Overweight/obese and Actual Overweight/obesity Categories at Wave III.*

Perceived overweight / obese	Overweight / obese	% / (N)	Mean BMI change	SD
No	No	43.7% / (1704)	2.41	3.33
	Yes	15.7% / (610)	2.32	3.93
Yes	No	6.3% / (246)	3.39	4.67
	Yes	34.3% / (1339)	2.62	4.92

Table S2. *Study 2 Unadjusted Body Mass Index Changes between age 23 and 45 by Perceived Overweight/obese and Actual Overweight/obesity Categories at age 23.*

Perceived overweight / obese	Overweight / obese	% / (N)	Mean BMI change	SD
No	No	60% / (4038)	4.55	3.09
	Yes	1.8% / (124)	3.93	4.15
Yes	No	24.8% / (1673)	5.26	4.02
	Yes	13.4% / (905)	6.03	4.86

Table S3. *Study 3 Unadjusted Body Mass Index Changes between 1995/1996 and 2005/2006 by Perceived Overweight/obese and Actual Overweight/obesity Categories at Baseline in 1995/1996.*

Perceived overweight / obese	Overweight / obese	% / (N)	Mean BMI change	SD
No	No	26.5% / (893)	1.49	2.34
	Yes	6.5% / (222)	1.01	2.57
Yes	No	15% / (505)	1.62	2.51
	Yes	52% / (1752)	1.01	3.58

Table S4. *Study 1 Linear Regression Results for the Association between Perceived Overweight and Weight Gain Excluding Initially Underweight (BMI < 18.5) Participants (n = 125, 3.2% of the sample).*

	B (SE)	t
Perceived overweight	1.07 (.18)	6.06***
Age	-.07 (.04)	-1.80
Female	-.27 (.14)	-1.94
White	-.56 (.14)	-3.99***
Education Level	-.10 (.03)	-2.97**
Personal Income	.00 (.00)	-.53
Chronic Conditions	-.53 (.23)	-2.28*
Baseline BMI	.92 (.01)	64.95***

* p < .05, ** p < .01, *p < .001

Table S5. *Study 2 Linear Regression Results for the Association between Perceived Overweight and Weight Gain Excluding Initially Underweight (BMI < 18.5) Participants (5% of the sample).*

Model[a]	Covariates	B (SE)	t
1	Body mass index measured at age 23	.787 (.112)	7.02***
2	+ Female, white, socioeconomic status at birth, highest educational level	.795 (.119)	6.68***
3	+ Intelligence (age 11), childhood self-control (age 7, 11), psychological distress (age 23)	.795 (.119)	6.66***
4	+ Family difficulties (13 items), mother/father age at birth, mother school leaving age, crowding in childhood home, region	.800 (.119)	6.71***
5	+ Birth weight, breast fed, relative weight (age 7), hearing problems, vision problems, teeth problems, childhood health conditions (36 conditions assessed at age 7)	.769 (.119)	6.46***

Models are additive; each model includes variables from the previous model for a progressively restrictive test of the association between perceived weight and weight gain.

*** $p < .001$

Table S6. *Study 3 Linear Regression Results for the Association between Perceived Overweight and Body Mass Index in Models Before and After Adjustment for Stress-induced Eating Excluding Initially Underweight (BMI < 18.5) Participants (2% of the sample).*

	B (SE)	t	B (SE)	t
Perceived overweight	.35 (.14)	2.60**	.22 (.13)	1.65
Stress-induced eating			.32 (.03)	10.42***
Age	-.05 (.00)	-11.27***	-.04 (.00)	-9.99***
Female	.01 (.11)	.10	-.31 (.11)	-2.74**
White	-.41 (.23)	-1.77	-50 (.23)	-2.16*
Education level	-.07 (.02)	-2.96**	-.08 (.02)	-3.66***
Household income	.00 (.00)	-.38	.00 (.00)	-.44
Chronic conditions	.05 (.02)	2.22*	.03 (.02)	1.16
Body discrimination	.40 (.16)	2.44*	.29 (.16)	1.84
Baseline BMI	.90 (.01)	68.98***	.87 (.01)	66.34***

* $p < .05$, ** $p < .01$, *** $p < .001$