Weight Loss and Economic Activity in the 1970 British Cohort Study

Charis Bridger Staatz[1*], Laura Gimeno [1], Demelza Smeeth[2], Nish Chaturvedi [2^], George Ploubidis [1^]

* First Author

^Joint senior authors

[1] Centre for Longitudinal Studies, University College London, London, UK

[2] Unit for Lifelong Health and Ageing, University College London, London, UK

Abstract

Background: Economic inactivity and obesity are both public health and policy concerns. Despite growing interest in weight-loss medication, little evidence exists on whether weight loss in midlife is associated with reduced economic inactivity.

Methods: Using data from the 1970 British Cohort Study (BCS70), we applied lagged multinomial logistic regression to imputed data representing the target population (N=16,749). Models adjusted for a broad range of sociodemographic and health variables across life. Weight change was defined at ages 46 and 51–54 relative to the highest body mass index (BMI) recorded between ages 26 and 42.

Results: Between ages 46 and 51–54, 4% of the population lost more than 5% of body weight from a previously obese BMI. In comparison, 19% maintained a healthy BMI, 39% maintained overweight, and 38% maintained, gained obesity, or cycled within obesity. Individuals who lost weight were more socioeconomically and physically disadvantaged across the life course. In unadjusted models, weight loss, weight gain, maintaining obesity, and weight cycling were all associated with higher risk of health-related economic inactivity compared with maintaining a healthy weight. After full adjustment, only the weight-gain group remained significantly associated (RRR = 1.69, 95% CI 1.08–2.63).

Conclusions: Weight loss in later midlife did not offset the long-term effects of socioeconomic disadvantage and sustained obesity. By contrast, continued weight gain, affecting almost one-fifth of adults, was linked to an increased risk of becoming economically inactive due to health reasons, underscoring the importance of preventing further weight gain in midlife.

Topic

Weight Loss and Economic Activity in the 1970 British Cohort Study.

Theoretical Focus

Obesity is a major public health problem in the UK – in 2022-2023, 64% of adults were estimated to be overweight or living with obesity in England [1]. Prevalence of obesity has risen in the UK since the 1980s, with more recently born cohorts at greater risk of overweight and obesity at younger ages [2]. The rapid development of new weight-loss medications has renewed optimism about achieving and maintaining substantial weight loss among people living with obesity. These treatments may offer an effective tool for those who have found behavioural interventions insufficient for long-term weight control. Evidence suggests that sustained weight loss can lead to improvements in physical and mental health [3, 4], which may in turn support individuals' participation in the labour market and increased economic productivity.

There has been concern related to growing health related economic inactivity in the UK [5] - where people are out of work due to health reasons and not seeking employment – which has fiscal impacts both on a national level, as well as an individual level related to loss of income [6]. Reducing health-related inactivity through improving population health, such as reducing obesity levels, has the potential to benefit both the economy and population ageing. Previous research has found only small associations between obesity and health-related economic inactivity [7]. However, these findings were based on single-point measures of body mass index (BMI), which provide a limited picture of weight-related health.

Weight is dynamic and changes across the life course. For most adults, BMI tends to rise steadily with age [8]. Once excess weight is gained, individuals typically remain in a higher weight category or continue to gain additional weight over time. When episodes of weight loss occur, the weight is often regained within a few years, known as "weight cycling". Patterns of weight gain or loss—rather than one-off measures—are likely to be more informative for understanding long-term health and economic outcomes. At present, little is known about the proportion of the population who are able to achieve and sustain meaningful weight loss in later mid-life without pharmacological support, and the impact this has on economic inactivity.

The 1970 British Birth Cohort (BCS70) offers a unique opportunity to explore these relationships using longitudinal data on weight and BMI collected over several decades. We therefore aimed to identify individuals that lose weight and maintain weight loss for 5 or more years in later mid-life. Given the limited existing evidence on individuals who successfully lose weight, we also aimed to describe the sociodemographic characteristics of people experiencing different patterns of weight change or maintenance. Because weight loss could also occur unintentionally as a result of illness, we examined the health characteristics of cohort members by weight change or maintenance groups. Finally, we aimed to assess whether sustained weight loss was associated with a reduced risk of transitioning into economic inactivity due to health reasons. We hypothesised that individuals who achieved and maintained weight loss would have a lower likelihood of becoming inactive for health-related reasons compared with those following similar weight trajectories, such as maintaining obesity, or those who continue to gain weight.

Data

BCS70 is a nationally representative birth cohort born in Britain in one week in 1970. Rich data has been collected across the life course since birth, including on socioeconomic circumstances, anthropometry and work histories. There have been 12 main data sweeps, with eight occurring in adulthood. A detailed profile of the cohort has been published elsewhere [9]. Self-reported weight and height during adulthood were collected at ages 26, 30, 34, 42, 46-48 and 51-54, and nurse-measured height and weight were collected at age 46-48. The present analysis uses nurse measured weight at age 46-48, unless unavailable, where self-reported weight is used instead.

Methods

We aimed to quantify the proportion of individuals in BCS70 who lost and maintained weight between ages 46-48 and 51-54. We used the following definition: *More than 5% of body weight lost from a previous BMI greater than 30 kg/m^2 and sustained for at least two time points spanning 5 years or more.* We also defined other weight change groups, such as weight gain (individuals who gained more than 5% of body weight compared to their previously highest recorded weight, and whose BMI was >30kg/m^2 at age 51-54), weight cycling (in and out, or within the obesity BMI class), and weight maintenance groups (maintained healthy weight, overweight or obesity).

Economic activity at age 51-54 was defined using a categorical variable with five levels: Active full-time (≥30 hours per week) - including both employed and self-employed; Active part-time (<30 hours per week) - including both employed and self-employed; Unemployed and looking for work; Inactive for health reasons (long-term and short-term illness); Inactive for other reasons (including looking after home/family, full-time education, and retirement).

We used a series of multinomial logistic regression models to quantify associations between each weight loss group and economic activity at age 51-54. We report relative risk ratios (RRRs) from multinomial logistic regression models, focusing on the category of *economic inactivity due to health reasons*. The richness of the data available in BCS70 allowed us to account for confounding by controlling for covariates measured across the life course, and to additionally adjust for lagged economic activity at age 42 to better quantify transitions between economic activity categories at age 51-54:

- Model 1: Including weight loss, sex and age at the time of outcome measurement.
- Model 2: Additionally adjusting for the lagged outcome (economic activity at age 42)
- Model 3: Additionally adjusting for previous weight history (BMI in childhood), and variables capturing unintended weight loss: previous longstanding illness (LSI), new cancer diagnosis between ages of 42 and 51-54, and intention to lose weight at age 42.
- Model 4: Additionally adjusting for covariates in adulthood (smoking status, occupational social class, mental ill-health, geographical region) and childhood (cognitive ability, parental occupational class, mental ill-health).

Sensitivity analysis excluded individuals classified as underweight according to their BMI measured at either peak, age 46-48, or 51-54. In additional analysis, we also stratify the weight loss group by the age at which peak BMI is achieved, either before the age of 34 years, or at the age of 42 years.

All analyses imputed to the study's target population at ages 51–54 (those alive and living in Britain), to addresses both item non-response and sample attrition, thereby removing the need for any additional non-response weighting. Previous work using the British birth cohorts has demonstrated that this approach effectively restores population representativeness [10, 11].

Findings

Table 1 shows the proportion of individuals in the weight change and maintenance groups between the age 46-48 and 51-54. Approximately 4% of the population lost and sustained weight compared to a previous "peak" BMI >30kg/m^2 (observed between ages 26 and 42). Roughly half of the weight-loss group reached their peak BMI by age 34, and half by age 42. 19% of the population continued to gain weight with a final observed BMI >30kg/m^2, 9% maintained a BMI >30kg/m^2 in the final two observations, and 11% weight cycled, either in and out of the obese range (>30kg/m^2), or cycled within the obese range. Just 19% of the population had a peak BMI in the healthy (or underweight) range and maintained a healthy or underweight BMI at ages 46-48 and 51-54. Approximately 39% of population mostly maintained an overweight BMI (>25 kg/m^2 to <30kg/m^2).

Table 1. Proportion of population in weight maintenance and weight change groups between the ages of 46 and 51-54.

Weight Groups age 46 to 51-54	Proportion (%)
Maintains Normal Weight	19.11
Mostly Maintains Overweight	38.81
Mostly Maintains Obese	8.79
Weight gain (>5%) – final BMI obese (>30kg/m^2)	18.78
Weight loss (>5%)- peak BMI obese (>30kg/m^2)	3.85
Weight Cycling – obese (>30kg/m^2)	10.67

Figure 1. Mean BMI trajectories and 95% Confidence Intervals by weight change and maintenance group at 46-48 to 51-54

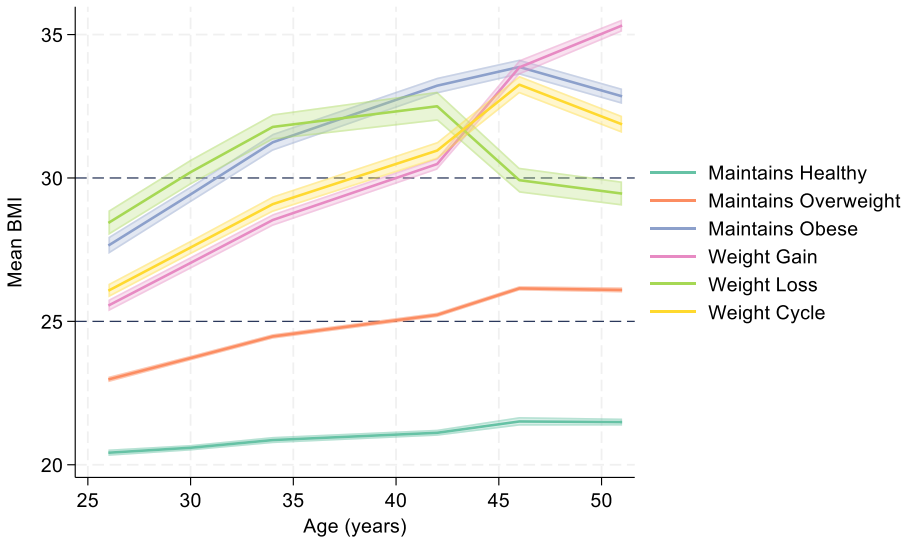


Figure 1 shows mean BMI trajectories across adulthood for each weight change and maintenance category. Up to the weight loss observation period at ages 46-48 to 51-54, individuals in the weight-loss group typically had the highest BMI, until their trajectory crossed and diverged from the maintains obesity group at age 42. The weight-gain and weight-cycle groups followed similar BMI trajectories up to age 46-48, after which their paths began to diverge.

Across the life course, individuals who lost weight in later life were more likely to be male (58%) and were consistently more disadvantaged across socioeconomic and health indicators. They were more likely to have lower cognitive ability in childhood (mean –0.34 vs –0.04 compared to population average), and to have lived in rented housing during childhood (54% vs 44%) and adulthood (37% vs 31%). They were also more likely to have come from manual-class households (78% vs 68%) and to have grown up in lower-income families (46% vs 38%). These disadvantages persisted into adulthood, when nearly half of the weight-loss group (49%) remained in the lowest two income quintiles, compared to 38% of the total

population. Educational attainment was also lower in the weight-loss group, with 64% having no qualifications or highest qualifications at NVQ Level 1–2 compared with 56% of the population. Although these patterns were most evident for those who lost weight, similar levels of disadvantage were seen in other obesity-related groups. In terms of health, individuals who lost weight tended to have a higher BMI from childhood onwards, with the highest mean BMI of any group at both age 10 (18.1 kg/m^2 vs 15.9 kg/m^2 for the healthy-weight group) and age 16 (23.7 kg/m^2 vs 19.5 kg/m^2). By midlife, they were more likely to report a long-standing illness (42% vs 25% for the maintained healthy weight group), psychological distress (21% vs 15% for the maintained healthy weight group), and active attempts to lose weight (58% vs 16% for the maintained healthy weight group).

Figure 2. Proportion of each economic activity group at age 51-54 by weight change and maintenance group.

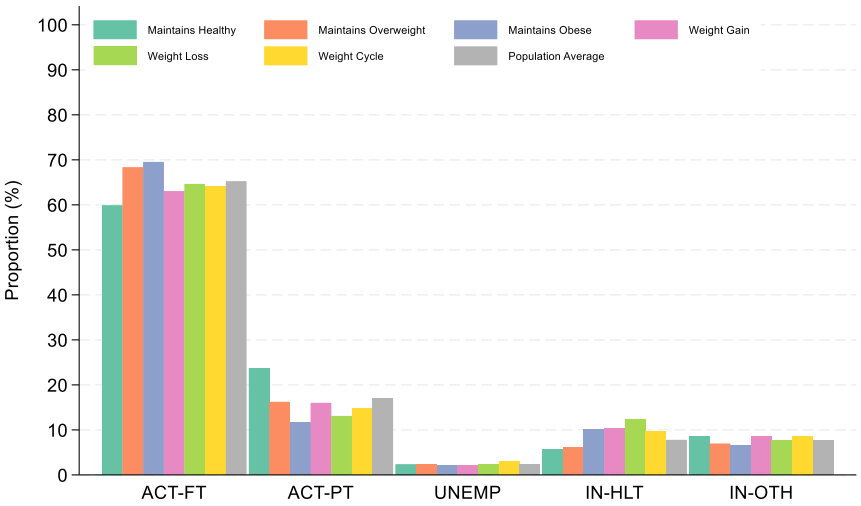
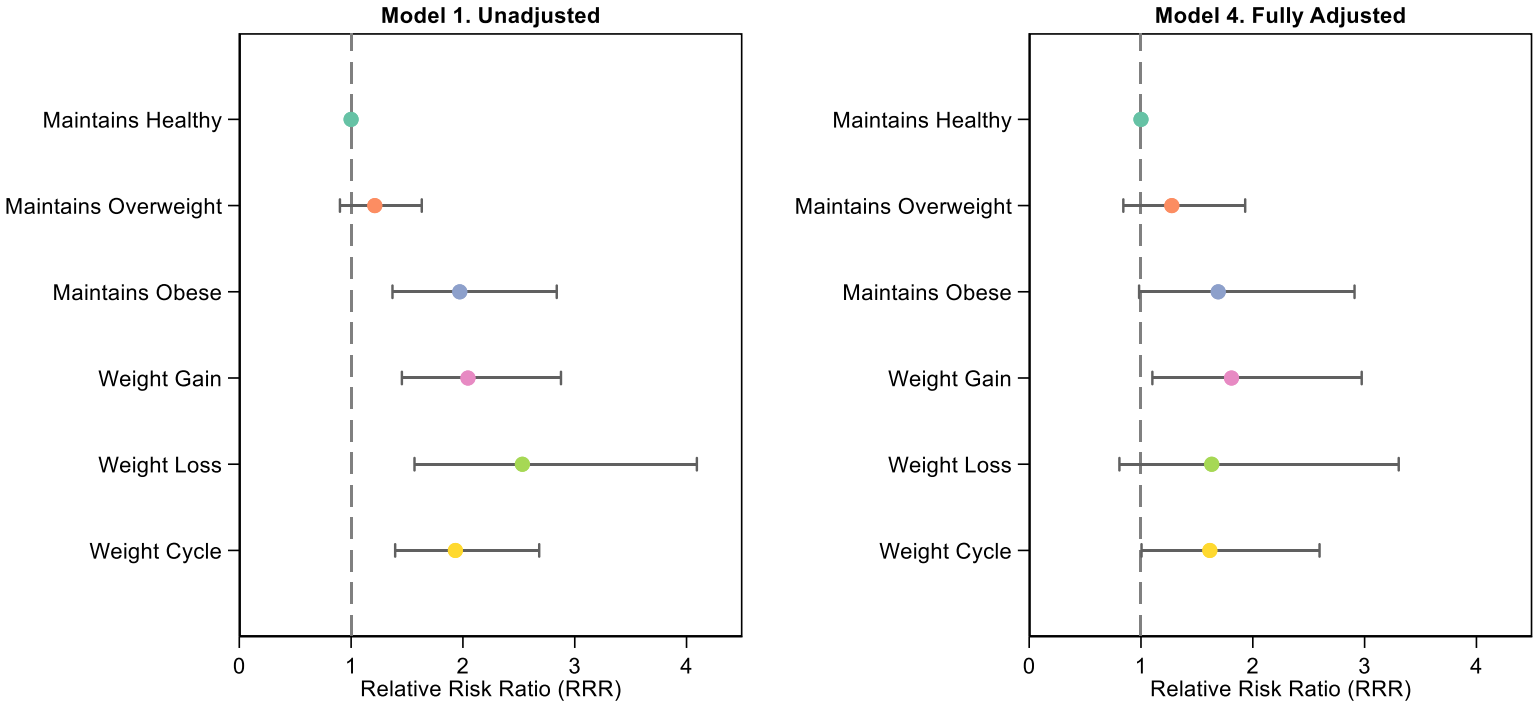


Figure 5 Footnote. *ACT-FT: Economically active in full time work. ACT-PT: Economically active in part-time work. UNEMP: Unemployed but seeking work. IN-HLT: Economically inactive due to health reasons. IN-OTH: Economically inactive for other reasons.*

Figure 2 shows the proportion of individuals in each economic activity group at ages 51–54 within weight change and maintenance groups. Individuals in the weight loss group had the highest rate of inactivity due to health reasons (12.3%) compared with the population average (7.8%) and other weight change and maintenance groups. Inactivity due to health was lowest among those who maintained a healthy weight or maintained overweight, while rates were above the population average in the other obesity-related groups: maintained obesity (10.0%), weight gain (10.3%), and weight cycling (9.6%).

Figure 3 presents relative risk ratios (RRRs) for economic inactivity due to health from Models 1 (unadjusted) and Model 4 (fully adjusted). In the unadjusted analysis (Model 1), maintaining obesity (RRR = 1.66, 95% CI 1.18–2.34, p = 0.004), weight gain >5% (RRR = 1.73, 95% CI 1.28–2.34, p < 0.001), weight loss >5% (RRR = 2.14, 95% CI 1.37–3.35, p = 0.001), and weight cycling (RRR = 1.63, 95% CI 1.22–2.19, p = 0.001) were all associated with higher risk of inactivity due to health compared with maintaining a healthy weight. In the fully adjusted analysis (Model 4), which accounted for childhood and adulthood sociodemographic and health factors, associations were attenuated for the weight loss, maintained obesity, and weight cycling groups. However, a consistent effect remained for the weight gain group (RRR = 1.69, 95% CI 1.08–2.63,

Figure 3. Unadjusted and fully adjusted associations between weight change and maintenance groups and economic inactivity due to health reasons at age 51-54.



p = 0.021), indicating higher risk of economic inactivity even after controlling for disadvantage across multiple measures. Results from sensitivity analyses excluding underweight individuals (BMI <18.5 kg/m^2) were similar. In the fully adjusted sensitivity model, only weight gain (RRR = 1.81, 95% CI 1.10–2.97, p = 0.019) and weight cycling (RRR = 1.62, 95% CI 1.01–2.60, p = 0.048) remained associated with a health-related inactivity.

When stratifying the weight loss group by age of peak BMI and in fully adjusted models (Model 4), individuals in the weight-loss group whose peak BMI occurred at age 42 had a reduced risk of transitioning to inactivity due to health reasons (RRR = 1.12, 95% CI 0.42–2.98, *p* = 0.83), with little difference in risk compared to those that remained healthy weight. Modest evidence of increased risk remained among those maintaining obesity (RRR = 1.58, 95% CI 0.93–2.68, *p* = 0.094) and those experiencing obesity cycling (RRR = 1.51, 95% CI 0.95–2.40, *p* = 0.085). Only two groups remained at significantly higher risk of economic inactivity: those who continued to gain weight in midlife (RRR = 1.69, 95% CI 1.08–2.63, *p* = 0.021), and those who lost weight but had reached their peak BMI before age 34 (RRR = 2.07, 95% CI 1.00–4.31, *p* = 0.050).

Interpretation

Our analyses showed that individuals who were obese and then lost weight in later life (similar to the other obesity groups) were among the most socioeconomically disadvantaged across the life course, and experienced poorer health and higher BMI throughout their lives. Individuals in the obesity-related groups (who maintained obesity, lost weight, gained weight, or weight cycled) had higher relative risks of health-related economic inactivity compared with those who maintained a healthy weight in unadjusted models. After accounting for a wide range of confounders, the association between weight loss and economic inactivity was attenuated, indicating that a combination of socioeconomic disadvantage and prior health explains much of the observed relationship. However, those who reached their highest BMI earlier in adulthood faced an elevated risk of inactivity due to health reasons, even when they subsequently lost weight between ages 46 and 54 and in fully adjusted models. Weight loss in later mid-life alone may not prevent economic inactivity if it occurs against early onset of obesity and a backdrop of longstanding socioeconomic and health inequalities. In contrast, the association with health-related economic inactivity for the weight-gain group remained consistent and statistically significant even after full adjustment, underscoring the importance of preventing further weight gain in later midlife. Taken together, these results emphasise the need for earlier and sustained intervention to prevent the development and persistence of obesity across the life course. Tackling weight gain in midlife may help reduce health-related economic inactivity and support longer, healthier working lives.

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