Rev Econ Household (2023) 21:1215–1246
https://doi.org/10.1007/s11150-022-09644-4

Check for updates

Life satisfaction and body mass index: estimating the monetary value of achieving optimal body weight

Kristjana Baldursdottir[1] · Paul McNamee[2] · Edward C. Norton[3] · Tinna Laufey Asgeirsdottir[1]

Received: 5 September 2022 / Accepted: 29 December 2022 / Published online: 24 January 2023

Abstract
According to the World Health Organization, obesity is one of the greatest public-health challenges of the 21st century. Body weight is also known to affect individuals' self-esteem and interpersonal relationships, including romantic ones. We estimate the "utility-maximizing" Body Mass Index (BMI) and calculate the implied monetary value of changes in both individual and spousal BMI, using the compensating income variation method and data from the Swiss Household Panel. We employ the Oster's method (Oster, 2019) to estimate the degree of omitted variable bias in the effect of BMI on life satisfaction. Results suggest that the optimal own BMI is 27.1 and 20.1 for men and women, respectively. The annual value of reaching optimal weight ranges from $7069 for women with underweight to $88,709 for women with obesity and between $95,165 for men with underweight to $32,644 for men with obesity. On average, women value reduction in their own BMI about four times higher than reduction in their spouse's BMI. Men, on the other hand, value a reduction in their spouse's BMI almost twice as much compared to a reduction in their own BMI. This highlights important gender differences and relative effects based on spousal BMI.

Keywords Body mass index · Spouse · Compensating income variation · Life satisfaction obesity

✉ Kristjana Baldursdottir
krb10@hi.is

[1] University of Iceland, Reykjavík, Iceland

[2] University of Aberdeen, Aberdeen, Scotland, UK

[3] University of Michigan & NBER, Ann Arbor, MI, USA

1 Introduction

Obesity is one of the greatest public-health challenges of the 21st century according to the World Health Organization. Worldwide obesity has nearly tripled since 1975 (World Health Organization, 2021) and in Europe one in three school-aged children, and almost 60% of the adult population, are now living with overweight or obesity (WHO European Regional Obesity Report, 2022). In addition to increasing a person's risk of various physical ailments, including cardiovascular disease, cancer, diabetes, and COVID 19 (WHO European Regional Obesity Report, 2022), body weight is also known to affect individuals psychologically based on factors such as social norms that are formed through interactions with society at large and interpersonal relationships (Carr & Friedman, 2005).

Efficient resource allocation is a challenge within any health-care system. An important part of tackling this challenge is knowledge of the value of health itself together with the more easily measured costs and benefits of health interventions, such as medical expenses and changes in productivity. A wide range of polices relating to body weight are justified as a means of fixing market failures such as imperfect information, negative externalities including higher medical cost, irrational behavior, and unanticipated variation in social norms regarding body shape (Philipson, 2001). Policies that affect individuals' body weight alter individual well-being, which is likely to weigh heavily in many cost-benefit or cost-utility analyses, leaving studies that exclude or miscalculate benefits of health interventions severely biased. Furthermore, allocation of resources requires efficiency comparisons not only within health-care systems but also between health care and other uses of resources.

One way to determine individuals' value of improvements in non-market goods like body mass index (BMI) is to calculate the willingness to pay (WTP) for such improvements or the willingness to accept (WTA) compensation for losses. That is, to estimate how much money individuals would be willing to give up (or receive) in exchange for such improvements (losses). Studies determining the monetary value that individuals place on intangible goods are scarce because the methods traditionally used have limitations. These limitations have led researchers to focus largely on non-monetary measures such as health-related quality of life (HRQoL). The limitations further restrict efficiency evaluations to cost-effectiveness analyses that focus on prioritization within health-care systems rather than cost-benefit analyses that compare health care and other uses of resources.

A promising method to calculate the monetary value of health and other goods that do not have a revealed market price, and thus facilitate efficiency comparisons between health care and other uses of resources, is the compensating income variation (CIV) method. The method is firmly rooted in economic theory (Hicks, 1939) and has been used to estimate the monetary value of various non-market goods, although economists have only recently started using it for health-related conditions. Applications to health include some studies examining specific conditions, such as migraines (Groot & Maassen van den Brink, 2004) cardiovascular disease (Groot & Maassen van den Brink, 2006), and pain (Ferrer-i-Carbonell & van Praag, 2002; McNamee & Mendolia, 2014; Ólafsdóttir, Ásgeirsdóttir, & Norton, 2020), body weight (Asgeirsdóttir et al., 2020), depression and anxiety

(Buason et al., 2021; McNamee, Mendolia & Yerokhin, 2021), and studies examining a set of different health problems and diseases (Asgeirsdottir, Birgisdottir, Ólafsdóttir, & Olafsson, 2017; Asgeirsdottir, Birgisdottir, Henrysdottir & Ólafsdóttir, 2020, Powdthavee & van den Berg, 2011; Howley, 2017). In addition, the method has been used to estimate the dollar value of a quality-adjusted life-year (QALY) (Huang, Frijters, Dalziel & Clarke, 2018) and changes in HRQoL (McNamee & Mendolia; 2019).

Applications of the method to estimate the monetary compensation needed to offset the welfare loss associated with a sub-optimal Body Mass Index (BMI) is limited. Kuroki (2016) calculated the CIV for having overweight and obesity. He concluded that life satisfaction of people who are affected by overweight or obesity is statistically significantly lower than people who have normal weight, even after controlling for socioeconomic factors and obesity-related health variables. He also found the relationship to be greater for women with overweight than men. Asgeirsdottir et al., (2020) also found gender differences using the method, but more importantly highlighted the importance of income measurement when using the method. Although Kuroki (2016) and Asgeirsdottir et al., (2020) mark important first attempts at estimating the CIV for body weight, we substantially improve upon their results in several important ways. First, we calculate the CIV for being below, as well as above the optimal BMI, defined as the BMI that optimizes life satisfaction, which was not done by Kuroki and analyzed in a limited manner by Asgeirsdottir et al., (2020), due to a small overall sample size, and with only under 1% of their sample being with underweight. We furthermore estimate the CIV for the continuous measure of BMI for the first time. Second, and maybe more interestingly, the study sheds light on the interplay between own and spouse's BMI and the corresponding CIVs, which to our knowledge has not been done before. This spousal analysis underscores the gender differences in own and spousal CIV for BMI changes. We calculate CIVs for the individual's own and spouse's optimal BMI directly from the data and assess the concordance in couple's BMI preferences. Meylera, Stimpson and Peek (2007) performed a systematic review of 103 studies of health-concordance in mental health, physical health, and health behavior among couples. The review suggests evidence for concordant mental and physical health, as well as health behaviors among couples. Studies have furthermore found BMI to be highly correlated between spouses (Jeffery and Rick, 2002, The & Gordon-Larsen, 2009). Clark and Etilé (2011) found that the negative well-being effect of own BMI is lower when the individual's partner is heavier, which is consistent with social contagion effects in weight. This paper extends the analysis made by Clark and Etilé (2011) by producing CIV estimates and by including a separate underweight category for BMI. Furthermore, this paper calculates values for optimal own BMI conditional on spouse's BMI and optimal spouse's BMI conditional on own BMI.

A benefit of the CIV method is that it can be applied to existing data, contrary to most valuation methods. Individual responses to questions about life-satisfaction, as well as BMI and income, are used for the direct estimation of a life-satisfaction equation. The estimation results are then used to calculate the income-BMI trade-off that keeps life satisfaction constant. The CIV thus represents the monetary compensation needed by an individual with a *sub-optimal* BMI to have the same level of well-being as with optimal BMI, *ceteris paribus*. Our definition of sub-optimal is any deviation from optimal BMI, where optimal BMI is defined as the BMI that maximizes life satisfaction.

We choose Switzerland for the context of our study due to the availability of exceptional data. The Swiss Household Panel is a rich dataset, which includes 21 waves and is well suited for estimation of CIVs. Calculating CIVs for sub-optimal BMI using data from Switzerland adds to the existing CIV literature, as well as the literature on sub-optimal BMI that has been analyzed in different contexts. However, it should be kept in mind that results could be context specific, especially as Switzerland has a relatively low rate of obesity (OECD, 2017). It is therefore possible that there is a greater penalty in Switzerland for being above optimal BMI than in other countries.

The results suggest that both women and men would be willing to pay an increasing amount to reach the optimal BMI the further away from the optimal BMI they become, both when below and above the optimal BMI. Similarly, there is a positive value for changing the BMI of a spouse whose BMI is sub-optimal, which is conditional on one's own BMI. This spousal analysis highlights the gender differences in own and spousal CIV for BMI changes and shows how limited the individual analyses can be. Importantly, women's values are on average about four times as high for reductions in their own BMI compared to reduction in their spouse's BMI. Values for men, on the other hand, are almost twice as high for a reduction in their spouse's BMI towards the optimal level compared to a reduction in their own BMI when above their optimal BMI.

The main implications for policy are the systematic gender differences in weight preferences, with females being more sensitive to being over their optimal BMI than under, while men would be willing to forego considerable consumption possibilities to not be with underweight. Our results suggest that health promotion policies aimed at obesity prevention may be more effective if they are tailored to gender and designed with an understanding of gender difference in issues relating to causes and consequences of body weight.

The paper is organized as follows. The next section presents the data and variables, and the third section discusses the methodological approach. The results are presented in Section 4 and discussed in Section 5. The final section includes our conclusions.

2 Data and variables

2.1 Data

The Swiss Household Panel (SHP) data is a nationally representative annual survey conducted since 1999 with information on living conditions in Switzerland. All individuals aged 14 or older who live in the household are eligible to answer the individual questionnaire. We use waves 6 (2004) to 21 (2019) because they include the variables needed to calculate CIV for sub-optimal BMI. The original sample of the sixteen waves consisted of 124,700 observations on 19,031 individuals. Our final sample, after dropping observations with missing values, consisted of 112,710 observations on 18,012 individuals. The size of the sample is lower in the spousal analysis, or 49,784 observations on 8,099 individuals, because it includes only those who have spouses.

2.2 Variables

Well-being is measured with a question about satisfaction with life in general. The question is on an 11-point scale and the respondents are asked the following question: In general, how satisfied are you with your life if 0 means "not at all satisfied" and 10 means "completely satisfied"? As expected, the distribution of life satisfaction over the sample is highly skewed with an average of 8.0 and the interquartile range (IQR) is 2. Despite some criticism, measures of subjective well-being such as questions on life satisfaction have been widely used in social sciences and psychology, as well as in some economic studies. For a reference to discussion on the vast testing of the robustness of these subjective measures, we refer the reader to Clark, Frijters, and Shields (2006). To ease interpretation of the estimated coefficients and comparisons to previous results in the literature, the life satisfaction variable is standardized to having a mean of zero and a standard deviation of one.

BMI is calculated using respondents self-reported height and weight and is the ratio of weight, in kilograms, over height, in meters, squared. For the most part BMI is used in continuous form, although for certain purposes it is categorized into the traditional four categories using criteria from the WHO. Individuals are defined to have underweight if their BMI is under 18.5, normal weight if their BMI is between 18.5 and 25, overweight if their BMI is over 25 and up to 30, and obesity if their BMI exceeds 30 (World Health Organization, 2021). As the survey is a household survey, the spouses BMI is also available based on self-reported weight and height.

Income is yearly household income equivalized according to a modified OECD scale (Voorpostel et al., 2020). We use the log of income in our estimations to account for diminishing marginal utility of income (Layard, Nickell, & Mayraz, 2008). To prevent inflation from affecting the results, the income variable was CPI-adjusted to the 2019 price level (Federal Statistical Office of Switzerland, 2021), and we convert the results to US dollars to facilitate comparison with other studies, using the average exchange rate from 2019 of one CHF equaling 0.9937 US dollar (Board of Governors of the Federal Reserve System U.S., 2021).

Other control variables are years of education based on the International Standard Classification of Education (ISCED classification scheme), age, marital status, labor-force status, wave dummy, degree of urbanization, and number of children. We include age in 5-year brackets, as previous research suggests that it is important to include age in the model in a flexible form (Blanchflower & Oswald, 2008). Table 1 shows means, and standard deviations of continuous variables and percentage distributions of dummy variables used in the study.

Table 1 Summary statistics

Variable	Women		Men	
	Mean	SD	Mean	SD
Life satisfaction (unstandardized)	8.04	1.4	8.03	1.4
Yearly income in CHF	72,168[a]	59,162	80,573[a]	55,560
BMI categories %				
Underweight	5.2		0.9	
Normal weight	62.9		50.0	
Overweight	22.8		38.8	
Obese	9.1		10.3	
BMI	23.8	4.3	25.5	3.8
BMI of spouse	25.8	3.7	23.9	4.2
Age	50.6	17.5	49.7	17.6
Marital status %				
Single, never married (base)	24.5		28.0	
Married	54.5		60.4	
Separated	1.5		1.5	
Divorced	11.1		7.5	
Widower/widow	8.2		2.4	
Registered partnership	0.2		0.2	
Urbanization %				
Highly and moderately urbanized centers (base)	59.7		58.2	
Small, urbanized centers	9.4		9.9	
Communes of urbanized Centers	11.9		12.3	
Communes of small urbanized centers	10.2		10.6	
Communes remote from urbanized centers	8.9		9.0	
Number of children	0.5	0.9	0.5	0.9
Labor-market status%				
Employed (base)	64.2		73.7	
Unemployed	1.6		1.5	
Not in labor force	34.2		24.8	
Education in years	13.1	3.0	14.2	3.2

Source: Swiss Household Panel (SHP)

[a]Equivalent to $71,713 for women and $80,065 for men at the average 2019 exchange rates

Further descriptions of all variables are listed in Table 6 in the Appendix

3 Methods

We follow Groot and van den Brink (2004), Asgeirsdottir et al., (2017 & 2020), and Olafsdottir et al., (2020) and define an indirect well-being function W which is determined by household income Y, BMI status B, and other individual characteristics X as

$$W = W(Y, B, X). \tag{1}$$

Comparison of well-being with a sub-optimal BMI status B to that of optimal BMI status B^* can be expressed as follows:

$$\Delta W = W(Y, B|X) - W(Y, B^*|X). \tag{2}$$

The CIV is the additional amount of income that leaves the individual with the same level of well-being with the sub-optimal BMI status as without it so that:

$$W(Y + CIV|B, X) = W(Y|B^*, X). \tag{3}$$

Three different empirical estimations of Eq. (1) are considered. The first model represents B as dummy variables indicating a person's BMI category, i.e., whether a person has underweight, normal weight, overweight or obesity. The model is empirically estimated using the following equation:

$$W_{it} = \beta_0 + \beta_1 logY_{it} + \sum_{j=1}^{3} \beta_{2,j} B_{it,j} + \sum_{k=1}^{q} \alpha_k X_{k,it} + \varepsilon_{it} \tag{4}$$

where W_{it} is life satisfaction of individual i at time t, and the α's and β's are coefficients measuring the relationship between the independent variables and life satisfaction. ε is the error term, and $X_{k,it}$ represents other individual characteristics. The benchmark BMI category in this model is normal weight. We can then use point estimates from Eq. (4) to calculate the CIV from Eq. (3) as follows:

$$CIV_j = \overline{Y}\left(exp\left(-\frac{\beta_{2,j}}{\beta_1}\right) - 1\right) \tag{5}$$

where $\overline{Y}$ is mean income and $\beta_{2,j}$ represents the coefficient of sub-optimal BMI category j.

Using BMI categories has two notable disadvantages. First, the categorization of this continuous variable inevitably discards some within-category information. Second, this categorization is based on the medical literature and does not have to be in accordance with people's preferred weight. In the second model, the B in Eq. (1) is modeled as the continuous form of BMI and includes a square term of BMI as well. The motivation for including the square term in BMI comes from the hump-shape shown in Figure A1, where life satisfaction increases up to a peak level and then decreases again with increasing BMI after accounting for outliers. The following model is empirically estimated:

$$W_{it} = \beta_0 + \beta_1 logY_{it} + \beta_2 B_{it} + \beta_3 B_{it}^2 + \sum_{k=1}^{q} \alpha_k X_{k,it} + \varepsilon_{it} \tag{6}$$

where W_{it}, the α's, β's, and the $X_{k,it}$ are the same as in Eq. (4). In this model, BMI is related to life satisfaction in a parabolic way, and the vertex of the parabola represents a well-being optimizing BMI, provided that $\beta_2 > 0$ and $\beta_3 < 0$. The optimal BMI is then found using the standard formula for the vertex of a parabola:

$$B^* = -\frac{\beta_2}{2\beta_3}. \tag{7}$$

Employing the point estimates from Eq. (6), one can calculate the CIV for moving to the optimal BMI from Eq. (3) as follows:

$$CIV = \overline{Y}\left(exp\left(-\frac{\beta_2(B - B^*) + \beta_3(B^2 - B^{*2})}{\beta_1}\right) - 1\right) \tag{8}$$

where $\overline{Y}$ is average income and B^* is found from Eq. (7). Note that the CIV is now a function of B so that for each value of B we get a specific CIV value.

In the third approach, we follow Clark & Etilé (2011) and define a model in terms of both individual's and spouse's BMI together with the square of both BMI levels and their interaction. The questions are then what BMI level for the spouse would maximize the individual's life satisfaction, given the BMI of the individual, and what the optimal BMI for the individual would be, given the BMI of the spouse. Representing the BMI of the individual as B_i and the BMI of the spouse as B_s, the third model is empirically estimated using the following equation:

$$\begin{gathered} W_{it} = \beta_0 + \beta_1 logY_{it} + \beta_2 B_{it} + \beta_3 B_{it}^2 + \beta_4 B_{st} + \\ \beta_5 B_{st}^2 + \beta_6 B_{it} B_{st} + \sum_{k=1}^{q} \alpha_k X_{k,it} + \varepsilon_{it} \end{gathered} \tag{9}$$

where W_{it}, the α's, β's, and the $X_{k,it}$ have the same meaning as in Eq. (4). Both individual BMI and spouse's BMI have a squared term in the model, and the model also includes their interaction. Fixing all variables except B_i in Eq. (9), there is an optimal BMI for the individual that maximizes life satisfaction. As for Eq. (7), the optimal BMI is found using the standard formula for the vertex of a parabola:

$$B_i^* = -\frac{\beta_2 + \beta_6 B_s}{2\beta_3}, \tag{10}$$

provided that $\beta_2 + \beta_6 B_s > 0$ and $\beta_3 < 0$. The optimal BMI for the individual depends on the BMI of the spouse. If $\beta_6 > 0$ the optimal BMI for the individual increases with increasing BMI of the spouse. Employing the point estimates from Eq. (9), one can calculate the CIV for the individuals own BMI changing to its optimal, given the BMI of the spouse as follows:

$$CIV = \overline{Y}\left(exp\left(-\frac{(\beta_2 + \beta_6 B_s)\left(B_i - B_i^*\right) + \beta_3\left(B_i^2 - B_i^{*2}\right)}{\beta_1}\right) - 1\right) \tag{11}$$

where $\overline{Y}$ is average income and B_i^* is found from Eq. (10). Note that the CIV is now a function of both B_i and B_s so that for each pair of values B_i and B_s we get a CIV value. Similarly, holding all variables except B_s in Eq. (9) constant, there is an optimal BMI for the spouse in the sense that the life satisfaction of the individual is maximized. The optimal BMI for the spouse is then

$$B_s^* = -\frac{\beta_4 + \beta_6 B_i}{2\beta_5}, \tag{12}$$

provided that $\beta_4 + \beta_6 B_i > 0$ and $\beta_5 < 0$. Note that the optimal BMI for the spouse depends on the BMI of the individual, allowing for exploration of potential social interaction in BMI between spouses (Clark & Etilé, 2011). If $\beta_6 > 0$ the optimal BMI for the spouse increases with increasing BMI of the individual. Employing the point estimates from Eq. (9), one can calculate the CIV for changing the spouse's BMI to its optimal from Eq. (3) as follows:

$$CIV = \overline{Y}\left(exp\left(-\frac{(\beta_4 + \beta_6 B_i)\left(B_s - B_s^*\right) + \beta_5\left(B_s^2 - B_s^{*2}\right)}{\beta_1}\right) - 1\right) \tag{13}$$

Several endogeneity biases in the body-weight coefficients can be hypothesized. However, neither the direction of the body-weight bias nor its magnitude is as established in the literature as the well-known income-endogeneity bias. In an earlier version (Clark & Etilé, 2010) of their paper, Clark and Etilé (2011) applied past changes in BMI as an instrument on the BMI variable. Their results were inconclusive, and they observed that finding a good instrument for BMI is very challenging (Clark & Etilé, 2011). Katsaiti (2012) tried to account for the endogeneity of BMI by using height as an instrument. That instrument is, however, unlikely to fulfill the exclusion restriction since height has been shown to have a significant effect on well-being (Deaton & Arora, 2009). Kuroki (2016) and Asgeirsdottir et al., (2020), the only two papers in the literature to calculate the CIV of BMI, were also unable to account for endogeneity due to similar data limitations. Asgeirsdottir et al., (2020) however, point out that although the endogeneity of body weight in subjective well-being regressions could hypothetically cause biases either way, some clues can be found in studies using polygenic risk scores as instruments for BMI when regressed on depression (Huang et al., 2014; Jokela et al., 2012; Lawlor et al., 2011; Tyrell et al., 2019; Walter et al., 2015; Willage, 2018). In all six studies the non-instrumented results showed a positive relationship between BMI and depression, while the BMI coefficient either increased with instrumentation or decreased. This suggests therefore that it is difficult to assess the direction of any endogeneity bias in the BMI coefficient, if such a bias exists. However, the mixed results on the direction of the bias in depression equations indicate that an extreme bias is unlikely to affect our results.

We employ the Oster's method (Oster, 2019) to estimate the degree of omitted variable bias in the effect of BMI on life satisfaction under the assumption that the selection on the observed controls is proportional to the selection on the unobserved controls. The Oster method assumes that if a coefficient is stable after the inclusion of the observed controls, considering R^2 or the proportion of the variance explained by the inclusion of the controls, then the omitted variable bias must be limited. Oster applies further assumptions on the relationship between observable and unobservable variables and derives bounds on the unbiased OLS coefficients. We apply the method on model 1 and compare an uncontrolled regression, only including the key variable of interest, with the controlled regression where the key variable of interest is included together with all other relevant observable control variates. The method requires parameters that are set following Oster's suggestions (e.g., $R_{max} = 1.3\tilde{R}$ where $\tilde{R}$ is the R^2 of the controlled regression). Table 2 reports the bounds of the BMI effects on life satisfaction estimated using the Stata package psacalc (Oster, 2013).

Table 2 The estimated omitted variable bias of BMI on life satisfaction

	OLS					
	Women			Men		
	Uncontrolled	Controlled	Treatment estimate	Uncontrolled	Controlled	Treatment estimate
Underweight	−0.0931**	−0.1097***	−0.1149	−0.3019***	−0.2824**	−0.2764
Overweight	−0.0312	−0.0640***	−0.0751	0.0309*	0.0019	−0.0086
Obese	−0.2103***	−0.2019***	−0.1990	−0.0665**	−0.0460*	−0.0388

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using OLS. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status and year dummies. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. Men (OLS): $N = 51{,}561$. Women (OLS): $N = 61{,}011$

The first column contains the baseline uncontrolled effect, the second column contains the controlled effect, taking into consideration the observable controls, and the third column shows the estimated unbiased treatment effect. If the range between the controlled effect and estimated unbiased treatment effect does not include zero, i.e., the sign of the two estimates is the same, omitted variable bias is considered to be of little concern. The findings in Table 2 suggest that the bias adjusted BMI effects on life satisfaction have the same sign as the estimated controlled effects, and that these effects are close in magnitude. Thus, the omitted variable bias is of limited concern in the effect of BMI on life satisfaction expect perhaps for men with overweight, but the controlled estimate is insignificant in this case.

We also explored the impact of lagging both income and BMI in model 1. Results from those estimations are reported in Table 7 in the Appendix and indicate that the results are robust to this change, with similar implications and comparable CIV's as in the original model without lagging. We did not lag the spousal model since lagging significantly reduces the sample size as each individual and their spouse needs to participate in the survey in consecutive years.

Evidence suggests that endogeneity likely causes the effect of income on life satisfaction to be significantly understated without instrumentation and the derived CIVs might consequently be biased upwards (Groot & Massen van den Brink 2004, 2006; Powdthavee, 2010, Powdthavee & van den Berg, 2011). For completeness, we followed Howley (2017) and Ólafsdóttir et al., (2020) and estimated two-stage least squares (IV-2SLS) models, with mother's education as an instrument to account for the potential endogeneity in income. The availability in the dataset of suitable instruments for income is limited and the chosen instrument may not act on life satisfaction only through income. Comparing the income coefficients from the IV-2SLS and OLS models (see IV-2SLS results in the Appendix Tables 8–10), shows an increase by approximately two to threefold with instrumentation, which is in line with previous results (Howley, 2017; Ólafsdóttir et al., 2020; Powdthavee, 2010). Table 11 contains the comparison of IV-2SLS, OLS and adjustments according to Lindqvist et al., (2020) who used lottery winnings in Sweden to estimate the treatment effect of one unit of log household income on standardized life-satisfaction, which is only about 30% higher than our OLS coefficient.

Due to the nature of the data, we explored panel regressions. However, the main variation in BMI is between individuals (see Table 12). Approximately 75% of participants were always in the same BMI category throughout the survey and 25% even had the exact same BMI every year they participated. Although panel regression methods did not produce robust results they are reported in the Appendix for completeness (see Table 13).

4 Results

Table 3 shows point estimates for the key variables of interest, BMI categories, and household income, along with the corresponding CIVs. Point estimates are statistically significant except for the overweight coefficient for men. The results for women suggest that higher income is associated with greater life satisfaction and that sub-optimal BMI categories affect life satisfaction in a negative way. The CIVs for women with underweight is higher than for women with overweight but the highest CIV is for women with obesity.

Gender differences in CIVs are substantial. For men, being with underweight produces the highest CIV, but the CIV for men affected by obesity is much lower, and the point estimate for the overweight category is statistically insignificant, suggesting that there is no gain or loss relative to the normal weight category.

Table 3 OLS point estimates for BMI categories and income, as well as corresponding CIV's

	OLS	
	Women	Men
Underweight	−0.1097***	−0.2824**
	(0.0391)	(0.1109)
Overweight	−0.0640***	0.0019
	(0.0190)	(0.0177)
Obese	−0.2019***	−0.0460
	(0.0318)	(0.0305)
Log(income)	0.2893***	0.2816***
	(0.0174)	(0.0201)
CIV Underweight	33,049***	138,160***
	(6791)	(34,526)
CIV Overweight	17,748***	−546
	(3138)	(2561)
CIV Obese	72,399***	14,216***
	(7910)	(4898)

Source: Swiss Household Panel (SHP)

Estimates are basdepression and anxietyed on life-satisfaction equations using OLS. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status and year dummies. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. Men (OLS): $N = 51{,}561$. Women (OLS): $N = 61{,}011$. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted. Standard errors (in parentheses) are clustered on individuals

Table 4 includes point estimates for the continuous form of BMI, BMI squared, and household income, along with the corresponding CIVs. All point estimates are highly significant both for men and women.

Optimal BMI for women is 20.1 and 27.1 for men. This means that the optimal level for women is within the normal weight category but for men it is optimal to be with a slight overweight. Table 4 and Fig. 1 show CIVs for selected BMI levels for men and women, showing that both women and men have higher CIVs the further away from the optimal BMI they are, both when below and above the optimal BMI.

As seen in Table 4, men have a higher CIV than women when they are with underweight, but women have higher CIVs than men when they are with overweight or obesity. It can also be seen from Table 4 that men whose BMI is 15 have a CIV value of $95,615 per year to achieve the well-being associated optimal BMI or 120% of their average yearly income, but on the other hand women's CIV in the same situation is only $7069 or 10% of their average annual income. Table 4 shows that women with a BMI of 35 have a higher CIV than women with BMI 15 to reach optimal BMI, with values of $88,709 (around 125% of their average annual salary)

Table 4 OLS point estimates for BMI and income, as well as optimal BMI and corresponding CIVs for selected BMI levels

	OLS	
	Women	Men
BMI	0.0422**	0.0817***
	(0.0173)	(0.0239)
BMI squared	−0.0011***	−0.0015***
	(0.0003)	(0.0004)
Log(income)	0.2898***	0.2791***
	(0.0174)	(0.0201)
Optimal BMI value	20.1	27.1
CIB BMI = 15	7069*	95,615***
	(3755)	(20,296)
CIB BMI = 20	2	24,713***
	(48)	(4902)
CIB BMI = 25	6536***	1843**
	(1924)	(765)
CIB BMI = 30	30,623***	3859***
	(3828)	(1162)
CIB BMI = 35	88,709***	32,644***
	(9849)	(6201)

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using OLS. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status, and year dummies. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.Men (OLS): $N = 51{,}574$. Women (OLS): $N = 61{,}011$. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted. Standard errors (in parentheses) are clustered on individuals

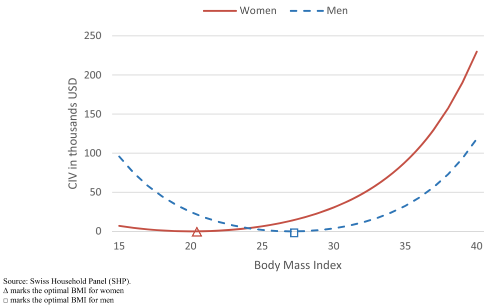


Fig. 1 CIV for different BMI levels

and $7069, respectively. Men with BMI of 35 would have a CIV value of $32,644 to reach the optimal BMI of 27.1 (around 41% of average yearly salary). Appendix Table 14 contains the CIV for 1-10 BMI units away from the optimal BMI and CIV per unit BMI.

Table 5 includes point estimates for individual's own BMI and spouse's BMI, as well as the squared BMI levels and their interactions, for both men and women.

Table 5 and Fig. 2 furthermore include individual's own optimal BMI and CIV given the spouse's BMI, and then spouse's optimal BMI and CIV given the individual's own BMI (Table 15 in the Appendix shows standard errors in CIVs).

For example, Table 5, section A for women shows that when the spouse's BMI is fixed at 22 or 28 the corresponding optimal own BMI levels are 20.7 and 22.8. If a woman's BMI is for example 15 and her spouse has a BMI of 28, then she has a CIV of $34,199 to reach the optimal BMI of 22.8. However, she has a CIV of $116,197 to reach the optimal BMI of 22.8 if her actual BMI is 35 and her spouse has a BMI of 28. The results for section A can also be seen in the upper half Fig. 2.

Table 5, section B for men shows that when their own BMI is fixed at 28 or 35, the corresponding spouse's optimal BMI levels are 28.5 and 38.1. If a man's own BMI is for example at 28 and his spouse has a BMI of 15, the man has a CIV of $79,612 for his spouse to achieve the optimal BMI of 28.5. However, the same man has a CIV of $14,052 for his spouse to achieve the optimal BMI of 28.5 if his spouse has an actual BMI of 35. The results for section B can also be seen in the lower half of Fig. 2.

Comparing sections, A and B for women in Table 5 shows that women are generally affected more severely by their own BMI being above their optimal level than by their spouses BMI being above the optimal as indicated by the shaded area in Table 5. The CIV values for men, on the other hand, show them to be affected by their spouse's BMI being above the optimal point for a spouse. In other words, they are more concerned (from the perspective of negative impact on their own life satisfaction) about reducing their spouse's BMI towards the optimal than reducing their own BMI to the optimal level. The opposite is true when men are below their optimal BMI as underlined by the symmetry in the shaded areas in Table 5.

Table 16 contains the findings of categorical spouse analysis for robustness and Table 17 contains the CIV for 1-10 BMI units away from own optimal BMI and spouse optimal BMI and CIV per unit BMI.

Table 5 OLS point estimates for own BMI, spouse's BMI, BMI interaction and income, as well as optimal own and spouse's BMI and corresponding CIVs

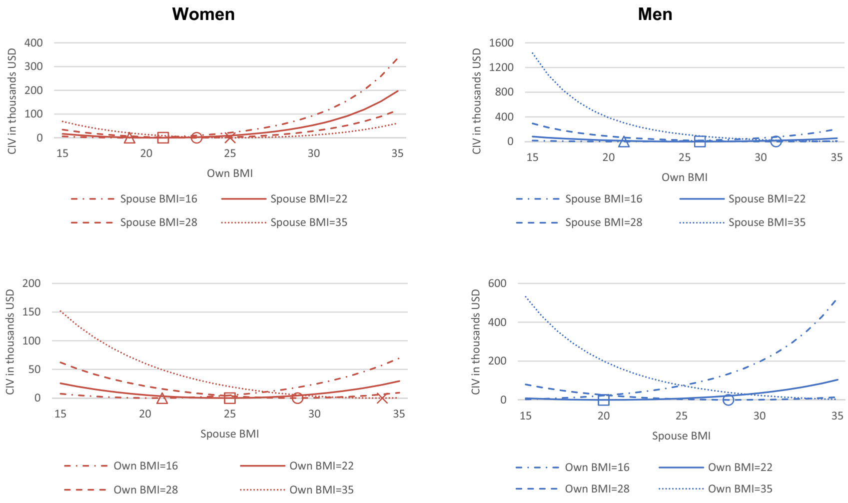
	OLS							
	Women				Men			
BMI	0.0367 **				0.0159			
	(0.0158)				(0.0154)			
BMI squared	-0.0014 ***				-0.0012 ***			
	(0.0003)				(0.0003)			
BMI spouse	0.0135				-0.0158			
	(0.0167)				(0.0130)			
BMI spouse squared	-0.0007 **				-0.0008 ***			
	(0.0003)				(0.0002)			
Interaction	0.0010 **				0.0022***			
	(0.0004)				(0.0004)			
Log(income)	0.2189 ***				0.2054***			
	(0.0143)				(0.0144)			
Section A BMI spouse	16	22	28	35	16	22	28	35
Optimal own BMI	18.6	20.7	22.8	25.2	20.5	25.8	31.0	37.2
CIV: Own BMI = 15	6,227	16,615	34,199	68,856	15,919	80,109	292,139	1,432,587
CIV: Own BMI = 20	920	217	3,655	13,756	125	17,651	85,743	386,874
CIV: Own BMI = 25	21,724	9,146	2,322	22	10,239	289	19,498	114,223
CIV: Own BMI = 30	94,210	53,760	28,677	11,397	57,010	9,001	520	28,903
CIV: Own BMI = 35	335,009	197,053	116,197	61,206	200,398	53,005	7,853	2,314
Section B Own BMI	16	22	28	35	16	22	28	35
Optimal spouse BMI	20.6	24.7	28.9	33.7	11.9	20.2	28.5	38.1
CIV: Spouse BMI = 15	7,586	25,714	62,151	151,661	2,917	8,681	79,612	531,431
CIV: Spouse BMI = 20	73	5,358	20,822	60,218	22,475	13	25,145	199,127
CIV: Spouse BMI = 25	4,748	20	3,548	19,968	73,160	7,313	3,765	74,084
CIV: Spouse BMI = 30	24,107	6,842	307	3,249	196,816	35,232	709	22,857
CIV: Spouse BMI = 35	69,573	29,502	9,376	401	524,979	103,913	14,052	3,035

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using OLS. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status, and year dummies. $***p<0.01$, $**p<0.05$, $*p<0.10$ Men: $N=24{,}900$. Women: $N=24{,}884$. The shaded numbers indicate the higher CIV of the two values, CIV for own or spouse's BMI for men and women separately. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted. Standard errors (in parentheses) are clustered on individuals

5 Discussion

We find that the life satisfaction of people who are with underweight or obesity is lower than for people with normal weight. Women have a higher value for not being in the obese category than men, while men have a stronger preference than women to avoid being with underweight. This is in line with the findings of a Swiss Health Survey (Forrester-Knauss & Zemp Stutz, 2012) which reported that men with underweight were two times more likely to be dissatisfied with their weight compared to women with underweight. They also found that while more men than women were with overweight or obesity, more women reported weight dissatisfaction. When accounting for spouse's BMI, men are more sensitive to their spouse's BMI being above its optimal than to their own BMI. Women on the other hand have a higher WTP for reduction in



Source: Swiss Household Panel (SHP).
Δ marks the optimal own BMI when spouse's BMI 16
□ marks the optimal own BMI when spouse's BMI is 22
○ marks the optimal own BMI when spouse's BMI is 28
X marks the optimal own BMI when spouse's BMI is 35

Fig. 2 CIV for different own and spouse BMI levels

their own BMI than their spouse's BMI. This could be a manifestation of pressure on women, both from themselves and their husbands, to be in the normal weight category. Swiss women have the lowest average BMI (23.7) in Europe, while men's average BMI (26.7) lies close to the average BMI for European men (WHO, 2021), suggesting that the norm in Switzerland is for women being within the normal weight category while it is more acceptable for men to be above. BMI has been shown to be related to the number of work hours through marriage and labor market mechanisms (Cawley, 2015, Grossbard & Mukhopadhyay, 2017). Some studies have shown that hours of work are positively associated with body weight for women, i.e., that high-BMI women work more hours (Cawley, 2015, Caliendo, & Gehrsitz, 2016, Grossbard & Mukhopadhyay, 2017). In the light of traditional gender values, married women have shown to be more likely than married men to receive in-marriage income transfers as women are rewarded for thinness while higher body weight reduces their bargaining power in marriage, leading to lower access to their spouse's income (Oreffice & Quintana-Domeque, 2012). However, BMI has been shown to be unrelated to work hours for married men (Caliendo, & Gehrsitz, 2016, Grossbard & Mukhopadhyay, 2017). These findings are consistent with traditional gender roles, and although we find evidence of positive sorting in spouses' BMI, both men and women place greater value on women not being above their optimal BMI and men not under their optimal BMI. In terms of gender equality, Switzerland still lags behind many European countries (Boeglin, 2021). While the gap between women and men in labor force participation has narrowed in recent years, traditional values are still somewhat ingrained in the Swiss culture (Boeglin, 2021, Lalive, & Lehmann, 2020). Our results, coupled with the traditional gender values in Switzerland, are thus in tune with the results described above on the impact of gender differences in BMI on the marriage and labor markets. Furthermore, our results underline the traditional gender roles in household decisions where the man has the status of the strong breadwinner and the status on the woman focuses more on physical appearance as both spouses are willing to use significant resources to avoid BMI above the optimal for women and below optimal for men.

Kuroki (2016) calculated the CIV for being with overweight and obesity using separate OLS models. According to our results, including individuals with underweight is crucial to get the full picture of BMI preferences, especially in the case of males. Using the point estimates in Kuroki (2016), the CIV for women with overweight was $39,434 and $54,401 for women with obesity compared to our finding of $17,748 (overweight) and $72,399 (obese) (see Table 3). Similarly, Kuroki (2016) estimates the CIV for men with overweight to be $13,730 and men with obesity to be $37,128 while our findings suggest that men do not require a CIV for being with overweight, and our CIV for men with obesity is $14,216. The findings of Asgeirsdottir et al., (2020) are in accordance with our results, showing males not to be affected (from a life satisfaction perspective) from being with overweight, whilst they are affected if they are living with obesity. In addition to including the underweight category in the analyses, this study extends the work of Kuroki (2016) and Asgeirsdóttir et al., (2020) exploring both the individual's own and spouse's optimal BMI taking into consideration their interactions.

Clark and Etilé (2011) explored the association of sub-optimal BMI levels and life satisfaction controlling for spouse's BMI but did not produce CIV estimates. In their semi-parametric approach, they find that the optimal BMI for women is in the range of 22–23, and 24–25 for men (both unconditional on spouse's BMI). Our unconditional optimal BMI for women is 20.1 and 27.1 for men as seen in Table 4.

Clark and Etilé (2011) also explored the impact of own and spousal BMI levels on life satisfaction. They estimated categorical models considering all combinations of BMI categories between husbands and wives where the reference category was neither the husband or wife being with overweight or obesity. While our model is continuous, we can align the results from Clark and Etile in a comparable way by looking at the effect on life satisfaction in various complimentary situations where one person has a different BMI category than his or her spouse (see Table 18). The table shows that in 2 out of 3 situations, the impact on men's life satisfaction is higher when their wives have a higher BMI compared to the situation when they have a higher BMI themselves. In other words, women are more concerned about reducing their own BMI than their husbands. This trend is the same as we observed in our results. Our findings also show that optimal BMI increases with spouse's BMI.

Clark and Etilé (2010) remarked that BMI instrumentation is remarkably difficult to carry out in this context. This paper does not include an instrumental variable for BMI and conclusions on causality can thus not be made although our estimated omitted variable bias of BMI on life satisfaction is not a concern. Instrumentation might impact the results in a similar manner as in Clark and Etilé (2011), and this could be explored further in future studies. Although depression and life satisfaction are clearly measuring different aspects of an individual's well-being, it is reassuring that instrumentation of BMI in depression regressions does not consistently create biases in one direction rather than the other (Huang et al., 2014; Jokela et al., 2012; Lawlor et al., 2011;

Sabia & Rees, 2015; Tyrell et al., 2019; Walter et al., 2015; Willage, 2018). However, the literature on the causal effect of body weight on well-being measures is not large and a future improvement of our study with an inclusion of an instrument for body weight would be of value given availability of data.

When comparing results from different studies on valuation of relief from sub-optimal health conditions, a few things should be kept in mind. The specific type of model used has a significant impact on the CIV estimates. Other factors include size of the data sets and the number of waves collected, as well as the inclusion or exclusion of specific control variables.

Our research has some limitations. The results are based on self-reported key variables such as life satisfaction, income, height, and weight which may be biased. The SHP dataset does not include any objective measurements for height and weight so for the BMI calculations we rely on self-reported height and weight. The use of BMI, based on self-reported weight and height, may result in biases (Rothman, 2008, Cawley, 2015). Individuals tend to underreport their weight and heavier individuals underreport to a greater extent. In addition to this bias, BMI may not reflect changes in body fat and muscle mass (Rothman, 2008, Cawley, 2015). This bias may underestimate the number of individuals affected by overweight or obesity in our study. Physical activity could be used as a proxy indicator for muscle mass (An et al., 2020), and Table 19 reports the results when the physical activity variable is added to Model 1, and the conclusions remain largely the same. We assume that individuals of the same gender generally have the same optimal BMI, apart from the dependence on spousal BMI which is a special focus of this paper. However, other characteristics such as education and work status might be related to optimal BMI as well. For simplicity, we assume that the utility function does not, e.g., involve interaction between income and BMI although Finkelstein, Luttmer and Notowidigdo (2013) found evidence that the marginal utility of income declines as health deteriorates, which would cause heterogeneity in CIV across health-income combinations. Similarly, Sato (2021) report an increase in BMI for both men and women after marriage, which would make future studies including heterogeneous results by marriage duration interesting. Just as we examine own-spousal combinations, other such state dependencies would be worth further exploration in future research. Future studies could also explore other intra-household relationships in this context, such as between parents and children. However, a strength of this study is the rich dataset, which made for opportunities to estimate different models, as well as to explore both the individual's own and spouse's optimal BMI accounting for their interactions.

6 Conclusion

In conclusion, we add to the expanding literature applying the CIV method and shed light on aspects of the method, opportunities, and challenges. The main contributions are fourfold. First, we estimate CIV´s for all BMI categories, not only the overweight and obese categories as in Kuroki (2016) or Asgeirsdottir et al., (2020) who only do so in underpowered estimations. This has proved important to shed light on gender differences and is especially important for males. Second, the study estimates the

CIV for the continuous form of own BMI, allowing for optimal BMI to differ from the health-maximizing BMI on which WHO results are based. Third, the study calculates the CIV for BMI conditional on spouse's BMI, which to our knowledge has not been done before, and highlights important gender differences and relative effects based on spousal BMI. Fourth, the study makes several methodological improvements to the previously published results.

The main implications for policy are the systematic gender differences in weight preferences. Health promotion policies aimed at obesity prevention may be more effective if they are tailored to gender and designed with an understanding of gender difference in issues relating to causes and consequences of body weight (Östlin et al., 2006, Kanter & Caballero, 2012). Policies that take the difference in gender roles into account are more likely to be successful compared to policies that do not (Östlin et al., 2006, Kanter & Caballero, 2012). Our results suggest material gender differences where females are more sensitive to being over their optimal BMI than under, while men would be willing to forego considerable consumption possibilities to avoid being with underweight. Traditional gender roles are still prevalent in Switzerland where men are often assigned the gender role of a 'breadwinner' that can lead to increased pressure and stress. Some men may try to cope with stresses through unhealthy behaviors that may cause weight gain. Swiss women, in general, pay more attention to their diet but are also more dissatisfied with their weight than men (Turuban, 2021). This can be explained in part by social norms and traditional gender roles that pressures women to be thin. On the one hand, it could protect them from being overweight or obese, but on the other it could have negative impact on wellbeing and, in severe situations, can increase the probability of eating disorders which are a much more prevalent in women (Turuban, 2021). With these gender differences in mind, policies that promote gender equality can add health benefits if implemented thoughtfully.

Acknowledgements We gratefully acknowledge financial support from The Icelandic Research Fund (grant no. 184975-052) and the University of Iceland Research Fund. This study has been realized using the data collected by the Swiss Household Panel (SHP), which is based at the Swiss Center of Expertise in the Social Sciences FORS. The SHP project is supported by the Swiss National Science Foundation.

Author contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by K.B. and T.L.Á. The first draft of the manuscript was written by K.B., and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

7 Appendix

Tables 6–19, Fig. 3

Table 6 Variable descriptions

Variable	Description
Life satisfaction	Life satisfaction is on an 11-point scale and the respondents are asked the following question: In general, how satisfied are you with your life if 0 means "not at all satisfied" and 10 means "completely satisfied"?
Yearly income in CHF	The yearly household income is equivalized according to a modified OECD scale (Voorpostel et al., 2016). We use the log of income in our estimations to account for diminishing marginal utility of income (Layard, Nickell, and Mayraz, 2008).
BMI	BMI is the ratio of self-reported weight, in kilograms, over self-reported height, in meters, squared
BMI of spouse	The BMI of the spouse of the respondent
BMI categories	
Underweight	1 if BMI is less than 18.5, 0 otherwise
Normal	1 if BMI is between 18.5 and 25, 0 otherwise. This is the reference category.
Overweight	1 if BMI is between 25 and 30, 0 otherwise
Obese	1 if BMI exceeds 30, 0 otherwise
Sex	1 if female, 2 if male
Age	Age in the year of interview, included in 5-year brackets. Respondents 18 and over included
Marital status	
Single, never married	1 if the single, never married, 0 otherwise. This is the reference category.
Married	1 if married, 0 otherwise
Separated	1 if separated, 0 otherwise
Divorced	1 if divorced, 0 otherwise
Widower/Widow	1 if widower/widow, 0 otherwise
Registered partnership	1 if in registered partnership, 0 otherwise
Urbanization	
Highly and moderately urbanized centers	1 if respondent lives in a highly or moderately urbanized centers, 0 otherwise. This category includes wealthy and suburban communes. This is the reference category.
Small, urbanized centers	1 if respondent lives in a small, urbanized center, 0 otherwise. This category includes industrial and tertiary sector communes.
Communes of urbanized centers	1 if respondent lives in a commune of urbanized center, 0 otherwise. This category includes peripheral urban communes.
Communes of small urbanized centers	1 if respondent lives in a commune small, urbanized center, 0 otherwise. This category includes tourist communes and rural commuter communes.
Communes remote from urbanized centers	1 if respondent lives in a commune remote from urbanized centers, 0 otherwise. This category includes mixed and peripheral agricultural communes.
Number of children	Number of children born

Table 6 continued

Variable	Description
Labor-market status	
Employed	1 if employed, 0 otherwise. This is the reference category.
Unemployed	1 if unemployed, 0 otherwise
Not in labor force	1 if not in labor force, 0 otherwise
Education in years	Number of years of education based on the International Standard Classification of Education (ISCED classification scheme) and gives the number of years relative to the highest finished type of education),

Table 7 OLS point estimates for lagged BMI categories and income, with corresponding CIV's

	OLS Lagged	
	Women	Men
Underweight	−0.0784*	−0.2863**
	(0.0424)	(0.1356)
Overweight	−0.0736***	−0.0037
	(0.0208)	(0.0191)
Obese	−0.2293***	−0.0458
	(0.0339)	(0.0333)
Log(income)	0.2572***	0.2570***
	(0.0189)	(0.0218)
CIV Underweight	25,566	163,867
CIV Overweight	23,771	1157
CIV Obese	103,189	15,610

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using OLS. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status and year dummies. $***p<0.01$, $**p<0.05$, $*p<0.10$. Men: $N=41{,}358$. Women: $N=49{,}774$

Table 8 Point estimates for BMI categories and income, as well as corresponding CIV's using IV-2SLS

	IV-2SLS	
	Women	Men
Underweight	−0.1015***	−0.3496***
	(0.0229)	(0.0743)
Overweight	−0.0210	0.0013
	(0.0133)	(0.0103)
Obese	−0.1013***	−0.0400**
	(0.0204)	(0.0167)

Table 8 continued

	IV-2SLS	
	Women	Men
Log(income)	0.9287***	0.8921***
	(0.1122)	(0.0983)
CIV Underweight	8315***	38,518***
	(2331)	(11,720)
CIV Overweight	1644	−113
	(1178)	(929)
CIV Obese	8300***	3679**
	(2551)	(1652)

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using IV-2SLS. The reference category for BMI is normal weight. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status, and year dummies. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. Men: $N = 43{,}628$. Women: $N = 53{,}158$

Table 9 Point estimates for BMI and income, optimal BMI and corresponding CIVs for selected BMI levels using IV-2SLS

	IV-2SLS	
	Women	Men
BMI	0.0312***	0.0700***
	(0.0095)	(0.0144)
BMI squared	−0.0007***	−0.0013***
	(0.0002)	(0.0003)
Log(income)	0.9237***	0.9202***
	(0.1126)	(0.0996)
Optimal BMI value	22.7	27.4
CIV BMI = 15	3235*	19,088***
	(1770)	(5989)
CIV BMI = 20	386	6333***
	(449)	(2035)
CIV BMI = 25	290	642*
	(326)	(350)
CIV BMI = 30	2934**	760**
	(1178)	(375)
CIV BMI = 35	8626***	6713***
	(2790)	(2068)

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using IV-2SLS. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status and year dummies. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. Men: $N = 43{,}640$. Women: $N = 53{,}158$

Table 10 Point estimates for own BMI, spouse's BMI, BMI interaction and income, as well as optimal own and spouse's BMI and corresponding CIVs using IV-2SLS

	IV-2SLS							
	Women				Men			
BMI	0.0402 **				0.0094			
	(0.0175)				(0.0169)			
BMI squared	-0.0009 ***				-0.0012 ***			
	(0.0003)				(0.0003)			
BMI spouse	0.0028				-0.0163			
	(0.0191)				(0.0129)			
BMI spouse squared	-0.0002				-0.0008 ***			
	(0.0004)				(0.0002)			
Interaction	0.0002				0.0023 ***			
	(0.0004)				(0.0004)			
Log(income)	0.8593 ***				0.4171 ***			
	(0.1633)				(0.1131)			
Section A BMI spouse	16	22	28	35	16	22	28	35
Optimal own BMI	23.4	24.1	24.7	25.5	19.2	25.0	30.7	37.4
CIV: Own BMI = 15	5,721	6,685	7,733	9,068	4,267	26,626	83,063	259,945
CIV: Own BMI = 20	914	1,300	1,755	2,377	131	5,943	31,439	111,704
CIV: Own BMI = 25	194	67	6	18	8,005	0	7,930	44,783
CIV: Own BMI = 30	3,443	2,781	2,194	1,599	31,618	6,008	122	13,769
CIV: Own BMI = 35	11,206	9,898	8,684	7,383	83,446	26,786	4,321	1,366
Section B Own BMI	16	22	28	35	16	22	28	35
Optimal spouse BMI	15.4	18.5	21.6	25.2	12.2	20.4	28.7	38.3
CIV: Spouse BMI = 15	3	201	716	1,727	1,258	4,907	36,453	157,242
CIV: Spouse BMI = 20	347	37	42	446	10,367	31	13,046	76,390
CIV: Spouse BMI = 25	1,524	695	190	1	31,113	3,413	2,195	33,950
CIV: Spouse BMI = 30	3,575	2,199	1,166	377	71,031	16,127	286	11,783
CIV: Spouse BMI = 35	6,572	4,600	3,004	1,588	146,915	42,475	6,714	1,736

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using IV-2SLS. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status, and year dummies. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. Men (IV-2SLS): $N = 22{,}604$. Women (IV-2SLS): $N = 22{,}929$ The shaded numbers indicate the higher CIV of the two values, own or spouse's. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted. Standard errors (in parentheses) are clustered on individuals

Table 11 Point estimates for BMI categories using different approaches

	IV-2SLS		OLS		Lindquist adjusted	
	Women	Men	Women	Men	Women	Men
Underweight	−0.1015***	−0.3496***	−0.1097***	−0.2824**	−0.1069***	−0.2777**
	(0.0229)	(0.0743)	(0.0391)	(0.1109)	(0.0391)	(0.1100)
Overweight	−0.0210	0.0013	−0.0640***	0.0019	−0.0571***	0.0009
	(0.0133)	(0.0103)	(0.0190)	(0.0177)	(0.0190)	(0.0177)
Obese	−0.1013***	−0.0400**	−0.2019***	−0.0460	−0.1911	−0.0433
	(0.0204)	(0.0167)	(0.0318)	(0.0305)	(0.0317)	(0.0305)
log(income)	0.9287***	0.8921***	0.2893***	0.2816***	0.377	0.377
	(0.1122)	(0.0983)	(0.0174)	(0.0201)		
CIV Underweight	8315	38,518	33,049	138,160	23,512	87,186
CIV Overweight	1644	−113	17,748	−546	11,735	−191
CIV obese	8300	3679	72,399	14,216	47,337	9750

Source: Swiss Household Panel (SHP)

The reference category for weight categories is normal weight. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status, and year dummies. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. Men (IV-2SLS): $N = 43{,}628$. Women (IV-2SLS): $N = 53{,}158$. Men (OLS, Lindqvist): $N = 51{,}561$. Women (OLS, Lindqvist): $N = 61{,}011$. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted. Standard errors (in parentheses) are clustered on individuals

Table 12 Between and within statistics for main variables of interest

Variable		Women		Men	
		Mean	Std Dev	Mean	Std Dev
Life satisfaction	overall	8.04	1.42	8.03	1.36
(unstandardized)	between		1.23		1.20
	within		0.92		0.86
Yearly income in CHF	overall	72,168	59,162	80,573	55,560
	between		41,274		49,923
	within		41,172		30,580
BMI category	overall	0.78	1.08	1.09	1.14
	between		0.99		1.06
	within		0.46		0.48
BMI	overall	23.82	4.31	25.46	3.80
	between		4.17		3.69
	within		1.29		1.30
BMI of spouse	overall	25.80	3.65	23.87	4.19
	between		3.55		4.08
	within		1.28		1.26
Height	overall	165.15	6.21	177.43	6.90
	between		6.29		6.98
	within		0.24		0.39
Weight	overall	64.88	11.92	80.14	12.86
	between		11.56		12.51
	within		3.50		4.03

Table 13 Point estimates for BMI categories using individual fixed effects

	FE	
	Women	Men
Underweight	−0.1440***	−0.1069
	(0.0331)	(0.0721)
Overweight	0.0431***	0.0503***
	(0.0158)	(0.0168)
Obese	0.0879***	0.0599**
	(0.0305)	(0.0304)
Log(income)	0.1335***	0.0888***
	(0.0137)	(0.0158)
CIV Underweight	139,668	187,072
CIV Overweight	−19,853	−34,726
CIV Obese	−34,716	−39,396

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using FE. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status, and year dummies. ***$p<0.01$, **$p<0.05$, *$p<0.10$. Men (OLS): $N=51{,}561$. Women (OLS): $N=61{,}011$. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted. Standard errors (in parentheses) are clustered on individuals

Table 14 CIV for 1-10 BMI units away from optimal BMI and CIV per unit BMI

	OLS			
	Women		Men	
BMI units from optimal	CIV	CIV per unit	CIV	CIV per unit
1	260	260	434	434
2	1047	787	1752	1318
3	2377	1591	3996	2244
4	4280	2690	7241	3245
5	6800	4110	11,599	4357
6	9992	5882	17,221	5622
7	13,933	8050	24,311	7090
8	18,717	10,666	33,137	8826
9	24,462	13,796	44,045	10,908
10	31,317	17,521	57,485	13,440

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using OLS. Men: $N=51{,}561$ observations. Women: $N=61{,}011$ observations. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted

Table 15 Optimal own and spouse's BMI, corresponding CIVs and standard error in CIV using OLS

Section A BMI spouse	16	22	28	35	16	22	28	35
Optimal own BMI	19	21	23	25	21	26	31	37
CIV: Own BMI = 15	6227	16,615*	34,199**	68,856***	15,919	80,109**	292,139***	1,432,587*
	(6534)	(9069)	(14,535)	(33,717)	(14,178)	(33,980)	(102,869)	(746,320)
CIV: Own BMI = 20	920	217	3655	13,756	125	17,651**	85,743***	386,874**
	(2107)	(685)	(2697)	(8815)	(900)	(7879)	(22,165)	(159,247)
CIV: Own BMI = 25	21,724*	9146**	2322	22	10,239	289	19,498***	114,223**
	(11,482)	(3886)	(1505)	(265)	(7535)	(621)	(5812)	(46,759)
CIV: Own BMI = 30	94,210**	53,760***	28,677***	11,397*	57,010**	9001**	520	28,903*
	(36,586)	(12,638)	(5785)	(6394)	(22,698)	(3776)	(983)	(17,214)
CIV: Own BMI = 35	335,009**	197,053***	116,197***	61,206***	200,398***	53,005***	7853	2314
	(140,323)	(50,542)	(23,699)	(22,012)	(77,173)	(17,328)	(5806)	(4671)
Section B Own BMI	16	22	28	35	16	22	28	35
Optimal spouse BMI	21	25	29	34	12	20	28	38
CIV: Spouse BMI = 15	7586	25,714	62,151*	151,661	2917	8681	79,612***	531,431**
	(11,507)	(19,003)	(33,992)	(95,363)	(7,320)	(8699)	(27,544)	(243,501)
CIV: Spouse BMI = 20	73	5358	20,822	60,218*	22,475	13	25,145***	199,127**
	(865)	(5267)	(10,680)	(35,538)	(20,738)	(240)	(7908)	(84,262)
CIV: Spouse BMI = 25	4748	20	3548	19,968	73,160*	7313	3765*	74,084**
	(6154)	(215)	(2777)	(14,698)	(44,337)	(4803)	(2133)	(36,090)
CIV: Spouse BMI = 30	24,107	6842*	307	3249	196,816*	35,232***	709	22,857
	(15,252)	(3900)	(830)	5402	(101,578)	(11,840)	(1157)	(17,125)
CIV: Spouse BMI = 35	69,573*	29,502**	9376	401	524,979*	103,913***	14,052*	3035
	(36,928)	(13,106)	(7017)	(2130)	(277,168)	(33,170)	(8317)	(6264)

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using OLS. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status, and year dummies. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. Men: $N = 24{,}900$ observations. Women: $N = 24{,}884$ observations. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted. Standard errors (in parentheses) are clustered on individuals

Table 16 OLS point estimates for own and spouse BMI categories and income, as well as corresponding CIV's where the categories are two: obese or overweight (OO) vs normal or underweight (NU). The reference category is NU-NU

	OLS	
Own-Spouse	Women	Men
NU-OO	−0.0141	−0.0573***
	(0.0134)	(0.0195)
OO-NU	−0.0608***	−0.0171
	(0.0195)	(0.0130)
OO-OO	−0.0778***	−0.0115
	(0.0166)	(0.0154)
Log(income)	0.2251***	0.2059***
	(0.0144)	(0.0144)
CIV NU-OO	4631	25,707
CIV OO-NU	22,233	6927
CIV OO-OO	29,593	4614

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using OLS. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. Men: $N = 24{,}791$ observations. Women: $N = 24{,}775$ observations. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted

Table 17 CIV for 1-10 BMI units away from own optimal BMI and spouse optimal BMI and CIV per unit BMI

	OLS			
Section A	Women		Men	
BMI units from own optimal	CIV	CIV per unit	CIV	CIV per unit
1	464	464	480	480
2	1874	1410	1935	1456
3	4284	2875	4421	2485
4	7793	4918	8027	3606
5	12,543	7625	12,891	4864
6	18,735	11,111	19,201	6311
7	26,643	15,533	27,214	8013
8	36,631	21,098	37,267	10,052
9	49,181	28,083	49,803	12,536
10	64,936	36,853	65,405	15,603
Section B BMI units from spouse optimal	CIV	CIV per unit	CIV	CIV per unit
1	234	234	305	305
2	939	705	1226	922
3	2130	1191	2786	1864
4	3830	1700	5020	3155
5	6074	2244	7980	4825
6	8908	2833	11,739	6914
7	12,389	3482	16,389	9475
8	16,594	4205	22,047	12,573
9	21,614	5020	28,863	16,290
10	27,562	5949	37,019	20,729

Source: Swiss Household Panel (SHP)

Men: $N = 24{,}900$ observations. Women: $N = 224{,}884$ observations. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted. Standard errors (in parentheses) are clustered on individuals

Table 18 The impact of spousal situations on life satisfaction as measured by Clark and Etile (2011)

		Men		Women	
Situation	**Opposite situation**	**Impact**	**Impact of opposite**	**Impact**	**Impact of opposite**
Man with non-overweight, woman with overweight	Women with non-overweight, man with overweight	-0.220***	-0.032	-0.227***	-0.106***
Man with non-overweight, woman with obesity	Woman with non-overweight, man with obesity	-0.347***	-0.243***	-0.509***	-0.178***
Man with overweight, woman with obesity	Women with overweight, man with obesity	-0.083	-0.273***	-0.253***	-0.281***

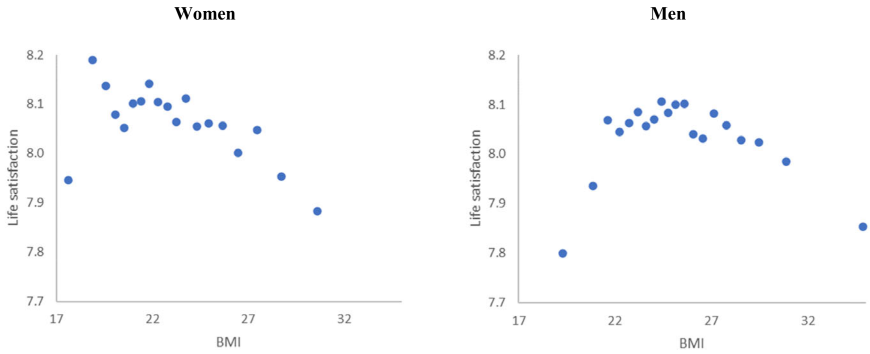
The reference category is when both husbands and wives are in the non-overweight BMI category, i.e., normal or underweight. The shading indicates the situation with the higher impact on men on the one hand and women on the other hand

Table 19 OLS point estimates for BMI categories, income and physical activity, as well as corresponding CIVs

	OLS	
	Women	Men
Underweight	−0.0984**	−0.2470**
	(0.0388)	(0.1104)
Overweight	−0.0539***	0.0092
	(0.0188)	(0.0175)
Obese	−0.1789***	−0.0202
	(0.0313)	(0.0302)
Log(income)	0.2753***	0.2659***
	(0.0170)	(0.0201)
physicalact	−0.2289***	−0.2293***
	(0.0165)	(0.0175)
CIV Underweight	30,830	122,606
CIV Overweight	15,515	−2722
CIV Obese	65,664	6304

Source: Swiss Household Panel (SHP)

Estimates are based on life-satisfaction equations using OLS. Controls included for age, marital status, the degree of urbanization where the individual resides, the number of children in the household, education, labor-market status, and year dummies. $***p<0.01$, $**p<0.05$, $*p<0.10$. Men: $N=51{,}561$. Women: $N=61{,}011$. CIVs are reported in USD per year: 1 CHF = 0.9937 USD. Results are unweighted. Standard errors (in parentheses) are clustered on individuals



Source: Swiss Household Panel (SHP).
Men: N= 55,003. Women: N=66,560.

Fig. 3 Binscatter plots of life satisfaction vs BMI

References

An, H. Y., Chen, W., Wang, C. W., Yang, H. F., Huang, W. T., & Fan, S. Y. (2020). The relationships between physical activity and life satisfaction and happiness among young, middle-aged, and older adults. *International Journal of Environmental Research and Public Health*, *17*(13), 4817 https://doi.org/10.3390/ijerph17134817.

Asgeirsdottir, T. L., Birgisdottir, K. H., Ólafsdóttir, T., & Olafsson, S. P. (2017). A compensating income variation approach to valuing 34 health conditions in Iceland. *Economics & Human Biology*, *27*, 167–183. https://doi.org/10.1016/j.ehb.2017.06.001.

Asgeirsdottir, T. L., Birgisdottir, K. H., Henrysdottir, H. B., & Ólafsdóttir, T. H. (2020). Health-related quality of life and compensating income variation for 18 health conditions in Iceland. *Applied Economics*, *52*(15), 1656–1670. https://doi.org/10.1080/00036846.2019.1677849.

Asgeirsdóttir, T. L., Buason,A., Jonbjarnardottir, B.,& Ólafsdóttir, T. (2020). The value of normal body weight: evidence from Iceland. *Applied Economics*. https://doi.org/10.1080/00036846.2020.1859450.

Blanchflower, D. G., & Oswald, A. J. (2008). Is well-being U-shaped over the life cycle. *Social Science & Medicine*, *66*, 1733–1749. https://doi.org/10.1016/j.socscimed.2008.01.030.

Board of Governors of the Federal Reserve System (U.S.). (2021, March). Foreign Exchange Rates- G.5A Annual. https://www.federalreserve.gov/releases/g5a/current/ (accessed March, 2021).

Boeglin, T., (2021, March). A misrepresentation: Switzerland as an economically advanced country but lacking in terms of Gender Equality. EUROPEAN STUDENT THINK TANK. (accessed November 18. 2022) https://esthinktank.com/2021/03/08/a-misrepresentation-switzerland-as-an-economically-advanced-country-but-lacking-in-terms-of-gender-equality/.

Buason, A., Norton, E., C., McNamee, P., Thordardottir, E., B., & Asgeirsdottir, T. L. (2021). The Causal Effect of Depression and Anxiety on Life Satisfaction: An Instrumental Variable Approach. (NBER Working Paper No. 28575). National Bureau of Economic Research. https://doi.org/10.3386/w28575.

Caliendo, M., & Gehrsitz, M. (2016). Obesity and the labor market: A fresh look at the weight penalty. *Economics & Human Biology*, *23*, 209–225. https://doi.org/10.1016/j.ehb.2016.09.004.

Carr, D., & Friedman, M. (2005). Is obesity stigmatizing? Body weight, perceived discrimination and psychological wellbeing in the United States. *Journal of Health and Social Behavior*, *46*, 244–259. https://doi.org/10.1177/002214650504600303.

Cawley, J. (2015). An economy of scales: A selective review of obesity's economic causes, consequences, and solutions. *Journal of Health Economics*, *43*(2015), 244–268. https://doi.org/10.1016/j.jhealeco.2015.03.001.

Clark, A. E., & Etilé, F. (2011). Happy house: Spouse weight and individual well-being. *Journal of Health Economics*, *30*(5), 1124–1136. https://doi.org/10.1016/j.jhealeco.2011.07.010.

Clark, A. E., Etilé, F. (2010). Happy house: spousal weight and individual well-being. PSE Discussion Paper 2010-07.

Clark, A., Frijters, P., & Shields, M. A. (2006). Income and happiness: evidence, explanations and economic implications. *Paris-Jourdan Sciences Economiques*. Working Paper no. 2006–2024.

Deaton, A., & Arora, R. (2009). Life at the top: The benefits of height. *Economics & Human Biology*, *7*, 133–136. https://doi.org/10.1016/j.ehb.2009.06.001.

Federal Statistical Office of Switzerland. (2021, March). Swiss Consumer Price Index. https://www.bfs.admin.ch/bfs/en/home/statistics/prices/consumer-price-index.assetdetail.16224179.html (Accessed March, 2021).

Ferrer-i-Carbonell, A., & van Praag, B. M. S. (2002). The subjective costs of health losses due to chronic diseases. An alternative model for monetary appraisal. *Health Economics*, *11*, 709–722. https://doi.org/10.1002/hec.696.

Finkelstein, A., Luttmer, E. F., & Notowidigdo, M. J. (2013). What good is wealth without health? The effect of health on the marginal utility of consumption. *Journal of the European Economic Association*, *11*(1), 221–258. https://doi.org/10.1111/j.1542-4774.2012.01101.x.

Forrester-Knauss, C., & Zemp Stutz, E. (2012). Gender differences in disordered eating and weight dissatisfaction in Swiss adults: which factors matter. *BMC Public Health*, *12*, 809 https://doi.org/10.1186/1471-2458-12-809.

Groot, W., & Maassen van den Brink, H. (2004). A direct method for estimating the compensating income variation for severe headache and migraine. *Social Science & Medicine*, *58*, 305–314. https://doi.org/10.1016/S0277-9536(03)00208-9.

Groot, W., & Maassen van den Brink, H. (2006). The compensating income variation of cardiovascular disease. *Health Economics*, *15*, 1143–1148. https://doi.org/10.1002/hec.1116.

Grossbard, S., & Mukhopadhyay, S. (2017). Marriage markets as explanation for why heavier people work more hours. *IZA Journal of Labor Economics*, *6*, 9 https://doi.org/10.1186/s40172-017-0059-y.

Hicks, J. R. (1939). *Value and Capital: An Inquiry Into Some Fundamental Principles of* Economic Theory. Oxford: Clarendon Press.

Howley, P. (2017). Less money or better health? Evaluating individual's willingness to make trade-offs using life satisfaction data. *Journal of Economic Behavior & Organization*, *135*, 53–65. https://doi.org/10.1016/j.jebo.2017.01.010.

Huang, C. F., Rivera, M., Craddock, N., Owen, M. J., Gill, M., Korszun, A., & McGuffin, P. (2014). Relationship between obesity and the risk of clinically significant depression: Mendelian randomisation study. *The British Journal of Psychiatry*, *205*, 24–28. https://doi.org/10.1192/bjp.bp.113.130419.

Huang, L., Frijters, P., Dalziel, K., & Clarke, P. (2018). Life satisfaction, QALYs, and the monetary value of health. *Social Science & Medicine*, *211*, 131–136. https://doi.org/10.1016/j.socscimed.2018.06.009.

Jeffery, R. W., & Rick, A. M. (2002). Cross-sectional and longitudinal associations between body mass index and marriage-related factors. *Obesity Research, Aug*, *10*(8), 809–815. https://doi.org/10.1038/oby.2002.109.

Jokela, M., Elovainio, M., Keltikangas-Järvinen, L., Batty, G. D., Hintsanen, M., Seppälä, I., & Kivimäki, M. (2012). Body mass index and depressive symptoms: instrumental-variables regression with genetic risk score. *Genes, Brain and Behavior*, *11*, 942–948. https://doi.org/10.1111/j.1601-183X.2012.00846.x.

Kanter, R., & Caballero, B. (2012). Global gender disparities in obesity: a review. *Advances in Nutrition*, *3*, 491–498. https://doi.org/10.3945/an.112.002063.

Katsaiti, M. S. (2012). Obesity and happiness. *Applied Economics*, *44*, 4101–4114. https://doi.org/10.1080/00036846.2011.587779.

Kuroki, M. (2016). Life satisfaction, overweightness and obesity. *International Journal of Wellbeing*, *6*(2), 93–110. https://doi.org/10.5502/ijw.v6i2.519.

Lalive, R., & Lehmann, T. (2020). The labor market in Switzerland, 2000–2018. *IZA World of Labor*. 402 https://doi.org/10.15185/izawol.402.v2.

Lawlor, D., Harbord, R., Tybjaerg-Hansen, A., Palmer, T., Zacho, J., Benn, M., & Nordestgaard, B. (2011). Using genetic loci to understand the relationship between adiposity and psychological distress: a Mendelian randomization study in the copenhagen general population study of 53221 adults. *Journal of Internal Medicine*, *269*, 525–537. https://doi.org/10.1111/j.1365-2796.2011.02343.x.

Layard, R., Nickell, S., & Mayraz, G. (2008). The marginal utility of income. *Journal of Public Economy*, *90*, 1846–1857. https://doi.org/10.1016/j.jpubeco.2008.01.007.

Lindqvist, E., Östling, R., & Cesarini, D. (2020). Long-run effects of lottery wealth on psychological well-being. *The Review of Economic Studies*, *87*(6), 2703–2726. https://doi.org/10.1093/restud/rdaa006.

McNamee, P., & Mendolia, S. (2014). The effect of chronic pain on life satisfaction: evidence from Australian data. *Social. Science & Medicine*, *121*, 65–73. https://doi.org/10.1016/j.socscimed.2014.09.019.

McNamee, P., & Mendolia, S. (2019). Changes in health-related quality of life: a compensating income variation approach. *Applied Economics*, *51*(6), 639–650. https://doi.org/10.1080/00036846.2018.1504160.

McNamee, P., Mendolia, S., & Yerokhin, O. (2021). The transmission of partner mental health to individual life satisfaction: Estimates from a longitudinal household survey. *Scottish Journal of Political Economy*, *68*, 494–516. https://doi.org/10.1111/sjpe.12296.

Meylera, D., Stimpson, J. P., & Peek, M. K. (2007). Health concordance within couples: A systematic review. *Social Science & Medicine*, *64*, 2297–2310. https://doi.org/10.1016/j.socscimed.2007.02.007.

OECD (2017). *Obesity Update 2017*. The Organization for Economic Cooperation and Development. Retrieved from https://www.oecd.org/els/health-systems/Obesity-Update-2017.pdf.

Ólafsdóttir, T., Ásgeirsdóttir, T. L., & Norton, E. C. (2020). Valuing pain using the subjective well-being method. *Economics and Human Biology*, *37*, 100827 https://doi.org/10.1016/j.ehb.2019.100827.

Oreffice, S., & Quintana-Domeque, C. (2012). Fat spouses and hours of work: are body and Pareto weights correlated? IZA. *Journal of Labor Economics*, *1*, 1–21. https://doi.org/10.1186/2193-8997-1-6.

Oster, E. (2019). 'Unobservable selection and coefficient stability: theory and evidence'. *Journal of Business & Economic Statistics*, *37*, 187–204. https://doi.org/10.1080/07350015.2016.1227711.

Oster, E. (2013). PSACALC: Stata Module to Calculate Treatment Effects and Relative Degree of Selection Under Proportional Selection of Observables and Unobservables. Revised 18 November 2022 ed, Boston Collage Department of Economics, Technical Report S457677.

Östlin, P., Eckermann, E., Mishra, U., Nkowane, S., & M., Wallstam, E. (2006). Gender and health promotion: A multisectoral policy approach. *Health Promotion International*, *21*, 25–35. https://doi.org/10.1093/heapro/dal048.

Philipson, T. (2001). The world-wide growth in obesity: an economic research agenda. *Health Economics*, *10*(1), 1–7. 10.1002/1099-1050(200101)10:1<1::aid-hec586>3.0.co;2-1. PMID: 11180565.

Powdthavee, N. (2010). How much does money really matter? Estimating the causal effect of income on happiness. *Empirical Economics*, *39*, 77–92. https://doi.org/10.1007/s00181-009-0295-5.

Powdthavee, N., & van den Berg, B. (2011). Putting different price tags on the same health condition: Re-evaluating the well-being valuation approach. *Journal of Health Economics*, *30*, 1032–1043. https://doi.org/10.1016/j.jhealeco.2011.06.001.

Rothman, K. J. (2008). BMI-related errors in the measurement of obesity. *International Journal of Obesity (2005)*, *32*(Suppl 3), S56–S59. https://doi.org/10.1038/ijo.2008.87.

Sabia, J. J., & Rees, D. I. (2015). Body weight, mental health capital, and academic achievement. *Review of the Economics of the Household*, *13*, 653–684. https://doi.org/10.1007/s11150-014-9272-7.

Sato, K. (2021). Relationship between marital status and body mass index in Japan. *Review of the Economics of the Household*, *19*, 813–841. https://doi.org/10.1007/s11150-020-09503-0.

The, N. S., & Gordon-Larsen, P. (2009). Entry into romantic partnerships associated with obesity. *Obesity*, *17*, 1441–1447. https://doi.org/10.1038/oby.2009.97.

Turuban, P., (2021, February) How gender disparities impact health. Swissinfo.ch. (accessed November 20. 2022). https://www.swissinfo.ch/eng/society/how-gender-disparities-impact-health/46353974.

Tyrell, J., Mulugeta, A., Wood, A. R., Beaumont, R. N., Tuke, M. A., Jones, S. E., & Hyppönen, E. (2019). Using genetics to understand the causal influence of higher BMI on depression. *International Journal of Epidemiology*, *48*, 834–848. https://doi.org/10.1093/ije/dyy223.

Voorpostel, M., Tillmann, R., Lebert, F., Kuhn, U., Lipps, O., Ryser, ……. & Wernli, B. (2020). Swiss Household Panel Userguide (1999-2018), Wave 20, February 2020. Lausanne: FORS. Retrived from https://forscenter.ch/wp-content/uploads/2020/05/shp_user-guide-w20.pdf.

Walter, S., Kubzansky, L. D., Koenen, K. C., Liang, L., Tchetgen, E. J., Cornelis, M. C., & Glymour, M. M. (2015). Revisiting mendelian randomization studies of the effect of body mass index on depression. *American Journal of Medical Genetics Part B: Neuropsychiatric Genetics*, *168*, 108–115. https://doi.org/10.1002/ajmg.b.32286.

WHO European Regional Obesity Report (2022). Copenhagen: WHO Regional Office for Europe; 2022. Licence: CC BY-NC-SA 3.0 IGO.

Willage, B. (2018). The effect of weight on mental health: New evidence using genetic IVs. *Journal of Health Economics*, *57*, 113–130. https://doi.org/10.1016/j.jhealeco.2017.11.003.

World Health Organization (2021). *Obesity and overweight*. Retrieved from https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight.