Author's response to reviews

Title: Weight status at age 18 influences marriage prospects. A population-based study of Swedish men.

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Author's response to reviews: see over
Authors reply

**Title:** Weight status at age 18 influences marriage prospects. A population-based study of Swedish men.

**Date:** 12 June 2012

*We thank the reviewers for their work. We are grateful for all the comments and we feel that these changes will improve our manuscript.*

**Reviewer's report**

**Title:** Weight status at age 18 influences marriage prospects. A population-based study of Swedish men.

**Version:** 1  **Date:** 4 April 2012

**Reviewer:** Susan Averett

**Reviewer's report:**
This is an interesting manuscript. The authors find that underweight, overweight and obese men are all less likely to be married and the penalty is particularly severe for obese men. They conclude that there is likely discrimination against obese men.

Major compulsory revisions:
I think the authors need to push their findings some more. I recommend they try including height as a separate covariate. This may explain the underweight finding. Furthermore, do the authors have a measure of self-esteem? It is likely that self-esteem is related to both obesity and marriage prospects in a way that biases the obesity coefficient downward. At a minimum this deserves more discussion. If there is not a self-esteem variable, I would interact the weight coefficients with some of the SES indicators--particularly parent's education. Or, perhaps with the intelligence variable on the assumption that those with higher intelligence may have higher self-esteem and therefore this may mitigate the obesity penalty.

**ANSWER:**
When we included height in the model, no changes occurred with regard to odd ratios. We will not add height into our fully adjusted model.

*We discuss self-esteem on page 11, last part of paragraph 2, and we clarify that we do not have information on self-esteem and therefore we are unable to control for that in our analyses. We have included a sentence regarding this in the Discussion on Page 11, “Unfortunately, no information on self-esteem has been collected in this study so we are unable to control for that in our analyses.”.*

*We thank you for the suggestion and have carried out two interaction analyses with regard to BMI-parental education and BMI-intelligence. We found no statistical interaction in neither of the analyses. We have included a sentence about this in the*
Result section on page 8. “We also performed two separate interaction analyses between BMI and parental education respective BMI and intelligence and found no statistical significant interaction (data not shown).”

In general, I applaud the identification scheme. Measuring weight early and before the men are married is a good idea as is capturing marriage at age 40 when most people who are going to marry are likely to have done so.

However, it is my understanding that marriage is far less common in Sweden than in the U.S.. Are those who marry perhaps a select group? What about the role of cohabitation? Are obese men less likely to cohabit or partner in general?

**ANSWER:** In Figure 1 percentages of marriages among 40 year old men and women in Sweden between 1968 and 2011 are shown. In our study we are studying men who marry between 1990 and 2004. In 1990 around 60% of the men were married and in 2004, 45% of the men were married (Figure 1). Percentage of married persons in U.S. (ages 25-34 years old) seems to have dropped down from 55% in 2000 to 45% in 2009 (From [http://www.prb.org/Articles/2010/usmarriagedecline.aspx on 12 June 2012](http://www.prb.org/Articles/2010/usmarriagedecline.aspx)). We do not think that married people in Sweden represent a more select group than for example in U.S..

![Figure 1. Percentage of 40-year old married men and women in Sweden, 1968-2011. Data are modified from Statistics Sweden (From http://www.scb.se/default___2154.aspx on 12 June 2012).](image)

We don’t have information on cohabitation in our material. We did some analyses on another smaller material we have access to (men with BMI at age 18 and civil status at age 40 years) and found that around 10% of these men were cohabitating. The cohabitated men at age 40 years, however, didn’t differ with regard to BMI at age 18 years, than married men at age 40 years. Our results will probably be diluted towards the null, when cohabitated men are included in the unmarried group.

Further, we are not able to analyse our material and see whether Swedish obese men cohabit or having a partner to a lesser extent than normal weight men. Although, we are writing in the Discussion on page 11 about a study from USA [25] who found
that obese men cohabitated to a lesser extent than marriage compared to normal weight men.

There is also a literature that suggests that men gain weight upon marriage due to less exercise and more regular meals. If these are not first marriages, what about a man who has already been married or cohabiting? Might this contaminate the effects? If possible, it would be very interesting to see the contemporaneous effect of weight on marriage. It would not surprise me to find a positive coefficient in that specification.

**ANSWER:** Yes, the literature is suggesting that married men become heavier. Although, we only have information on BMI at age 18 years and we are discussing that in the Discussion on page 10. When looking into our material (data not shown in the manuscript) around 80% are indicated in the registers that they were married before 40 years of age and 50% had an indication of being divorced. Men in these two groups didn’t differ with regard to BMI at age 18 years.

Finally, the potential for endogeneity is not entirely mitigated in this research design. Unobservables affecting BMI at age 18 can be correlated with current marital status. Some discussion of this is warranted.

**ANSWER:** We are aware of the existence of residual confounding due to other more endogenous factors but we do not think this is a huge problem in this study. We include a sentence with regard to this in the Discussion on page 9-10. “The decreased risk for getting married among men with obesity could also be explained by nutritional and genetic factors early in life, but it is unlikely that, for example, certain genes are involved in whether people get married or not.”.
Reviewer's report

Title: Weight status at age 18 influences marriage prospects. A population-based study of Swedish men.

Version: 1 Date: 10 May 2012

Reviewer: Andrew Clark

Reviewer's report:

This paper uses register data from (almost) the population of Swedish Men over an 11-year period, and shows that weight at around age 18 is a very significant predictor of marital status around age 40. In particular, the obese are less likely to be married, conditional on a number of other control variables.

I found this paper to be well-done overall, in terms of the presentation of the empirical analysis. However, I thought that it actually did a less good job of describing why these correlations come about (when they are not observed in the US, for example). I list my concerns in turn below.

Major Compulsory Revisions

1) While I am sure that the correlation found here is “right” in the statistical sense, I wondered through which channels it operates. In particular, I note that the regression controls for contemporaneous education and social status. Yet it is entirely possible that weight at age 18 (which I will call “weight” from now on) affect these outcome variables too. So one exercise would be to first run the regressions with only the variables that we would think of as being not caused by weight, and then add in those that may well be.

ANSWER: Yes, weight affects both education and socioeconomic position. We have made a step-wise analysis, with all the variables that are included in the fully adjusted model. Each variable has a statistical effect on the relation between BMI and marital status. Therefore are all these variables included in the fully adjusted analysis with the purpose of controlling for confounding.

2) Along the same lines as the above, would it not be possible to control for the individual's income at age 40? We know that weight is a determinant of labour-market income: once we net out this effect, is there anything left?

ANSWER: Unfortunately, we don’t have information about income at age 40 years and are therefore not able to control for that in our analyses. If we had the opportunity to include income in our analyses, the result would probably not differ so much from what we report in our study due to that we control for both education and socioeconomic position in our analyses (Two out of three important socioeconomic factors are included in our analyses).

3) The background section confused me. Line 6 of page 3 says that “obese women but not men are less likely to get married”. It then says that there is no
longitudinal work. But if we are talking about getting married then we must be using panel data. Can it be made clear throughout here which of these existing pieces of work use panel data (and how) and which are cross-sectional?

**ANSWER:** We agree and we have changed the text in the first paragraph on page 3 as follows: “Marriage can be seen as a proxy of social success and previous longitudinal studies have reported a marriage market penalty for heavier individuals, showing that obese women, to a higher extent, than obese men are less likely to get married [4, 5]. These studies have only been able to follow their study participants 10-15 years with regard to early weight status and marital status among men.”.

4) In the middle of page 11, this line about education and obesity doesn’t work for me. I am sure that it is factually correct, but education is being controlled for in the multivariate analysis, essentially shutting off this channel of influence.

**ANSWER:** In this section we are trying to discuss the potential differences between the U.S. and Sweden. Since previous research have found effects of BMI in Sweden but not in U.S.. We changed and included some text in the Discussion on page 11-12, “One explanation why Swedish obese men are penalized on the marriage market, while less evidence has been found in the U.S., might be that Swedish men are more exposed to social stigma than American men. As previously reported; Swedish men who were obese in late adolescence were less likely to receive higher education and had an increased risk of being granted a disability pension later in life compared to their normal weight counterparts [10, 11].”.

5) I thought the first line of the conclusion about getting married to increase social status and prestige was taking it a bit far. People marry each other because they match well.

**ANSWER:** We agree and we have deleted the first part of the sentence in the Conclusion on page 12, “Efforts to increase social status and prestige through marriage might partially explain the results of this study, which clearly showed that”.

6) Along the same lines, if we marry each other because we match on weight, then we wouldn’t necessarily expect obesity to matter, as long as it affects both sexes equally. What the paper is showing is that our preferences over partner weight are not completely determined by the social context: even if everyone gets heavier we’d still like to marry someone with a BMI between 18.5 and 25. Unless of course there were “not enough” overweight Swedish women to marry these Swedish men with BMIs of over 25. As marriage is a matching game, I think that it would be very useful indeed for the paper to show us some statistics for the distribution of female weight in the cohorts that were most likely to marry the cohort of males analysed here. Could it be the joint movements in male and female weight that are behind the differences between Sweden and the US?

**ANSWER:** We can only agree that it would have been very interesting to see how women in Sweden manage on the marriage market. Unfortunately, as we describe in the Discussion on page 10, military conscription is only mandatory for men and there is no information available on weight for the whole population of women in Sweden. We also have discussed this in the Discussion on page 11, regarding differences in
prevalence of obesity among men and women in Sweden and we do not think that these differences are big enough to explain our results.

Minor Essential Revisions
7) The description of how the data is constructed needs a bit of tightening. The top of page 5 makes it sound as though the LOUISE data is available every year, but Figure 1 only provides data at five-year intervals. Also, the paper suggests that marriage information should be available for every age, so why are marriage rates only shown at ages 25, 30, 35, 40 and 45?

**ANSWER:** It is correct that the information from LOUISE is available for every year from 1990-2004. We also have information on marital status from several PHC:s 1975, 1980 and 1985. We have changed a sentence in the Methods where we included more years for the PHC:s on page 4, "Housing Censuses (PHC) of 1960, 1970, 1975, 1980 and 1985". We have also changed the paragraph in the Methods on page 5, "Marital status refers to whether the subject was never married, married (not including a common law spouse), divorced or widower, and was taken from LOUISE between the years 1990 to 2004 and from the PHC:s 1975, 1980 and 1985. Marital status are reported at 25, 30, 35, 40 and 45 years due to available information from PHC:s for the earlier ages. Information on marital status was available, yearly, only from 1990, when the oldest birth cohort born in 1951 was 39 years of age, we chose to present information on marital status at 40 years of age."

8) Middle of page 5. There is a noun missing after “potential confounding”.

**ANSWER:** We have clarified this by deletion of the last part of the sentence “…as a means of eliminating potential confounding.”.

9) What’s the logic for the 1-9 standardisation of intelligence: is this standard in the literature?

**ANSWER:** In our manuscript intelligence is based on a psychometric test used in the Swedish military conscription testing. The purpose was to measure individual differences in intellectual capacity, with the intention to select into different position of the military organization. It consists of four subtests as we described in the Methods on page 5. The score is standardized by the National Service Administration (normally distributed) into a 1-9 scale where mean is 5 and the SD is 2. Clarification of this has been made on page 5, by including “by the National Service Administration”.

10) At the top of page 9, it is said that the highest socio-economic position and education of the parent was taken, and that which was nearest to the time of birth of the subjects. I am not sure I get this. First, closest to time of birth and highest may not be the same (if education rises over time). Second, as PHC was measured in 1960 and 1970, and the subjects were born between 1950 and 1961, isn’t it obvious that 1960 is closest?

**ANSWER:** We have changed the text in the Methods on page 6, as follows “We used the highest socioeconomic position of the parent, either in 1960 or 1970, and whichever was nearest to age 10 years of the study subjects. Further, we used the highest level of education of the parent, in 1970.”.
11) Page 6, top. Many individuals will have two parents matched to them. What if one is blue collar and the other white collar; or if one is low education and the other high education?

**ANSWER:** We chose the parent with the highest level of education in the pair and the parent with the highest socio-economic group in the pair. See also above, note 10.

12) Page 6, lines 4-8. It is not clear enough whether these variables refer to the individual or to their parents, nor at which point in time they are measured.

**ANSWER:** We have clarified this by adding a sentence in the Methods on page 6, “Own level of socioeconomic position was taken at 30 years of age and own level of education is the highest education registered in the LOUISE”.

13) Page 10, line 2. “this type of potential bias should have skewed the estimate toward the null hypothesis”: When wouldn’t it do so?

**ANSWER:** We can only agree, but do not think that this is commonly known and we would like to keep this clarification in the text.

Discretionary Revisions

14) The paper uses BMI categories. One further analysis would be to see whether there is variation within these categories. You could, for example, introduce a polynomial in (BMI – 25), for those with BMI over 25 (and zero otherwise), and another for (18.5 – BMI), for those with BMI under 18.5 (and zero otherwise).

**ANSWER:** It would have been interesting to do some more analysis of our data and if the editor feels that this type of information would increase the value of our manuscript we are willing to do so.

15) Not everyone is a fan of stepwise techniques. Just to make sure, it might be worth preparing an appendix table showing the regression results when you include all of your covariates.

**ANSWER:** We appreciate the suggestion of creating a table that summarizes the stepwise analyses. If the editor advises us to create an appendix table showing these types of results, we would be happy to do this.

16) Page 8, lines 7 to 8. The fact that the low-educated are both less likely to be married and more likely to be divorced suggests that low education is not necessarily a barrier to getting married (although it is a barrier to staying married).

**ANSWER:** We can only agree, but will not add any more discussion in the text since this is not our purpose.

17) The paper estimates average effects. I would have been very interested to see whether some individuals are more affected (marriage-wise) by their weight
than are others. In particular, are individuals who live in higher-weight regions less penalised by their own weight in terms of marriage? Or even: Are individuals with higher-weight parents less penalised by their own weight in terms of marriage?

**Answer:** In our material we are not able to divide it into higher-weight regions. We have only a geographical variable, where the material is divided into urban, semi-urban and rural (See Table 1 in the manuscript). We did some analyses (not shown in the manuscript) to see if there were any geographical difference with regard to marital status at age 40 years and BMI. No interesting pattern occurred for those living in urban versus rural areas with regard to marital status and BMI. Further, we have no information on parental weight and are not able to see if there are any differences with regard to marriage.