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"Do I look fat?" Self-perceived body weight and labor market outcomes

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ABSTRACT

Research reporting that greater body weight is associated with lower wages and employment, particularly among women, focuses on how employers perceive workers. In contrast, we examine whether workers' own perceptions of body weight influence labor market outcomes. Numerous studies find that misperception of body weight influences health behaviors and health, both mental and physical. For example, anorexia nervosa involves the over-perception of weight and raises the risk of cardiovascular disease. Do the health consequences of inaccurate self-perceived weight carry through to the labor market? We use the National Longitudinal Survey of Youth 1997 (NLSY97) to investigate patterns in weight misperception and three labor market outcomes. We find little evidence that either over-perception or under-perception of weight is associated with wages, weeks worked, or the number of jobs held for women and men.

1. Introduction

The question of what determines wages has long interested workers, economists, and politicians. Early work focused on links with education and experience (Mincer, 1974). Researchers have since added variables such as skills, gender, race-ethnicity, health and beauty to the wage equation. Body weight, which signals health and is a component of beauty, has also been added so a considerable amount of research examines the role of Body Mass Index (BMI = kg/m^2). This literature generally finds that BMI is negatively associated with earnings among women (Averett, 2011; Fikkan and Rothblum, 2012) and that greater body fat is associated with reduced employment for both men and women (Burkhauser and Cawley, 2008; Wada and Tekin, 2010).

The literature on BMI and labor market outcomes focuses on how employers perceive workers. Will they be productive? Will they cost more to insure? Employers' perceptions, however, may not be all that matters. A substantial share of adolescents and adults do not perceive their weight accurately (Edwards et al., 2010; Jiang et al., 2014; Sonneville et al., 2016), thus weight misperception may also play a role in wage and employment determination.

Numerous studies find that self-perceived body weight influences health behaviors and health status (e.g., Ali et al., 2010; Atlantis and Ball, 2008; Roberts and Duong, 2013), which could affect human capital accumulation and labor market performance. Anorexia nervosa provides an extreme example. The over-perception of weight characteristic of this disorder raises the risks of cardiovascular disease, bone density loss, muscle loss, and fatigue (National Eating Disorders Association, 2018 n.d.). Anorexia nervosa impairs work capacity (Tchanturia et al., 2013) and has a relatively low recovery rate so many sufferers remain chronically ill (Steinhausen, 2002).

This paper contributes to the literature by using the National Longitudinal Survey of Youth 1997 (NLSY97) to investigate whether inaccurate self-perception of weight affects employment and earnings independent of BMI. If misperceived weight is associated with labor market outcomes then self-stigmatization, not just social stigmatization, of weight plays a role in wage determination. If there is an association, then policies to improve the accuracy of weight perceptions could improve not just health, but also labor market outcomes.

2. Background

Two strands of literature underlie this study. The first is research on the association between body weight and labor market

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outcomes. The second examines weight perception accuracy and the relationship between weight misperception and health.

Most studies of the association between body weight and labor market outcomes focus on wages. Reviews of this literature show that researchers have used a range of data sets, alternative measures of body fat, and a variety of strategies to identify causal patterns (Averett, 2011; Greve, 2015; Kelly, 2018). While results vary by gender, age, and race/ethnicity, the overall evidence shows that higher body weight reduces women's wages, especially among white women. Not all studies, however, find a labor market penalty for excess weight (e.g., Larose et al. (2016) and Majumder (2013) finds evidence of a wage bonus for heavier white men. Nonetheless, the majority of evidence indicates that obesity lowers women's wages (Cawley, 2015).

Some studies examine the association between obesity and employment rather than wages. These results indicate a negative association between obesity and the probability of employment for women, while the association for men is mixed (Cawley, 2000a,b; Cawley and Danziger, 2005; Devaux and Sassi, 2015; Han et al., 2009; Lindeboom et al., 2010; Morris, 2007; Tunceli et al., 2006). The mixed findings may result from differences in estimation methods used to account for the possible endogeneity of obesity.

Overall, this strand of literature indicates that body weight, particularly excess weight, influences labor outcomes via two general mechanisms: health and discrimination (Averett, 2011; Greve, 2015; Smith, 2009). Obesity increases risks to both physical and mental health, reducing human capital accumulation and labor productivity. Discrimination against heavy children and adults creates barriers to human capital accumulation, employment, and advancement in the labor market.

To our knowledge, no previous studies have examined whether self-perceived body weight is independently associated with labor market outcomes. Instead, the research on self-perceived weight focuses on perception accuracy and associations with health. Studies of accuracy compare respondents' perceived weight status to clinically assessed weight status based on BMI. A substantial portion of adolescents and adults misperceive their weight by this measure (e.g., Edwards et al., 2010; Jiang et al., 2014; Sonneville et al., 2016). Accuracy studies generally find that females at their medically-recommended weight are more likely than their male counterparts to perceive themselves as overweight, while men are more likely to under-assess their body weight (Chang and Christakis, 2003; Kuchler and Variyam, 2003; Mikolajczyk et al., 2010; Paeratakul et al., 2002).

Several studies report that self-perceived weight is independently associated with health outcomes (e.g., Atlantis and Ball, 2008; Roberts and Duong, 2013). Many of these studies focus on adolescence, a critical period in identity formation and human capital acquisition. Body dissatisfaction among adolescents, which may arise from both accurate and inaccurate perception of weight, raises the risk of unhealthy weight behaviors, like purging (Bucchianeri and Neumark-Sztainer, 2014; Neumark-Sztainer et al., 2006; Paxton et al., 2006). Body dissatisfaction also predicts future weight gain.

Over-perception of weight is consistently associated with an increased risk of unhealthy weight control behaviors (Eichen et al., 2012; Jiang et al., 2014; Martin et al., 2014). In addition, Sutin and Terracciano (2015) find that normal weight adolescents who misperceive themselves as overweight engage in behaviors that elevate their risk of obesity in early adulthood. Jiang et al. (2014) report that both over-perception and under-perception of weight correlate to risky health behaviors in a dose-response pattern. However, Eichen et al. (2012) find that among overweight adolescents, those who under-perceive their weight are less likely to use diet pills than those who accurately perceive their weight.

Adolescent weight misperception not only influences health behaviors, it also harms mental health. It is associated with lower self-esteem (Ali et al., 2010; Paxton et al., 2006), depression (Al-Mamun et al., 2007; Blashill and Wilhelm, 2014; Isomaa et al., 2011; Neumark-Sztainer et al., 2006; Byeon, 2015; Roberts and Duong, 2013), and suicide ideation (Dave and Rashad, 2009; Eaton et al., 2005.

Among adults, over-perceiving weight is associated with an elevated risk of psychological distress (Atlantis and Ball, 2008) and the amount of weight loss desired is positively associated with the number of monthly "unhealthy days" (Muennig et al., 2008). This latter association appears stronger for women than men and stronger for Whites than Blacks and Hispanics. Finally, Lam et al. (2010) present evidence that work absenteeism is positively associated with body weight only among women who perceive themselves as obese.

In contrast, under-perceiving weight is associated with fewer unhealthy behaviors, like fasting, taking diet pills, and purging among adults (Sonneville et al., 2016). Thus, failure to perceive excess weight accurately may protect against unhealthy weight control practices. However, failure to recognize excess weight may also reduce healthy weight control behaviors, leading to continued overweight or obesity.

Overall, the extant research indicates that under- and over-perception of weight by adolescents and adults is associated with reduced mental health. Weight over-perception increases the risk of unhealthy weight-control behaviors. Poorer mental health and engaging in unhealthy behaviors could impair human capital accumulation and reduce labor market outcomes.

3. Theory

Excess body weight is thought to influence labor market outcomes through multiple pathways (Cawley, 2003; Greve, 2015; Smith, 2009). First, occupational sorting could occur, with the obese gravitating to certain lower-paying occupations due to either the job's physical requirements or the availability of health care (Conley and Glauber, 2005). Second, obesity's health consequences could lead to lower labor productivity (Burton et al., 1999; Cawley, 2007). Third, obesity could damage self-esteem and confidence (Crocker and Garcia, 2005), which in turn could adversely affect labor market outcomes (Goldsmith et al., 1997; Waddell, 2006). Fourth, employers may offer lower wages to the obese to offset expected higher health insurance costs (Bhattacharya and Bundorf, 2009). Finally, weight discrimination in social and educational settings and labor markets could lead to smaller social networks, lower human capital, fewer job offers, and lower wages (Puhl, 2011; Rooth, 2009).

These pathways also explain why weight misperception could lead to reduced labor market outcomes. For example, perceiving oneself as overweight can lead to unhealthy weight control behaviors and/or elevated stress, both of which can diminish physical health (Eichen et al., 2012; Martin et al., 2014; Puhl, 2011; Sutin and Terracciano, 2015). Diminished physical health can reduce labor productivity and thus employment and earnings. Furthermore, weight misperception can damage mental health, raising the risk of depression (Al-Mamun et al., 2007; Atlantis and Ball, 2008; Blashill and Wilhelm, 2014; Granberg, 2011; Roberts and Duong, 2013) and reducing self-esteem (Ali et al., 2010; Crocker and Garcia, 2005). Indeed Miller and Downey's (1999) meta-analysis finds that self-esteem is more highly correlated with self-perceived body weight than with actual body weight. Poor mental health impairs human capital accumulation (Slominski et al., 2011; Fletcher, 2010) and reduces labor outcomes ((Banerjee et al., 2017; Drago, 2011; Fletcher, 2013. Finally, failure to perceive weight correctly means a person has missed an important clue

about their health, so they do not take appropriate remedial action (McCreary, 2002).

4. Data and methods

4.1. Data

We use the National Longitudinal Survey of Youth 1997 cohort (NLSY97), a nationally representative panel survey of nearly nine thousand youths born between 1980 and 1984 (ages 12–16 as of December 31, 1996) and living in the U.S. in 1997, to investigate patterns in perceived weight relative to clinical weight status and their association with labor market outcomes. Currently the NLSY97 has interviewed the same individuals annually seventeen times (1997–2014) and has publically released sixteen rounds of data. Two groups comprise the NLSY97 panel: a nationally representative sample of 6748 youths and a supplemental over sample of 2,236 of Black and Hispanic youth. Since results are more precise using both groups, they are combined using the methods outlined in the NLSY97 User Guide.[1]

4.2. Variables

We examine three labor market outcomes: annual wages (+$1) in natural logs;[2] annual weeks worked;[3] and number of lifetime jobs.[4] All regressions include a set of basic demographic control variables: gender (Female = 1); Black; Hispanic; age; the survey year; marital status (Married = 1); whether the respondent lives in the Southern Census region (South = 1)[5]; highest grade completed; household size; and whether the respondent lives in an urban area (Urban = 1).

Some regressions also include a set of four cognitive-psychological variables. The Armed Forces Qualifying Test (AFQT) score[6] was collected once between 1997 and 1998 and is often used to measure cognitive skills. Greater cognitive skills are associated with higher earnings (Heckman et al., 2006; Carbonaro, 2007). The Achenbach Behavioral Problem Score,[7] collected in 1997, tracks behavioral and emotional problems, which can impair human capital formation and employment success. This variable ranges from 0 to 8, with larger numbers indicating greater behavioral problems. Finally, two binary variables track if a respondent is generally depressed (Depressed = 1)[8] and whether s/he is generally happy (Happy = 1).[9]

The key predictors are BMI and weight misperception. Each wave of the NLSY97 asks respondents to report their weight and in the first fifteen waves participants also reported their height. We use these data to compute self-reported BMI. Because attrition is low (86% participation rate over 16 rounds) and weight question response rates are high each round (typically 97%), our sample contains over 90,000 data points, slightly more than 10 rounds of data per respondent.

We use national and international standards to categorize respondents as underweight (BMI < 18.5), recommended, or healthy, weight ($18.5 \leq$ BMI $\leq$ 24.9), overweight ($25 \leq$ BMI $\leq$ 29.9) and obese (BMI $\geq$ 30) (Kuczmarski and Flegal, 2000). These clinical definitions are based on the association of BMI with elevated morbidity and mortality. They may not reflect social norms for body weight, nor identify levels at which the risk of psychological harm rises (Schwartz and Brownell, 2004). While BMI has flaws (Burkhauser and Cawley, 2008), it is cost-effective and useful in assessing populations (Himes, 2011). Self-reported BMI contains reporting error, but analyses which adjust for such error produce results similar to those using unadjusted BMI (e.g., Cawley, 2000a; Zagorsky and Smith, 2009). Hence, we use unadjusted self-reported BMI to identify clinical weight status.

The NLSY97 asks respondents to describe how they perceive their weight using five categories: very underweight; slightly underweight; about the right weight; slightly overweight; and very overweight. To identify weight misperception, we compare a respondent's weight perception category to their clinical weight category. For example, we code respondents in the recommended-weight clinical category who perceive themselves as either very underweight or slightly underweight as under-perceivers (Under = 1). Similarly, respondents in the recommended-weight clinical category who report they perceive themselves as either slightly overweight or very overweight are over-perceivers (Over = 1).

The NLSY79 data also allow us to create a variable tracking if a person was content or not with their body weight. Content respondents are individuals who report either trying to maintain their current weight or not doing anything about their weight. Respondents who report either trying to gain or lose weight are categorized as not content. Regressions using this measure produce results similar to those using the weight misperception variables (Under and Over) and are available in the appendix.

4.3. Estimation procedures

Because the data are longitudinal, each respondent has multiple observations. The error terms associated with each respondent are likely correlated so we use standard linear mixed models to estimate the relationship between each labor market outcome and weight misperception (West et al., 2015). The demographic, cognitive, and weight perception variables constitute the fixed effects and the respondent identification number provides the random effect. This creates an individual random intercept term for each respondent, accounting for unobserved individual level heterogeneity. All models use robust standard errors.

For each dependent variable, the initial model contains only demographic controls (Model 1). Then we add the weight

[1] Except for regressions, the analysis uses the 1997 baseline weight, which is variable R12361.01. The Guide's key part on weighting is found online at http://www.nlsinfo.org/nlsy97/nlsdocs/nlsy97/use97data/weights.html.

[2] Wages are taken from NLSY97 variables YINC-1700 and YINC-1800. YINC-1700 tracks the respondent's total income from wages, salary, commissions, or tips from all jobs, before deductions if they have at least one job. If a respondent states they do not know or refuses, the interviewer asks them in YINC-1800 if they can specify a range. If a range is available the midpoint of the range is used. Wages and log of wages were inflation adjusted using the CPI into 2012 dollars. Since the log of zero is undefined we add one dollar to annual earnings.

[3] Weeks worked data are from variables CVC_WKSWK_YR_ALL which track the number of weeks the respondent worked at any job during the calendar year.

[4] Data on the number of lifetime jobs are from CVC_TTL_JOB_YR_ALL which counts as a job both self-employed positions and any work as an employee.

[5] Southern census region comprises Arkansas, Louisiana, Oklahoma, Texas, Alabama, Kentucky, Mississippi, Tennessee, Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, District of Columbia, and West Virginia.

[6] AFQT data come from the variable ASVAB_MATH_VERBAL_SCORE_PCT, which is an age adjusted percentile score. This score was transformed into an IQ measure with a mean of 100 and standard deviation of 15 by subtracting 50 from the score and dividing the result by 29. The military uses this score to measure trainability.

[7] Achenbach measure was fielded once in 1997 to both youth respondents and their parents. The measure asks if the youth lies or cheats; has poor school work; has trouble sleeping; is unhappy, sad or depressed; has trouble concentrating; or doesn't get along with others. The overall measure is based on the youth's self-report. However, if a youth missed answering a particular question their parent's answers are used instead.

[8] Depression questions were asked six times from 2000 to 2010. Individuals who stated in YSAQ_282E and YSAQ_282G that all or most of the time during the last month they felt depressed, downhearted or blue were coded as depressed.

[9] Individuals were coded as happy if in YSAQ_282F they stated they were all or most of the time a happy person during the last month.

Table 1
Descriptive Statistics (Weighted, except for n).

Variable	n	Mean	Std. error	Frequency
Achenbach Problem Score	57,966	2.13	1.58	
AFQT	79,217	100.6	15.0	
Age	97,775	22.5	4.08	
BMI	94,891	25.6	5.80	
Highest Grade Completed	96,806	12.5	2.54	
Hours Worked	94,562	1284.9	1004.42	
Number of Jobs	97,775	5.9	4.15	
Wages	73,967	$19,995	20,861	
Weeks Worked	96,389	34.9	20.09	
Female	97,775			49.4%
Black	97,775			15.6%
White	97,775			70.3%
Hispanic	97,775			12.9%
Married	97,775			18.1%
South	97,775			35.9%
Urban	97,775			73.2%
Depressed	70,072			9.1%
Happy	65,943			71.3%

misperception variables interacted with gender (Model 2). Model 3 contains the demographic variables plus the cognitive variables. Finally, Model 4, the full model, consists of the demographic variables, the cognitive variables, and the weight misperceptions variables interacted with gender. All specifications include the variable SurveyYear, a continuous variable tracking the year of the survey. We also estimated models using year indicator dummies to create year fixed effects and got similar results so we report only the regressions using the year indicator variable, SurveyYear, since they are simpler to interpret.

5. Results

5.1. Descriptive analysis

To account for the NLSY97's structure, we apply sampling weights before computing the descriptive statistics presented in Table 1. The sample is evenly divided between men and women. The majority of respondents are White; live in an urban area and report being happy all or most of the time.

Fig. 1 tracks the annual proportion of respondents who reported they are about the right weight, starting in their early teens and running until their early thirties. Because the survey data are weighted in the descriptive analysis, all figures can be interpreted as national averages. For example, among people born in the U.S. during the early 1980 s, at age 21 about half (51.1%) perceived their weight as about right regardless of the survey year.

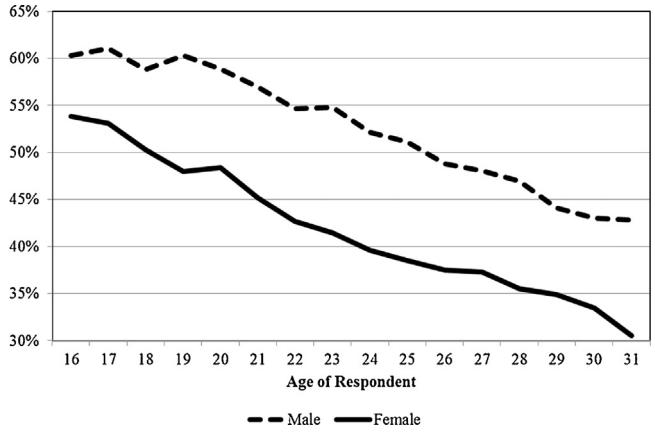

Fig. 2. Proportion Content with Weight by Gender.

Fig. 1's overall message is clear: as people age they grow increasingly discontent with their weight. At age sixteen roughly 57% perceived themselves as being about the right weight, but by age thirty-one just 37% do, a drop of twenty percentage points. Despite growing recognition that their weight is not about right, the fraction of respondents trying to change their weight also declines with age.

Figs. 2 and 3 disaggregate these trends by gender. Overall, females are much less content with their weight than males. The gender gap in Fig. 2 starts off with roughly 60% of males reporting being content with their weight at age sixteen, compared to 55% of females. By age thirty-one roughly 43% of males are content with their weight, but only 30% of females are. From the mid-teens to early thirties, men experience about a 14 percentage point drop in the share perceiving their weight as about right. The female rate not only starts off lower, but also falls faster, with the percent perceiving their weight as about right declining by over 27 percentage points.

Fig. 3 shows that among males there is little variation in the percentage trying to change their weight. From age sixteen to thirty-one about half of men report making no effort to change their weight. However, among women the percentage making no effort to change weight declines over time. Almost 44% of women at age sixteen report making no effort to modify their weight, but this falls to about 37% by age thirty-one. This result indicates

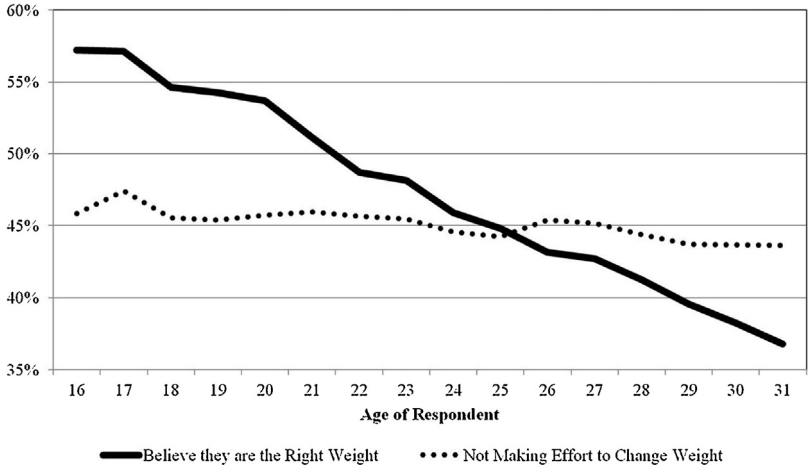

Fig. 1. Proportion Content with their Weight and Making No Effort to Change.

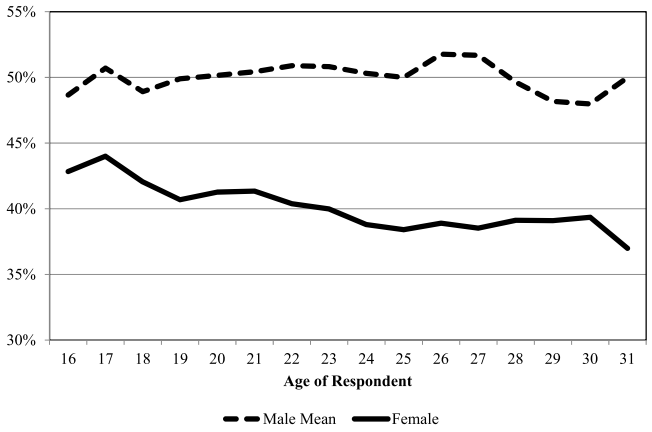

Fig. 3. Proportion Making No Effort to Change Weight, by Gender.

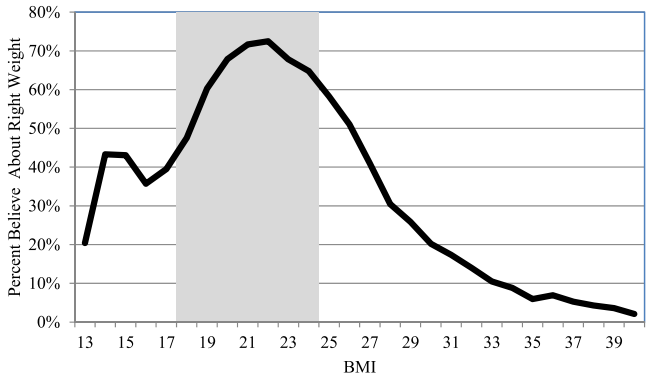

Fig. 4. Percent of Respondents Stating They are about the Right Weight Compared to BMI.

Table 2
Percent of Respondents with Accurate Weight Perception.

	Overall	Underweight	Normal	Overweight	Obese
All	56.0%	47.3%	67.0%	53.4%	28.9%
Men	50.2%	48.0%	68.9%	41.2%	15.5%
Women	62.0%	46.9%	65.3%	71.7%	43.3%

almost two-thirds of women are dieting, exercising or trying other strategies to change their weight by early middle age.

To assess the accuracy of weight perceptions we compare perceived weight status to clinical weight category based on BMI. It is possible that when a respondent's weight perception does not match the clinical definition, the respondent may be correct. For example, Harp and Hecht (2005) find most NFL players would be clinically classified as obese due to their high muscle mass, but few would perceive themselves as weighing too much.

Fig. 4 shows the percentage of people who believe they are about the right weight in each BMI category. For example, among those with a BMI of 17 nearly forty percent (39.5%) perceive their weight as about right despite being in the clinically underweight category (over-perception). The figure's shaded area marks the clinically recommended, or normal, weight range. Among people in the middle of the recommended weight range, roughly 70% think they are about the right weight. This means almost 30% of people of recommended body weight misperceive their weight.

On the other hand, a significant fraction of people with BMIs well outside the recommended weight range believe they are about the right weight. For example, 10% of people with a BMI of 33, clinically obese, believe they are about the right weight (under-perception). Over 40% of people with a BMI of 15, clinically underweight, perceive themselves as weighing about the right amount (over-perception). In sum, a substantial number of American adolescents and young adults misperceive their weight.

Table 2 shows the percent of respondents whose body weight perception matches their clinical weight category. Overall, a bit more than half (53.4%) of the overweight and 28.9% of the obese recognize their excess weight. This means about 47% of the

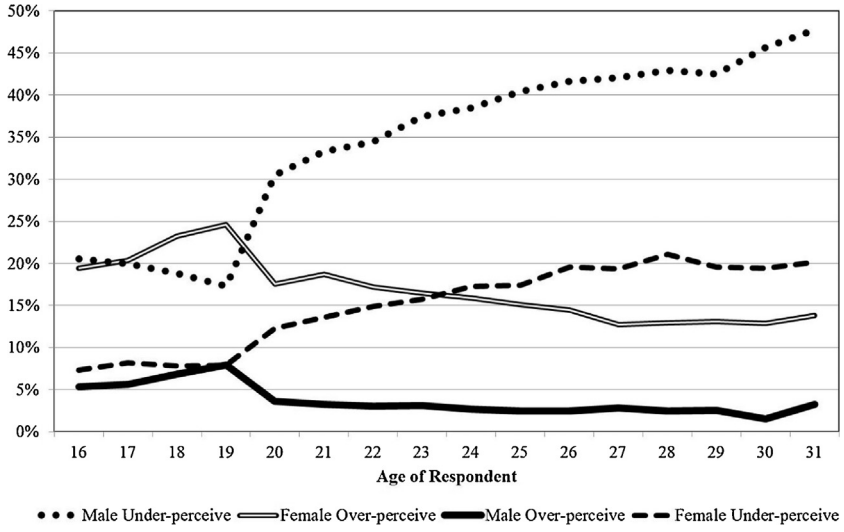

Fig. 5. Percent Over- or Under-perceiving Weight by Age and Gender.
Note: People who over-perceive weight meet one of two conditions. First, their BMI falls in the underweight ranges, but they perceive themselves as very overweight, slightly overweight or about the right weight. Second, their BMI falls in the normal range, but they perception themselves as very overweight or slightly overweight. People who under-perceive weight meet one of three conditions. First, BMI falls in the obese category but they perceive as underweight, about the right weight or slightly overweight. Second, BMI falls in the overweight category but they perceives as underweight or about the right weight. Third, BMI falls in the recommended range, but the person perceives as slightly or very underweight.

Table 3A
Ln(Wage + $1) Regressions.

	Model 1	Model 2	Model 3	Model 4
BMI	0.063***	0.063***	0.038***	0.038***
	(0.007)	(0.008)	(0.010)	(0.010)
BMI^2	−0.001***	−0.001***	−0.0005***	−0.0005***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Female	−0.133*	−0.114	−0.134	−0.130
	(0.069)	(0.074)	(0.103)	(0.114)
BMI*Female	−0.007***	−0.006**	−0.006	−0.005
	(0.003)	(0.003)	(0.004)	(0.004)
Black	−0.205***	−0.203***	−0.230***	−0.229***
	(0.022)	(0.022)	(0.035)	(0.035)
Hispanic	0.102***	0.102***	0.043	0.043
	(0.021)	(0.021)	(0.033)	(0.033)
Age	0.163***	0.163***	0.200***	0.200***
	(0.006)	(0.006)	(0.013)	(0.013)
Married	0.156***	0.156***	0.139***	0.139***
	(0.017)	(0.017)	(0.029)	(0.029)
South	−0.011	−0.011	−0.013	−0.013
	(0.017)	(0.017)	(0.026)	(0.026)
Highest Grade	0.135***	0.135***	0.081***	0.081***
	(0.004)	(0.004)	(0.006)	(0.006)
Household Size	−0.077***	−0.077***	−0.070***	−0.070***
	(0.004)	(0.004)	(0.006)	(0.006)
Urban	0.036**	0.036**	0.053**	0.053**
	(0.015)	0.015	(0.022)	(0.022)
Survey Year	0.004	0.004	0.006	0.006
	(0.006)	(0.005)	(0.013)	(0.013)
AFQT			−0.001	−0.001
			(0.001)	(0.001)
Depressed			−0.055	−0.055
			(0.036)	(0.036)
Happy			0.031	0.031
			(0.025)	(0.025)
Behavioral Problems			0.007	0.007
			(0.008)	(0.008)
Wald χ^2	25,148.7***	25,173.3	8,862.1***	8888.2***
n	71,704	71,704	24,113	24,113
AIC	229,169.7	229,173.8	74,584.5	74,590.3

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

Table 3B
Weight Misperception-Gender Interactions: Ln(Wage + $1).

Interaction Pair	Model 2 Contrast	Model 4 Contrast
MaleUnder vs. MaleCorrect	0.009	0.013
	(0.015)	(0.024)
MaleOver vs. MaleCorrect	−0.014	−0.013
	(0.032)	(0.052)
FemaleCorrect vs. MaleCorrect	−0.325***	−0.281***
	(0.019)	(0.028)
FemaleUnder vs. MaleCorrect	−0.337***	−0.313***
	(0.024)	(0.038)
FemaleOver vs. MaleCorrect	−0.296***	−0.261***
	(0.024)	(0.038)
MaleOver vs. MaleUnder	−0.023	−0.026
	(0.033)	(0.055)
FemaleCorrect vs. MaleUnder	−0.334***	−0.295***
	(0.019)	(0.029)
FemaleUnder vs. MaleUnder	−0.346***	−0.326***
	(0.024)	(0.039)
FemaleOver vs. MaleUnder	−0.305***	−0.275***
	(0.025)	(0.039)
FemaleCorrect vs. MaleOver	−0.310***	−0.269***
	(0.035)	(0.056)
FemaleUnder vs. MaleOver	−0.322***	−0.301***
	(0.037)	(0.062)
FemaleOver vs. MaleOver	−0.282***	−0.249***
	(0.038)	(0.062)
FemaleUnder vs. FemaleCorrect	−0.012	−0.032
	(0.019)	(0.033)
FemaleOver vs.FemaleCorrect	0.029	0.020
	(0.020)	(0.034)
FemaleOver vs. FemaleUnder	0.041	0.052
	(0.026)	(0.044)

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

overweight and 71% of the obese do not perceive themselves as weighing too much (under-perception). Slightly less than half (47.3%) of underweight respondents view their BMI as too low, indicating slightly more than half fail to recognize their lower-than-recommended weight status (over-perception). About two-thirds of people in the recommended body mass range think their weight is about right, meaning a third of those with healthy weight may think they need to change their diet and physical activity.

Disaggregating the data reveals that weight perception accuracy among the overweight and obese varies substantially by gender. Nearly 72% of overweight women perceive that they are overweight, compared to only 41% of overweight men. Roughly 43% of obese women correctly perceive their weight status, but only 15.5% of obese men do. These results are consistent with prior research on gender differences in the perception of weight (e.g., Sciacca et al., 1991).

Fig. 5 shows the percentage of people who misperceive their weight from their mid-teens until the early thirties by gender. The proportion of both men and women who are clinically overweight, but do not perceive themselves as overweight rises with age. The male rate of weight under-perception consistently exceeds the female rate by a substantial margin. In contrast, the proportion of both genders who are underweight, but perceive themselves as heavier steadily falls as the cohort ages. The female rate of weight over-perception generally exceeds the male rate.

5.2. Regression analysis

We examine three labor market outcomes: annual wages (+$1) in natural logs; weeks worked; and number of lifetime jobs. All regressions include basic demographic controls: gender; Black; Hispanic; age; survey year; marital status; whether living in Southern census region; highest grade completed; and household size. The regressions also include BMI, BMI^2, and BMI interacted with gender.

We first estimate each labor market outcome as a function of only these demographic variables (Model 1). Next we add the weight perception variables interacted with gender (Model 2). The third specification includes the demographic variables plus the four cognitive-psychological variables: AFQT, Achenbach Behavioral Problem Scale, Happy, and Depressed. Finally, model 4 includes all the variables: demographic, cognitive-psychological, and weight misperception. Because the data are longitudinal we estimate all the specifications as mixed models with robust standard errors using Stata's release 13. Dropping individuals with BMIs in the top and bottom 5 percent of the distribution does not substantially change the results so we report results based on all individuals in the sample with complete information.

Tables 3A and 3B presents the estimates for the four models of logged annual wages. BMI is positive and statistically significant in all the specifications. The negative coefficient for BMI^2 indicates that while wage increases with BMI, it does so at a decreasing rate. The three BMI-related coefficients in model 4 mean a 1-unit increase in BMI is associated with a 3.2% (exp(0.038-0.0005-0.005)-1) rise in average wages for women, ceteris paribus. For men, a one-unit rise in BMI is associated with a 3.8% rise in average wage. This result is consistent with some prior findings of a weight premium for men. For example, Majumder (2013) also use the NLSY97 and report that BMI is positively associated with wage among white men. The positive association of BMI is, however,

Table 4A
Weeks Worked Regressions.

	Model 1	Model 2	Model 3	Model 4
BMI	0.445***	0.453***	0.309**	0.306**
	(0.093)	(0.094)	(0.140)	(0.140)
BMI^2	−0.004**	−0.004**	−0.002	−0.003
	(0.001)	(0.002)	(0.002)	(0.002)
Female	6.364***	6.363***	5.400***	5.103***
	(1.074)	(1.146)	(1.630)	(1.753)
Female*BMI	−0.288***	−0.268***	−0.215***	−0.190***
	(0.042)	(0.043)	(0.063)	(0.065)
Black	−5.604***	−5.56***	−5.357***	−5.336***
	(0.328)	(0.328)	(0.532)	(0.533)
Hispanic	−1.252***	−1.247***	−1.885***	−1.887***
	(0.333)	(0.333)	(0.543)	(0.543)
Age	1.106***	1.105***	1.696***	1.696***
	(0.093)	(0.093)	(0.206)	(0.206)
Married	−1.893***	−1.894***	−2.116***	−2.120***
	(0.280)	(0.280)	(0.448)	(0.448)
South	−0.286	−0.283	−1.093***	−1.089***
	(0.282)	(0.282)	(0.417)	(0.417)
Highest Grade	2.064***	2.062***	1.640***	1.640***
	(0.057)	(0.057)	(0.097)	(0.096)
Household Size	−0.581***	−0.582***	−0.442***	−0.442***
	(0.054)	(0.054)	(0.083)	(0.083)
Urban	0.881***	0.884***	0.938***	0.942***
	(0.214)	(0.214)	(0.327)	(0.327)
Survey Year	−0.254***	−0.253***	−0.715***	−0.717***
	(0.091)	(0.091)	(0.205)	(0.205)
AFQT			−0.006	−0.007
			(0.016)	(0.016)
Depressed			−0.916**	−0.919**
			(0.445)	(0.445)
Happy			1.113***	1.120***
			(0.332)	(0.332)
Behavioral Problems			0.051	0.048
			(0.124)	(0.124)
Wald χ^2	7,772.5***	7798.1***	2399.4***	2409.4***
n	92,677	92,677	30,557	30,557
AIC	787,895.9	787,893.9	259,512.9	259,517.2

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

Table 4B
Weight Misperception-Gender Interactions: Weeks Worked.

Interaction Pair	Model 2 Contrast	Model 4 Contrast
MaleUnder vs. MaleCorrect	0.171	0.366
	(0.214)	(0.348)
MaleOver vs. MaleCorrect	0.026	0.135
	(0.435)	(0.694)
FemaleCorrect vs. MaleCorrect	−1.031***	0.086
	(0.283)	(0.438)
FemaleUnder vs. MaleCorrect	−1.468***	−0.420
	(0.336)	(0.536)
FemaleOver vs. MaleCorrect	−0.574*	0.326
	(0.348)	(0.545)
MaleOver vs. MaleUnder	−0.145	−0.231
	(0.453)	(0.726)
FemaleCorrect vs. MaleUnder	−1.202***	−0.280
	(0.291)	(0.446)
FemaleUnder vs. MaleUnder	−1.639***	−0.787
	(0.343)	(0.545)
FemaleOver vs. MaleUnder	−0.745**	−0.041
	(0.355)	(0.551)
FemaleCorrect vs. MaleOver	−1.057**	−0.049
	(0.493)	(0.772)
FemaleUnder vs. MaleOver	−1.494***	−0.556
	(0.526)	(0.832)
FemaleOver vs. MaleOver	−0.600	0.190
	(.532)	(0.838)
FemaleUnder vs. FemaleCorrect	−0.437*	−0.507
	(0.248)	(0.421)
FemaleOver vs.FemaleCorrect	0.457*	0.239
	(0.260)	(0.430)
FemaleOver vs. FemaleUnder	0.894***	0.746
	(0.338)	(0.572)

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

contrary to the general results for women. This may result because the NLSY97 is a young cohort, following respondents starting in their teens.

Table 3B presents the estimated misperception-gender interactions for models 2 and 4. Neither over- nor under-perception of weight exhibits a statistically significant association with wages. Gender, rather than weight misperception, matters. Women consistently earn lower wages than men regardless of weight perception category (correct, under-perceive, over-perceive). For example, the estimated coefficient comparing female to male wages among those with correct weight perceptions in the full model is −0.281. This means a woman with correct weight perception earns 24.5% (exp(−0.281) – 1) less than a man with correct weight perceptions. These regressions were also estimated using only observations with non-zero wages, which produced similar results.

Estimates for weeks worked (Tables 4A and 4B) also show that BMI again exhibits a positive association while the gender interaction term is negative and statistically significant in all model specifications. While the variable “Female” did not achieve statistical significance in the wage equations, it does in all four of the “Weeks Worked” regression and indicates that in this cohort women work more weeks annually than do men. Also in contrast to the wage regressions, two of the cognitive-psychological variables achieve statistical significance. “Depressed” is associated with about 1 week less worked per year, while being happy is associated with about 1 more week worked on average.

Table 4B shows weak evidence that women who under-perceive weight work about half a week less than women who correctly perceive their weight and that women who over-perceive their weight work about half a week more than those with correct weight perceptions. There is also evidence that women who over-perceive their weight work nearly 1 week more than those who under-perceive. These results suggest that while over-perception of weight is associated with risky health behaviors and mental distress, it may confer a small benefit in the labor market in terms of weeks worked. However, the weight misperception variables achieve statistical significance only in model 2; they vanish when we include the cognitive-psychological variables. We also estimated regressions on annual hours worked and got similar results.

Finally, Tables 5A and 5B present the estimates for the number of lifetime jobs. BMI is positive and BMI^2 is negative only in the specifications that omit the cognitive-psychological variables. Gender appears to matter little to this labor market outcome; neither Female nor Female*BMI achieve statistical significance. In the full model (model 4), one of the weight misperception-gender comparisons achieves marginal statistical significance: Women who over-perceive their weight hold 0.093 more jobs relative to women who correctly perceive their weight at the 10% level. Overall, neither weight misperception nor gender appear to be associated with the number of jobs held in this cohort.

AFQT exhibits a small positive association, suggesting that better cognitive function is associated with more lifetime jobs. The Achenbach Behavioral Problem Score is also positively associated with the number of jobs held, suggesting that individuals with early signs of behavioral problems change jobs more frequently. Because the number of lifetime jobs results from a count, we also used Poisson regression to estimate these models and got similar results.

Table 5A
Number of Lifetime Jobs Regressions.

	Model 1	Model 2	Model 3	Model 4
BMI	0.036**	0.037**	0.010	0.013
	(0.017)	(0.017)	(0.021)	(0.022)
BMI^2	−0.001**	−0.001**	−0.0002	−0.0003
	(0.0003)	(0.0003)	(0.0004)	(0.0004)
Female	−0.136	−0.127	−0.211	−0.148
	(0.195)	(0.200)	(0.260)	(0.266)
Female*BMI	0.004	0.004	0.007	0.006
	(0.008)	(0.009)	(0.011)	(0.011)
Black	−0.640***	−0.640***	−0.435***	−0.432***
	(0.074)	(0.074)	(0.118)	(0.118)
Hispanic	−0.864***	−0.864***	−0.744***	−0.745***
	(0.072)	(0.072)	(0.111)	(0.111)
Age	0.426***	0.426***	0.301***	0.301***
	(0.024)	(0.024)	(0.043)	(0.043)
Married	−0.175***	−0.175***	−0.107*	−0.109*
	(0.042)	(0.042)	(0.059)	(0.058)
South	0.041	0.041	−0.018	−0.019
	(0.057)	(0.057)	(0.075)	(0.075)
Highest Grade	0.174***	0.174***	0.133***	0.132***
	(0.011)	(0.011)	(0.017)	(0.017)
Household Size	−0.060***	−0.060***	−0.039***	−0.040***
	(0.007)	(0.007)	(0.010)	(0.010)
Urban	0.125***	0.124***	0.103**	0.103**
	(0.031)	(0.031)	(0.041)	(0.041)
Survey Year	0.136***	0.136***	0.290***	0.290***
	(0.023)	(0.023)	(0.042)	(0.042)
AFQT			0.009***	0.009***
			(0.003)	(0.003)
Depressed			−0.021	−0.020
			(0.053)	(0.053)
Happy			−0.007	−0.006
			(0.040)	(0.040)
Behavioral Problems			0.235***	0.234***
			(0.029)	(0.029)
Wald χ^2	24,703.6***	24,731.05***	10,911.7***	10,987.4***
n	93,974	93,974	30,951	30,951
AIC	389,342.9	380,348.8	123,248.1	123,246.8

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

Table 5B
Weight Misperception-Gender Interactions: Number of Lifetime Jobs.

Interaction Pair	Model 2 Contrast	Model 4 Contrast
MaleUnder vs. MaleCorrect	−0.015	−0.55
	(0.028)	(0.038)
MaleOver vs. MaleCorrect	−0.026	0.016
	(0.054)	(0.074)
FemaleCorrect vs. MaleCorrect	−0.030	−0.069
	(0.060)	(0.085)
FemaleUnder vs. MaleCorrect	−0.040	−0.043
	(0.064)	(0.092)
FemaleOver vs. MaleCorrect	−0.056	0.024
	(0.066)	(0.095)
MaleOver vs. MaleUnder	−0.011	0.072
	(0.059)	(0.081)
FemaleCorrect vs. MaleUnder	−0.015	−0.014
	(0.062)	(0.086)
FemaleUnder vs. MaleUnder	−0.025	0.012
	(0.066)	(0.093)
FemaleOver vs. MaleUnder	−0.041	0.079
	(0.067)	(0.096)
FemaleCorrect vs. MaleOver	−0.004	−0.086
	(0.080)	(0.111)
FemaleUnder vs. MaleOver	−0.014	−0.060
	(0.083)	(0.117)
FemaleOver vs. MaleOver	−0.031	0.007
	(0.084)	(0.119)
FemaleUnder vs. FemaleCorrect	−0.010	0.026
	(0.032)	(0.049)
FemaleOver vs.FemaleCorrect	−0.027	0.093*
	(0.033)	(0.050)
FemaleOver vs. FemaleUnder	−0.017	0.067
	(0.045)	(0.067)

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

6. Discussion

The NLSY97 offers unique data on both weight perceptions and BMI, allowing us to analyze associations between weight misperceptions and labor market outcomes in a large, nationally representative sample of adolescents and young adults. One drawback is that this dataset offers self-reported rather than measured BMI, which is a flawed measure of body weight since some people misreport their height and weight.

Our descriptive analysis shows that as individuals age they increasingly perceive that their body weight as not right. Nonetheless, the percentage trying change their weight also falls with age. This could indicate declining appreciation for the importance of body weight to health, growing acceptance of excess weight, or the difficulty of changing weight causing people to give up. Additional research is needed to understand which explanation matches the evidence.

Women tend to over-perceive weight, while men tend to under-perceive theirs. Both types of misperceptions can influence physical and mental health, and thus potentially labor productivity. The impact of weight misperception could vary by gender as well. For example, a woman's over-perception of weight could be more likely to discourage her from pursing advanced education or applying for higher-level positions than would be the case for a man. However, the regressions produce little evidence that either type of weight misperception is associated with labor market outcomes. Wage is associated with a few weight perception-gender interactions, but only across genders. Regardless of the weight perception-gender comparison, women earn lower wages than do men, suggesting that gender matters rather than self-perceived weight. Overall, while researchers have found compelling evidence that misperception of weight influences self-esteem, mental health and health behaviors, it does not appear to have much association with labor market outcomes in this cohort.

This research suggests how employers view a person's body weight matters more than self-perception. If the goal is to improve employment and earnings, then policies to reduce social stigmatization of body weight will be more effective than those aiming to reduce self-stigmatization.

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Appendix A. Analysis of Weight Contentment

See Tables A1A, A1B, A2A, A2B, A3A, A3B

Table A1A
Ln(Wage + $1) Regressions.

	Model 2	Model 4
BMI	0.064***	0.039***
	(0.007)	(0.010)
BMI^2	−0.0008***	−0.0005***
	(0.0001)	(0.0002)
Female	−0.133	−0.135
	(0.069)*	(0.103)
BMI*Female	−0.007***	−0.007
	(0.003)	(0.004)
Black	−0.204***	−0.229***
	(0.022)	(0.035)
Hispanic	0.103***	0.044
	(0.021)	(0.033)
Age	0.162***	0.200***
	(0.006)	(0.013)
Married	0.156***	0.140***
	(0.017)	(0.029)
South	−0.011	−0.013
	(0.017)	(0.026)
Highest Grade	0.135***	0.081***
	(0.004)	(0.006)
Household Size	−0.077***	−0.070***
	(0.004)	(0.006)
Urban	0.037**	0.054**
	(0.015)	(0.022)
Survey Year	0.004	0.006
	(0.006)	(0.013)
AFQT		−0.001
		(0.001)
Depressed		−0.054
		(0.036)
Happy		0.030
		(0.025)
Behavioral Problems		0.007
		(0.008)
Wald χ^2	25,154.7***	8872.4***
n	71,704	24,113
AIC	229,168.4	74,584.0

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

Table A2A
Weeks Worked Regressions.

	Model 2	Model 4
BMI	0.451***	0.314**
	(0.093)	(0.140)
BMI^2	−0.004**	−0.003
	(0.001)	(0.002)
Female	6.371***	5.418***
	(1.074)	(1.629)
BMI*Female	−0.288***	−0.210***
	(0.042)	(0.064)
Black	−5.602***	−5.360***
	(0.328)	(0.532)
Hispanic	−1.248***	−1.887***
	(0.333)	(0.543)
Age	1.106***	1.695***
	(0.093)	(0.206)
Married	−1.893***	−2.116***
	(0.280)	(0.448)
South	−0.284	−1.093***
	(0.282)	(0.417)
Highest Grade	2.065***	1.640***
	(0.057)	(0.097)
Household Size	−0.580***	−0.442***
	(0.054)	(0.083)
Urban	0.882***	0.939***
	(0.214)	(0.327)
Survey Year	−0.254***	−0.714***
	(0.091)	(0.205)
AFQT		−0.006
		(0.016)
Depressed		−0.916**
		(0.446)
Happy		1.110***
		(0.332)
Behavioral Problems		0.050
		(0.124)
Wald χ^2	7,773.2***	2399.6***
n	92,677	30,557
AIC	787,898.7	259,516.5

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

Table A1B
Weight Contentment-Gender Interactions: Ln(Wage + $1).

Interaction Pair	Model 2 Contrast	Model 4 Contrast
Male Content vs. Male Not Content	0.026*	0.047**
	(0.015)	(0.022)
Female Not Content vs. Male Not Content	−0.321***	−0.270***
	(0.019)	(0.029)
Female Content vs. Male Not Content	−0.302***	−0.261***
	(0.020)	(0.032)
Female Not Content vs. Male Content	−0.347***	−0.317***
	(0.019)	(0.028)
Female Content vs. Male Content	−0.328***	−0.308***
	(0.021)	(0.031)
Female Content vs. Female Not Content	0.019	0.009
	(0.016)	(0.026)

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

Table A2B
Weight Contentment-Gender Interactions: Weeks Worked.

Interaction Pair	Model 2 Contrast	Model 4 Contrast
Male Content vs. Male Not Content	0.125	−0.082
	(0.201)	(0.330)
Female Not Content vs. Male Not Content	−1.130***	−0.253
	(0.281)	(0.438)
Female Content vs. Male Not Content	−0.976***	−0.098
	(0.300)	(0.417)
Female Not Content vs. Male Content	−1.255***	−0.171
	(0.287)	(0.437)
Female Content vs. Male Content	−1.101***	−0.016
	(0.306)	(0.471)
Female Content vs. Female Not Content	0.154	0.155
	(0.199)	(0.341)

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

Table A3A
Number of Jobs Regressions.

	Model 2	Model 4
BMI	0.038**	0.011
	(0.017)	(0.021)
BMI^2	−0.0006**	−0.0003
	(0.0003)	(0.0004)
Female	−0.129	−0.205
	(0.195)	(0.260)
BMI*Female	−0.005	−0.008
	(0.008)	(0.011)
Black	−0.639***	−0.435***
	(0.074)	(0.118)
Hispanic	−0.863***	−0.744***
	(0.072)	(0.111)
Age	0.425***	0.300***
	(0.024)	(0.043)
Married	−0.174***	−0.107*
	(0.042)	(0.059)
South	0.042	−0.017
	(0.057)	(0.075)
Highest Grade	0.174***	0.133***
	(0.011)	(0.017)
Household Size	−0.059***	−0.039***
	(0.007)	(0.010)
Urban	0.125***	0.104**
	(0.031)	(0.041)
Survey Year	0.137***	0.291***
	(0.023)	(0.042)
AFQT		0.009***
		(0.003)
Depressed		−0.020
		(0.053)
Happy		−0.007
		(0.040)
Behavioral Problems		0.235***
		(0.029)
Wald χ^2	24,722.5***	10,937.2***
n	93,974	30,951
AIC	389,331.1	123,250.1

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

Table A3B
Weight Contentment-Gender Interactions: Number of Jobs.

Interaction Pair	Model 2 Contrast	Model 4 Contrast
Male Content vs. Male Not Content	0.041	0.014
	(0.026)	(0.036)
Female Not Content vs. Male Not Content	−0.034	−0.033
	(0.059)	(0.084)
Female Content vs. Male Not Content	0.031	0.007
	(0.061)	(0.087)
Female Not Content vs. Male Content	−0.075	−0.047
	(0.062)	(0.087)
Female Content vs. Male Content	−0.010	−0.007
	(0.064)	(0.089)
Female Content vs. Female Not Content	0.065***	0.040
	(0.025)	(0.038)

Note: *, **, and *** denote the 10%, 5% and 1% levels of significance, respectively.

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