Obesity and its Impact on Job Quality

Kelly Anguita Lessard

Professor Tracy Falba, Faculty Advisor
Professor Alison Hagy, Seminar Instructor

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Abstract

This study explores the relationship between body mass and job quality in the United States labor force using five variables to represent job quality: hourly wage, training in the past year, desire for training, expectations for success, and job satisfaction. I use the National Longitudinal Survey of Youth 1979 data from 1994 to calculate BMI and assess the job quality indicators. Like past research, I find BMI is negatively associated with wages for the obese population, most significantly for women. Women also suffer a greater body mass penalty for job training and demonstrate lower job satisfaction at a higher BMI.

JEL classification: J7, J71, J31

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I. Introduction

The global prevalence of obesity has increased over the past several decades and is continuing to do so. The Center for Disease Control and Prevention defines obesity as having a weight higher than what is considered healthy for an individual's height, as measured by a Body Mass Index (BMI) of greater than 30 (The Center for Disease Control and Prevention, 2012). By current estimates from the World Health Organization (WHO), this global epidemic is impacting 600 million adults worldwide, and domestically, 34.9% of U.S. adults are obese (World Health Organization, 2014 & The Center for Disease Control and Prevention, 2012).

This global trend of an increase in weight gain has caused great concern due to the number of adverse health conditions associated with being overweight and obese. Obesity is a key risk factor for chronic illnesses such as hypertension, type II diabetes, heart disease, stroke and certain cancers, which tend to decrease the quality of life and ultimately result in earlier mortality (Mora et al., 2014; Lundborg et al., 2014; Morris, 2007). As of the time of this writing, obesity is the leading cause of preventable death in the United States, and it has been labeled a national security threat by retired U.S. Army generals John M. Shalikashvili and Hugh Shelton (Lundborg et al., 2014; Shalikashvili and Shelton, 2010).

As well as imposing large mortality costs, obesity inflicts a substantial economic burden on society through costs on the labor force. Many researchers have studied the mechanisms by which these costs are imposed on the workforce and have identified multiple areas, including obese employees' increased healthcare costs, lower skill acquisition, and increased rates of workplace discrimination that interferes with

productivity (Morris, 2007; Lundborg et al., 2014; Murasko, 2014; Roehling, 1999; Baum and Ford 2004).

Recently, as this costly health concern has become a global reality, extensive research has been done on the economic impacts of overweight and obesity. Current literature focuses in two directions for this topic: the increase in costs (direct and indirect), and the impact on future job outcomes. This study examines how obesity relates to the latter – probability of success in the labor force. The majority of research in this area defines labor force success by a financial measure such as wages. However, very few studies explore how obesity impacts labor market outcomes by a non-pecuniary measure. Although monetary compensation is an aspect of employment, there are many other subjective and objective elements that determine quality of work. This vacancy in the literature leads to the core inquiry of this paper: How does obesity impact an individual's overall job quality in the United States?

Within this first strand of research, a substantial number of studies look at the cost of illness to society, and identify a positive relationship with BMI and increased healthcare costs, in both the US and internationally (Cawley, 2000; Goetzel et al, 2009; Wolfenstetter, 2012). Through these direct costs, as well as indirect costs from foregone productivity, obesity is estimated to cost the United States healthcare system $147 billion annually, with increased individual costs of nearly $1,500 more than those for a normal-weight individual (The Center for Disease Control and Prevention, 2015).

Not only does obesity have associations with higher medical costs, but also the next area of research indicates that there are also implications for individuals' wages. These studies use monetary compensation as a measure of job success, in part for the ease

in objective measurement, and in part for the economic theory on labor productivity. Overall, the literature on obesity and income indicates a negative relationship between BMI and wages, most notably for white women, while the effect is less consistent for men of different ethnicities (Cawley, 2004; Han et al., 2009).

However, income is not the only viable measure for success in the work force, though it is certainly the most frequently used. Across labor economics, more research has been done identifying alternative measures for job success, including skill acquisition and overall job quality (Clark, 1998; Boccuzzo and Gianecchini, 2014). While no consensus has been reached on the optimum measure for overall job quality, past literature has created composite indicators to include recurrent characteristics from the important dimensions in job-quality literature – economic, professional and work-life balance (Boccuzzo and Gianecchini, 2014). For obesity specifically, past research has established that obese individuals face adverse conditions in the work force in more ways than just through lower wages; these individuals cite discrimination based on their weight on a day-to-day basis, are more likely to feel job insecurity, and have more difficulty in maintaining social relationships with coworkers (Carr and Friedman, 2005; Kim and Han, 2015). My approach adds to current literature by analyzing separately the components that would form an overall job quality index and their relationship with obesity. This deconstructed index allows us to better understand the nature of obesity's impact on job quality through an individual factor approach.

The paper that most closely pertains to my work, Kim and Han (2015), identified a negative association between obesity and success in the South Korean labor force for women. This paper implemented a composite job-quality indicator called the Quality of

Work Index that incorporated work content, job security, possibilities for improvement, monetary compensation, work conditions and interpersonal relationships at work (Kim and Han, 2015). Although I deviate from this work by splitting up the characteristics of the index to determine how obesity influences five aspects of job quality individually, the two studies both explore the largely unexplored relationship between obesity and alternative job quality measures.

My research indicates that there is indeed a body mass penalty in the United States labor force, most prominently for women. Like past research, my results confirm that there is a negative relationship between body mass and wages and this effect is larger and more significant against obese women. Additionally, I identified a gender discrepancy in relationship between obesity and employment training, where men receive more training and women receive less. Lastly, obese women reported significantly lower job satisfaction, which further supports the conclusion that there is a body weight penalty in the US for obese women felt through a variety of measures

The rest of the paper is organized as follows: Section II reviews the current literature. Section III presents the theory that informs the relationship between obesity and labor market success, as well as the theory supporting job quality measures. Section IV describes the dataset I will use to run my analysis. Section V describes how I have constructed my model. Section VI discusses my results. Section VII concludes this study and addresses lines for future research.

II. Literature Review

There is an extensive landscape of literature on obesity and its economic impacts and this area of research continues to grow, as economists further understand the societal cost we face with this global epidemic. I have divided this review of the literature into three sections that distinctly pertain to my paper: the two predominant areas of obesity research as well as a separate strain of literature on quality of work indices. First, I will briefly address the original research on obesity, that which estimates the economic costs of the disease. In the second section, I will outline the literature pertaining to obesity and an individual's success in the labor force. In this section, I will look first at the relationship with wages and then at weight-discrimination in the workplace. In the last section, I will review past studies that have constructed composite indices to measure quality of work in the labor force.

1. Estimating the Costs of Obesity

One of the first areas of obesity to be explored in research was the economic cost of obesity on society. Studies in this field look at both direct medical costs as well as the indirect costs of foregone productivity. Direct costs represent the increase in healthcare expenses due to obesity-related illness that is felt by both the healthcare system and employers. Obesity also burdens the labor force indirectly through the lost productivity of workers who take sick days, incapacitated days, or leave the work force early due to obesity-related health concerns. Through both these direct and indirect costs, obesity is estimated to cost the United States healthcare system $147 billion annually (The Center for Disease Control and Prevention, 2015). A substantial amount of international research looks at the cost of injury to society, and identifies a positive relationship with BMI and

increased healthcare costs (Cawley, 2000; Goetzel et al, 2009; Wolfenstetter, 2012; Neovius et al., 2012).

When researchers became interested in the relationship between obesity and increased economic costs, one of the large questions they addressed was how obesity impacts a worker's labor capabilities. Cawley (2000) established a correlating relationship between obesity and employment disability by looking at the female respondents from the National Longitudinal Survey of Youth. He concluded that heavier women faced a higher probability that their health will limit the kind and amount of work they can do for pay (Cawley, 2000). This finding, although substantial for an early study in the field, is limited in that it looks only at women, and uses self-reported data on discomfort to measure disability. Additionally, this paper separates the longitudinal data into individual data points to increase the sample size, and a more meaningful relationship may have been identified if individuals' progress was studied over time. When Neovius et al. (2012) explored this association in a later study with longitudinal data in Sweden, they extended this finding by associating follow-up data with each individual. Looking at weight as a risk factor for sick leave, disability pensions and premature death, they associated obesity with almost twice as high productivity losses to society over a lifetime.

Despite its limitations, Cawley's influential research set the stage for many scholars who extended the finding beyond women, and for my purpose, led other researchers to explore the relationship with obesity and quantifiable measures of success and failure in the work force.

2. Obesity and Success in the Labor Force

Success in the labor force can be viewed from many different measures: successful employment, income, likelihood of promotion, work environment, productivity, or happiness in job, to name a few. Most studies use monetary compensation as a measure of job success, in part for the ease in objective measurement, and in part for the prevalent mentality that a higher paying job is a "better job" (Kim and Han, 2015). I will first discuss this strand of literature, where success is defined by higher wages. Next I will address the studies surrounding weight-based discrimination in the labor force, which influences many subjective measures of work conditions and therefore my research.

i. Obesity and Wages

The strand of literature associating obesity with lower wages has been thoroughly developed in the past decade. Both Cawley (2004) and Han et al. (2009) looked at the large population of data available with the National Longitudinal Survey of Youth. Cawley (2004) ran multiple regression strategies and saw a significant negative relationship between weight and wages for white women. He observed a weight difference of two standard deviations (~65 pounds) to be associated with a 9% difference in wages (equivalent to wage differential caused by 3 years work experience). Han et al. (2009) extended this study by including the marginal effects of age, gender and occupation type. After replicating the findings of Cawley (2004), Han et al. (2009) adds that the observed wage penalty is larger in occupations involving interpersonal skills or social interactions. This finding is particularly important for my study, and informed my decision to include industry controls when isolating the wage penalty in the labor market.

ii. Weight-based Discrimination

Bias against overweight individuals is a well-established phenomenon in many western cultures, and has been studied across many disciplines. Both laboratory and field studies have established that there is significant discrimination against overweight and obese workers present in the workforce, with a hiring obesity bias appearing more strongly for women and in occupations that involve significant social interaction (Roehling, 1999; Morris, 2007; Rooth, 2009; Han et al., 2009). Roehling (1999) takes an interdisciplinary approach to the question of discrimination by reviewing and integrating a diverse body of literature and exploring the psychological, economical, and legal aspects of a weight bias. Ultimately, he concludes that there is evidence of weight-based discrimination seen at all phases of the employment cycle, including selection, placement, compensation, promotion, discipline and discharge (Roehling, 1999 p. 983). This relationship is especially strong because it includes evidence from over 30 different studies, from both field and laboratory study designs.

As it pertains to my paper, the establishment of these underlying biases and how they pertain to the success in the labor force for the obese is a crucial finding. These discriminatory behaviors have a large influence on the individual subjective measures of a job's quality and the overall experience in a workplace for an obese individual. However, Roehling (1999) only identifies the existence of these weight-biases, whereas I will attempt to quantify them. Through my deconstructed index, I will account for multiple of these phases of employment where discrimination could be encountered, and discrimination will likely play a significant role in the quality of work experienced.

3. Job Quality Indices

Although, to the best of my knowledge, there is only one study (Kim and Han, 2015) that looks at obesity and its impact on a multidimensional measure for quality of work, the practice of using composite indices for work quality has become more popular in labor economics. Job quality is a complicated concept to measure due to its many dimensions and subjective nature. Attempts during the 80s and 90s to capture the complexity of job quality through a single variable measure have proven inaccurate, and thus the value and validity of a multi-characteristic approach has been increasingly adopted in the literature (Agovino and Parodi, 2014; Boccuzzo and Gianecchini, 2014). The literature using composite indicators to measure quality of work has been predominantly looking at quality of work for specific populations: disabled persons (Agovino and Parodi, 2014), part-time workers (Kauhanen and Natti, 2014) and young workers (Boccuzzo and Gianecchini, 2014).

Kim and Han (2015) are the only study to look at how obesity impacts an overall work quality indicator. Through the construction of the Quality of Work Index (QWI), this paper looks at the labor force success in a more holistic capacity, including six variables: work content, job security, possibilities for improvement, monetary compensation, work conditions, and interpersonal relationships at work (Kim and Han, 2015). The weights for each variable were developed by the Analytical Hierarchal Process (AHP). To measure obesity, this study used the BMI as the independent variable, and then used a regression model to create piecewise linear functions with certain segments defined as cutoff points to strengthen the association. Ultimately, Kim and Han (2015) concluded that BMI is negatively associated with job quality for women, while

there was no statistically significant effect for men. This study added to the literature on success in the labor market by addressing a non-pecuniary measure of work quality, and establishing a relationship with obesity for women that is consistent with previous research. As this is the only study looking at a multidimensional job quality measure and obesity, I am interested in the variables they included. However, this study analyzed the labor market in South Korea with an index, and the aim of my paper is to look at individual job quality characteristics with the obese population in the United States.

Overall, my study adds to the existing literature by identifying how obesity impacts quality of work through a more robust model than past research. Whereas many papers establish this body mass penalty with wages, I will be looking at five characteristics, as directed by job quality index literature. However, unlike the aforementioned job quality indices, I will be determining the relationship that BMI has with each component individually, rather than compiling all variables into an index. This deconstructed index allows me to better understand the nature of how obesity impacts each aspect of quality of work, rather than losing the effects in an aggregated measure. As Roehling (1999) has identified many of the weight-biases I explore, I quantify them to determine the phases of employment where discrimination is encountered.

III. Theoretical Framework

In this section, I will address the theory behind this paper, which I've organized into three subsections. First, I briefly establish the theory explaining the relationship between obesity and labor productivity. Then, I address the theory of why labor productivity is most frequently measured by wages in the obesity literature. Lastly, I explore existing indices used to measure quality of work, as well as the theory behind why this is superior when assessing obesity's impact on the labor force.

1. Obesity and Labor Productivity

Since obesity and success in the labor force has been a topic of research, there have been countless studies establishing a relationship between the two. Overall, the majority of literature agrees that obesity is linked with lower wages, and this effect is especially prominent for women (Cawley, 2004; Baum and Ford, 2004; Han et al., 2008). However, merely demonstrating a relationship between earnings and weight does not establish a causal relationship, and it fails to address the potential mediating factors that could be adversely affecting earnings. A better knowledge of the mechanism is crucial to understand how obesity might influence other workplace characteristics that play a part in job quality. In theory, there could be many alternative reasons for this relationship, such as employer discrimination against older workers (research has shown that Americans show an increase in weight as they age) or a discrimination against minority groups (blacks are more likely to be obese than other racial populations) (Baum and Ford, 2004).

To address this problem, Baum and Ford (2004) isolated the relationship and modeled the potential factors that mediate obesity and hourly wages. The five mediating factors they identified were (1) a decreased productivity due to health problems from

obesity, (2) less investment in human capital for obese workers, (3) employer distaste for obese employees due to high health-care costs, (4) consumer distaste for obese workers, and (5) health-care costs differentials offsetting wages (Han et al. 2009). Since this work, other studies have also identified some or all of these mechanisms as the reason that an increase in weight is reflected in decreased labor productivity (Gates et al., 2008; Rooth, 2009; Rudolph et al, 2008). Additionally, depending on the demographic being researched, some mechanisms play a larger role than others. For example, decreased labor productivity due to health complications is a more pertinent mechanism in an industry that requires manual labor (Gates et al., 2008). Overall, literature has confirmed the theoretical model by which obesity decreases workplace productivity, through factors that have a large impact on the job experience.

2. Wage as a Measure of Labor Productivity

Although there are many ways to define success in the labor force, a vast majority of the studies looking at obesity and the labor force use monetary compensation as a measure of productivity. In part, this common practice is due to the ease of objective measurement and collection. However, economic theory also supports the use of wages as a measure of success in the labor force, despite its many limitations in practice.

Neoclassical labor economics looks primarily at the setting of wages by the doctrine of the marginal productivity of labor. As British economist John Hicks identified in his *Theory of Wages*, "employers best take on that number of labourers which makes their marginal product equal in value to wage," (Hicks, p. 8). That is to say, in a competitive labor market, a firm will pay its workers equal to their added productivity. Although this theory does not capture all of the complexities of modern labor markets,

this general assumption - that overall compensation structures reflects the value added of each employee - is used frequently in practice.

Additionally, compensation captures some of the documented discriminatory effects that obesity has on employment. A substantial segment of research indicates that there is a bias against overweight individuals in virtually all stages of the employment cycle: selection, placement, compensation, promotion, discipline and discharge (Roehling, 1999; Rooth, 2009; Carr et al., 2005; Rudolph et al., 2008). This lack of employment, or lack of employment at desired level, as well as decreased propensity to be promoted and increased likelihood to be fired, would all be reflected through wages.

However, there are also many limitations to using wages as a measure of success in the labor force. Namely, many firms or organizations are restricted in how much they are allowed to be flexible with wages between workers. Unions, social pressures and firm policies all regulate compensation structures that make it more difficult for firms to penalize individuals based on a real or perceived decrease in productivity. For instance, if an individual becomes obese during their time with a firm, and their marginal productivity to the firm decreases, many firms have policies that prevent an immediate decrease in pay. The only influence on wages would be measurable through a lack of promotion and then potentially, if the decrease in productivity became extreme enough, a termination of employment. With inflexible wage policies in place, it is most noticeable to see obesity's impact on compensation during employment turning points: hiring process, promotion process and ultimate termination.

Furthermore, using strictly hourly wages to reflect worker productivity, rather than looking at total compensation, fails to account for a bonus structure that may better

reflect the obesity bias. In industries where all workers of the same level have equal hourly wages, additional bonuses account for the differences in productivity. Therefore, it is only by looking at the compensation structure as a whole (including the bonus package) that one could potentially see a weight-based discrimination towards wage. Although economic theory suggests that wages accurately reflect worker productivity, there are too many limitations in practice and we would be better served by using an alternative measure.

3. Quality of Work Indices

Alternative multidimensional measures may be superior to wages for judging an individual's success in the labor force. As explained in the previous section, wages may often be an inadequate measure for labor productivity. Moreover, as theory will elucidate in this segment, looking at job quality is better for measuring labor force success than using an improved proxy for labor productivity.

To better understand obesity's broader impact on labor market outcomes it is important to study how obesity influences an individual's ability acquire and retain employment that is a high quality match. In labor economics, the topic of job quality has been increasingly recognized as an important topic of study as well as an instrumental policy objective. The issue of job quality is even included as a part of the Europe 2020 agenda and is one of the overarching objectives of the European Union's strategy for growth (Kauhanen and Natti, 2014; Boccuzzo and Gianecchini, 2014). Literature has established that a worker's job quality has great consequences for their psychological, social, and economic well-being (Kauhanen and Natti, 2014). Furthermore, job quality has an established link with workplace performance, and is one of the key factors

influencing workers to stay longer in the workforce (Kauhanen and Natti, 2014; Brown et al., 2015). Due to the subjective nature of individual job quality, evaluating this measure can be difficult, and therefore I will use the definition of job quality from Boccuzzo and Gianecchini (2014): "the set of work- and employment- related factors that have a positive and direct effect on the worker's well-being" (Boccuzzo and Gianecchini, 2014, p. 455).

As there is very limited research with job quality used in obesity literature, we must look to other labor economics studies to understand how job quality indicators are constructed and implemented. In pursuit of understanding what makes a job objectively "good," Clark (1998) first formed a model looking at six summary variables that measured job quality: pay, hours of work, future prospects, job difficulty, job content and interpersonal relationships. Overall, the study showed that among the sample of 7,000 workers in OECD countries, pay was one of the least important job characteristics, with job security and whether the job is interesting ranking as the most important facets (Clark, 1998). Wage is still included in most indices for its ease of objective measurement, but literature acknowledges that compensation only partially represents job aspirations and quality of the employment (Clark, 1998; Freeman, 2001).

Operationally, most of the literature looking at composite indicators of job quality uses a combination of objective measures (compensation, work conditions) as well as subjective measures (interpersonal relationships, job satisfaction). The large number of relevant characteristics of job quality is frequently grouped into broader categories, which are weighed by relative importance to create an index. Many organizations and papers, including the International Work Organization, and the European Foundation for the

Improvement of Living and Working Conditions, have proposed frameworks of these broad categories to be used in the evaluation of job quality. Although they each differ slightly, many come back to the frequently-cited list of core indicators for job quality by Green (2006): (1) wages, (2) the skills involved, (3) autonomy/discretion over job tasks, (4) work effort, (5) low risks and security (Green, 2006; Kauhanen and Natti, 2014).

The existing literature on quality of work measures has been done largely in other subsections of labor economics rather than obesity. However, most studies have been looking at other specific groups that may face discrimination in the workplace: disabled persons and young workers. Therefore, the measures that are designed to capture real or perceived discrimination on the quality of work will hold as relevant when looking at obesity.

Theory, as well as initial studies, suggests that obesity causes not only lower compensation, but also adversity in other aspects of their work, influencing obese individuals to have less success in the labor force than their non-obese counterparts. Obesity is associated with a significantly increased likelihood to feel job insecurity, as well as a reported difficulty in social relationships with coworkers (Kim and Han, 2015). Roehling (1999) also identified bias against overweight individuals during virtually all stages of employment, which suggests stronger effects will be seen in a multi-faceted approach to quality of work. Kim and Han (2015) confirmed such theory using a composite index comprised of six job quality characteristics: work content, job security, possibilities for improvement, monetary compensation, work conditions, and interpersonal relationships at work (Kim and Han, 2015). In this longitudinal sample in South Korea, they found obesity in women to be associated with decreased job quality.

As past literature and theory has established, and Kim and Han (2015) quantified, we expect obesity to be associated with a lower job quality, especially by the measures of job security, income, employer investment in skills, and weeks employed. Theory suggests that job quality attributes in all labor market dimensions will exhibit adverse associations with BMI, and will serve as further evidence of a body mass penalty in the US labor market.

IV. Data

This paper will be using data from the National Longitudinal Survey of Youth 1979, subsequently referred to as the NLSY79. The NLSY79 is a nationally representative sample of 12,686 young men (50%) and women (50%) who were between 14 and 22 years old when they were first surveyed in 1979. This population was interviewed annually from 1979 through 1994 and then biennially from 1996 onwards (US Department of Labor, 2001). In this paper, I will be focusing on responses from the 1994 survey, during which the respondents range from age 29 to 37. I chose the survey from 1994 because this was the last year of annual interviews before the schedule switched to a biannual survey with slightly different questions. Additionally, the age range of participants during 1994 is an important period for the relationship between obesity and labor market success, because it is the time when individuals are likely settling into a longer-term career path.

For the purpose of this paper, we will look at the independent variable of BMI to measure obesity. Body Mass Index (BMI) is calculated by an individual's weight divided by his or her height, both of which are measured in the survey. The NLSY79 recorded the self-reported weight of respondents roughly every year or every other year from 1981-1998, and again in 2000. Self-reported height was recorded in 1981, 1982 and 1985. Given that the respondents in 1985 were between the ages of 20 and 27, we can assume that their reported height at this time is their permanent adult height. In this paper, I will be using data for height from 1985, and weight from 1994, and calculating BMI accordingly.

Starting with the data from the 1994 NLSY79 survey, I narrowed down the population to get the sample for this paper. From the original 12,686 observations, I first removed those with non-response for height and weight. This left me with a group of 8,401 responses that had a calculable BMI and therefore could be used to study obesity. Next, I focused my sample on the 6,432 individuals who were employed at the time of the 1994 survey. Including those who were either unemployed or out of the labor force at this time would not yield meaningful results for associations with job quality indicators, and therefore their exclusion was key to interpretability of my study. Lastly, I eliminated the 171 individuals who were effectively not employed for the purpose of this study, based on their having either a) not reported annual income or hourly wage b) reported an income of zero in the previous year or c) reported zero weeks worked in the previous year. Ultimately, my subsample of the NLSY79 had 6,261 respondents with calculable BMI for my independent variable, and interpretable data for the dependent variables. In the cases where the dependent variable in question had non-response, I omitted those individuals from that particular regression. The sample size of each dependent variable is noted in both the descriptive data in Table 5.1 as well is in the regression outputs.

When working with BMI, my independent variable, I segmented this continuous measure into four weight categories: normal & underweight, overweight, obese, and morbidly obese. The breakdown of my sample into each category is described in Table 4.1 below.

Table 4.1 Descriptive Statistics of Body Mass Index

	Definition (BMI)	Frequency
Normal & Underweight	<24.9	42.55%
Overweight	25.0-29.9	35.58%
Obese	30.0-39.9	18.26%
Morbidly Obese	>40.0	2.06%

The definition for each of these BMI classes is from the National Heart, Lung and Blood Institute, a division of the NIH, and is consistent with other information publicized by the WHO and CDC (NHLBI, 2012; WHO, 2014; CDC, 2012). Less than one percent of the observations in this sample were underweight (having a BMI <18.5) and therefore I combined it with the normal weight segment. As you can see above, the individuals from my sample are relatively well distributed among the BMI classes, with less than half of the population falling in the normal category and more than a third being overweight. Although the morbidly obese category is a relatively small percentage of the sample, I have included it as separate group in my regressions because these individuals are likely to face even stronger labor market penalties than what we would see for just obese individuals.

To construct the dependent variables for my study, I use the NLSY79's robust section of the interview that addresses employment. Each respondent answers questions about current and previously held jobs and records information about many features of their job, such as class of worker, discrimination experienced, industry, job satisfaction, tenure with employer, and wage. These data are collected about every employer for whom the respondent has worked since the last interview in order to construct a complete employment history of each individual. I have selected a combination of these questions, as guided by past literature, to get a multidimensional picture of job quality through five variables: wages, desire for training, having had training, expectations for success, and job satisfaction. Desire for training and completion of training are both measured by binary responses of either a 0 for no or 1 for yes. Expectations for success and job satisfaction are both measured by scales of 1 to 4, with 1 being the most desirable

(excellent ability to achieve success, high job satisfaction) and 4 being the least desirable (poor ability to achieve success, low job satisfaction). When working with the last dependent variable, wages, there was once again the issue of non-response for 330 individuals who did not report wages but reported an annual income. For these observations, I constructed their hourly wage by dividing reported annual income by the product of weeks worked in the past year and average hours worked per week. Lastly, I transformed the wage variable by taking the natural log.

The NLSY79 and NLSY97 are the most frequently used American datasets when looking at the relationship between obesity and labor force indicators, due to their accessibility and large range of available variables. Its breadth of questions regarding both employment and lifestyle over a large sample size makes it an ideal source of data for my paper. The largest limitation of the NLSY79 as it pertains to my study is that the survey questions do not include a section allowing for a subjective valuation of job quality measures. This would be a valuable piece of information to better understand why individuals choose specific combinations of job quality characteristics, and would allow me to create a job quality index. However, the survey data do have a vast number of employment questions that allow me to create a deconstructed index to model the relationship of obesity with individual quality of work characteristics.

Another characteristic of the NLSY79 is that there is an over-sampling of Blacks, Hispanics and economically disadvantaged non-black and non-Hispanics in the cohort (42%). When working online with the NLSY79 dataset, there is the option to change the weight of the respondents to better reflect the demographics of the United States. However, I do not believe this is necessary, as I control for race in my OLS regressions.

One limitation to this dataset is that all data (including height and weight) are only measured through self-reporting, and therefore could include a degree of reporting error. I include controls in my model to account for population characteristics, including age, sex, race and location of residence. In the initial interview of the NLSY, respondents were asked to report a variety of characteristics that will serve as additional control variables. Among these was race or ethnicity, which the NLSY simplified into three groups for: black, Hispanic, and nonblack/nonHispanic. The descriptive statistics for my sample by the control variables are included in Table 4.2 below.

Table 4.2 Descriptive Statistics of Control Variables

	Mean/Frequency
Age	32.9
Male	54.9%
Female	45.1%
Rural	19.6%
Urban	80.4%
Nonblack Nonhispanic	54.3%
Black	27.3%
Hispanic	18.4%

V. Empirical Specification

The empirical specification of this paper relates to the selection of my dependent variables, and then an explanation of the regressions I run. First, I will outline how theory and literature guide the selection for job quality, followed by an explanation of my model in particular, and then I will address my regressions.

Multidimensional Model Construction Theory

I looked to the past research on job quality indices when deciding how to construct my job quality model. Although I regress each of the variables individually rather than compiling them into an index, the construction of past job quality indices guided my work.

Similar to Boccuzzo and Gianecchini (2014), I implemented a theory-driven strategy for selection of relevant job quality characteristics, which draws characteristics of job quality from the literature. Although economic literature has not yet reached a consensus on the relevant aspects of job quality, many authors have grouped employment-related characteristics into a few broad dimensions. I selected variables that represented job quality characteristics from both the economic and professional dimensions. However, I am looking at each of the variables individually rather than though an overall job quality index. By doing this, I gain the ability to see how obesity impacts each individual job quality dimension and therefore understand where exactly in the labor force for job quality the body mass penalty is felt most strongly. Rather than simply knowing that obesity has a relationship with job quality, my results point to

specific job quality characteristics where this bias is evident, which yields more significant results and larger policy implications.

The Job Quality Model (JQM)

The set of characteristics that I include for a multidimensional account of job quality is compiled into my model that I will refer to as the job quality model (JQM). The variable titles and descriptive statistics are outlined in Table 5.1 below.

Table 5.1 Descriptive Statistics of Dependent Variables

	25%	50%	75%	Average	n=
Wage ($/hr)	7.00	10.17	15.00	12.37	6,261
	1 = excellent	2	3	4 =poor	n=
Expectation of Success	28.05%	47.34%	20.32%	4.29%	5,173
Job Satisfaction	45.06%	46.23%	6.30%	2.41%	6,256
				Frequency	n=
Had Training				15.97%	6,261
Desire Training				71.23%	4,776

Table 5.1 is divided into three categories to represent the three types of variable output given by NLSY79. Wage is a continuous variable with the quartiles and average described above. Expectation of professional success and job satisfaction are both measured on a scale from 1 to 4, with 4 being the least desirable outcome (low satisfaction or expectation of success) and 1 being the best situation (high satisfaction or expectations of success). For these variables, we can see that a majority of respondents experience higher job satisfaction and feel moderately able to achieve their career goals from their current employment position. Lastly, both had training in the past 12 months

and desire additional training are binary variables, with 0 indicating no and 1 indicating yes. Therefore, from Table 5.1, we observe that most respondents have not have training in the past year, and they would desire more training than they are getting.

To understand the relationship between these variables and BMI, I ran separate regressions for each that I describe in the following subsection.

Job Quality and BMI Regressions

Using my job quality model (JQM), I investigate the impact of obesity on job quality through five simple regressions on BMI. In these regressions, BMI is the independent variable and each of the individual job quality characteristics will serve as the dependent variable. BMI is constructed using the NLSY79 data on height and weight of the respondents from 1994 as described in the data section above. Rather than leave BMI as a continuous variable, I segmented the measure into four categories of dummy variables to treat it as a categorical predictor: normal weight & underweight, overweight, obese, and morbidly obese. This segmentation of the independent variable allowed for a variation in the relationship between BMI and each job quality characteristic at different levels in the weight spectrum rather than assuming all BMI levels have the same relationship. Equation 5.1 below displays the equation for the dependent variable, hourly wage, as an example.

(5.1) $$lnwage = \beta_0 overweight + \beta_1 obese + \beta_2 morbidly\ obese + B_i\ controls$$

In this model, I have included demographic controls to isolate the relationship between body mass and job quality measures. They are as follows: race, sex, industry of current occupation, urban vs. rural residence and age. In my regressions, the baseline for

the controls is white, male, working in professional services, in a rural area, and residing in the northwest. Additionally, I explored using wage as a control when looking at the other four job quality measures. In theory, this would allow for a pure relationship between alternative job quality measures and BMI by removing the possibility that individuals were taking jobs with lower satisfaction or other measures because of the wage. However, this did not significantly impact the results, and therefore I have removed wages as a control from this study. Additionally, I have removed the industry controls for the regressions on had training and desires more training because the inclusion of the controls was creating perfect prediction and skewing the results.

Due to the varied nature of the response types for each of the variables, I ran two different types of regressions. Both training in the past year and the desire for additional training produced binary outputs, and therefore I used a logistic regression model to predict the coefficients. For the other three dependent variables, hourly wage, expectations of success and job satisfaction, I used ordinary least squares (OLS) regression. Because expectations of success and job satisfaction have categorical outputs (1, 2, 3 or 4) I experimented with ordered logit regressions as well for these variables. Upon comparison with an OLS regression, neither variable differed significantly in their modeling. Therefore, for the ease of reporting, I continue using ordinary least squares.

For each of my five dependent variables, I explored the relationship with BMI for three subpopulations of my sample: the entire sample, only female respondents, and only male respondents.

Literature suggests there will be a negative relationship observed for many job quality variables, as an overweight or obese worker is more likely to face discrimination

in the workplace, lower wages, higher job insecurity, and more difficulty forming social relationships with coworkers (Kim and Han, 2015). However, some of the variables included in my model have not been looked at in past research, and therefore the effect can only be extrapolated by theory.

VI. Results

In this results section, I outline the main findings of the regressions of BMI on my job quality variables. I look first at the regression output for the full sample, then just for females and lastly just for males. Ultimately, I confirm that obesity has a significant negative relationship on wages, especially for women, and there are some effects on other job quality measures, though less dramatic.

Each of the regressions explore the relationship between obesity and job quality by looking at what a 1% increase in BMI would do to the individual job quality measure, once controlled for by demographic characteristics. Table 6.1 below summarizes the main results from the OLS and logistic regressions for my five job quality characteristics on the entire sample population.

Table 6.1 Regression Output of BMI on Job Quality Indicators, Full Sample

	Hourly Wages[A]		Had Training[B]		Desires Training[B]		Lower Expectations for Success[A]		Lower Job Satisfaction[A]	
BMI										
Overweight	0.0145		0.1775	*	-0.0737		-0.0111		0.0149	
	(0.027)		(0.081)		(0.075)		(0.026)		(0.020)	
Obese	-0.0948	**	0.127		0.108		0.00421		0.0297	
	(0.033)		(0.098)		(0.092)		(0.032)		(0.03)	
Morbidly Obese	-0.259	**	0.0819		0.157		0.0956		0.0699	
	(0.083)		(0.240)		(0.240)		(0.081)		(0.063)	
Demographic Controls										
Age	0.0197	***	0.0156		-0.0238		0.00727		-0.00984	*
	(0.005)		(0.027)		(0.018)		(0.005)		(0.004)	
Female	-0.154	***	0.421	***	-0.154		0.000914		0.0276	
	(0.025)		(0.072)		(0.067)		(0.024)		(0.019)	
Urban Residence	0.229	***	0.387	***	-0.0327		-0.186	***	0.0132	
	(0.031)		(0.098)		(0.083)		(0.029)		(0.023)	
Racial Controls										
Black	-0.209	***	-0.00522		0.602	***	0.145	***	0.142	***
	(0.029)		(0.085)		(0.082)		(0.028)		(0.022)	
Hispanic	-0.135	***	0.0143		0.533	***	0.147	***	-0.0323	
	(0.033)		(0.098)		(0.097)		(0.032)		(0.026)	
Wages as Control	-		no		no		no		no	
Location Controls	yes		yes		yes		yes		yes	
Industry Controls	yes		no		no		yes		yes	
R^2=	0.07525		-		-		0.02226		0.01764	
n=	6,261		6,261		4,776		5,173		6,256	

Note: Regression coefficient estimates with standard errors in parenthesis
Significance codes are as follows, '.' 10% level, '' 5% level, '**' 1% level, '***' 0.1% level*
[A] Ordinary Least Squares Regression
[B] Logistic Regression

Notably, from the first column in table 6.1, hourly wages are significantly negatively associated with BMI for both the obese and morbidly obese groups. This result confirms what past literature has found, which is that higher weight is associated with lower wages. Also interestingly, this weight-penalty is larger for the morbidly obese group than for the obese group. This effect indicates that even within the obese segment, the higher the BMI the larger the body mass penalty. However, it is important to note that

the morbidly obese population is a very small segment of the sample and therefore we should be careful to extrapolate larger implications from its findings.

Also, interesting from this table is the significant result that obesity has a positive relationship with training in the overweight segment. Literature has predicted a negative relationship with BMI and training from the theory that employers are less likely to invest in heavier employees who will eventually be more costly. However, these results indicate a positive relationship between BMI and training at every weight segment. One possible explanation for this is that employers perceive obese workers as less productive and in need of additional training. Thus, through a different mechanism, we understand that a positive relationship shows employers view overweight employees as less skilled or capable. Additionally, we see this positive effect decrease in magnitude for the heavier weight classes, which indicates that with an increased BMI, employers are still less likely to invest in training. By this potential mechanism, normal-weight employees get least training due to a perceived higher productivity, overweight is the peak where employers are willing to invest in additional training, and then once an employee is obese the training decreases (although it is still more training than for a normal-weight worker).

Although the coefficients for the other three job quality characteristics are not significant, the signs are in line with what we predict from theory and past literature. It is also important to note that desire for training had a significant positive relationship for overweight and obese segments of the respondents before adding controls into the model.

In Table 6.2, I summarize the results from the same five regressions, now run only on the subsample of female respondents.

Table 6.2 **Regression Output of BMI on Job Quality Indicators, Female**

	Hourly Wages[A]		Had Training[B]		Desires Training[B]		Expectations for Success[A]		Job Satisfaction[A]	
BMI										
Overweight	-0.02435		0.132		-0.18		-0.0772	.	0.0288	
	(0.039)		(0.120)		(0.110)		(0.039)		(0.033)	
Obese	-0.156	***	-0.0367		0.0493		-0.00676		0.0223	
	(0.046)		(0.138)		(0.130)		(0.046)		(0.034)	
Morbidly Obese	-0.138		0.0442		0.0329		0.0804		0.138	.
	(0.096)		(0.283)		(0.280)		(0.100)		(0.080)	
Demographic Controls										
Age	0.0051		0.0173		-0.026		0.0107		-0.0121	*
	(0.007)		(0.022)		(0.081)		(0.007)		(0.006)	
Urban Residence	0.237	***	0.317	*	0.00216		-0.221	***	0.0427	
	(0.043)		(0.134)		(0.120)		(0.043)		(0.036)	
Racial Controls										
Black	-0.0924	*	0.0988		0.691	***	0.155	***	0.174	***
	(0.041)		(0.120)		(0.120)		(0.041)		(0.034)	
Hispanic	-0.0515		0.0957		0.614	***	0.198	***	-0.0247	
	(0.047)		(0.136)		(0.140)		(0.047)		(0.039)	
Wages as Control	no		no		no		no		no	
Location Controls	yes		yes		yes		yes		yes	
Industry Controls	yes		no		no		yes		yes	
R^2=	0.1024		-		-		0.03248		0.01837	
n=	2,824		2,824		2,185		2,373		2,822	

Note: Regression coefficient estimates with standard errors in parenthesis
Significance codes are as follows, '.' 10% level, '' 5% level, '**' 1% level, '***' 0.1% level*
[A] Ordinary Least Squares Regression
[B] Logistic Regression

When looking at the relationships with job quality indicators and BMI for just women, we once again see a very significant negative association with hourly wages in the obese weight segment. The magnitude of the relationship was over 1.5x as strong, which confirms the findings of many past researchers, that obesity is negatively associated with wages, and more strongly for women (Cawley, 2004; Han et al., 2015).

Additionally the job quality measures of expectations for success and job satisfaction have significant relationships at different BMI segments. The significant positive relationship for morbidly obese women between body mass and job satisfaction

indicates an increase in body mass corresponds with a decrease in job satisfaction. This predictable result is seen at all three levels of BMI, although it has the largest magnitude and is most significant for the morbidly obese segment.

However, expectations for success has a negative coefficient, indicating that the obese segment of the female sample has higher expectations for career success than those with a healthy weight. This is interesting, because other variables indicate a body mass penalty for women in terms of external factors, such as wages, while the overweight population demonstrates that they feel more confident in their professional trajectory. More research on this effect by controlling for levels of position at the company could prove interesting and more informative.

Lastly, In Table 6.3, I summarize the results from the same five regressions, for the subsample of male respondents.

Table 6.3 **Regression Output of BMI on Job Quality Indicators, Male**

	Hourly Wages[A]		Had Training[B]		Desires Training[B]		Expectations for Success[A]		Job Satisfaction[A]	
BMI										
Overweight	0.0369		0.222	.	0.00678		0.0291		0.0015	
	(0.037)		(0.12)		(0.099)		(0.034)		(0.026)	
Obese	-0.0449		0.281	*	0.161		0.0131		0.0264	
	(0.047)		(0.142)		(0.13)		(0.043)		(0.033)	
Morbidly Obese	-0.563	***	0.0172		0.392		0.117		-0.0634	
	(0.151)		(0.48)		(0.46)		(0.14)		(0.106)	
Demographic Controls										
Age	0.0305	***	-0.0106		-0.0417	.	0.00381		-0.00773	
	(0.007)		(0.023)		(0.024)		(0.006)		(0.005)	
Urban Residence	0.215	***	0.469	**	-0.0643		-0.153	***	-0.00882	
	(0.043)		(0.14)		(0.12)		(0.041)		(0.030)	
Racial Controls										
Black	-0.303	***	-0.0921		0.542	***	0.145	***	0.111	***
	(0.04)		(0.12)		(0.11)		(0.038)		(0.028)	
Hispanic	-0.195	***	-0.0529		0.462	***	0.102	*	-0.0396	
	(0.047)		(0.14)		(0.13)		(0.044)		(0.033)	
Wages as Control	no		no		no		no		no	
Location Controls	yes		yes		yes		yes		yes	
Industry Controls	yes		no		no		yes		yes	
R^2=	0.05892		-		-		0.01779		0.01618	
n=	3,437		3,437		2,591		2,800		3,434	

Note: Regression coefficient estimates with standard errors in parenthesis
Significance codes are as follows, '.' 10% level, '' 5% level, '**' 1% level, '***' 0.1% level*
[A] Ordinary Least Squares Regression
[B] Logistic Regression

By looking at the male sample, we see a slightly different relationship between BMI and wages. The relationshp is positive for the overweight segment, becomes negative for the obese segment, and is only significant for the morbidly obese subpopulation. Although the first two findings are not significant, they do mirror the findings of Kim and Han (2015), that there is a positive relationship for men between weight and job quality in the higher end of the normal weight segment. Also, the smaller magnetude of results, and lack of significance confirms the findings of Cawley (2004) and Han et al. (2009) that the body mass penalty for wages is strongest with women.

Similar to the finding for the whole sample population, we see a significant relationship from the male population for the job quality indicator of had training. It is interesting for this result that the positive coefficient was significant for the whole sample, and even more significant with a higher magnetude for the subsample of just men, while being negative for obese women. This difference indicates another area of job quality where women suffer a larger body mass penalty compared to their male peers. Whereas employers are inclined to invest more in overweight and obese male employees to overcome their perceived lower productivity, they feel less motivated to invest in the human capital for their obese female employees. Therefore, I confirm the finding by Baum and Ford (2004), that obese workers are less likely to receive human capital invesment by their employers, and add that this effect is primarily for women. This finding is very intersting, and further research in this area with a more descriptive dependent variable may yield interesting findings for policy.

Overall, this job quality model (JQM) found interesting and significant relationships with job quality measures and BMI, most notably for wages and predominantly for women. Although the other job quality characteristics were not all significant after the inclusion of the controls in my model, the variable that were significant showed that women face a penalty in the labor force for body mass by both their job satisfaction and their lack of training compared to male counterparts.

VII. Conclusion

As obesity continues to be an increasing threat to health and productivity worldwide, the ability to understand its impact on daily life is progressively relevant. In the labor force, the literature has not yet addressed how obesity influences the many dimensions of the workplace that cause an individual to be successful in the labor force. Therefore, my findings, that obesity decreases job quality in various aspects of the United States labor force, are quite pertinent. Some areas, such as income and skills acquisition have been related to obesity in the past, and I add to this strand of literature by addressing and quantifying significant body weight penalties in the labor force in regards to wages, employee training and job satisfaction.

The direction of these relationships between obesity and each job characteristic may have potential policy implications. Especially with regards to employee training, this paper finds that obese women are less likely to receive training where as their male counterparts are significantly more likely to receive training when obese. This gender discrimination within the labor market weight bias is inefficient and requires more research and potentially policy. Supplying this training could help alleviate the weight bias we experience in the US labor force, and potentially would result in productivity gains among disadvantaged workers. As overweight and obese adults make up more than one third of America, understanding their experience in the labor force will serve to make policies to improve the participation of everyone. Those who have the best experiences in their jobs are more likely to stay at work longer, so policies to improve job quality for all are very important.

Future research may benefit from creating a more consistent job quality measure or composite index to form consensus among labor economists looking into this important and emerging area. In order to create a job quality index, future research could include survey questions to understand how individuals weigh the included job quality characteristics. This research, continuing off the work of Clark (1998), will help us understand what the modern US labor force values for optimal job quality. Additionally, a logical follow up to this study would be to look into the relationship between BMI and job quality measures longitudinally. Such a paper would be able to look at how BMI trends within one individual and how that affects their ultimate labor market outcomes. Lundborg, Nystedt and Rooth (2014) explored such a long-term study with body size and skill acquisition among Swedish teens, and a similar method could be extended to the US for job quality.

Overall, the literature on obesity should continue to expand into the area of job quality to help policy-makers understand how to optimize the labor market experience for all participants. As the obese segment of the United States labor force continues to grow, our ability to mediate a weight bias in employment is instrumental to maximize worker productivity and pursue long-term growth.

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