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**Article**

## Obesity and labor market outcomes

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# Obesity and labor market outcomes

## The hidden private costs of obesity: lower earnings and a lower probability of employment

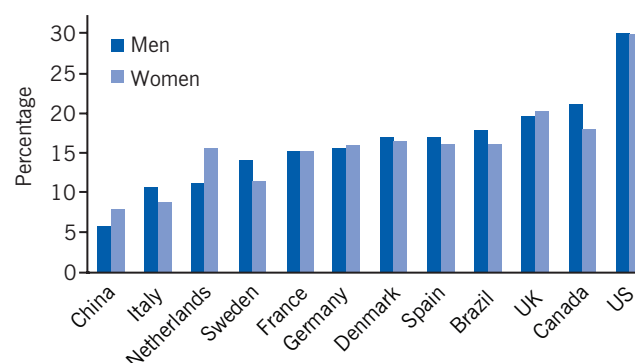
Keywords: obesity, BMI, wages, employment, occupation, absenteeism

### ELEVATOR PITCH

Rising obesity is a pressing global public health problem responsible for rising health care costs and in some countries one of the leading causes of preventable deaths. There is substantial evidence that obese people are less likely to be employed and, when employed, earn lower wages. There is some evidence that the lower earnings are a result of discriminatory hiring and sorting into jobs with less customer contact. Understanding whether obesity is associated with adverse labor market outcomes and ascertaining the source of these outcomes are essential for designing effective public policy.

### KEY FINDINGS

Obesity rates for men and women, 2014–2017



Source: [1].

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#### Pros

- + Numerous studies using data from many countries make use of clever econometric methods to document a plausibly causal negative effect of obesity on earnings and employment.
- + Obesity is a significant driver of higher medical costs for adults and children.
- + There is credible evidence that obese people face discrimination in the labor market, either taste-based or statistical discrimination.
- + The dynamic effects of obesity may matter for labor market outcomes.
- + Obesity impacts cognitive and non-cognitive skills and this may start early in life, indicating that early-life obesity may have long-term economic consequences.

#### Cons

- Data sets drawn from survey data with information on labor market outcomes often have weak coverage of health issues, so obesity measurements may not be accurate enough for rigorous statistical studies.
- Despite strong correlations between obesity and adverse labor market outcomes, causality is difficult to demonstrate—and the direction of causality could run from lower wages to obesity.
- It is possible that there is no causal relationship in either direction, or that a third factor is linked to both obesity and labor market outcomes.
- Researchers have begun to use data that allows for the use of genetic risk scores as instrumental variables; however, it is unclear if the scores satisfy the required exclusion restriction for instrumental variables estimation.

### AUTHOR'S MAIN MESSAGE

There is growing evidence that obese people often receive lower wages and are less likely to be employed than non-obese people, and that these adverse outcomes are likely caused by obesity. Obesity threatens to become an increasing burden on all taxpayers as a result of the associated higher medical costs, lower productivity and wages, and reduced probability of finding employment. The medical costs of obesity have been rising. Governments and employers have a compelling interest in finding ways to reduce obesity levels and discrimination against obese workers.

## MOTIVATION

Worldwide, obesity has nearly tripled since 1975, reaching epidemic proportions in many high-income countries and rising rapidly in developing countries as well. The World Health Organization (WHO) estimates that there were 1.9 billion overweight adults and at least 650 million obese adults worldwide in 2016 (based on body mass index, BMI). Rates of childhood overweight and obesity have also increased dramatically. In 2016 there were 41 million children under the age of five who were obese. Scholars have demonstrated that there is a strong intergenerational correlation between parental obesity and childhood obesity.

### Measures of fat and obesity

*Body mass index (BMI)*: provides a common measure to clinically classify weight status for adults. Alone however, it is not an accurate measure of obesity, particularly for males, because it does not distinguish muscle from fat. In addition, in most data sets BMI is calculated from self-reported height and weight, which may be systematically misreported. BMI is calculated thus:

$$\text{BMI} = \text{weight (kg)} / \text{height}^2 \text{ (meters)}.$$

An adult with a BMI between 25 and 29.9 is considered overweight. An adult with a BMI of 30 or higher is considered obese.

*Waist circumference*: is a measure of central obesity, or the deposition of excess adiposity around the center of the body. It has at least two advantages over BMI. It is a stronger predictor of morbidity and mortality, and it is a measure of fatness that is visible to others and that might be interpreted by employers, customers, or co-workers as an unattractive physical attribute that could lead to discrimination against people who are obese.

*Fat-free mass and body fat*: are two other measures for assessing obesity. Fat-free mass includes everything in the body—skin, bones, organs, muscles—except the fat. Body fat excludes everything in the body except the fat.

Obesity is a risk factor for many diseases, including diabetes, heart ailments, stroke, hypertension, arthritis, sleep apnea, and asthma. In most high-income countries the medical costs of obesity-related illness in adults are estimated at 1–5% of annual health care expenditures. One study estimates the medical costs for adults to have been \$342.2 billion in 2013. Obesity rivals smoking as the leading preventable cause of death worldwide [2].

The literature on the possible links between obesity and adverse labor market outcomes has grown tremendously since the mid-1990s [3]. It finds that obese people earn less, have lower productivity, and may have higher rates of absenteeism on average than other workers. From a public policy standpoint, understanding whether obesity is associated with adverse labor market outcomes and establishing the source of these outcomes are essential for designing effective public policy.

## DISCUSSION OF PROS AND CONS

### Is obesity the cause of adverse labor market outcomes?

Despite the strong correlations found between obesity and adverse labor market outcomes, demonstrating causality is challenging. There is growing evidence, however, that obesity itself is a cause of the adverse labor market outcomes experienced by obese people. The health conditions associated with obesity can contribute to these outcomes, even limiting the type of work that obese people can do. Obesity may also impair the acquisition of human capital—whether through a poor diet or because of teacher discrimination. Research also indicates that obesity may cause physiological brain changes that could impair cognitive function or performance.

Another possibility is that obese people are just as productive as other workers but face discrimination in the labor market, either taste-based or statistical discrimination. That employers or customers might have a subjective distaste for obese people (taste-based discrimination) is consistent with the considerable evidence that they are stigmatized. Statistical discrimination stems not from subjective dislike but from imperfect information about potential employees, which leads employers to make individual hiring decisions based on the assumed (statistical) characteristics of the group to which a person belongs.

Finally, obese people might earn lower wages because of their higher health care costs. Employers who hire obese people might have to pay higher premiums for health insurance. They might therefore compensate obese employees with lower wages to maintain the same overall costs for combined wages and benefits needed to stay profitable.

Causality may also run from lower wages to obesity (reversed causality). People who are paid less might become obese in part because they cannot afford healthful food and must rely instead on low-cost, low-nutrition, calorie-dense foods. In most countries, there is an income-education-obesity gradient: poor and less-educated people are more likely to be obese [4]. Adverse labor market outcomes may lead to depression and low self-esteem, which in turn lead to weight gain.

It is also possible that there is no causal relationship between obesity and labor market outcomes at all, and that a third factor is linked to both. A high rate of time preference is one possibility. Individuals who are more present-oriented and who more heavily discount the future may overeat in the present, discounting the future consequences of their actions. There is some evidence that a rise in the marginal rate of time preference has led to increasing obesity.

### Sorting out causation from correlation

Early research linking obesity to labor market outcomes used ordinary least squares (OLS) regression analysis. Most of these studies find a negative relationship between obesity and the labor market outcome of interest. But even though these models typically control for a host of observable socio-economic and demographic factors, OLS cannot address the potential for reverse causality, or for a third factor that is the cause of both obesity and labor market outcomes.

**Analytic methods applied to obesity and labor market outcomes**

*Ordinary least squares (OLS)*: a statistical method that allows researchers to relate labor market outcomes (earnings, employment, or occupation) to obesity, while controlling for the influence of other factors that predict these outcomes, including education and work experience, in order to isolate the effect of obesity on the outcome of interest.

*Instrumental variables (IV)*: a preferred analytic method when there are concerns about reverse causality, or when there are important unobservable factors. IV can also mitigate attenuation bias to random additive measurement error. This technique involves finding a variable (the instrument) that is highly predictive of an individual's obesity but completely unrelated to that individual's labor market outcomes except through its effect on obesity.

*Randomized experiments*: represent the “gold standard” in terms of determining causality since participants are randomly selected into treatment and control groups. Such experiments are rare in this area given the potential ethical issues involved.

Later researchers have used a variety of more sophisticated econometric techniques to determine whether there is a causal link between obesity and labor market outcomes. These are described below; a more technical discussion of these methods can be found in [5].

Many researchers relate an early BMI measure of obesity to a later labor market outcome, arguing that this temporal ordering precludes reverse causality. These studies typically report a negative association between obesity and earnings, particularly for women. Results from these studies are most convincing if this early measure of BMI is taken before the person enters the labor market, so that the BMI cannot be affected by the labor market outcome.

Sibling studies—in which one sibling is obese and one is not—have also been used to examine the relationship between obesity and wages on the assumption that the difference between siblings removes the variation in weight attributable to a shared family environment. However, variations in weight remain that are attributable to genetic makeup unshared by siblings and to non-genetic factors. This method will yield biased estimates of the effect of obesity on earnings to the extent that these factors are not captured by observable factors such as education, or that parents treat children differently in response to early signs of academic potential in ways that are related to future earnings.

Longitudinal data, which follow the same individuals over time, enable researchers to control for unobservable or hard-to-measure factors that might affect both obesity and labor market outcomes as long as these unobservable factors are constant over time. Essentially, with this type of data, individuals serve as their own control in fixed-effects models. Unobservable characteristics that might influence obesity and labor market outcomes include an individual's rate of time preference and personality traits such as laziness. However, if these unobservable factors vary over time, individual fixed-effects models cannot account for them.

When important unobservable factors are time-varying or reverse causality is suspected, studies can use instrumental variables (IV) to study obesity and labor market outcomes. But finding a variable that is highly predictive of an individual's obesity but is unrelated to labor market outcomes except through its effect on obesity is challenging. Some

economists are critical of these studies because the instruments do not convincingly meet the assumptions needed in the exclusion restriction. In other words, the instruments need to be good predictors of the endogenous (internal) variable (in this case obesity) but only impact the dependent variable (e.g. employment) through the impact on the endogenous variable. This latter claim cannot be directly tested but only argued intuitively.

Many of these studies use the weight of a biological relative as the instrument. This appears to be a valid instrument, since it is a source of variation in weight due to genetics (roughly half the variation in weight across people is genetic in origin) and ought to be unrelated to an individual's labor market outcomes. While its validity would be compromised if many of the genes responsible for obesity were also responsible for other factors that affect labor market outcomes, such as willingness to delay gratification (time discount rate), most studies have been unable to detect any effect of a common household environment on body weight [6]. Some more recent studies have begun to use an individual's own genetic information as instruments. Genetic risk factors are an appealing instrument for obesity because they are determined at birth and are not under the control of the individual so in theory they make excellent IVs. However, since certain genes that determine obesity may also be correlated with other risky behaviors, genetic instruments may not be legitimately excluded from the labor market outcome and it is fair to say that their use, while promising, is still in its infancy.

Other instruments have also been used, but their validity is questionable. For example, studies have used the average BMI and the proportion of obese people who live in the same area as the study subjects as an instrument. But because people choose where to live, this instrument could be related to occupational choices and earnings, rendering it invalid. Instruments used in yet other studies have included the presence of other obese people in the household, being an oldest child, having only sisters, or having a parent who has been treated for obesity. Their validity is questionable, however, as they are probably correlated with an individual's labor market outcome independent of their association with obesity.

A particularly innovative approach to estimating the causal impact of BMI on employment exploits the results of a randomized experiment in which obese individuals are assigned to a treatment group that is offered a financial reward for weight loss or a control group that is not. The researchers find that a decline in BMI leads to an increase in the probability of remaining employed for women, with no significant impact on employment for men.

## Results of empirical studies

Using the methods described above, many studies based on US data have assessed the relationship between obesity and wages or on both wages and employment. One of the most robust findings is that obese women generally earn less than their non-obese counterparts, even after controlling for other factors by using a wide array of statistical techniques. That obesity has little effect on the earnings of men may be indicative of the premium that society places on thinness for women. The size of the effect is economically meaningful. For example, a difference in weight of two standard deviations among white women is associated with a 9% difference in wages, which is equivalent to 1.5 years of education or three years of work experience [6].

Studies relating obesity to labor market outcomes have also been conducted using data for Australia, Canada, China, Denmark, Finland, France, Germany, Iceland, South Korea,

Sweden, Taiwan, and the UK, among other countries, and have generally reached similar results. Most (but not all) of these studies find a negative and statistically significant effect of obesity on earnings and often on employment as well, and the effect is most often found for women.

Ascertaining whether there are wage penalties for obesity in European countries is difficult, because European labor markets generally have more compact wage structures, large shares of the labor force in the public sector, and more rigid wage structures, which leave little room for employer discretion. Yet studies using data on Europe as a whole find evidence of wage and employment penalties for women who are obese and sometimes also for men.

Cultural norms may influence whether labor market penalties are associated with obesity. Researchers have used deviations from the social norm (a relative rather than absolute measure of obesity) to study whether people whose weight exceeds the social norm are sanctioned through lower wages. While these studies have not been as rigorous as is desirable in dealing with potential reverse causality, they generally find a negative relationship. A related study hypothesizes that if cultural norms for thin body types are inversely related to the prevalence of obesity, the labor market penalty for obesity should be lower in societies with a greater prevalence of obesity. The same study notes that if social interaction is valued in the labor market, and if obese people are less likely to interact socially, labor market penalties would be expected to be higher for obesity in settings with more social interactions [7]. The study reports some suggestive evidence in support of these hypotheses.

Some scholars have found evidence of taste-based discrimination. The hypothesis is that employers with a personal dislike of obesity will hire fewer obese workers and thus incur higher production costs than their non-discriminating peers, who are more likely to obtain the most-qualified workers for the job because they draw their employees from a larger pool of candidates. In a competitive market, with freedom of market entry, employers who discriminate and face higher production costs will be driven out of business in the long term. A study using data for nine European countries that finds a negative correlation in each country between wages and obesity rates also finds a higher negative penalty for obesity in countries with less competition, as theory predicts [8].

Other researchers find evidence consistent with statistical discrimination. A study using a large sample of Swedish men concludes that the 18% lower earnings of obese men it finds is more likely due to statistical discrimination than to taste-based discrimination, as the obesity penalty could be explained almost entirely by differences in cognitive skills, non-cognitive skills, and physical fitness, indicating that employers were using obesity as an indicator of skill limitations.

There is also evidence that obese workers suffer from both customer and employer discrimination. In an audit study, two equally qualified applications were submitted for the same advertised jobs, the only difference being the photos submitted with the applications [9]. One photo was of an individual of a normal weight, and the other was of the same person digitally modified to appear obese. The applications with the modified photos were less likely to receive callbacks for an interview. There were also differences in callback rates across occupations. If customer discrimination is the cause of the lower earnings among obese workers, then the effect would be expected to be stronger in occupations that involve significant customer contact. This hypothesis is



bolstered by the findings of other studies that report a stronger negative relationship between BMI and wages in occupations requiring interpersonal skills, particularly for overweight women in sales and service occupations.

Moreover, it is worth noting that scholars have begun to ask if the duration of obesity matters. For example, is it worse for economic outcomes if an individual has been obese since childhood or if they have only recently become obese? Evidence from these studies indicates the timing of obesity may matter; for example, if you are obese at the start of your career (in your early 20s, for example) that may have different impacts than becoming obese say in your 40s.

Finally, there is evidence that the effects of obesity on wages vary for high- and low-earning individuals and that the wage effects of obesity may change over the lifecycle or even from generation to generation. For example, one study reports that the highest-earning women may be penalized as much as five times that of the lowest earners.

## LIMITATIONS AND GAPS

The most often used measure of obesity in studies linking obesity to labor market outcomes is BMI. This is not surprising, since social science data sets that contain detailed information on labor market outcomes were typically not designed to collect health information. At most, they generally contain information on self-reported height and weight, which can be used to calculate BMI. But BMI is not an accurate measure of obesity since it does not distinguish between fat and muscles, for instance [10].

To avoid the limitations of BMI, some studies use waist circumference, a measure of excess weight that is centrally distributed. Waist circumference is a stronger predictor of morbidity and mortality than BMI, and it is a visible measure of fatness that employers, customers, or co-workers might see as an unattractive physical attribute.

Other studies use fat-free mass and body fat to examine the link between obesity and earnings, finding lower earnings for people who have lower fat-free mass and higher body fat. One study using Finnish data finds no association between BMI and earnings or employment for men but does find that fat-free mass and waist circumference are predictive of men's earnings and employment. Another study, using US data, finds body fat to be inversely related to earnings for men and women and fat-free mass to be positively associated with earnings. For women, all three measures are predictive of lower earnings and a lower probability of employment. This evidence is consistent with the concern that BMI is not an accurate measure of fat for men.

Despite numerous studies finding that obese people receive lower wages and have a lower probability of employment, and some evidence that obese people are sorted into occupations requiring less customer contact, additional evidence is still needed as to whether the lower wages, particularly for obese women, are due to employers' subjective dislike of obese women, statistical discrimination, or real differences in productivity.

## SUMMARY AND POLICY ADVICE

The weight of the evidence indicates that obese workers have lower earnings and a lower probability of employment. While there is some debate about whether the relationship



is causal, the persistence of this finding across many data sets in many countries using sophisticated econometric methods indicates that obesity is a likely cause of lower earnings and a lower probability of employment.

Two policy questions emerge from these findings. First, should governments intervene to reduce obesity? And, second, should obese workers be protected under antidiscrimination laws?

From an economic perspective, policies to reduce obesity may be warranted on efficiency grounds if obesity results in inefficiencies in resource allocation (market failure) [8], or on equity grounds if obesity is correlated with socio-economic status in ways that are not under an individual's control.

Indeed, many governments have already determined that the health care costs of obesity alone provide a rationale for intervention, such as taxing foods that are major contributors to higher calorie intake, including fats and oils, refined grains, and sugar and other sweeteners. Other policies aimed at reducing obesity rates include requiring restaurants to post calorie counts on their menus, revising school lunches to make them more nutritious, and mandating physical education classes in schools. In response to the high health care costs associated with obesity, businesses and insurance companies have also begun to experiment with incentivizing employees to lose weight, with varying degrees of success.

Another policy debate concerns whether there should be antidiscrimination legislation aimed at protecting obese workers. Many economists argue that taste-based employer discrimination requires no government intervention because, as described earlier, market forces will eradicate such pay differentials, which are incompatible with profit maximization in a competitive market in the long term. From this perspective, the best policy prescription for reducing the wage differentials associated with obesity is to encourage competition in product markets. If the discrimination is customer-based or statistical in nature, however, legal protection may be warranted. Nonetheless, the issue of whether people who are obese should be a protected class under the law is far from resolved, in part because weight, unlike skin color or gender, is considered at least partly under an individual's control.

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## Competing interests

The IZA World of Labor project is committed to the IZA Code of Conduct. The author declares to have observed the principles outlined in the code.

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