

Obesity Cost Calculator (OCC)

Frequently Asked Questions (FAQ)



RTI OBESITY COST CALCULATOR

Launch Calculator

Estimate medical and absenteeism costs

Determine program impact



Contents

1 What is the purpose of this tool?	1	10 How representative is the model of my company?	3
2 What is the tool NOT intended to do?	1	11 How closely will does the tool estimate my "real" costs?	3
3 What do I have to know in order to use the tool?	1	12 How was the tool created (basic methodology)?	3
4 What if I don't know some of the input values?	2	13 How was the tool created (advanced methodology)?	3
5 Can I save my inputs?	2	14 What is the difference between "numbers" and "percents"?	8
6 How were these input variables chosen, and not others?	2	15 What do the results screens show?	8
7 Which outcomes does the tool estimate?	2	16 Who developed this tool?	8
8 For what conditions does the tool produce estimates?	2	17 Why was the tool developed?	8
9 What is BMI (Body Mass Index)?	2		

1| What is the purpose of this tool?

This tool is designed to collect and evaluate input data provided by human resources or benefits personnel, calculate an estimate of the costs to an organization that are obesity related, and compare the costs and benefits of user-defined interventions targeted at reducing obesity.

2| What is the tool NOT intended to do?

The tool is not intended to be used for making hiring or other personnel decisions.

3| What do I have to know in order to use the tool?

At a minimum, the user must enter the number of employees in the company. If available, other information that will increase the precision of the estimates includes:

- Type of industry (from a list of 12 industry categories)
- State that best represents the location of the company
- Number of employees overall, by sex or age category (18 to 44 and 45 to 64), or by sex by age category
- Number of overweight or obese employees by the same stratifications
- Average wage information for employees by the same stratifications
- Proportion of employees receiving benefits by the same stratifications
- Share of total compensation going to benefits

4| **What if I don't know some of the input values?**

Default values from nationally representative datasets are provided for the optional inputs if the user does not have such information.

5| **Can I save my inputs?**

The user is prompted to save each new session of the OCC after clicking on “Begin New Calculation.” To view and continue with a previously saved session, the user should click on “Choose a Saved Calculation,” which can be accessed after the user clicks on “Launch Calculator.”

The user can email a PDF report that includes the output reported in the “Calculated Costs” tab of the tool by clicking on the “Email Calculated Costs” button at the bottom of the screen in the “Overall Disease Prevalence” or “Estimated Annual Obesity Costs” subtabs. The user can also email a PDF report that includes results from the Return on Investment (ROI) analysis by clicking “Email my ROI” in the top right hand corner of the ROI screen.

6| **How were these input variables chosen, and not others?**

These inputs are required to calculate the medical and work loss costs attributable to obesity and were chosen in part based on data availability and after discussions with potential users concerning which variables were most important to include in the model.

7| **Which outcomes does the tool estimate?**

1. The tool estimates the costs of obesity based on characteristics of your company. These include costs for medical expenditures and the dollar value of increased absenteeism resulting from obesity. Costs are estimated separately for four groups based on body mass index (BMI; measured as weight in kilograms divided by height in meters squared):
 - a. Overweight (BMI 25-29.9)
 - b. Obese 1 (BMI 30-34.9)
 - c. Obese 2 (BMI 35-39.9)
 - d. Obese 3 (BMI >= 40)
2. The tool includes a module to assess:
 - a. Expected costs of interventions to reduce obesity,
 - b. Potential reductions in medical costs and work loss resulting from interventions, and
 - c. The number of years before a break-even period is reached.

8| **For what conditions does the tool produce estimates?**

- Overweight (BMI 25-29.9)
- Obese 1 (BMI 30-34.9)
- Obese 2 (BMI 35-39.9)
- Obese 3 (BMI >= 40)

9| **What is BMI (Body Mass Index)?**

Body mass index (BMI). A measure of body weight relative to height. BMI is a measure that is often used to determine if a person is at a healthy weight, overweight, or obese, and whether a person's health is at risk due to his or her weight. To figure out BMI, use the following formula:

$$\text{BMI} = \frac{\text{weight (lb)}}{[\text{height (in)}]^2} * 703$$

For adults 20 years of age and older, a BMI of 18.5 to 24.9 is considered healthy (normal weight). A person with a BMI of 25 to 29.9 is considered overweight, and a person with a BMI of 30 or more is considered obese.

Note: BMI is used as a screening tool to identify possible weight problems for adults. However, BMI is not a diagnostic tool. For example, if a person has a high BMI, a health care provider would need to perform further assessments to determine if the excess weight is a health risk. These assessments might include evaluations of diet, physical activity, family history, blood tests and other appropriate health screenings.

It is important to remember that although BMI correlates with the amount of body fat, BMI does not directly measure body fat. As a result, some people, such as athletes, may have a BMI that identifies them as overweight even though they do not have excess body fat.

From: www.cdc.gov/nccdphp/dnpa/bmi/adult_BMI/about_adult_BMI.htm#Interpreted

10| How representative is the model of my company?

The inputs for the model are based on either nationally, state, or industry representative data. The extent to which the data are representative of your company depends on whether the employee profile in your company differs significantly from the national, state, or industry average. The greater the level of detail you input in the tool (e.g., number of employees by sex by age), the more representative the estimates will be for your company.

11| How closely will does the tool estimate my “real” costs?

If your company's employee profile is typical for your industry or state, then these estimates should be a good approximation of your costs. However, because of the uncertainty (variance) surrounding the estimates, actual costs could be higher or lower than those reported in the model. The degree of uncertainty decreases as the firm size increases and as more user-defined inputs are entered into the model.

12| How was the tool created (basic methodology)?

The basic methodology applies nationally representative data to compare medical expenditures and absenteeism costs between normal weight employees and those who are overweight or in one of three obesity classes. All else equal, the difference in these outcomes is a measure of the additional costs attributable to overweight and each obesity class. Multiplying these costs times the predicted number of employees in each BMI class allows for quantifying the total costs of obesity.

We estimate cost savings for a specific intervention by comparing the cost profile for a company before and after an intervention that reduces weight of the target population by a given amount. These savings are then compared to the costs of the intervention to determine whether the intervention shows a positive return on investment.

13| How was the tool created (advanced methodology)?

Obesity Prevalence

Obesity prevalence for four categories of obesity (overweight ($25 \leq \text{BMI} < 30$), obese 1 ($30 \leq \text{BMI} < 35$), obese 2 ($35 \leq \text{BMI} < 40$) and obese 3 ($\text{BMI} \geq 40$)) were calculated by industry and by state. Within industries and states, the prevalence rates were calculated by sex, by age (18 to 44 and 45 to 64), and by age and sex.

Prevalence rates by state were obtained from self-reported height and weight from the 2013 Behavioral Risk Factor Surveillance System (BRFSS).

Prevalence rates by industry were obtained from self-reported height and weight from the 2013 National Health Interview Survey (NHIS). The industry categories were based on NHIS recodes of the 2007 North American Industry Classification System (NAICS) and the 2000 Standard Occupation Classification (SOC). Some industries were combined further due to small sample sizes in the industry/weight/age/sex subgroups. The 12 industry categories (NAICS codes) were Agriculture, Forestry Fishing, and Hunting (111-115); Construction (236-238); Education Services and Health Care and Social Assistance (611, 621-624); Arts, Entertainment and Recreation and Accommodation and Food Services (711-713, 721-722); Finance and Insurance and Real Estate and Rental and Leasing (521-524, 531-533); Information (511, 512, 515-519); Manufacturing (311-316, 321-327, 331-337, 339); Other Services except Public Administration (811-814); Professional, Scientific, and Technical Services, Management of Companies and Enterprises, and Administrative and Support and Waste Management and Remediation Services (541, 551, 561-562); Public Administration (921-928); Transportation and Warehousing and Utilities (481-488, 491-493, 221); and Wholesale and Retail Trade (423-425, 441-448, 451-454). If a sample size for the specified group (e.g., industry/weight/age/sex) was less than 70 people (before applying sample weights), then the estimated prevalence was replaced with the prevalence for the less stratified group (i.e., by sex by age estimates were replaced with by sex estimates; by age estimates were replaced with overall estimates for the industry). This occurred primarily for female subgroups within agriculture.

Prevalence rates for each weight category were adjusted for self-reporting by multiplying by a scaling factor. The scaling factor was the group-specific ratio of prevalence for the weight category based on measured BMI from the 2011 and 2012 National Health and Nutrition Examination Survey (NHANES) to the self-reported prevalence in the NHIS (or BRFSS for state estimates). The NHANES could not be used directly since it did not provide industry codes or state identifiers. The approach assumes that self-reporting bias does not vary by industry but does allow self-reporting bias to vary by obesity category, age and sex.

Hourly Wages and Benefits

Average hourly wages by industry were estimated from the March 2014 Current Population Survey (CPS). Within industries, average hourly wages were calculated for the overall population of full-time workers ages 18 to 64 and by sex, by age, and by sex and age. Average hourly wages were calculated from average weekly earnings from the sole or primary job by dividing by 40 hours.

Estimates of total compensation, defined as wages plus the value of benefits offered to employees, were obtained by scaling average hourly wages by a benefits multiplier. The benefits multiplier is the percentage of an employee's total compensation that is received as benefits. The national estimate for this share is 31% based on data from the Statistical Abstract of the United States. User-defined benefit multipliers are used when available. Average hourly wages for each industry and demographic group are a weighted average of wages for those with benefits and wages for those without benefits, with weights equal to the percent of full-time workers with benefits in each industry/group as calculated in the 2013 NHIS.

Average hourly wages do not vary by weight category as the CPS does not provide information about weight. Thus, the calculator assumes that the value of work time lost to illness is the same across all weight categories. There is some evidence in the literature that obese employees earn less than normal weight employees, but generally only for women.

Total Medical Expenditures

Econometric modeling was used to estimate the costs associated with obesity using the 2008 through 2012 Medical Expenditure Panel Survey (MEPS; see Finkelstein et al. 2005, 2007 for examples of the methodology). We estimated the total medical costs for each obesity category separately for the full-time working population ages 18 to 64 by sex and age. We pooled the five most recent years of data to increase the sample sizes available for the subgroup analyses.

Based on extensive specification testing as recommended by Manning and Mullahy (2001), Buntin and Zaslavsky (2004), Manning, Basu, and Mullahy (2005), and Hill and Miller (2010), we chose a two-part model of total expenditures. The first part was a logit model for the probability of positive expenditures; the second part modeled expenditures for people with positive expenditures using generalized linear model (GLM) with log link and gamma variance function. Expected annual per capita expenditures were predicted by multiplying the probability of positive expenditures by expected expenditures conditional on having positive expenditures. All regressions included weight category (underweight ($BMI < 18.5$), normal weight (omitted), overweight, obese 1, obese 2, and obese 3), age, age squared, sex, race/ethnicity, education, household income, smoking status, Census region, and year.

For each sex and age subgroup, the medical expenditures per person attributable to obesity were calculated using the following method.

1. Expenditures were predicted for each individual based on observed weight categories and other covariates.
2. Then, we subtracted from that predicted expenditures for an otherwise identical person of normal weight.
3. The difference in predicted expenditures from steps 1 and 2 were then averaged among each weight category.

This counterfactual indicates the extent to which medical expenditures per overweight or obese person would be lower in the absence of excess weight, all else constant. Total medical costs by sex, by age, and for the overall population were calculated by applying weighted averages to the costs estimated by sex and age.

Due to the lack of state identifiers and the small sample sizes within industries, the per-person estimates of medical expenditures attributable to excess weight are nationally representative. The total medical costs of overweight and obesity to companies vary by industry or state due to differences in prevalence of overweight and obesity across industries and states.

Medical Expenditures by Point of Service

In addition to providing estimates of total medical expenditures, the calculator includes a breakdown of the medical costs by the following points of service.

1. Prescription drug costs
2. Inpatient costs
3. All other medical costs

The specification testing described above was also conducted for each point of service and the same econometric model that was used to calculate total medical expenditures was used to quantify cost estimates by point of service. Expenditures for each point of service were estimated separately by weight class for the overall full-time working population, ages 18-64. For each weight class, we summed these estimates and calculated the percentage of total medical costs spent on each point of service. We then applied these percentages to the total

medical cost estimates of each weight class for overall population and by sex, age, and by sex and age to calculate estimates of medical expenditures by point of service.

Work Loss

The days of work loss associated with obesity were estimated using the 2009 through 2013 NHIS. We estimated the days of work loss separately for the same groups as in the medical expenditure analysis. The dependent variable was annual days of work missed. We used a negative binomial model with log link to account for the fact that the dependent variable was a count. The model included weight category, age, age squared, sex, race/ethnicity, education, household income, smoking status, whether paid hourly, years of work experience, family size, alcohol consumption, and functional limitations.

The number of annual work days missed attributable to obesity was calculated using similar steps as for medical expenditures. The difference between predicted work days lost at observed weight and predicted work loss for an otherwise identical person of normal weight was calculated for each person in the sample. The estimate of lost work days attributable to overweight and obesity was the average of this difference among people in each weight category. The calculator multiplies the estimates of the average days of work missed due to obesity by average hourly cost of an employee and by eight hours in a work day to report the financial costs of absenteeism due to obesity.

Due to the lack of state identifiers and the small sample sizes within industries, the estimates of lost work days per-person attributable to excess weight are nationally representative. The total value of lost work days to the company due to overweight and obesity varies by industry or state due to differences in prevalence of overweight and obesity across industries and states and variation in compensation across industries.

Disease Prevalence

The prevalence of hypertension, cardiovascular disease (CVD), diabetes, dyslipidemia, arthritis, asthma, depression, injury, chronic obstructive pulmonary disease (COPD), mental health/substance abuse problems, and back disorders by weight class were estimated using data from the 2008-2012 MEPS. Diseases were defined using Clinical Classification and ICD-9 codes based on self-reported diseases that were transcribed by professional coders and reported in the MEPS Medical Conditions files (see Table below). Prevalence was defined as the percentage of the population reporting treatment for or problems with the disease in the previous year. Due to the lack of state identifiers and the small sample sizes within industries, the prevalence rates are nationally representative.

Condition Categories by Clinical Classification (CC)14 Code and 3-digit ICD-9

Hypertension	
Hypertension without heart disease	ICD-9: 401 403
Cardiovascular Disease (CVD)	
Coronary heart disease	ICD-9: 410-414
Congestive heart failure, nonhypertensive	ICD-9: 428
Stroke	ICD-9: 430 431 433 434 436 438
Other CVD	ICD-9: 390-400 402 405-409 415-427 429 432 435 437 439 440-459 745-747
Diabetes	
Dyslipidemia	
	ICD-9: 272 CC: 53

Condition Categories by Clinical Classification (CC)14 Code and 3-digit ICD-9

Arthritis	ICD-9: 274 354 390 391 443 446 710-716 719-721 725-729
Asthma	ICD-9: 493 CC: 128
Depression	ICD-9: 296 311
Injuries	CC: 225-244
COPD	CC: 127
Other MHSA	CC: 66 67 69-73 or (no Depression and CC: 650-652 654-660 662)
Back Problems	CC: 205

Intervention Module

The predicted number of intervention participants is equal to the (number of employees) x (prevalence of target population) x (participation rate). The prevalence of target population (all overweight and obese, overweight, all obese, obese 1, obese 2, and obese 3) was derived as described above. Since the interventions are not targeted by age and sex, these estimates were generated for the full-time employed population ages 18 to 64. The participation rate is defined by the user.

The total annual intervention-related medical costs are equal to (cost of intervention per participant) x (1 – employee co-payment) x (number of participants). The total annual intervention-related work loss costs are equal to (# of days missed due to intervention per participant) x (daily earnings) x (number of participants). The cost of the intervention and days of work missed due to the intervention are supplied by the user. Daily earnings and the number of participants were calculated as described above.

A prevalence-based approach was used to translate expected weight loss for the target population into expected changes in medical expenditures and work loss for the employer's workforce. First, expected medical expenditures and work loss as a function of BMI and squared BMI were estimated. Next, information provided by the user about overweight and obesity among their employees, combined with estimates of the BMI distribution in the working age population from the NHANES was used to estimate the number of employees at each BMI. Then the weight distribution of the target population is shifted by the average weight loss provided by the user to estimate the number of employees at each BMI post-intervention. Finally, the financial benefit of the intervention to the company is the difference in predicted medical expenditures and work loss for the employees between the initial BMI distribution and the post-intervention distribution. The calculation is done separately for the average weight loss entered by the user for the first year and for subsequent years. In both calculations, the original, pre-intervention BMI distribution is used as the reference.

To determine whether the cumulative savings ever exceed the cumulative costs for an intervention, the present value of the savings from the intervention (total medical savings + total work loss savings) are compared to the present value of the company's intervention-related costs, including intervention-related work loss. The present value calculations discount the value of future savings and costs using the user-supplied annual discount rate. The calculator reports the period of the duration of the intervention, defined as the maximum of the number of years that intervention costs or benefits accrue, in which the present value of the savings exceed the present value of the costs, if any.



14| What is the difference between “numbers” and “percents”?

“Numbers” present the actual units (i.e., number of individuals, total costs), whereas “percents” present the “number” as a fraction of the total (e.g., number of class III obese individuals divided by total number of individuals with excess BMI).

15| What do the results screens show?

The results screens contain tabs that summarize the inputs used, report the costs attributable to overweight and obesity for the company, and allow the user to evaluate potential interventions.

Calculated Costs—Summary

The “Summary” shows the input choices made by the user. The number of employees, the number of employees in each weight category, the average hourly compensation, and the percent of employees with benefits are all reported by the level of demographic detail chosen by the user.

Calculated Costs—Overall Disease Prevalence

The “Overall Disease Prevalence” tab reports the prevalence of obesity-related diseases by weight category.

Calculated Costs—Estimated Annual Costs

The “Estimated Annual Obesity Costs” reports the annual costs to the company attributable to overweight and obesity. These numbers represent the extent to which medical expenditures or work loss costs would be lower in the absence of overweight and obesity, all else constant. The (advanced methodology) question above describes in detail the generation of the cost estimates.

All costs are reported in 2014 dollars using the GDP deflator provided by the Bureau of Labor Statistics. All results generated from the tool are estimates. Actual results may be larger or smaller than those reported.



16| Who developed this tool?

This tool was developed by RTI International and supported by the Centers for Disease Control and Prevention (CDC) and the CDC Foundation.

17| Why was the tool developed?

Obesity is a growing trend affecting workers all over the world. Many organizations realize the need to assess the costs of obesity as it relates to their bottom line. Forward thinking organizations are looking for ways to quantify the magnitude of this challenge and to assess the options and benefits of providing interventions and incentives to better manage the health of their employees.

The Obesity Cost Calculator is designed to collect and evaluate input data provided by human resources or benefits personnel, calculate an estimate of the costs to an organization that are obesity related, and compare the costs and benefits of user-defined interventions targeted at reducing obesity.

More Information
Olga Khavjou
919.541.6689
okhavjou@rti.org

RTI International
3040 E. Cornwallis Drive
Research Triangle Park, NC 27709

www.rti.org/occ