OCTOBER 2018

AMERICA'S OBESITY CRISIS

THE HEALTH AND ECONOMIC COSTS OF EXCESS WEIGHT

BY HUGH WATERS AND MARLON GRAF

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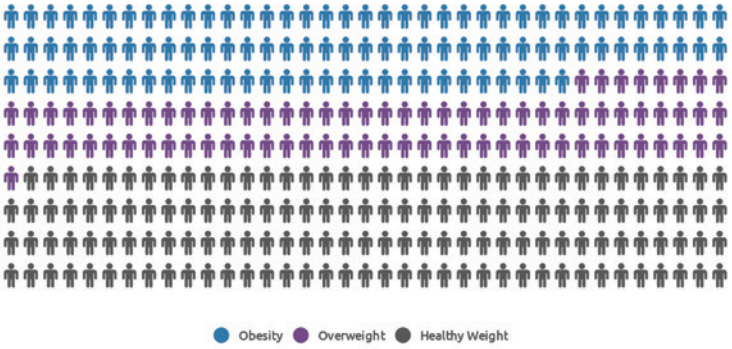
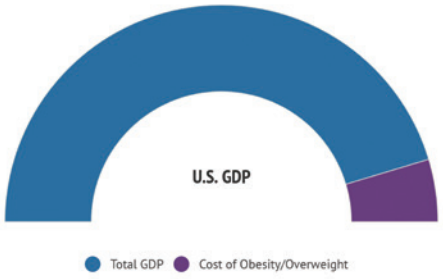
Executive Summary

The prevalence of obesity in the U.S. population has increased steadily since the 1960s—from 3.4 percent of adults in 1962 to 39.8 percent in 2016, the year of the most recent Centers for Disease Control and Prevention data. An estimated 100.3 million U.S. residents had obesity in 2016, and another 80.2 million were overweight. In all, 180.5 million people—or 60.7 percent of the population ages 2 and over—were either obese or overweight. Among the population aged 20 and over, the prevalence of obesity was 39.8 percent, and an additional 32.8 percent were overweight.



In 2016, **~100.3 million U.S. residents** had **obesity** and another **~80.2 million** were **overweight**.

The extent of obesity and overweight doesn't stop there. Because obesity and overweight are major risk factors for a broad range of chronic diseases, the increase in their prevalence across the nation has major implications for the health and wellbeing of the population. The burden of obesity, and the chronic diseases for which it is a contributing factor, has reached record economic heights. In 2016, chronic diseases driven by the risk factor of obesity and overweight accounted for $480.7 billion in direct health care costs in the U.S., with an additional $1.24 trillion in indirect costs due to lost economic productivity. The total cost of chronic diseases due to obesity and overweight was $1.72 trillion (Table 1)—equivalent to 9.3 percent of the U.S. gross domestic product (GDP). Obesity as a risk factor is by far the greatest contributor to the burden of chronic diseases in the U.S., accounting for 47.1 percent of the total cost of chronic diseases nationwide.



In 2016, the cost of **chronic diseases** attributed to the prevalence of **obesity** and being **overweight** resulted in a **$1.72 trillion price tag**, equivalent to **9.3%** of **U.S. GDP**.

TABLE 1

Total Costs of Obesity and Overweight, 2016

Condition	Costs (in $ Millions)		
	Direct	Indirect	Total
Alzheimer's and Vascular Dementia	$73,572	$32,606	$106,178
Asthma and COPD	$10,564	$16,234	$26,798
Breast Cancer	$5,900	$3,669	$9,569
Chronic Back Pain	$38,476	$217,291	$255,768
Colorectal Cancer	$6,151	$5,425	$11,576
Congestive Heart Failure	$5,201	$2,039	$7,239
Coronary Heart Disease	$22,700	$39,315	$62,015
Diabetes (Type 2)	$120,707	$214,500	$335,208
Dyslipidemia	$28,619	†	$28,619
End Stage Renal Disease	$3,716	††	$3,716
Endometrial Cancer	$189	$158	$347
Esophageal Adenocarcinoma	$970	$92	$1,061
Gallbladder Cancer	$22	$17	$39
Gallbladder Disease	$26,863	$27,401	$54,264
Gastric Cardia Adenocarcinoma	$1,433	$136	$1,568
Hypertension	$29,323	$432,230	$461,553
Liver Cancer	$87	$67	$154
Osteoarthritis	$86,480	$215,303	$301,783
Ovarian Cancer	$1,152	$152	$1,304
Pancreatic Cancer	$146	$738	$884
Prostate Cancer	$1,983	$13,411	$15,393
Renal Cancer	$2,254	$559	$2,813
Stroke	$14,148	$14,527	$28,674
	$480,655	**$1,235,869**	**$1,716,523**

† Included in heart disease, diabetes, and stroke.[1]
†† Included in diabetes and hypertension.

Source: Milken Institute.

Introduction

This study calculates the prevalence and economic effects of diseases related to obesity and overweight in the United States. These costs are paid by individuals and their households, employers, government, and society. The study uses a range of data sources to comprehensively establish the prevalence of conditions related to obesity, as well as the costs. To capture all costs, this study evaluated the *direct costs* of health care services to treat these diseases—costs paid by individuals, families, insurance companies, and employers—as well as *indirect costs* that relate to work absences, lost wages, and reduced economic productivity for the individuals suffering from the conditions and their family caregivers.[2, 3, 4] For each condition, the direct health care costs and the indirect costs are calculated and presented separately.

Methodology

The prevalence of each chronic health condition is calculated based on data from the U.S. Centers for Disease Control and Prevention (CDC). The CDC compiles prevalence estimates from state reports and registries, as well as data reported through national surveys, including the National Health and Nutrition Examination Survey (NHANES).[5] The CDC prevalence data are compared with estimates from other sources, including data published in peer-reviewed academic journals.

For each condition, the study calculates the Population Attributable Risk (PAR) to determine the number of episodes of the illness that can be attributed to obesity. The PAR is defined as the proportion of a disease occurring in the total population attributable to the exposure or risk factor in question.[6, 7] Throughout this report, we use the concept of the *treated prevalence* of health conditions that are associated with obesity. This corresponds to the percentage of the population that not only has the condition in question but also has received treatment for it.

The principal source for the costs of medical treatment for different chronic health conditions is the Medical Expenditure Panel Survey (MEPS).[8] The MEPS is a nationally representative sample of non-institutionalized Americans collected by the U.S. Agency for Healthcare Research and Quality (AHRQ). It includes a household survey component and an insurance component, which provides information for employer-provided insurance plans. We also use the results of separate studies conducted by the CDC[9] and the National Cancer Institute,[10] as well as published journal articles.

All data are for 2016, and the amounts are in 2016 U.S. dollars. Cost estimates for 2016 are not available for some rare health conditions, so we updated earlier estimates from the peer-reviewed literature using health care inflation rates calculated by the Bureau of Labor Statistics for the Consumer Price Index to accurately reflect current price levels.[11]

The Prevalence of Obesity and Overweight

The international standard for measuring obesity is the body mass index (BMI), adopted by the World Health Organization (WHO),[12] as well as other international organizations and the U.S. government. BMI is calculated as a person's weight (measured in kilograms) divided by the square of their height (measured in meters):

$$\text{BMI} = \frac{\text{kg}}{\text{m}^2}$$

The U.S. standards follow the WHO standards and include a classification of extreme obesity, indicated by a BMI of 40.0 or higher.[13, 14, 15] BMI data are collected and analyzed by the National Center for Health Statistics (NCHS), part of the CDC. The NCHS collects nutrition and BMI data through several nationally representative sources, including the National Health Interview Survey (NHIS)[16,17] and the NHANES.[5, 18, 19] The CDC also collects data on BMI and obesity through the Behavioral Risk Factor Surveillance System, based on telephone surveys.[20]

The NHANES is the primary source of prevalence data for obesity and overweight for this study. Among the nationally representative sources of data on obesity in the U.S. population, the NHANES has the most sophisticated measures. The survey directly measures height and weight to calculate BMI, rather than relying on individuals' self-reporting.[21] Table 2 shows the trends in the prevalence of overweight, obesity, and severe obesity for adults ages 20 and over in the U.S. since the CDC began systematic measurement through household surveys.

TABLE 2

Prevalence of Overweight, Obesity, and Severe Obesity Among Adults[22, 23]

Years	Overweight, Not Obese	Obese	Severe Obesity (BMI >= 40)
1960-1962	31.5%	13.4%	0.9%
1971-1974	32.3%	14.5%	1.3%
1976-1980	32.1%	15.0%	1.4%
1988-1994	33.1%	22.9%	2.9%
1999-2002	34.7%	30.4%	4.9%
2003-2006	33.3%	33.4%	5.4%
2007-2010	34.4%	34.7%	6.0%
2011-2014	33.4%	36.4%	6.9%
2015-2016	32.8%	39.8%	N/A

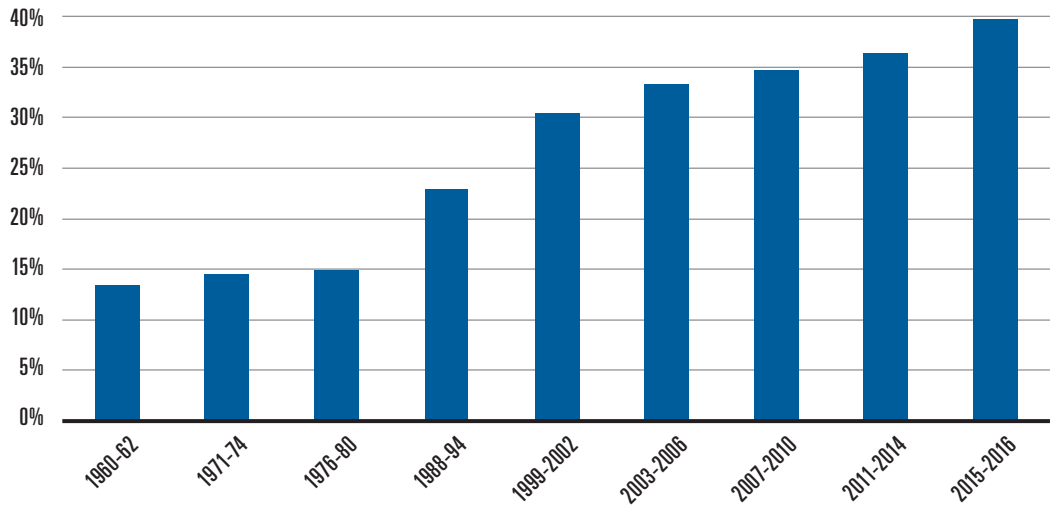
Note: The surveys were conducted in rounds, corresponding to the years listed in the chart. Initially, the surveys were not continuous. No survey years are missing from the data presented.

Source: National Health Examination Survey (NHES) and National Health and Nutrition Examination Surveys (NHANES).

As shown in Table 2 and Figure 1, the prevalence of obesity in the U.S. population has increased steadily since the 1960s—from 13.4 percent in 1962 to 39.8 percent in 2016.

FIGURE 1

Prevalence of Obesity in the U.S. Adult Population Over Time[22, 23]



Note: The years 1960-1962 were pulled from data from the National Health Examination Survey (NHES). From 1971 onward, the data is from the National Health and Nutrition Examination Surveys (NHANES).

Source: Milken Institute, based on NHANES data.

TABLE 3

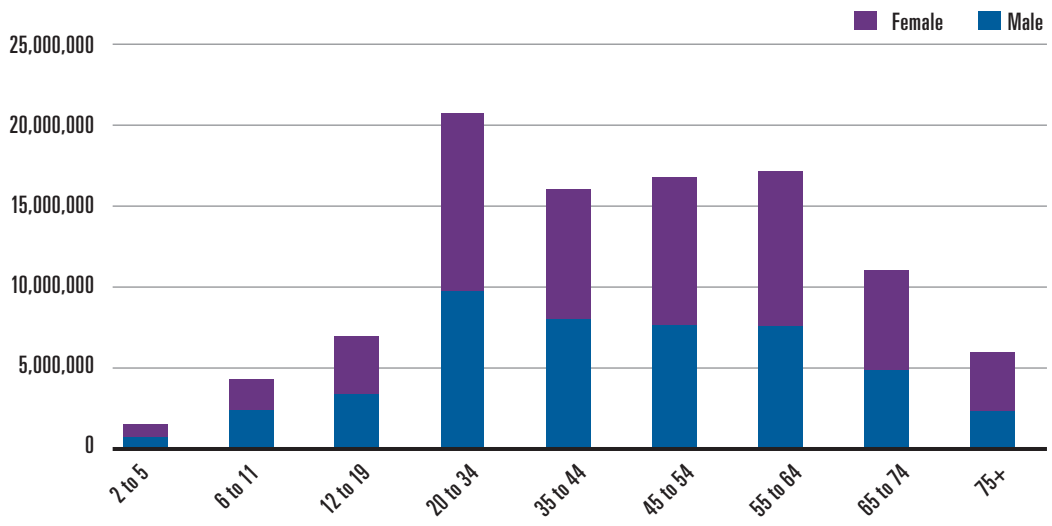
Number of Individuals with Obesity, 2016

Age Range	Male	Female	Total
2 to 5	721,432	784,409	1,505,841
6 to 11	2,359,669	1,914,312	4,273,982
12 to 19	3,388,391	3,507,001	6,895,392
20 to 34	9,715,879	11,011,134	20,727,013
35 to 44	8,020,800	7,944,101	15,964,900
45 to 54	7,724,847	9,040,785	16,765,632
55 to 64	7,619,633	9,530,063	17,149,697
65 to 74	4,847,581	6,202,363	11,049,944
75+	2,251,660	3,724,705	5,976,365
Totals	**46,649,893**	**53,658,873**	**100,308,766**

Source: Milken Institute, based on NHANES and U.S. Census Bureau data.[24]

FIGURE 2

Number of Individuals with Obesity, 2016



Source: Milken Institute, based on NHANES data.

100.3 million U.S. residents had obesity in 2016. Another 80.3 million were overweight. In sum, 180.6 million people, or 60.7 percent of the population ages 2 and over, were either obese or overweight (Table 4 and Figure 3). Among the population ages 20 and over, the prevalence of obesity was 39.8 percent, and the prevalence of overweight was 32.8 percent. These results from the NHANES are similar to other estimates from the literature and show a steady increase in the levels of obesity and overweight in the U.S.[18, 19]

TABLE 4

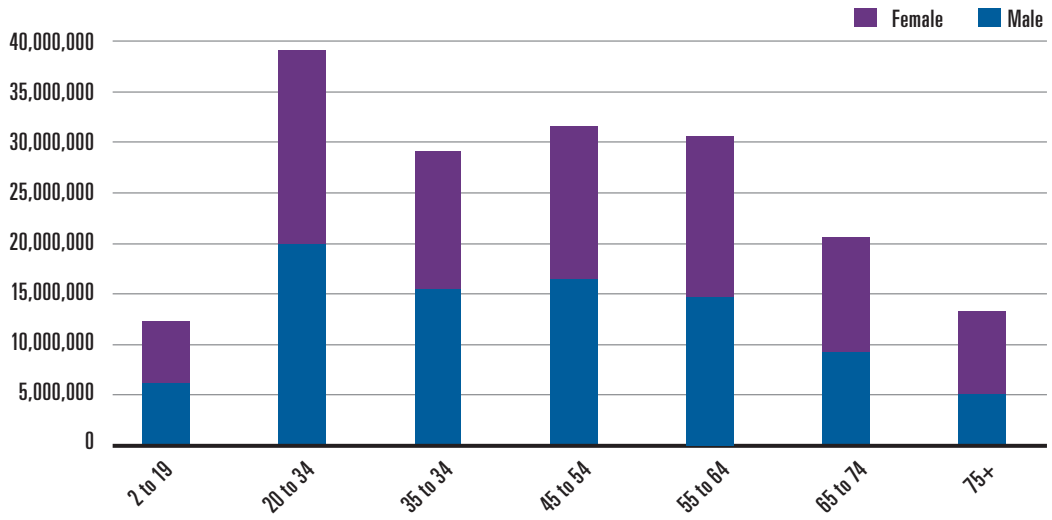
Number of Individuals with Obesity or Overweight, 2016

Age Range	Male	Female	Total
2 to 19	6,469,492	6,205,722	12,675,214
20 to 34	20,590,845	19,285,969	39,876,814
35 to 44	15,981,141	13,328,210	29,309,351
45 to 54	17,053,760	15,479,906	32,533,666
55 to 64	15,339,262	15,947,831	31,287,093
65 to 74	10,190,634	10,850,325	21,040,959
75+	5,965,219	7,889,048	13,854,267
Totals	**91,590,353**	**88,987,011**	**180,577,364**

Source: Milken Institute, based on NHANES and U.S. Census Bureau data.

FIGURE 3

Number of People with Obesity or Overweight, 2016



Source: Milken Institute, based on NHANES data.

Obesity's Impact on Chronic Diseases

Obesity is by far the greatest risk factor contributing to the burden of chronic diseases in the U.S. Obesity increases insulin resistance, blood pressure, LDL cholesterol, and triglycerides. Further, obesity lowers HDL cholesterol and places the body in a pro-inflammatory state.[25] Extreme fat retention in the body is detrimental because fat cells networked together act as an endocrine organ. Fat cells release resistin, a hormone that causes insulin resistance and Type 2 Diabetes. Further, they release another hormone, leptin, which has deleterious impacts on the cardiovascular system.[26] The pancreas tries to counterbalance the insulin resistance by producing even more insulin, which raises the risk of a variety of cancers.[27] The number of metabolic pathways that are affected by obesity suggests a high degree of interrelationships among the associated diseases. Together, these multiple related pathways are referred to as metabolic syndrome.[28]

This section reviews the epidemiologic evidence linking the presence of obesity and overweight to different chronic diseases. We assessed the greater likelihood of a person with obesity developing a chronic disease using relative risk. Relative risk is defined as the ratio of: the percentage of individuals exposed to a risk who develop a disease to the percentage of individuals who are not exposed to the risk who develop that disease.

$$RR = \frac{\text{Percentage of exposed with disease}}{\text{Percentage of unexposed with disease}}$$

In this context, exposure refers to having obesity or being overweight, compared to people of normal weight. For example, the higher an individual's BMI, the higher the risk for Type 2 Diabetes Mellitus, as excess weight affects the body's ability to regulate insulin.[29, 30] This effect holds independent of waist circumference.[31] In a study of 10,568 adults who participated in the 2010 NHANES, 18.5 percent of participants who were obese also had diabetes, compared to 8.2 percent of participants who were overweight and 5.4 percent of participants who were normal weight. The relative risk of Type 2 Diabetes related to obesity is 3.43, meaning that individuals suffering from obesity are 3.43 times more likely to contract diabetes than individuals of normal weight.[32] Likewise, the relative risk related to overweight is 1.52, meaning that individuals who are overweight are 1.52 times more likely to contract diabetes than individuals of normal weight.

End Stage Renal Disease

End Stage Renal Disease (ESRD)—sometimes referred to as kidney failure—is the last stage of kidney disease and is similar to Type 2 Diabetes in its association with obesity. The Framingham study identified the relationship between BMI and increased risk for ESRD, finding a relative risk of 1.23 per increase of 1 standard deviation in BMI.[33] This relationship has been confirmed in more recent research, with a meta-analysis showing that individuals suffering from being overweight or obesity have relative risks of 1.87 and 3.57, respectively.[34]

Dyslipidemia

Dyslipidemia refers to an imbalance of lipids in the blood. In the U.S., most cases are hyperlipidemias—an excess of cholesterol or fat. Individuals with obesity have a 1.74 relative risk for dyslipidemia, compared to individuals of normal weight. Individuals who are overweight have a relative risk of 1.56.[32]

Hypertension

Among the cardiovascular diseases affected by obesity, hypertension has the strongest association. Women who are obese face a higher risk of developing hypertension than men with the same BMI. Several studies have shown a strong link between BMI and hypertension.[35, 36] A systematic review and meta-analysis published in *BMC Public Health* in 2009 found the relative risks for men and women who are overweight to be 1.65 and 1.28, respectively. The relative risks for men and women who suffer from obesity are 2.42 and 1.84, respectively.[37]

Coronary Heart Disease

On average, a 1-point increase in an individual's BMI leads to a 10 percent increase in the risk of coronary heart disease (CHD).[26, 38] A 20-year follow-up analysis of the Nurses' Health Study cohort found that women who are overweight have a 1.43 relative risk of developing CHD compared to women of normal weight; the relative risk for women who suffer from obesity was 2.44.[39] A meta-analysis of 31 studies—including 389,239 individuals and 20,652 CHD events—found a relative risk of 1.33 for individuals who are overweight and 1.69 for individuals with obesity after adjusting for age, gender, and smoking status.[40]

Congestive Heart Failure

BMI is also strongly correlated with the incidence of congestive heart failure.[41] Analysis of the Framingham Heart Study found a relative risk of 2.12 for women suffering from obesity and 1.90 for men.[42] A pooled meta-analysis of studies found that being overweight is associated with relative risks of 1.27 and 1.31 for women and men, respectively. Obesity is associated with relative risks of 1.78 and 1.79, respectively.[37]

Cancer

The medical community has been aware of the connection between obesity and various cancers since the late 1970s. Several studies have found a strong association between obesity and cancers of the breast, colon, endometrium, gallbladder, liver, pancreas, and ovaries. Summary relative risks for gallbladder cancer are estimated to be 1.5 for individuals who are overweight and 2.0 for individuals suffering from obesity. High BMI levels also pose a risk for gallbladder disease, with summary relative risks of 1.44 for women who are overweight and 2.32 for women suffering from obesity. The corresponding numbers for men are 1.09 and 1.43. Obesity is also a risk factor for liver cancer; the relative risk for individuals who are obese is estimated to range from 1.5 to 4.0.[26, 27]

In general, public awareness concerning the risk obesity poses in relation to cancer is lower than more common associations such as Type 2 Diabetes or cardiovascular disease.[43] For women, obesity is estrogenic and stimulates the development of breast, ovarian, and endometrial cancers. The risk for cancer is often heightened for men with obesity because of the storing of the greatest proportion of fat in the midsection, leading to higher incidence of kidney, gallbladder, liver, and prostate cancer.

Obesity has a double impact on women and breast cancer. Obesity has consistently been found to be associated with breast cancer among women, increasing the prevalence by 30 to 50 percent.[26, 44, 45, 46, 47] A summary review published in 2004 calculated a relative risk of 1.3 for women who are overweight and 1.5 for women suffering from obesity.[27] In addition, among women who have breast cancer, those who are overweight or obese have shorter survival times and worse prognoses.[44, 48]

Women with obesity have a high relative risk for ovarian cancer compared to women of normal weight—the summary RR of developing ovarian cancer is 1.53 for women who are overweight and 3.22 for women with obesity.[37] There is also a linear relationship between endometrial cancer risk and BMI, possibly related to an increase in circulating estrogen for women who are overweight or obese. The summary relative risk is 2.0 if overweight and 3.5 if obese.[26]

Several studies have shown a link between obesity in men and the likelihood of developing advanced prostate cancer. Moreover, among those who have the disease, men with obesity are more likely to develop advanced symptoms and die, as well as suffer a recurrence after a radical prostatectomy. Summary RRs are 1.14 for men who are overweight and 1.05 for men with obesity.[26, 37, 49, 50, 51, 52]

Obesity and overweight have been consistently found to be associated with the incidence of colorectal cancer, particularly in men. Summary relative risks are 1.20 and 1.50 for women who are overweight or obese, respectively, and 1.50 and 2.0 for men, respectively.[27, 45, 46, 53, 54] Being overweight leads to an estimated 1.55 relative risk for developing adenocarcinoma of the esophagus, while being obese leads to a relative risk of 2.3.[26, 27, 55]

The best estimates of the relative risk for pancreatic cancer are 1.24 and 1.28 for women and men, respectively, who are overweight, and 1.60 and 2.29 for women and men, respectively, who suffer from obesity. The relative risk of developing renal cancer is estimated at 1.15 and 1.41 if overweight for women and men, respectively, and 1.20 and 1.82 if obese for women and men, respectively.[37]

Asthma and COPD

Obesity can lead to inflammation of the airways in the lungs, increasing the risk of asthma and chronic obstructive pulmonary disease (COPD), as well as the severity of asthma and COPD.[56, 57] These relationships vary by gender, with several studies showing that women have a greater risk than men.[58] A meta-analysis published in 2009 found that the summary relative risk is 1.25 for women who are overweight and 1.78 for women who are obese. The corresponding numbers for men are 1.20 and 1.43.[37] Obesity also has a 2.81 relative risk for chronic back pain. Being overweight has a relative risk of 1.50.[37] Osteoarthritis is linked to overweight and obesity as well, with relative risks of 1.80 and 1.96 for women who are overweight and obese, respectively. The corresponding relative risks for men are 2.76 and 4.20.[26, 37]

Other Chronic Diseases Affected by Obesity

In the past decade, several studies have demonstrated the effect of obesity on Alzheimer's disease and other vascular dementia.[59] A meta-analysis of 15 prospective studies, published in 2011, found that the relative risk for Alzheimer's disease or vascular dementia was 1.35 and 2.04 for individuals who are overweight or obese, respectively.[37, 60] Obesity is also a significant risk factor for stroke. A systematic review covering more than 2 million participants in prospective studies found that the relative risk of stroke for individuals who are overweight is 1.22 and individuals who are obese is 1.64.[61]

Table 5 shows the number of U.S. cases in 2016 of each disease shown to be associated with obesity or overweight—whether related to obesity or not. Data sources include the CDC, the National Cancer Institute, and peer-reviewed articles, as detailed in the references section.

TABLE 5

Total Prevalence of Diseases Associated with Obesity, 2016

	Male	Female	Total	References
Alzheimer's and Vascular Dementia	2,093,540	3,525,960	5,619,500	62
Asthma and COPD	9,275,354	12,525,692	21,801,046	63
Breast Cancer	--------	3,669,600	3,669,600	64
Chronic Back Pain	15,345,546	16,228,395	31,573,940	65
Colorectal Cancer	681,863	664,723	1,346,586	66, 67
Congestive Heart Failure	3,525,306	3,072,277	6,597,583	68, 69, 70, 71
Coronary Heart Disease	9,236,616	7,511,095	16,747,711	70
Diabetes (Type 2)	13,513,211	13,159,924	26,673,135	72, 73
Dyslipidemia	46,106,177	48,592,443	94,698,620	74
End Stage Renal Disease	405,160	295,809	700,969	75, 76
Endometrial Cancer	--------	726,047	726,047	66, 67
Esophageal Adenocarcinoma	36,518	10,043	46,561	66, 67, 77
Gallbladder Cancer	2,279	5,983	8,262	66, 67
Gallbladder Disease	6,168,248	14,130,230	20,298,477	78
Gastric Cardia Adenocarcinoma	60,160	35,604	95,764	66, 67
Hypertension	38,847,356	39,772,425	78,619,781	70
Liver Cancer	48,085	18,686	66,771	66
Osteoarthritis	27,065,665	28,622,788	55,688,453	79
Ovarian Cancer	--------	222,060	222,060	80
Pancreatic Cancer	31,868	32,800	64,668	66, 67
Prostate Cancer	3,085,209	--------	3,085,209	66, 67
Renal Cancer	291,796	191,429	483,225	66, 67
Stroke	**4,748,986**	**4,045,432**	**8,794,418**	70

Source: Milken Institute.

Cases Attributable to Obesity and Overweight

Stemming from a comprehensive search of the academic literature, we identified the relative risk for individuals who are obese and overweight—in both cases compared to individuals with normal weight. We use the population attributable risk (PAR) to calculate the percentage of cases where obesity increases the risk for each disease. The PAR, also called etiologic fraction or just attributable risk, is the proportion of cases of a disease and associated mortality in a given population that is related to exposure to a risk factor.[81] The PAR is calculated as:

$$\frac{\text{(Incidence in total population)} - \text{(Incidence in unexposed group)}}{\text{(Incidence in total population)}}$$

In the case of chronic illnesses, prevalence is continuous—so, in a given year, incidence is equal to prevalence. As a hypothetical example, if the prevalence of a disease for an entire population is 20 percent in a given year, and the prevalence among those who are not obese is 17.2 percent, then the prevalence attributable to obesity is:

$$\frac{(0.2 - 0.172)}{0.2} = \frac{0.028}{0.2} = 0.14 = 14\%$$

The PAR can also be calculated using a mathematically equivalent formula with the prevalence of the exposure to the risk factor and the relative risk (RR) for a specific condition.[82, 83] The formula for calculating the PAR in this way is:

$$\frac{\text{(Prevalence of Obesity/Overweight)} * (RR - 1)}{\text{(Prevalence of Obesity/Overweight)} * (RR - 1) + 1}$$

Using this formula, we calculated the PAR for each of the health conditions associated with obesity. In this case, the prevalence of obesity and overweight is the prevalence of exposure to the risk factor. The relative risks, which indicate how likely people with obesity or who are overweight are to develop that particular condition when compared to people of normal weight, are summarized in Section 3.

Table 6 summarizes these relative risks and the resulting PARs for each condition.

TABLE 6

Relative Risks and Population Attributable Risks

Condition	Relative Risk		Population Attributable Risk	
	Overweight	Obesity	Overweight	Obesity
Alzheimer's and Vascular Dementia	1.35	2.04	0.10	0.29
Asthma and COPD	1.23	1.61	0.07	0.19
Breast Cancer	1.30	1.50	0.09	0.17
Chronic Back Pain	1.59	2.81	0.16	0.42
Colorectal Cancer	1.35	1.75	0.10	0.23
Congestive Heart Failure	1.29	1.27	0.09	0.10
Coronary Heart Disease	1.33	1.69	0.10	0.22
Diabetes (Type 2)	1.52	3.43	0.15	0.49
Dyslipidemia	1.56	1.74	0.16	0.23
End Stage Renal Disease	1.87	3.57	0.22	0.51
Endometrial Cancer	1.05	1.10	0.02	0.04
Esophageal Adenocarcinoma	1.55	2.30	0.15	0.34
Gallbladder Cancer	1.50	2.00	0.14	0.28
Gallbladder Disease	1.27	1.88	0.08	0.26
Gastric Cardia Adenocarcinoma	1.23	2.00	0.07	0.28
Hypertension	1.47	2.13	0.13	0.31
Liver Cancer	1.30	1.48	0.09	0.16
Osteoarthritis	2.28	3.08	0.30	0.45
Ovarian Cancer	1.47	1.10	0.13	0.04
Pancreatic Cancer	1.26	1.60	0.08	0.19
Prostate Cancer	1.10	1.22	0.03	0.08
Renal Cancer	1.30	1.63	0.09	0.20
Stroke	1.22	1.64	0.07	0.20

Source: Milken Institute, from sources summarized in the section above.

Whereas Table 6 shows the percentage of cases of each disease affected by obesity and overweight, Table 7 presents the number of cases of each condition attributable to obesity—calculated as the total prevalence of each conditioned multiplied by the PAR.

TABLE 7

Cases Attributable to Obesity and Overweight, 2016

Condition	Overweight	Obesity	Total
Alzheimer's and Vascular Dementia	578,686	1,645,088	2,223,774
Asthma and COPD	1,498,340	4,230,751	5,729,091
Breast Cancer	328,741	609,050	937,790
Chronic Back Pain	5,119,469	13,221,053	18,340,522
Colorectal Cancer	138,669	309,554	448,223
Congestive Heart Failure	573,053	640,182	1,213,236
Coronary Heart Disease	1,635,722	3,608,335	5,244,057
Diabetes (Type 2)	3,877,027	13,102,602	16,979,629
Dyslipidemia	14,695,055	21,494,794	36,189,848
End Stage Renal Disease	155,621	354,445	510,066
Endometrial Cancer	11,715	27,791	39,506
Esophageal Adenocarcinoma	7,116	15,876	22,992
Gallbladder Cancer	1,417	2,863	4,280
Gallbladder Disease	1,623,251	5,243,052	6,866,303
Gastric Cardia Adenocarcinoma	6,718	27,263	33,981
Hypertension	10,404,235	24,389,518	34,793,753
Liver Cancer	5,982	10,710	16,692
Osteoarthritis	16,466,813	25,221,644	41,688,457
Ovarian Cancer	29,660	8,500	38,160
Pancreatic Cancer	5,082	12,466	17,547
Prostate Cancer	97,981	248,392	346,373
Renal Cancer	43,290	96,874	140,163
Stroke	591,894	1,785,350	2,377,244

Source: Milken Institute.

The Economic Impact of Obesity

For each health condition associated with obesity and overweight, the costs of health care treatment are based on a detailed review of the research literature and analysis of the Medical Expenditure Panel Survey (MEPS),[8] as described in the methodology. The resulting estimates of the costs for each chronic condition are presented in Table 8.

TABLE 8

Costs per Individual for Each Health Condition, 2016

Condition	Cost per Case, 2016		References
	Direct	Indirect	
Alzheimer's and Vascular Dementia	$33,084	$14,662	84, 85, 86, 87
Asthma and COPD	$1,844	$2,834	88
Breast Cancer	$6,291	$3,912	89, 90, 91
Chronic Back Pain	$2,098	$11,848 *	92
Colorectal Cancer	$13,723	$12,104	10, 89, 91
Congestive Heart Failure	$4,287	$1,680	93, 94
Coronary Heart Disease	$4,329	$7,497	93, 94
Diabetes (Type 2)	$7,109	$12,633	95, 96
Dyslipidemia	$791	†	97, 98
End Stage Renal Disease	$7,285	††	99, 100, 101
Endometrial Cancer	$4,781	$3,991	8, 9
Esophageal Adenocarcinoma	$42,167	$3,991	8, 9
Gallbladder Cancer	$5,219	$3,991	8, 9
Gallbladder Disease	$3,912	$3,991	8, 9
Gastric Cardia Adenocarcinoma	$42,167	$3,991	8, 9
Hypertension	$843	$12,423	93, 94, 97, 102
Liver Cancer	$5,219	$3,991	8, 9
Osteoarthritis	$2,074	$5,165	89, 90, 103
Ovarian Cancer	$30,181	$3,991	8, 9
Pancreatic Cancer	$8,308	$42,061	8, 9, 93
Prostate Cancer	$5,724	$38,718	91
Renal Cancer	$16,080	$3,991	8, 9
Stroke	$5,951	$6,111	88, 94, 95, 102

† Included in heart disease, diabetes, and stroke.[1]
†† Included in diabetes and hypertension.

Source: Milken Institute.

As shown in Table 9, in 2016 diseases caused by obesity and overweight accounted for $480.7 billion in direct health care costs, plus $1.24 trillion in indirect costs due to lost economic productivity. The total cost of chronic diseases due to obesity in 2016 was $1.72 trillion—equivalent to 9.3 percent of the U.S. GDP. Obesity and overweight accounted for 47.1 percent of the total direct and indirect costs of chronic diseases in the U.S. in 2016.

TABLE 9

Total Costs of Obesity and Being Overweight, 2016

Condition	Costs (in $ Millions), 2016		
	Direct Costs	Indirect Costs	Total
Alzheimer's and Vascular Dementia	$73,572	$32,606	$106,178
Asthma and COPD	$10,564	$16,234	$26,798
Breast Cancer	$5,900	$3,669	$9,569
Chronic Back Pain	$38,476	$217,291	$255,768
Colorectal Cancer	$6,151	$5,425	$11,576
Congestive Heart Failure	$5,201	$2,039	$7,239
Coronary Heart Disease	$22,700	$39,315	$62,015
Diabetes (Type 2)	$120,707	$214,500	$335,208
Dyslipidemia	$28,619	†	$28,619
End Stage Renal Disease	$3,716	††	$3,716
Endometrial Cancer	$189	$158	$347
Esophageal Adenocarcinoma	$970	$92	$1,061
Gallbladder Cancer	$22	$17	$39
Gallbladder Disease	$26,863	$27,401	$54,264
Gastric Cardia Adenocarcinoma	$1,433	$136	$1,568
Hypertension	$29,323	$432,230	$461,553
Liver Cancer	$87	$67	$154
Osteoarthritis	$86,480	$215,303	$301,783
Ovarian Cancer	$1,152	$152	$1,304
Pancreatic Cancer	$146	$738	$884
Prostate Cancer	$1,983	$13,411	$15,393
Renal Cancer	$2,254	$559	$2,813
Stroke	$14,148	$14,527	$28,674
	$480,655	**$1,235,869**	**$1,716,523**

† Included in heart disease, diabetes, and stroke.[1]
†† Included in diabetes and hypertension.

Source: Milken Institute.

These economic losses are not irreversible. For example, a review of interventions designed to reduce obesity concluded that, for individuals with a BMI of 40 or greater, a 5 percent weight reduction would reduce their annual medical costs by $2,137. With the same percentage reduction, individuals with a BMI of 35 would save $528 and individuals with a BMI of 30 would save $69.[104]

There is no magic bullet to address the obesity epidemic. Multiple factors are responsible for the increase in obesity—including food production, distribution, and marketing; commuting patterns; and sedentary lifestyles. A single tactic will prove insufficient. Rather, a societal consensus in favor of healthful eating and exercise is required. Individuals at risk for obesity, employers, health care providers, insurers, governments, and communities must all participate to find solutions to this societal challenge.

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