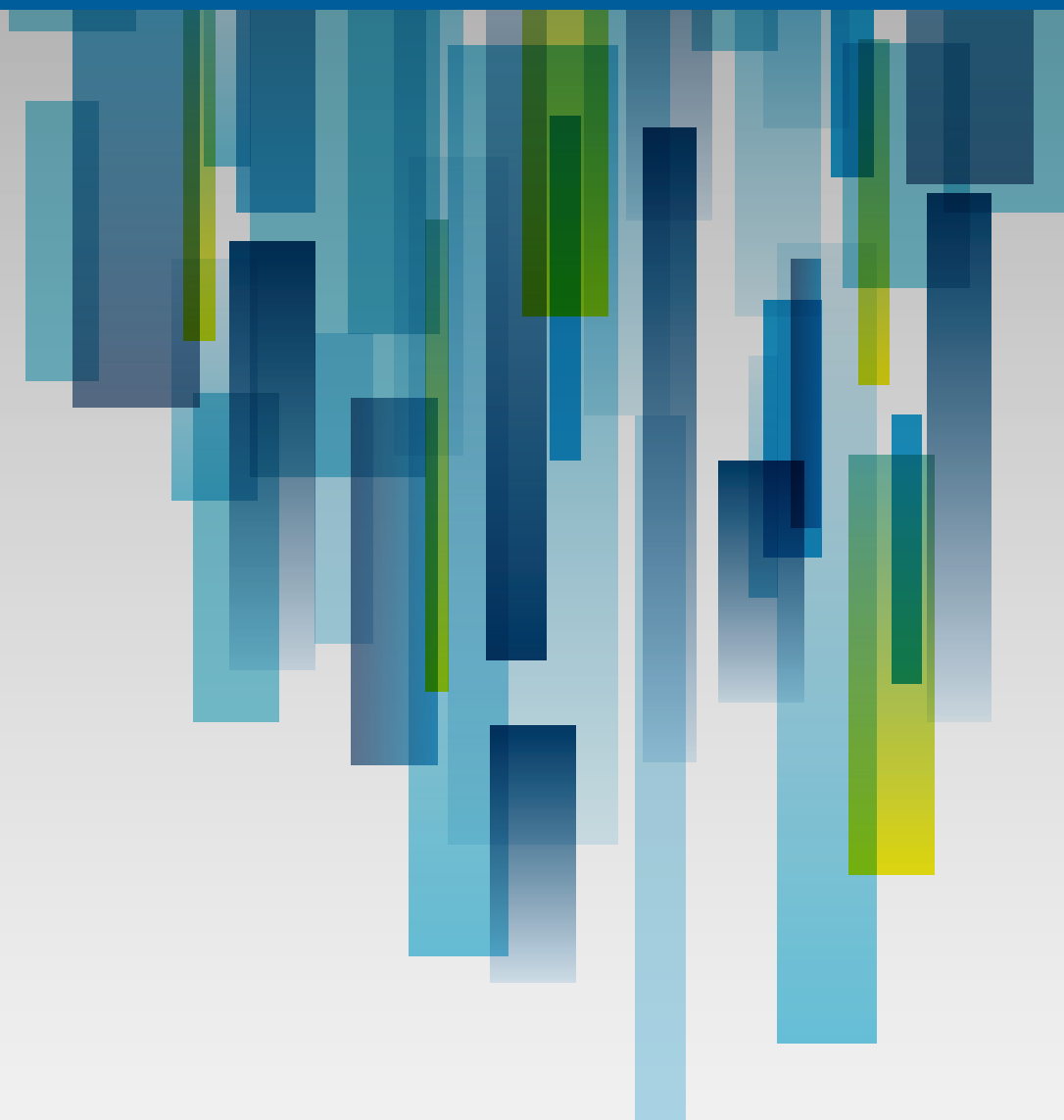


AUGUST 2018

THE COSTS OF CHRONIC DISEASE IN THE U.S.



BY HUGH WATERS AND MARLON GRAF



MILKEN INSTITUTE

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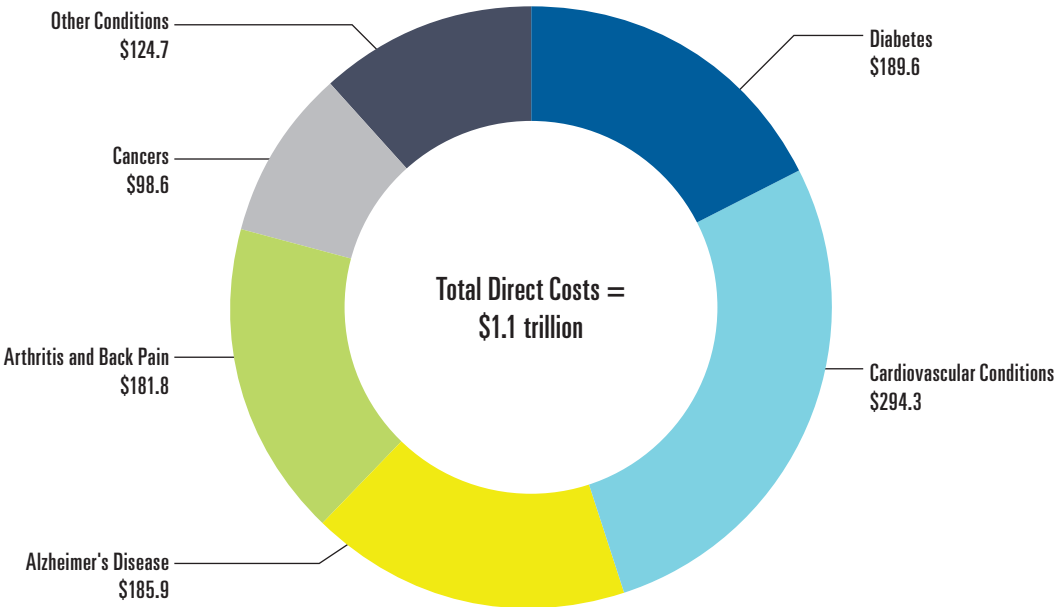
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Executive Summary

The total costs in the U.S. in 2016 for direct health care treatment for chronic health conditions totaled \$1.1 trillion—equivalent to 5.8 percent of U.S. gross domestic product (GDP) (Figure 1). The most expensive conditions in terms of direct health care costs are diabetes (\$189.6 billion in annual direct health care expenditures), Alzheimer’s disease (\$185.9 billion), and osteoarthritis (\$115.5 billion). When the indirect costs of lost economic productivity are included, the total costs of chronic diseases in the U.S. increase to \$3.7 trillion (Figure 2). This is equivalent to 19.6 percent of the U.S. GDP—in other words, nearly one-fifth of the U.S. economy.

FIGURE 1

Total Direct Costs of Chronic Diseases in the U.S., 2016 (\$ billions)

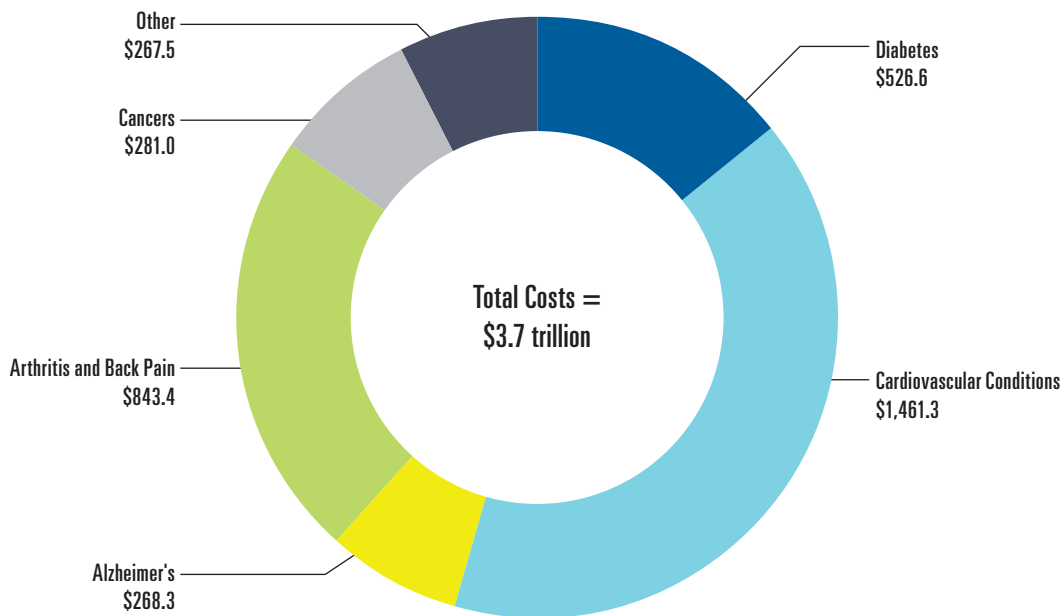


Source: Milken Institute.

The most common chronic health conditions in the U.S. are dyslipidemia, hypertension (high blood pressure), and osteoarthritis. In 2016, 94.7 million Americans had dyslipidemia, which is a cholesterol imbalance—that is, high levels of low-density lipoprotein (LDL) cholesterol (“bad” cholesterol) or low levels of high-density lipoprotein (HDL) cholesterol (“good” cholesterol). 78.6 million individuals lived with hypertension, which is a significant risk factor for heart disease and stroke. Furthermore, 55.7 million U.S. residents had osteoarthritis, which leads to the breakdown of joint cartilage. The fourth most prevalent chronic health condition in the U.S. is type 2 diabetes, which affected 26.7 million adults in 2016.

FIGURE 2

Total Costs of Chronic Diseases in the U.S., 2016



Source: Milken Institute.

Obesity is by far the greatest risk factor contributing to the burden of chronic diseases in the U.S. The prevalence of obesity in the U.S. population has increased steadily since the 1960s. In 2016, diseases caused by obesity and being overweight accounted for 47.1 percent of the total cost of chronic diseases in the U.S.—responsible for \$480.7 billion in direct health care costs, plus \$1.24 trillion in indirect costs related 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 that year.

The increasing trends in the prevalence and costs of chronic diseases in the U.S. are projected to continue well into the future. Moreover, these trends will be magnified by the aging of the U.S. population. By 2060, the U.S. population aged 65 years and older is projected to more than double—from 46 million today to more than 98 million. By 2030, an estimated 83.4 million people in the U.S. will have three or more chronic diseases—compared to 30.8 million in 2015.

TABLE 1**Prevalence and Costs of Chronic Diseases in the U.S., 2016**

Condition	Costs (in \$ Millions)		
	Direct	Indirect	Total
Alzheimer's or Vascular Dementia	\$185,917	\$82,395	\$268,312
Asthma	\$40,201	\$61,775	\$101,975
Breast Cancer	\$23,086	\$14,357	\$37,442
Chronic Back Pain	\$66,239	\$374,076	\$440,315
Colorectal Cancer	\$18,479	\$16,299	\$34,778
Congestive Heart Failure	\$28,281	\$11,087	\$39,368
Coronary Heart Disease	\$72,497	\$125,558	\$198,055
Diabetes Type 2	\$189,618	\$336,956	\$526,574
Dyslipidemia	\$74,887	†	\$74,887
End Stage Renal Disease	\$5,107	††	\$5,107
Endometrial Cancer	\$3,472	\$2,897	\$6,369
Esophageal Adenocarcinoma	\$1,963	\$186	\$2,149
Gallbladder Cancer	\$52	\$40	\$93
Gallbladder Disease	\$79,415	\$81,003	\$160,418
Gastric Cardia Adenocarcinoma	\$4,038	\$382	\$4,420
Hypertension	\$66,257	\$976,665	\$1,042,923
Liver Cancer	\$348	\$266	\$615
Lung Cancer	\$14,448	\$23,056	\$37,504
Osteoarthritis	\$115,523	\$287,607	\$403,129
Ovarian Cancer	\$6,702	\$886	\$7,588
Pancreatic Cancer	\$537	\$2,720	\$3,257
Prostate Cancer	\$17,659	\$119,452	\$137,111
Renal Cancer	\$7,770	\$1,928	\$9,698
Stroke	\$52,338	\$53,741	\$106,079
	\$1,074,832	\$2,573,333	\$3,648,166

† Included in heart disease, diabetes, and stroke.

†† Included in diabetes and hypertension.

Source: Milken Institute.

Introduction

This study calculates the prevalence and economic effects of chronic diseases in the U.S. The study includes the direct costs of health care services to treat these diseases—costs paid by individuals, families, insurance companies, and employers—as well as the indirect costs that relate to work absences, lost wages, and reduced economic productivity. For each condition, the direct health care costs and the indirect costs are calculated and presented separately.

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).¹ The CDC prevalence data are compared with estimates from other sources, including published data in peer-reviewed academic journals.

The principal source for the costs of medical treatment for different chronic conditions is the Medical Expenditure Panel Survey (MEPS).² 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 CDC³ and the National Cancer Institute,⁴ as well as published journal articles.

All data are from the year 2016, which is the most recent year available. The amounts recorded are in 2016 U.S. dollars. Cost estimates for 2016 are not available for some rare health conditions, so we updated earlier estimates from peer-reviewed literature using health care inflation rates calculated by the Bureau of Labor Statistics for the Consumer Price Index.⁵ The estimates of indirect economic costs related to lost productivity are calculated and reported separately from direct medical costs.

Prevalence

Table 2 shows the numbers of individuals in the United States living with each of the most prevalent chronic diseases.

TABLE 2

Total Prevalence of Chronic Conditions in the U.S., 2016

Condition	Male	Female	Total	References
Alzheimer's or Vascular Dementia	2,093,540	3,525,960	5,619,500	6
Asthma	9,275,354	12,525,692	21,801,046	7
Breast Cancer	-----	3,669,600	3,669,600	8
Chronic Back Pain	15,345,546	16,228,395	31,573,940	9
Colorectal Cancer	681,863	664,723	1,346,586	10, 11
Congestive Heart Failure	3,525,306	3,072,277	6,597,583	12, 13, 14, 15
Coronary Heart Disease	9,236,616	7,511,095	16,747,711	14
Diabetes Type 2	13,513,211	13,159,924	26,673,135	16,17
Dyslipidemia	46,106,177	48,592,443	94,698,620	18
End Stage Renal Disease	405,160	295,809	700,969	19, 20
Endometrial Cancer	-----	726,047	726,047	10, 11
Esophageal Adenocarcinoma	36,518	10,043	46,561	10, 11, 12
Gallbladder Cancer	2,279	5,983	8,262	10, 11
Gallbladder Disease	6,168,248	14,130,230	20,298,477	22
Gastric Cardia Adenocarcinoma	60,160	35,604	95,764	10, 12
Hypertension	38,847,356	39,772,425	78,619,781	14
Liver Cancer	48,085	18,686	66,771	10, 12
Lung Cancer	274,123	253,105	527,228	10, 23
Osteoarthritis	27,065,665	28,622,788	55,688,453	24
Ovarian Cancer	-----	222,060	222,060	25
Pancreatic Cancer	31,868	32,800	64,668	10, 11
Prostate Cancer	3,085,209	-----	3,085,209	10, 11
Renal Cancer	291,796	191,429	483,225	10, 11
Stroke	4,748,986	4,045,432	8,794,418	14

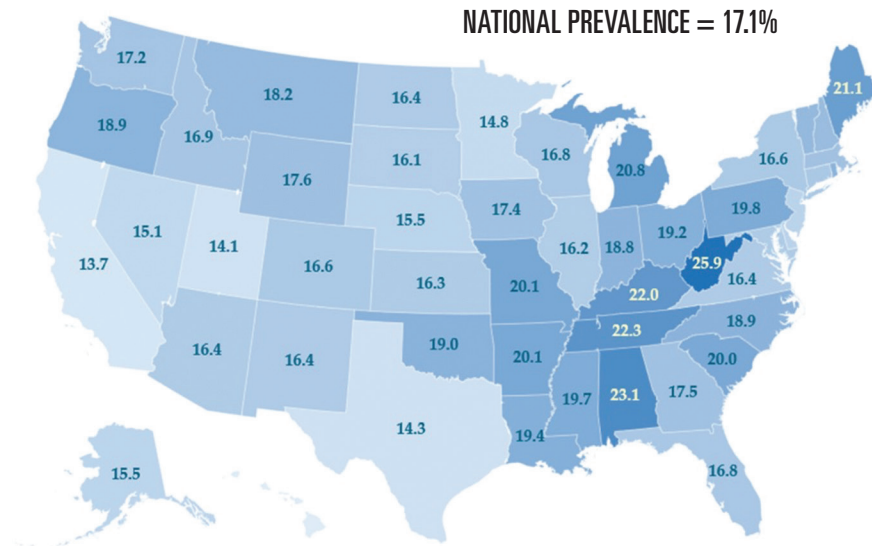
Source: Milken Institute.

The most common conditions are hypertension (high blood pressure), dyslipidemia, and osteoarthritis. In the U.S. in 2016, 94.7 million Americans had dyslipidemia, which is a cholesterol imbalance—indicating high levels of low-density lipoprotein (LDL) cholesterol (“bad” cholesterol), or low levels of high-density lipoprotein (HDL) cholesterol (“good” cholesterol). 78.6 million individuals lived with hypertension, which is a significant risk factor for heart disease and stroke.²⁶

Furthermore, 55.7 million U.S. residents had osteoarthritis, which leads to the breakdown of joint cartilage. Osteoarthritis is most common among the elderly and is more prevalent in the eastern U.S., particularly the southern parts of the Appalachian region (see Figure 3).

FIGURE 3

Prevalence of Osteoarthritis as % of Population, 2016²⁷

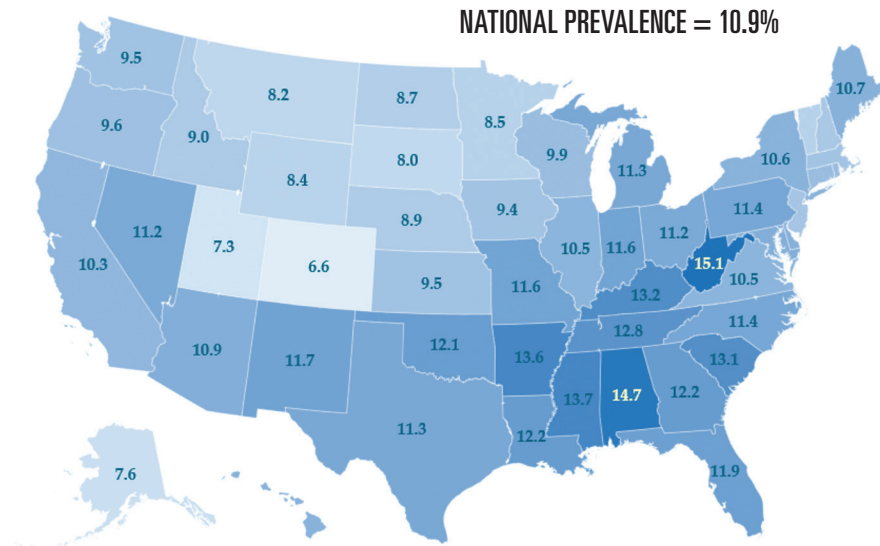


Source: Milken Institute.

The fourth most prevalent chronic health condition in the U.S. is type 2 diabetes, which affected 26.7 million people in 2016—or 10.9 percent of the adult population (Figure 4). The prevalence of diabetes is strongly correlated with the prevalence of obesity in the U.S.

FIGURE 4

Prevalence of Type 2 Diabetes as % of Adult Population, 2016¹⁶



Source: Milken Institute.

The National Economic Impact of Chronic Diseases

For each chronic health condition included in this report, the costs of health care treatment are based on a detailed review of the research literature, as indicated by the sources used in Table 3. Health care expenditures are grouped by medical condition based on the Clinical Classification Software (CCS), developed by AHRQ, which categorizes medical conditions into 260 exclusive groups.²⁸ The resulting estimates of the costs for each chronic condition are presented in Table 3.

TABLE 3

Costs per Individual for Each Health Condition

Condition	Cost per Case, 2016		References
	Direct	Indirect	
Alzheimer's or Vascular Dementia	\$33,084	\$14,662	29, 30, 31, 32
Asthma	\$1,844	\$2,834	33
Breast Cancer	\$6,291	\$3,912	3, 34, 35, 36
Chronic Back Pain	\$2,098	\$11,848 *	2, 37
Colorectal Cancer	\$13,723	\$12,104	4, 34, 36
Congestive Heart Failure	\$4,287	\$1,680	38, 39
Coronary Heart Disease	\$4,329	\$7,497	38, 39
Diabetes Type 2	\$7,109	\$12,633	40, 41
Dyslipidemia	\$791	†	42, 43
End Stage Renal Disease	\$7,285	††	44, 45, 46
Endometrial Cancer	\$4,781	\$3,991	2, 3
Esophageal Adenocarcinoma	\$42,167	\$3,991	2, 3
Gallbladder Cancer	\$5,219	\$3,991	2, 3
Gallbladder Disease	\$3,912	\$3,991	2, 3
Gastric Cardia Adenocarcinoma	\$42,167	\$3,991	2, 3
Hypertension	\$843	\$12,423	38, 39, 42, 47
Liver Cancer	\$5,219	\$3,991	2, 3
Osteoarthritis	\$2,074	\$5,165	48, 34, 35
Ovarian Cancer	\$30,181	\$3,991	2, 3
Pancreatic Cancer	\$8,308	\$42,061	3, 4, 38
Prostate Cancer	\$5,724	\$38,718	36
Renal Cancer	\$16,080	\$3,991	2, 3
Stroke	\$5,951	\$6,111	31, 39, 47, 33, 40

*For chronic back pain, the indirect costs amount is calculated by applying the median proportion of direct vs. indirect costs from a literature review of the costs of back pain, resulting in a range of estimates of indirect costs in the U.S. in 2014 from \$84.1 to \$624.8 billion, or \$5,127 to \$38,091 per case.⁴⁹

† Included in heart disease, diabetes, and stroke.⁵⁰

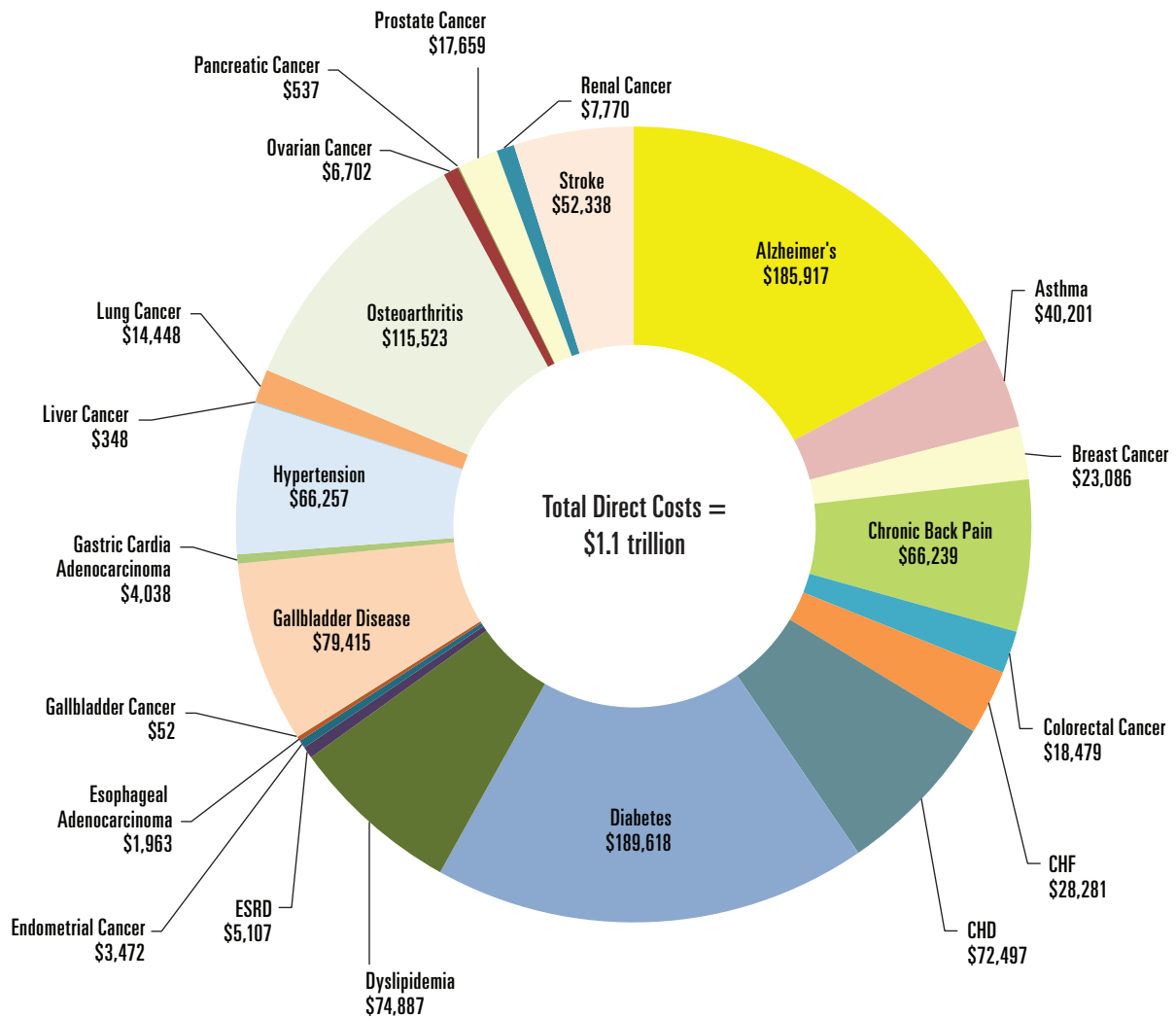
†† Included in diabetes and hypertension.

Source: Milken Institute.

In 2016, the total costs in the U.S. for direct health care treatment for chronic health conditions totaled \$1.1 trillion (Figure 5)—equivalent to 5.8 percent of U.S. GDP. The most expensive conditions in terms of direct health care costs are diabetes (\$189.6 billion in annual direct health care expenditures), Alzheimer’s disease (\$185.9 billion), and osteoarthritis (\$115.5 billion).

FIGURE 5

Direct Health Care Costs of Chronic Diseases, 2016 (in \$ millions)

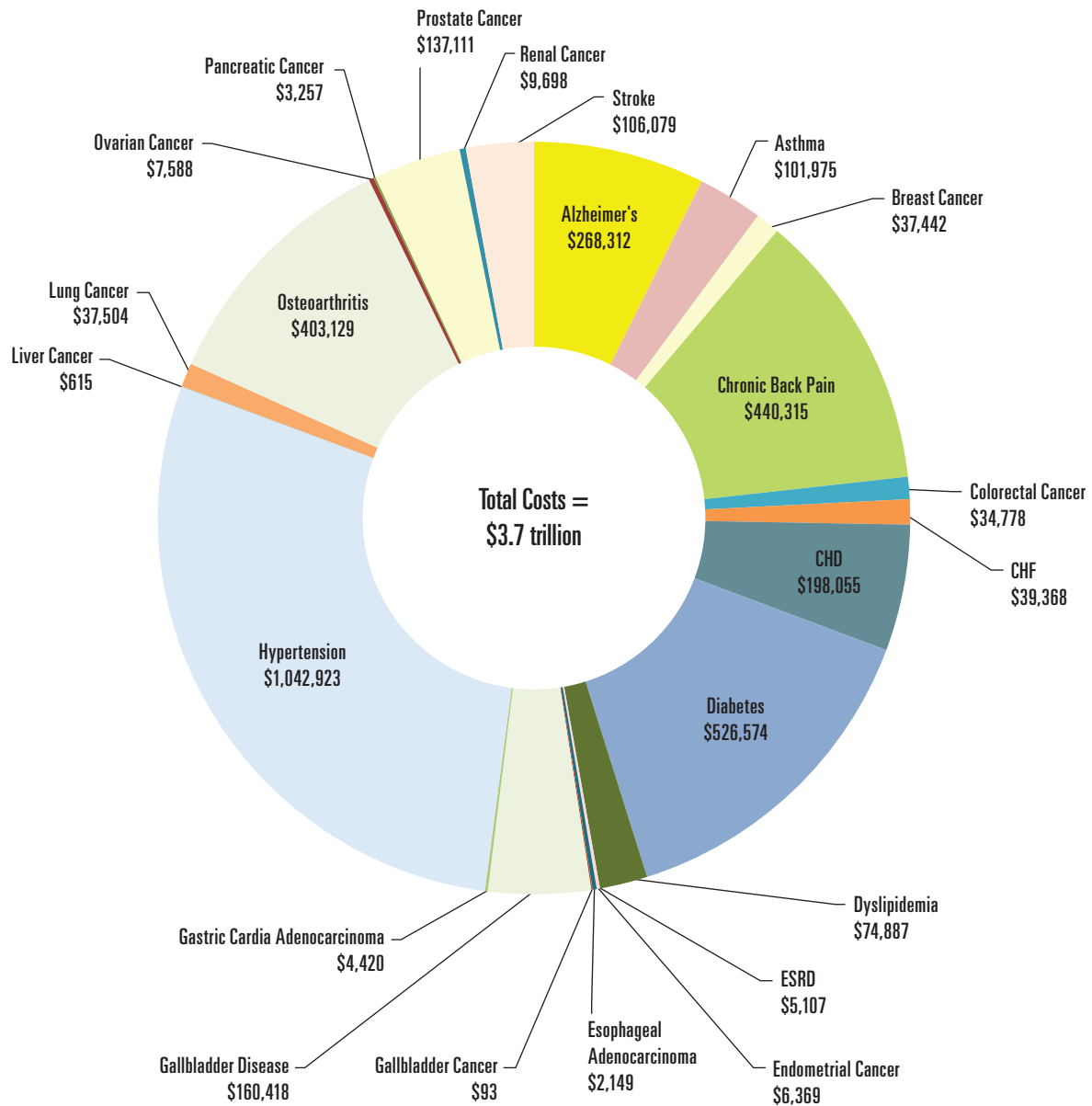


Source: Milken Institute.

When the indirect costs of lost economic productivity are included, the total costs of chronic diseases in the U.S. increase to \$3.7 trillion (Figure 6). This is equivalent to 19.6 percent of the U.S. GDP in 2016—in other words, nearly one-fifth of the U.S. economy.

FIGURE 6

The Total Costs of Chronic Diseases in the U.S., 2016 (in \$ Millions)



Source: Milken Institute.

State-Level Economic Impact of Chronic Diseases

Across the U.S., direct health care expenditures for chronic conditions average \$3,300 per person. The average indirect costs, including lost productivity, are \$7,901 per person. Table 5 in the Appendix show the levels of per-capita spending for chronic health conditions by state—for direct health care spending and for the total economic costs of these diseases, respectively.

The highest levels of per capita spending on chronic health conditions occur in West Virginia, Alabama, Florida, and Maine—all states with relatively older populations. Maine has the highest median age of any state in the U.S.—44.5 years. West Virginia has the fourth highest median age (42.3 years) and Florida the fifth highest (42.1 years).⁵¹ As with the prevalence of chronic conditions, the costs are highest in the eastern U.S. The national per capita average total cost of chronic diseases is \$11,201.

Combined, direct health care expenditures and the costs of lost productivity due to chronic diseases impose a significant economic burden on individuals, families, employers, and governments across the U.S. This impact is particularly acute in the east and southeast parts of the country.

Risk Factors for Chronic Diseases

Obesity is by far the greatest risk factor contributing to the burden of chronic diseases in the U.S. As shown in Table 4 and Figure 7, the prevalence of obesity in the U.S. population has increased steadily since the 1960s. In 2016, diseases caused by obesity and being overweight accounted for 47.1 percent of the total cost of chronic diseases in the U.S.—responsible for \$480.7 billion in direct health care costs, plus \$1.24 trillion in indirect costs related 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 that year.⁵²

TABLE 4

Prevalence of Overweight, Obesity, and Severe Obesity Among Adults^{53, 54}

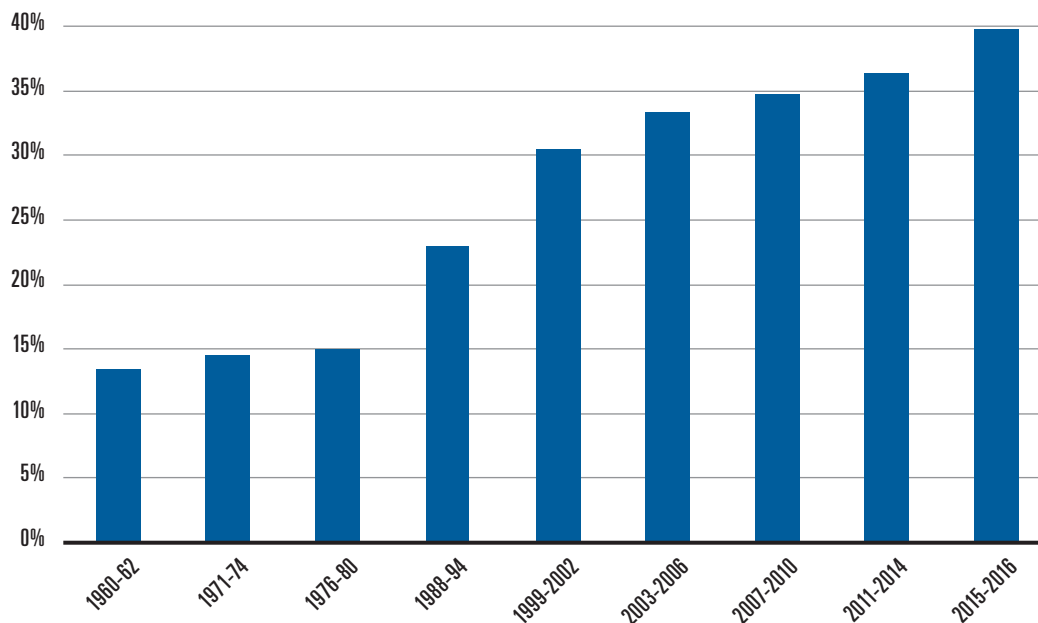
Years	Overweight, Not Obese	Obese	Severe Obesity (BMI \geq 40)
1960-62	31.5%	13.4%	0.9%
1971-74	32.3%	14.5%	1.3%
1976-80	32.1%	15.0%	1.4%
1988-94	33.1%	22.9%	2.9%
1999-2002	34.7%	30.4%	4.9%
2003-2006	33.3%	33.4%	5.4%
2007-2010	34.4%	34.7%	6.0%
2011-2014	33.4%	36.4%	6.9%
2015-2016	32.8%	39.8%	N/A

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: Milken Institute.

FIGURE 7

Prevalence of Obesity in the U.S. Adult Population Over Time



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.

Other important behavioral risk factors for chronic diseases include smoking and exposure to secondhand smoke. Approximately 8.7 percent of health care spending in the U.S. is attributable to cigarette smoking, and 60 percent of this amount is paid by public sources—Medicare, Medicaid, and other U.S. federal and state health programs.⁵⁵ In 2015, 36.5 million U.S. adults were current cigarette smokers— 15.1 percent of all adults. This rate has decreased from 20.9 percent in 2005.⁵⁶ Health problems caused by excessive drinking cost \$27.4 billion in the U.S. in 2010— 1 percent of the total cost of chronic diseases and 11 percent of the total costs of alcohol abuse.⁵⁷

Projections of the Costs of Chronic Diseases

The increasing trends in the prevalence and costs of chronic diseases in the U.S. are projected to continue well into the future. Moreover, these trends will be magnified by the aging of the U.S. population. By 2060, the U.S. population aged 65 years and older is projected to more than double—from 46 million today to more than 98 million.⁵⁸ By 2030, an estimated 83.4 million people in the U.S. will have three or more chronic diseases—compared to 30.8 million in 2015.⁵⁹ Spending on prescription drugs is projected to increase more rapidly than health care spending overall.⁶⁰

These trends will impose upward pressure on health care spending in the United States. U.S. health care spending is already substantially higher than comparable high-income countries. Health spending per person in the U.S. was \$10,348 in 2016—31 percent higher than Switzerland, the next highest spender on a per capita basis.⁶¹ These trends make it very clear that the U.S. will need to identify and implement effective policies to prevent and manage chronic diseases.

Appendix

TABLE 5

Costs of Chronic Diseases by State, 2016

State	2017 Pop. (millions)	Direct Costs (\$B)	Indirect Costs (\$B)	Total Cost (\$B)	Per Capita Direct Costs	Per Capita Indirect Costs	Per Capita Total Costs
Alabama	4.9	\$18.2	\$42.1	\$60.3	\$3,724	\$8,641	\$12,365
Alaska	0.7	\$2.0	\$5.3	\$7.4	\$2,765	\$7,194	\$9,959
Arizona	7.0	\$23.4	\$55.2	\$78.7	\$3,341	\$7,871	\$11,212
Arkansas	3.0	\$10.6	\$24.8	\$35.4	\$3,533	\$8,241	\$11,774
California	39.5	\$123.4	\$300.4	\$423.8	\$3,122	\$7,598	\$10,720
Colorado	5.6	\$16.0	\$41.5	\$57.5	\$2,856	\$7,404	\$10,259
Connecticut	3.6	\$12.2	\$28.5	\$40.7	\$3,393	\$7,940	\$11,333
D.C.	0.7	\$2.2	\$5.6	\$7.8	\$3,173	\$8,078	\$11,251
Delaware	1.0	\$3.2	\$7.7	\$10.9	\$3,324	\$7,963	\$11,287
Florida	21.0	\$76.8	\$172.7	\$249.5	\$3,660	\$8,232	\$11,892
Georgia	10.4	\$33.4	\$82.2	\$115.6	\$3,205	\$7,883	\$11,087
Hawaii	1.4	\$4.7	\$11.0	\$15.7	\$3,267	\$7,739	\$11,006
Idaho	1.7	\$5.2	\$12.9	\$18.1	\$3,026	\$7,513	\$10,539
Illinois	12.8	\$41.6	\$99.9	\$141.5	\$3,249	\$7,803	\$11,051
Indiana	6.7	\$22.4	\$53.3	\$75.7	\$3,353	\$8,001	\$11,354
Iowa	3.1	\$10.5	\$24.5	\$35.0	\$3,333	\$7,792	\$11,125
Kansas	2.9	\$9.3	\$22.0	\$31.3	\$3,180	\$7,557	\$10,737
Kentucky	4.5	\$15.7	\$37.4	\$53.1	\$3,530	\$8,390	\$11,920
Louisiana	4.7	\$16.0	\$37.7	\$53.7	\$3,417	\$8,047	\$11,464
Maine	1.3	\$4.8	\$11.3	\$16.1	\$3,599	\$8,460	\$12,060
Maryland	6.1	\$19.8	\$47.7	\$67.5	\$3,268	\$7,883	\$11,151
Massachusetts	6.9	\$22.8	\$55.2	\$77.9	\$3,320	\$8,041	\$11,361
Michigan	10.0	\$34.9	\$82.5	\$117.4	\$3,503	\$8,282	\$11,785
Minnesota	5.6	\$17.0	\$41.9	\$58.9	\$3,054	\$7,508	\$10,562
Mississippi	3.0	\$10.5	\$24.5	\$34.9	\$3,502	\$8,196	\$11,698
Missouri	6.1	\$21.0	\$49.7	\$70.7	\$3,434	\$8,132	\$11,567
Montana	1.1	\$3.4	\$8.2	\$11.6	\$3,243	\$7,777	\$11,020
Nebraska	1.9	\$5.9	\$14.3	\$20.2	\$3,089	\$7,423	\$10,512
Nevada	3.0	\$9.4	\$23.2	\$32.6	\$3,145	\$7,729	\$10,873
New Hampshire	1.3	\$4.4	\$10.7	\$15.1	\$3,292	\$7,958	\$11,250
New Jersey	9.0	\$29.3	\$69.5	\$98.8	\$3,248	\$7,717	\$10,966
New Mexico	2.1	\$7.0	\$16.5	\$23.5	\$3,350	\$7,904	\$11,253
New York	19.8	\$67.6	\$158.9	\$226.5	\$3,404	\$8,007	\$11,412
North Carolina	10.3	\$34.0	\$82.4	\$116.5	\$3,314	\$8,023	\$11,336
North Dakota	0.8	\$2.4	\$5.8	\$8.2	\$3,197	\$7,702	\$10,899
Ohio	11.7	\$39.9	\$94.8	\$134.7	\$3,422	\$8,130	\$11,552
Oklahoma	3.9	\$13.2	\$31.6	\$44.8	\$3,369	\$8,036	\$11,405
Oregon	4.1	\$13.4	\$32.9	\$46.3	\$3,230	\$7,950	\$11,180
Pennsylvania	12.8	\$45.6	\$105.8	\$151.4	\$3,559	\$8,263	\$11,822
Rhode Island	1.1	\$3.7	\$8.6	\$12.4	\$3,505	\$8,154	\$11,659
South Carolina	5.0	\$17.6	\$41.6	\$59.2	\$3,499	\$8,276	\$11,774
South Dakota	0.9	\$2.7	\$6.5	\$9.3	\$3,145	\$7,502	\$10,646
Tennessee	6.7	\$23.4	\$56.2	\$79.7	\$3,491	\$8,373	\$11,864
Texas	28.3	\$85.0	\$211.5	\$296.5	\$3,005	\$7,472	\$10,477
Utah	3.1	\$8.2	\$21.4	\$29.6	\$2,639	\$6,890	\$9,529
Vermont	0.6	\$2.1	\$5.0	\$7.0	\$3,325	\$7,968	\$11,293
Virginia	8.5	\$27.6	\$66.5	\$94.0	\$3,253	\$7,849	\$11,102
Washington	7.4	\$23.3	\$57.5	\$80.8	\$3,144	\$7,771	\$10,915
West Virginia	1.8	\$7.1	\$16.3	\$23.4	\$3,908	\$8,961	\$12,869
Wisconsin	5.8	\$19.3	\$45.7	\$65.0	\$3,324	\$7,887	\$11,211
Wyoming	0.6	\$1.8	\$4.4	\$6.2	\$3,093	\$7,550	\$10,643
Totals	325.7	\$1,075	\$2,573	\$3,648	\$3,300	\$7,901	\$11,201

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About Us

Hugh Waters is director of health economics research at the Milken Institute, where he leads work on measuring the health impacts and economic costs of public health risks and health disparities. He is an expert in the application of quantitative methods to evaluate health policies and programs. Waters has more than 20 years of experience working with public health programs, both in the U.S. and internationally. He was previously full-time faculty at the University of North Carolina and the Johns Hopkins Bloomberg School of Public Health. He has a Ph.D. in public health economics from Johns Hopkins, and a M.S. in international economics from Georgetown University. He speaks French and Spanish.

Marlon Graf is a health research analyst at the Milken Institute. His work focuses primarily on applied microeconomic analysis of health and substance abuse issues, with an emphasis on mixed methods research, and has published in peer-reviewed journals and policy reports. He has studied and written on a range of health policy issues, including the effects of community health programs on health outcomes, the efficiency and effectiveness of health systems across U.S. states, the impact of ridesharing services on drunk-driving, and the economics of chronic diseases. Before joining the Institute, Graf was an assistant policy analyst at the RAND Corp. and a doctoral fellow at the Pardee RAND Graduate. Graf holds a B.Sc. in business administration from the University of Mannheim (Germany), a master's in public policy from UC Los Angeles, and a Ph.D. in policy analysis from the Pardee RAND Graduate School.

SANTA MONICA

1250 Fourth Street
Santa Monica, CA 90401
P +1.310.570.4600

WASHINGTON

1101 New York Avenue NW
Suite 620
Washington, D.C. 20005
P +1.202.336.8900

LONDON

23 Savile Row
London W1S 2ET UK
P +44 (0) 207.043.5926

SINGAPORE

8 Marina View #15-05
Asia Square Tower 1
Singapore 018960
P +65.6636.2507