Diabetes burden on population groups: Research summary

Commissioned by Eli Lilly

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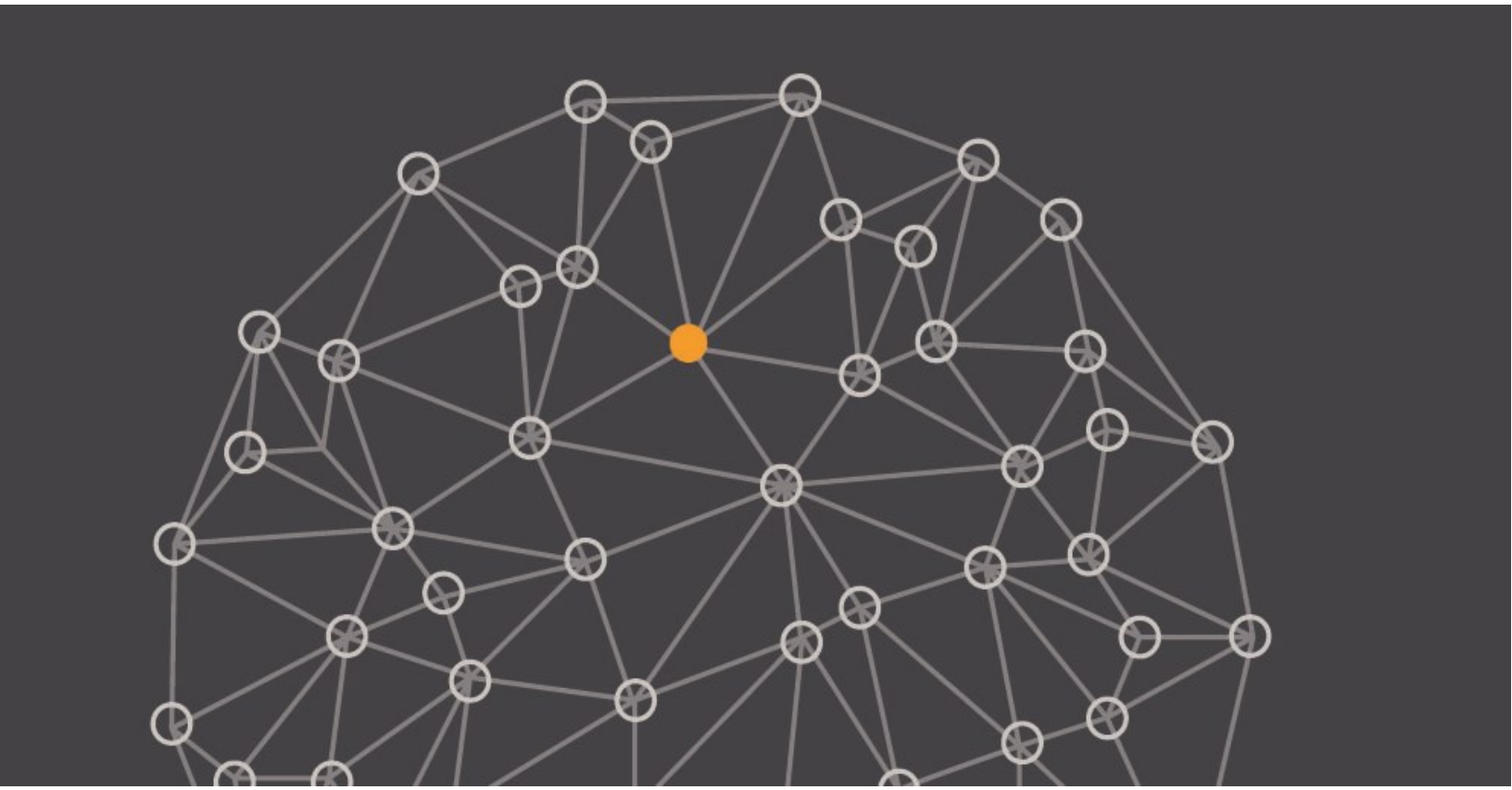

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Introduction

Background

Eli Lilly commissioned Milliman to compile data on the burden of diabetes on various subsets of the U.S. population. Milliman gathered publically available research, statistics, and survey results published by U.S. government agencies and diabetes research centers. These data and statistics were used to create this research summary document and related infographics for population groups. The research summary document presents the findings from each data source. The infographics compile information from multiple data sources to create a snapshot of available data and statistics separately for each of the population groups.

Scope of research and data limitations

Research focused on the following topics for each population group:

- Prevalence of diabetes
- Complications related to diabetes, including mortality
- Cost of care related to diabetes
- Treatment and health care resource utilization
- Presence of diabetes risk factors

Population groups within the scope of research include racial/ethnic groups, veteran status, and individuals who identify as lesbian, gay, bisexual, and transgender (LGBT).

The research summary document contains background information on underlying data sources, along with tables to summarize population data discovered in the research. Many different data sources were used to create this research summary, and stratifications for each population group were not available in every data source.

- In some cases, this limitation is due to a small sample size for the population group, leading to results that are not statistically significant.
- In other cases, this limitation is due to the level of detail presented by the underlying data source. For example, studies that stratify by race/ethnicity often do not separately report veteran status and/or sexual orientation. When a population group was not reported for a particular data source used to create a table in this summary, that population group was excluded from the table.

Labels for population groups were not consistent across all data sources. The population group labels that appear on the tables within the research summary document have not been altered or modified from the terminology used in the original sources. For display purposes, the population group labels that appear within the subsequent infographics have been modified from the original data source population group label. This modification is intended for consistency when reading the infographics and is not intended to alter the population group that the data source is referring to. For a full list of how data source population group labels were modified for display on the infographics, see the Appendix section.

Insights and conclusions

Diabetes is a complicated disease and is not fully described or characterized by this literature review. The information provided within these tables and infographics often represent a single component or factor related to diabetes. Additional contributing and/or mitigating variables may be indirectly influencing the statistics. Any reader or investigator should evaluate the research, as described by the original authors, to understand the limitations and caveats. Milliman does not represent any of its own conclusions, opinions, or positions within this work.

The remainder of this research summary document includes summarized data along with methodology and assumptions. Data and statistics do not belong to Milliman. All references to data and statistics in this research summary should be attributed to the original data source, not Milliman.

Diabetes prevalence

Many public and private sector organizations produce statistics for diabetes prevalence in the U.S. One such agency is the Centers for Disease Control and Prevention (CDC), which tracks diabetes and diabetes-related risk factors through their Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is an annual national survey of over 400,000 adults that contains stratifications for all population groups within the scope of analysis. Data is weighted by a number of demographic characteristics, including sex, age, race, education, and more. The 2017 survey responses were used as the source of diabetes and pre-diabetes prevalence rates on the associated infographics.

Tables 1 through 5 below contain the sample size, diabetes and pre-diabetes prevalence, and two calculated metrics used on the infographics for each population group:

1. **Proportional diabetes prevalence ("1 in *x*")**: Proportion of the population with diabetes expressed as a ratio
2. **Diabetes prevalence relative to total population prevalence:** Population group prevalence expressed as a percentage above or below the total population prevalence

VETERAN STATUS

TABLE 1: DIABETES AND PRE-DIABETES PREVALENCE BY VETERAN STATUS

VETERAN STATUS	SAMPLE SIZE*	DIABETES PREVALENCE**	PRE-DIABETES PREVALENCE AMONG THOSE WITHOUT DIABETES***	PROPORTIONAL DIABETES PREVALENCE ("1 in *x*")	DIABETES PREVALENCE RELATIVE TO TOTAL POPULATION PREVALENCE
Veteran	57,775	16.1%	12.6%	1 in 6	48%
Non-Veteran	390,744	10.3%	10.0%	1 in 10	-6%
Total	448,519	10.9%	10.2%	1 in 9	0%

Table Notes

* Excludes sample members who refused to answer, were not sure, or were not asked the veteran status and diabetes prevalence questions.

** Includes sample members who responded "Yes" to the question "Has a doctor, nurse, or other health professional ever told you that you have diabetes?"

*** Includes sample members who responded "Yes" to the question "Have you ever been told by a doctor or other health professional that you have pre-diabetes or borderline diabetes?" This question was not asked to members who answered "Yes" to the diabetes prevalence question.

Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

RACE / ETHNICITY

TABLE 2: DIABETES AND PRE-DIABETES PREVALENCE BY RACE/ETHNICITY POPULATION GROUP

RACE/ETHNICITY	SAMPLE SIZE*	DIABETES PREVALENCE**	PRE-DIABETES PREVALENCE AMONG THOSE WITHOUT DIABETES***	PROPORTIONAL DIABETES PREVALENCE ("1 in *x*")	DIABETES PREVALENCE RELATIVE TO TOTAL POPULATION PREVALENCE
American Indian/Alaskan Native, Non-Hispanic	8,471	17.1%	12.9%	1 in 6	57%
Asian, Non-Hispanic	9,922	8.4%	10.8%	1 in 12	-23%
Black, Non-Hispanic	36,117	14.4%	13.1%	1 in 7	32%
Hispanic	37,127	11.7%	9.8%	1 in 9	7%
Other race, Non-Hispanic	13,280	10.8%	10.9%	1 in 9	-1%
White, Non-Hispanic	344,302	10.1%	9.7%	1 in 10	-7%
Total	449,219	10.9%	10.2%	1 in 9	0%

Table Notes

* Excludes sample members who refused to answer, were not sure, or were not asked the race/ethnicity and diabetes prevalence questions.

** Includes sample members who responded "Yes" to the question "Has a doctor, nurse, or other health professional ever told you that you have diabetes?"

*** Includes sample members who responded "Yes" to the question "Have you ever been told by a doctor or other health professional that you have pre-diabetes or borderline diabetes?" This question was not asked to members who answered "Yes" to the diabetes prevalence question.

Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

TABLE 3: DIABETES AND PRE-DIABETES PREVALENCE BY INCOME CATEGORY

				PERCENT OF POPULATION GROUP BY INCOME CATEGORY					
INCOME CATEGORY*	SAMPLE SIZE**	DIABETES PREVALENCE***	PRE-DIABETES PREVALENCE AMONG THOSE WITHOUT DIABETES****	American Indian/ Alaskan Native, Non-Hispanic	Asian, Non-Hispanic	Black, Non-Hispanic	Hispanic	Other race, Non-Hispanic	White, Non-Hispanic
< $10,000	18,279	16.7%	11.4%	11.9%	5.5%	10.5%	11.9%	6.5%	3.6%
$10,000-$15,000	19,290	19.0%	12.5%	8.9%	3.0%	7.2%	9.6%	5.7%	3.7%
$15,000-$20,000	27,681	15.9%	11.9%	12.6%	5.4%	11.1%	13.7%	8.2%	5.6%
$20,000-$25,000	34,158	13.7%	11.6%	13.2%	6.7%	12.2%	13.9%	10.1%	7.6%
$25,000-$35,000	39,693	12.9%	10.8%	11.5%	8.4%	12.3%	13.7%	11.3%	9.2%
$35,000-$50,000	53,091	11.2%	10.1%	12.2%	10.3%	14.0%	12.2%	12.9%	13.5%
$50,000-$75,000	59,580	9.3%	11.0%	11.8%	13.7%	12.6%	9.4%	13.9%	16.4%
> $75,000	122,695	6.6%	9.1%	18.0%	47.0%	20.2%	15.7%	31.5%	40.3%
Total	374,467	10.8%	10.4%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table Notes

* Average annual household income from all sources, 2017.

** Excludes sample members who refused to answer, were not sure, or were not asked the diabetes prevalence and income category questions.

*** Includes sample members who responded "yes" to the question "Has a doctor, nurse, or other health professional ever told you that you have diabetes?"

**** Includes sample members who responded "yes" to the question "Have you ever been told by a doctor or other health professional that you have pre-diabetes or borderline diabetes?" This question was not asked to members who answered "yes" to the diabetes prevalence question.

Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

LGBT

TABLE 4: DIABETES AND PRE-DIABETES PREVALENCE BY SEXUAL ORIENTATION

SEXUAL ORIENTATION	SAMPLE SIZE*	DIABETES PREVALENCE**	PRE-DIABETES PREVALENCE AMONG THOSE WITHOUT DIABETES***	PROPORTIONAL DIABETES PREVALENCE ("1 in *x*")	DIABETES PREVALENCE RELATIVE TO TOTAL POPULATION PREVALENCE
Straight	190,023	11.3%	10.6%	9	1%
Lesbian/Gay/Bisexual/Other	7,620	8.4%	9.3%	12	-25%
Total	197,643	11.2%	10.5%	9	0%

Table Notes

* Excludes sample members who refused to answer, were not sure, or were not asked the diabetes prevalence and sexual orientation questions.

** Includes sample members who responded "yes" to the question "Has a doctor, nurse, or other health professional ever told you that you have diabetes?"

*** Includes sample members who responded "yes" to the question "Have you ever been told by a doctor or other health professional that you have pre-diabetes or borderline diabetes?" This question was not asked to members who answered "yes" to the diabetes prevalence question.

Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

TABLE 5: DIABETES AND PRE-DIABETES PREVALENCE BY TRANSGENDER STATUS

TRANSGENDER STATUS	SAMPLE SIZE*	DIABETES PREVALENCE**	PRE-DIABETES PREVALENCE AMONG THOSE WITHOUT DIABETES***	PROPORTIONAL DIABETES PREVALENCE ("1 in *x*")	DIABETES PREVALENCE RELATIVE TO TOTAL POPULATION PREVALENCE
No	199,882	11.3%	10.5%	9	0%
Yes	832	12.3%	15.8%	8	9%
Total	200,714	11.3%	10.5%	9	0%

Table Notes

* Excludes sample members who refused to answer, were not sure, or were not asked the diabetes prevalence and transgender status questions.

** Includes sample members who responded "yes" to the question "Has a doctor, nurse, or other health professional ever told you that you have diabetes?"

*** Includes sample members who responded "yes" to the question "Have you ever been told by a doctor or other health professional that you have pre-diabetes or borderline diabetes?" This question was not asked to members who answered "yes" to the diabetes prevalence question.

Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

Diabetes mortality rate

Diabetes is the seventh leading cause of death in the U.S., according to the CDC's WONDER database, which provides age-adjusted mortality rates per 100,000 population with stratifications for underlying cause of death. WONDER data from 2017 was used as the source of mortality rate metrics, including mortality rate with diabetes as the underlying cause.

Table 6 contains the mortality rates for the top ten causes of death by total population, stratified by race/ethnicity. Stratifications for veterans and LGBT are not included in the WONDER database. Calculated metrics include:

1. **Diabetes rank (relative to other causes):** Where diabetes mellitus ranks relative to other underlying causes of death for each population group
2. **Diabetes ratio of all causes of death:** Proportion of total deaths with diabetes mellitus as the underlying cause expressed as a ratio
3. **Diabetes mortality rate relative to total population:** Population group mortality rate with diabetes mellitus as the underlying cause expressed as a percentage above or below the total population mortality rate with diabetes mellitus as the underlying cause

TABLE 6: RATE OF MORTALITY WITH DIABETES AS THE UNDERLYING CAUSE BY POPULATION GROUP

AGE ADJUSTED MORTALITY RATE PER 100,000 POPULATION (2017)							
	RACE				ETHNICITY		
ICD-10 113 CAUSE LIST	AMERICAN INDIAN OR ALASKA NATIVE	ASIAN OR PACIFIC ISLANDER	BLACK OR AFRICAN AMERICAN	WHITE	HISPANIC OR LATINO	NOT HISPANIC OR LATINO	TOTAL
Diseases of heart (I00-I09,I11,I13,I20-I51)	115.8	85.4	202.4	164.4	114.1	169.9	165
Malignant neoplasms (C00-C97)	99.2	94.4	172.8	153.7	108.1	156.8	152.5
Accidents (unintentional injuries) (V01-X59,Y85-Y86)	55.8	16.8	45.7	52.4	32.5	52.3	49.4
Chronic lower respiratory diseases (J40-J47)	31.1	11.9	29.4	43.8	17.2	43.1	40.9
Cerebrovascular diseases (I60-I69)	26.2	30.1	51.2	36.3	31.8	38	37.6
Alzheimer disease (G30)	16.5	15.2	27.8	32.3	24.7	31.5	31
Diabetes mellitus (E10-E14)	**34.4**	**16.4**	**37.5**	**19.6**	**25.5**	**21.1**	**21.5**
Influenza and pneumonia (J09-J18)	13.1	13	14.9	14.2	11.3	14.6	14.3
Intentional self-harm (suicide) (U03,X60-X84,Y87.0)	13.5	6.6	6.6	15.8	6.9	15.4	14
Nephritis, nephrotic syndrome and nephrosis (N00-N07,N17-N19,N25-N27)	10.9	8.5	24.9	11.8	11.3	13.2	13
All Causes of Death	587.5	393.6	854.1	734.5	524.7	753.8	731.9
CALCULATED METRICS							
Diabetes Rank (Relative to Other Causes)	4	5	5	7	5	7	7
Diabetes Ratio of All Causes of Death	1 in 17	1 in 24	1 in 23	1 in 37	1 in 21	1 in 36	1 in 34
Diabetes Mortality Rate Relative to Total Population	60%	-24%	74%	-9%	19%	-2%	0%

Table Notes

Only the top 10 causes of death by total population age adjusted mortality rate are included in the table.

Data Source

Centers for Disease Control and Prevention, National Center for Health Statistics on CDC WONDER Online Database, released December, 2018. Underlying Cause of Death (2017)

https://wonder.cdc.gov/ucd-icd10.html

Diabetes-related complications

Complications relating to or resulting from diabetes can have health impacts and associated costs. Common complications with diabetes as a root cause include lower extremity amputations, kidney failure (including end stage renal disease [ESRD]), loss of vision, and more, all of which will typically result in hospitalization.

One data source with prevalence rates for complications related to diabetes is the Agency for Healthcare Research and Quality's (AHRQ) National Healthcare Quality and Disparities Reports. Table 7 contains AHRQ data from year 2015 stratified by race/ethnicity (stratifications for veterans and LGBT are not included in the AHRQ database), including complication rates per 100,000 people for the following conditions:

- Lower extremity amputations
- Hospital admissions for uncontrolled diabetes with no additional complications
- Hospital admissions for short-term complications related to diabetes
- Hospital admissions for long-term complications related to diabetes
- Total hospital admissions attributed to diabetes

TABLE 7: DIABETES-RELATED COMPLICATIONS BY POPULATION GROUP

PER 100,000 COMPLICATION RATES					
		HOSPITAL ADMISSIONS PER 100,000			
POPULATION GROUP	LOWER EXTREMITY AMPUTATIONS AMONG ADMISSIONS FOR DIABETES PER 100,000*	UNCONTROLLED DIABETES WITHOUT COMPLICATIONS**	SHORT-TERM COMPLICATIONS***	LONG-TERM COMPLICATIONS****	TOTAL
Total	19	13	86	116	214
White, non-Hispanic	15	9	75	89	173
Black, non-Hispanic	48	35	199	263	497
Asian or Pacific Islander, non-Hispanic	8	5	24	55	84
Hispanic, all races	30	18	65	166	248
COMPLICATION RATES RELATIVE TO TOTAL POPULATION					
White, non-Hispanic	0.8	0.7	0.9	0.8	0.8
Black, non-Hispanic	2.5	2.8	2.3	2.3	2.3
Asian or Pacific Islander, non-Hispanic	0.4	0.4	0.3	0.5	0.4
Hispanic, all races	1.6	1.4	0.8	1.4	1.2

Table Notes

Age 18+, US.

Rates are adjusted by age and gender using the total U.S. resident population for 2010 as the standard population.

* Consistent with the AHRQ PQI software, a procedure code for lower-extremity amputation and a diagnosis of diabetes must be present. Exclusions include admissions for toe amputation or traumatic amputations of the lower extremity, obstetric discharges, and transfers from other institutions.

** Consistent with the AHRQ PQI software, diabetes without complications must be the principal diagnosis. Transfers from other institutions are excluded.

*** Consistent with the AHRQ PQI software, diabetes must be the principal diagnosis and short-term complications include ketoacidosis, hyperosmolarity, or coma. Transfers from other institutions are excluded.

**** Consistent with the AHRQ PQI software, diabetes must be the principal diagnosis and long-term complications include renal, eye, neurological, circulatory, or other unspecified complications. Transfers from other institutions are excluded.

Data Source

Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 2001-2015, weighted to provide national estimates using the same methodology as the HCUP Nationwide Inpatient Sample; and the AHRQ Quality Indicators, version 4.4. Estimates for 2015 were based on nine months of data (January-September) with ICD-9-CM coding. For more information on the sampling approach, included States, and special handling of 2015 data, see the HCUP Methods Series Report on Methods Applying AHRQ Quality Indicators to HCUP Data (https://www.hcup-us.ahrq.gov/reports/methods/methods.jsp).

https://nhqrnet.ahrq.gov/inhqrdr/data

ADDITIONAL COMPLICATIONS

Another data source with prevalence rates for complications related to diabetes is the United States Renal Data System. Table 8 contains 2016 data for prevalence of end stage renal disease with diabetes as the primary cause per one million people, stratified by race/ethnicity. Total population metrics were not available. Therefore, the “relative rate” statistic for this data source was calculated relative to the largest population group available (white). Stratifications for veterans and LGBT are not included in the U.S. Renal Data System.

TABLE 8: END STAGE RENAL DISEASE PREVALENCE BY POPULATION GROUP

POPULATION GROUP	PREVALENCE OF REPORTED ESRD, PER MILLION POPULATION (2016)	RATE RELATIVE TO WHITE
Black/African American	2,006	3.5
Non-Hispanic Black/African American	1,674	3.0
Hispanic	1,538	2.7
Other	1,019	1.8
Non-Hispanic	667	1.2
White	567	1.0
Non-Hispanic White	480	0.8

Table Notes

Diabetes as primary cause, U.S. 2016.

Adjusted for age, sex, race and ethnicity.

Data Source

United States Renal Data System, 2018 Annual Data Report

https://www.usrds.org/reference.aspx

Cost of care

The American Diabetes Association conducted a study to estimate the economic burden of diagnosed diabetes on the American healthcare system. According to the study, the total estimated cost of diagnosed diabetes in 2017 was $327 billion, including $237 billion in direct medical costs and $90 billion in reduced productivity. In addition, the survey states:

- Care for people with diagnosed diabetes accounts for $1 in every $4 healthcare dollars in the U.S., and more than half of that expenditure is directly attributable to diabetes.
- People with diagnosed diabetes incur average medical expenditures of approximately $16,750 per year, of which approximately $9,600 is attributed to diabetes.
- People with diagnosed diabetes, on average, have medical expenditures about 2.3 times higher than what expenditures would be in the absence of diabetes.

Table 9 contains per patient healthcare expenses related to diabetes among people with diabetes. Stratifications are included for race/ethnicity, and were not included for veterans or LGBT. Data was retrieved from the American Diabetes Association's study, *Economic Costs of Diabetes in the U.S. in 2017*.

TABLE 9: U.S. PER CAPITA HEALTHCARE EXPENDITURES ATTRIBUTED TO DIABETES BY RACE/ETHNICITY

COST COMPONENT	NON-HISPANIC WHITE	NON-HISPANIC BLACK	NON-HISPANIC OTHER	HISPANIC	TOTAL POPULATION
INSTITUTIONAL CARE					
Hospital inpatient	$2,866	$3,521	$2,481	$2,036	$2,819
Nursing/residential facility	$323	$271	$80	$89	$261
Hospice	$3	$3	$1	$2	$3
Subtotal	**$3,192**	**$3,795**	**$2,562**	**$2,127**	**$3,083**
OUTPATIENT CARE					
Physician office	$1,294	$1,046	$1,070	$1,143	$1,213
Emergency department	$291	$531	$149	$318	$323
Ambulance services	$13	$13	$13	$13	$13
Hospital outpatient	$446	$708	$253	$537	$488
Home health	$137	$137	$137	$137	$137
Podiatry	$10	$10	$10	$10	$10
Subtotal	**$2,191**	**$2,445**	**$1,632**	**$2,158**	**$2,184**
OUTPATIENT MEDICATIONS AND SUPPLIES					
Insulin	$603	$695	$489	$586	$607
Diabetic supplies	$167	$138	$167	$90	$151
Other anti-diabetic agents*	$628	$645	$719	$651	$641
Prescription medications	$3,130	$2,702	$2,269	$2,385	$2,882
Other equipment and supplies	$53	$53	$53	$53	$53
Subtotal	**$4,581**	**$4,233**	**$3,697**	**$3,765**	**$4,334**
ALL CATEGORIES					
Total	**$9,963**	**$10,473**	**$7,892**	**$8,051**	**$9,601**

Table Notes

Sample includes population members with diabetes only.

* Other anti-diabetic agents include oral medications and non-insulin injectable anti-diabetic agents.

Data Source

American Diabetes Association, Economic Costs of Diabetes in the US in 2017, Supplemental Tables

http://care.diabetesjournals.org/content/diacare/suppl/2018/03/20/dci18-0007.DC1/DCi180007SupplementaryData.pdf

Treatment and utilization

Healthcare services and treatments can play a role in helping patients manage their diabetes. Medical exams are standard practice for individuals with diabetes. Adherence to prescribed medication can help patients manage their diagnosed conditions. Accessible and affordable healthcare is an important factor for patients seeking either medical exams/services or prescribed medication.

The AHRQ's National Healthcare Quality and Disparities Reports provides 2015 data on what AHRQ considers four key medical exams and services that are relevant to diabetes and diabetes related comorbidities. The four exams and services are:

- Two or more annual hemoglobin A1c measurements to check blood sugar levels and determine if current treatment is effective
- Annual dilated eye exam to check for early signs of retinopathy and vision impairment
- Annual feet checks for sores or irritation to catch lower extremity problems early and prevent potential amputation
- Annual flu vaccination as people with diabetes are at high risk of serious flu complications (according to CDC's web page: "Flu and People with Diabetes"[1])

Table 10 contains completion rates of these four exams and services by population group with stratifications for race/ethnicity (stratifications for veterans and LGBT are not included in the AHRQ database).

TABLE 10: MEDICAL EXAMS AND SERVICES BY POPULATION GROUP

	2+ ANNUAL HEMOGLOBIN A1C MEASUREMENTS		RECEIVED A DILATED EYE EXAMINATION		FEET CHECKED FOR SORES OR IRRITATION		RECEIVED A FLU VACCINATION	
POPULATION GROUP	SAMPLE SIZE	PERCENTAGE	SAMPLE SIZE	PERCENTAGE	SAMPLE SIZE	PERCENTAGE	SAMPLE SIZE	PERCENTAGE
Total	1,500	76%	1,994	63%	1,991	69%	1,988	61%
White	981	77%	1,277	63%	1,276	69%	1,278	62%
Black	365	73%	510	65%	510	73%	505	54%
Asian	-	-	129	49%	128	58%	127	67%
Native Hawaiian or Other Pacific Islander	-	-	-	-	-	-	-	-
American Indian or Alaska Native	-	-	-	-	-	-	-	-
Multiple races	-	-	-	-	-	-	-	-
Non-Hispanic, all races	1,111	77%	1,460	64%	1,456	70%	1,455	62%
Non-Hispanic, White	612	79%	769	64%	767	71%	771	63%
Non-Hispanic, Black	359	72%	503	65%	503	73%	498	54%
Hispanic, all races	389	69%	534	59%	535	65%	533	58%

Table Notes

Sample size includes adults age 40 and over with diagnosed diabetes, 2015.

Estimates are age adjusted to the 2000 U.S. standard population with two age-groups: 40-59, 60 and over.

Entries of "-" indicate the population group was included in the sample, but did not meet the study's criteria for statistical reliability.

Data Source

Agency for Healthcare Research and Quality, Center for Financing, Access, and Cost Trends, Medical Expenditure Panel Survey (2015)

https://nhqrnet.ahrq.gov/inhqrdr/data

[1] CDC. (2019) Flu and People with Diabetes. Retrieved May 23, 2019, from https://www.cdc.gov/flu/highrisk/diabetes.htm

ADDITIONAL TREATMENT AND UTILIZATION

Another data source that captures healthcare utilization data is the CDC's U.S. Diabetes Surveillance System. This database contains 2016 data on medication usage rates by population group. Stratifications are included for race/ethnicity, but were not included for veterans or LGBT. Table 11 contains medication usage as a percent of population group with diabetes, split between oral medication, insulins, both, or neither. Note that this data did not contain information on GLP-1 agonists, which can be used to help treat diabetes but do not fall into the insulin or pill category.

TABLE 11: MEDICATION USAGE BY POPULATION GROUP

POPULATION GROUP	EITHER INSULIN OR ORAL	ORAL ONLY	BOTH INSULIN & ORAL	INSULIN ONLY	NO MEDICATION
Asian	89%	80%	7%	2%	11%
Black	80%	47%	25%	9%	20%
Hispanic	82%	63%	6%	13%	18%
Native Hawaiian/Pacific Islander	77%	63%	6%	8%	23%
White	81%	50%	13%	18%	19%

Table Notes

Age-adjusted percentage among adults with diabetes age 18+ by race-ethnicity; United States.

Data Source

CDC, US Diabetes Surveillance System - Diabetic Medication Use 2016

https://gis.cdc.gov/grasp/diabetes/DiabetesAtlas.html

ADDITIONAL TREATMENT AND UTILIZATION

Finally, data was retrieved from the American Diabetes Association's study, *Economic Costs of Diabetes in the U.S. in 2017*, which contains utilization rates of healthcare resources relevant to people with diabetes. Categories relate to hospital care, physician visits, utilization of other healthcare professionals, and medication prescription volume. Table 12 contains this per capita resource use data with stratifications for race/ethnicity (stratifications for veterans and LGBT were not available).

TABLE 12: U.S. PER CAPITA HEALTHCARE RESOURCE USE ATTRIBUTED TO DIABETES BY POPULATION GROUP

HEALTHCARE RESOURCE	NON-HISPANIC WHITE	NON-HISPANIC BLACK	NON-HISPANIC OTHER	HISPANIC	TOTAL POPULATION
Hospital inpatient days	0.92	1.18	0.78	0.67	0.91
Nursing/residential facility days	2.87	2.41	0.71	0.79	2.32
Hospice days	0.01	0.01	0.01	0.01	0.01
Physician office visits	5.21	4.25	4.44	4.69	4.92
Emergency department visits	0.26	0.48	0.14	0.29	0.29
Hospital outpatient visits	0.49	0.81	0.28	0.64	0.55
Home health visits	0.41	0.41	0.41	0.41	0.41
Medication prescriptions	29.19	25.2	21.17	22.25	26.89

Table Notes

Sample size includes population members with diabetes only.

Data Source

American Diabetes Association, Economic Costs of Diabetes in the US in 2017, Supplemental Tables

http://care.diabetesjournals.org/content/diacare/suppl/2018/03/20/dci18-0007.DC1/DCi180007SupplementaryData.pdf

Risk factors

Diabetes risk factors are attributes and characteristics of people and populations that increase the likelihood of developing diabetes and diabetes-related complications. Two of the leading risk factors with reliable data are obesity and inactivity level. Many additional diabetes risk factors were researched (see Additional Factors Explored section). However, little to no data was found for these additional factors of interest.

Maintaining a healthy weight can be a major step in preventing the development of diabetes and diabetes-related complications. The CDC's BRFSS contains body mass index (BMI) data that can be used to classify people into weight categories: obese, overweight, normal weight, and underweight. Regular exercise is another important factor that helps reduce the likelihood of diabetes and diabetes-related complications from developing. Therefore, lack of exercise can be a significant diabetes risk factor. The BRFSS also contains data from survey respondents on whether or not they are physically active in their leisure time.

Tables 13 through 20 contain the sample size and metric (BMI or physical activity rate) as a percentage of population group from 2017 survey responses.

RACE / ETHNICITY

TABLE 13: BODY MASS INDEX CATEGORY BY RACE/ETHNICITY POPULATION GROUP

		BODY MASS INDEX CATEGORY*			
RACE/ETHNICITY	SAMPLE SIZE**	UNDERWEIGHT	NORMAL WEIGHT	OVERWEIGHT	OBESE
American Indian/Alaskan Native, Non-Hispanic	7,826	2%	26%	33%	39%
Asian, Non-Hispanic	8,931	5%	54%	30%	11%
Black, Non-Hispanic	32,840	2%	26%	33%	39%
Hispanic	31,959	2%	28%	38%	32%
Other race, Non-Hispanic	12,294	3%	33%	33%	31%
White, Non-Hispanic	319,720	2%	33%	35%	29%
Total	413,570	2%	33%	35%	30%

Table Notes

* Underweight = BMI under 18.5; Normal = BMI 18.5 to 25; Overweight = BMI 25 to 30; Obese = BMI over 30.

** Excludes sample members who refused to answer, were not sure, or were not asked the race/ethnicity and BMI questions.

Data Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

TABLE 14: LEISURE TIME PHYSICAL ACTIVITY BY RACE/ETHNICITY POPULATION GROUP

		LEISURE TIME PHYSICAL ACTIVITY*	
RACE/ETHNICITY	SAMPLE SIZE**	ACTIVE	INACTIVE
American Indian/Alaskan Native, Non-Hispanic	7,615	72%	28%
Asian, Non-Hispanic	8,888	80%	20%
Black, Non-Hispanic	32,275	68%	32%
Hispanic	33,413	67%	33%
Other race, Non-Hispanic	12,223	76%	24%
White, Non-Hispanic	321,399	75%	25%
Total	415,813	73%	27%

Table Notes

* Adults who reported doing physical activity or exercise during the past 30 days other than their regular job.

** Excludes sample members who refused to answer, were not sure, or were not asked the race/ethnicity and physical activity questions.

Data Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

VETERAN STATUS

TABLE 15: BODY MASS INDEX CATEGORY BY VETERAN STATUS

		BODY MASS INDEX CATEGORY*			
VETERAN STATUS	SAMPLE SIZE**	UNDERWEIGHT	NORMAL WEIGHT	OVERWEIGHT	OBESE
Veteran	55,669	1%	24%	44%	32%
Non-Veteran	357,520	2%	34%	34%	30%
Total	413,189	2%	33%	35%	30%

Table Notes

* Underweight = BMI under 18.5; Normal = BMI 18.5 to 25; Overweight = BMI 25 to 30; Obese = BMI over 30.

** Excludes sample members who refused to answer, were not sure, or were not asked the veteran status and BMI questions.

Data Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

TABLE 16: LEISURE TIME PHYSICAL ACTIVITY BY VETERAN STATUS

		LEISURE TIME PHYSICAL ACTIVITY*	
VETERAN STATUS	SAMPLE SIZE**	ACTIVE	INACTIVE
Veteran	53,918	74%	26%
Non-Veteran	361,388	73%	27%
Total	415,306	73%	27%

Table Notes

* Adults who reported doing physical activity or exercise during the past 30 days other than their regular job.

** Excludes sample members who refused to answer, were not sure, or were not asked the veteran status and physical activity questions.

Data Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

LGBT

TABLE 17: BODY MASS INDEX CATEGORY BY SEXUAL ORIENTATION

		BODY MASS INDEX CATEGORY*			
SEXUAL ORIENTATION	SAMPLE SIZE**	UNDERWEIGHT	NORMAL WEIGHT	OVERWEIGHT	OBESE
Straight	179,040	2%	32%	36%	30%
Gay/Lesbian/Bisexual/Other	7,199	4%	34%	30%	32%
Total	186,239	2%	32%	35%	31%

Table Notes

* Underweight = BMI under 18.5; Normal = BMI 18.5 to 25; Overweight = BMI 25 to 30; Obese = BMI over 30.

** Excludes sample members who refused to answer, were not sure, or were not asked the sexual orientation and BMI questions.

Data Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

TABLE 18: BODY MASS INDEX CATEGORY BY TRANSGENDER STATUS

		BODY MASS INDEX CATEGORY*			
TRANSGENDER?	SAMPLE SIZE**	UNDERWEIGHT	NORMAL WEIGHT	OVERWEIGHT	OBESE
No	187,870	2%	32%	36%	30%
Yes	774	4%	32%	34%	31%
Total	188,644	2%	32%	36%	30%

Table Notes

* Underweight = BMI under 18.5; Normal = BMI 18.5 to 25; Overweight = BMI 25 to 30; Obese = BMI over 30.

** Excludes sample members who refused to answer, were not sure, or were not asked the transgender status and BMI questions.

Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

TABLE 19: LEISURE TIME PHYSICAL ACTIVITY BY SEXUAL ORIENTATION

		LEISURE TIME PHYSICAL ACTIVITY*	
SEXUAL ORIENTATION	SAMPLE SIZE**	ACTIVE	INACTIVE
Straight	188,491	73%	27%
Gay/Lesbian/Bisexual/Other	7,554	74%	26%
Total	196,045	73%	27%

Table Notes

* Adults who reported doing physical activity or exercise during the past 30 days other than their regular job.

** Excludes sample members who refused to answer, were not sure, or were not asked the sexual orientation and physical activity questions.

Data Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

TABLE 20: LEISURE TIME PHYSICAL ACTIVITY BY TRANSGENDER STATUS

		LEISURE TIME PHYSICAL ACTIVITY*	
TRANSGENDER?	SAMPLE SIZE**	ACTIVE	INACTIVE
No	198,221	73%	27%
Yes	823	63%	37%
Total	199,044	73%	27%

Table Notes

* Adults who reported doing physical activity or exercise during the past 30 days other than their regular job

** Excludes sample members who refused to answer, were not sure, or were not asked the transgender status and physical activity questions.

Source
Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

https://www.cdc.gov/brfss/annual_data/annual_2017.html

Additional factors explored

There are many other factors that could help provide a better understanding of the impact and burden of diabetes on various population groups. However, little to no data was found for these additional factors of interest, which are discussed below.

- Population groups that make up a small portion of the total U.S. population are sometimes omitted from reporting and statistics. For example, many statistics are available to help investigate the burden of diabetes on larger population groups like African Americans and Hispanics, but smaller population groups like American Indians and Pacific Islanders are not separately reported. This is often due to the fact that research is regularly done using random sampling, so smaller population groups naturally result in smaller sample sizes upon which statistically significant conclusions cannot be drawn.
- The awareness of diabetes in general, diabetes risk factors, and potential diabetes complications among population groups is a topic without much available research. Understanding the diabetes awareness level by population group could help us better understand what factors contribute to differences in diabetes prevalence rates.
- Another topic lacking available research is potential differences in diet based on population groups, which has been linked to health states such as obesity. Underlying factors, such as availability and affordability of healthy food options and time for food preparation and cooking affect an individual's diet. Further population research in this area can provide more insight.
- While insurance rates for population groups as a whole are available, data surrounding the rate of insurance among people with diabetes would be helpful in gaining a better understanding of the cost burden associated with utilization of healthcare resources. A further understanding of healthcare resource cost burden by population group would also provide new context for healthcare resource utilization rates.
- Visiting healthcare professionals to receive treatment advice and prescriptions can be one important step in managing diabetes. The necessary follow-up for effective management is adherence to prescribed medications and other treatments. Understanding potential adherence differences between population groups could provide additional context to many of the other metrics. However, reliable adherence data across many populations is yet to be widely available.

There may be other factors that could be beneficial in understanding the burden of diabetes on various population groups, and this research summary is not necessarily a comprehensive list of all publically available data for the topics researched.

Appendix

The table below contains population group labels that were modified from the original data source for use on the infographics, as described in the Scope of Research and Data Limitations section in the introduction:

DATA SOURCE	POPULATION GROUP LABEL (SOURCE)	INFOGRAPHIC POPULATION GROUP LABEL
CDC Behavioral Risk Factor Surveillance System Survey Data	Black, Non-Hispanic	African American
	American Indian/Alaskan Native, Non-Hispanic	American Indian
	Asian, Non-Hispanic	Asian American
	Hispanic	Hispanic American
CDC Underlying Cause of Death Database	Black or African American	African American
	American Indian or Alaska Native	American Indian
	Asian or Pacific Islander	Asian American
	Hispanic or Latino	Hispanic American
AHRQ National Healthcare Quality and Disparities Reports – Complications	Black, non-Hispanic	African American
	Asian or Pacific Islander, non-Hispanic	Asian American
	Hispanic, all races	Hispanic American
US Renal Data System 2018 Annual Data Report	Black/African American	African American
	Hispanic	Hispanic American
ADA Economic Costs of Diabetes in the US in 2017	Non-Hispanic Black	African American
	Non-Hispanic Other	Asian American
	Hispanic	Hispanic American
AHRQ National Healthcare Quality and Disparities Reports – Exams and Services	Black	African American
	Asian	Asian American
	Hispanic, all races	Hispanic American
CDC US Diabetes Surveillance System National Diabetic Medication Use	Black	African American
	Asian	Asian American
	Hispanic	Hispanic American

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DIABETES BURDEN INFOGRAPHICS

- **African Americans**
- **American Indians**
- **Asian Americans**
- **Hispanic Americans**
- **Veterans**