Economic Costs of Diabetes in the U.S. in 2017

Appendix 1. Additional Tables and Figures

Supplementary Table A-1. Summary of data sources

Data Source and Description	Used to Estimate/Analysis	+Strengths and - Limitations
Current Population Survey (CPS): 2016 Available at Available at: http://www.census.gov/cps/data/	• annual and daily earnings by demographic	+ large sample size – file does not contain diabetes status
Behavioral Risk Factor Surveillance System (BRFSS): combined 2015 - 2016 surveys Available at: http://www.cdc.gov/brfss/	• state level population by age, sex, race/ethnicity, and insurance status	+ large sample size – diabetes status self-reported based on answer to the question, "Have you ever been told by a doctor that you have diabetes?" – excludes institutionalized population where diabetes is over-represented
American Community Survey (ACS): 2016 Available at: http://www.census.gov/acs/www/	• state level diagnosed diabetes prevalence by age, sex, race/ethnicity, and insurance status	+ large sample size that is representative of the population in each state – diabetes status not collected
National Health Interview Survey (NHIS): combine 2014-2016 surveys to increase sample size. Available at: http://www.cdc.gov/nchs/nhis.htm	• diagnosed diabetes prevalence rates for children by sex and race/ethnicity • prevalence of insulin and other anti-diabetic agents use • impact of diabetes on employment and missed work days	+ large sample size + contains employment-related information – diabetes status self-reported based on answer to the question, "Have you EVER been told by a doctor or health professional that you have diabetes or sugar diabetes?" – excludes institutionalized population where diabetes is over-represented
Medical Expenditure Panel Survey (MEPS): combine 2011-2015 surveys to increase sample size. Available at: http://meps.ahrq.gov/mepsweb/	• average cost per physician office, outpatient and emergency department visit, inpatient physician services and prescription medication • average annual expenditures for podiatry, home health, insulin, other anti-diabetic agents, diabetes-related supplies, ambulance, and other medical equipment and supplies	+ rich source of health resource use and cost information – relatively small sample size per year – contains only 3-digit diagnosis codes; many chronic complications of diabetes require 4-digit and 5-digit codes to identify – excludes institutionalized population where diabetes is over-represented

SUPPLEMENTARY DATA

Data Source and Description	Used to Estimate/Analysis	+Strengths and - Limitations
Medicare Current Beneficiary Survey: 2013 Available at: https://www.cms.gov/Research-Statistics-Data-and-Systems/Research/MCBS/	• prevalence of diabetes, smoking, overweight and obese, and chronic disease among population living in residential care facilities	+ large sample size + most recent individual level data available on people in residential care (using subset of MCBS on people in this living arrangement) – people in residential care who are not in Medicare are assumed to have disease prevalence similar to a person with the same demographic in Medicare
National Ambulatory Medical Care Survey (NAMCS): combine 2013-2015 surveys to increase sample size. Available at: http://www.cdc.gov/nchs/ahcd.htm	• national number of physician office visits by medical condition (using primary diagnosis code) • average number of prescriptions written per visit	+ larger sample size than MEPS + contains 5-digit diagnosis codes to identify chronic complications of diabetes – visits are the units of observations, with incomplete information on patients (including whether they have diabetes)
National Hospital Ambulatory Medical Care Survey (NHAMCS): combine 2012-2014 surveys to increase sample size for emergency visits; 2009-2011 data for outpatient visits Available at: http://www.cdc.gov/nchs/ahcd.htm	• national number of hospital outpatient and emergency department visits by medical condition (using primary diagnosis code) • average number of prescriptions written per visit	+ same as NAMCS – same as NAMCS
National Inpatient Sample (NIS): 2014 survey. Available at: http://www.hcup-us.ahrq.gov/nisoverview.jsp	• national number of hospital inpatient days for diabetes and comorbidities of diabetes (using primary diagnosis) • cost per inpatient day calculated using hospital-specific cost-to-charge ratios	+ same as NAMCS – same as NAMCS
National Home and Hospice Care Survey (NHHCS): 2007 survey. Available at: http://www.cdc.gov/nchs/nhhcs.htm	• hospice care use	+ same as NAMCS – same as NAMCS
CMS Long Term Care Minimum Data Set (MDS): 2013 data Available at: http://www.cms.gov/Research-Statistics-Data-and-Systems/Files-for-Order/IdentifiableDataFiles/StandardAnalyticalFiles.html	• nursing facility use	+ large sample size + contains data on all patients who reside in nursing homes that receive payments from CMS + reflects variation in patient characteristics across states

SUPPLEMENTARY DATA

Data Source and Description	Used to Estimate/Analysis	+Strengths and - Limitations
OptumInsight De-Identified Normative Health Informatics (dNHI): 2013-2015 data Proprietary data, overview available at: http://www.optuminsight.com/life-sciences/solutions/real-world-evidence/data-assets/retrospective-database/overview/	• calculate age-sex specific relative rate ratios for each medical condition for hospital inpatient days, emergency department visits, and ambulatory visits (physician office and hospital outpatient combined) for population under the age of 65	+ large sample size + all medical records can be linked for the year to identify people with diabetes based on whether they have any diabetes diagnosis code during the year – lacks detailed data on health behavior found in MEPS
Medicare 5% Sample Standard Analytical Files (SAF): 2014 data Available at: http://www.cms.gov/Research-Statistics-Data-and-Systems/Files-for-Order/IdentifiableDataFiles/StandardAnalyticalFiles.html	• calculate age-sex specific relative rate ratios for each medical condition for hospital inpatient days, emergency department visits, and ambulatory visits (physician office and hospital outpatient combined) for population over the age of 65	+ large sample size + all medical records can be linked for the year to identify people with diabetes based on whether they have any diabetes diagnosis code during the year + lacks detailed data on health behavior found in MEPS

SUPPLEMENTARY DATA

Supplementary Table A- 2. U.S. population and percent of U.S. population with diabetes, 2017 (in thousands)

	Total U.S. Population	With diagnosed diabetes	
Total Population[1]	326,600	24,700	7.6%
Adult Population[2]	252,800	24,600	9.7%
Race/ethnicity			
Non-Hispanic white	198,800	15,100	7.6%
Non-Hispanic black	40,500	4,000	10.0%
Non-Hispanic other	27,800	1,900	6.8%
Hispanic	59,500	3,700	6.2%
Sex			
Male	161,000	12,800	8.0%
Female	165,600	11,900	7.2%
Age (years)			
<18	73,800	100	0.2%
18-34	76,200	1,000	1.3%
35-44	40,900	1,900	4.7%
45-54	42,400	4,100	9.6%
55-59	22,100	3,100	13.8%
60-64	20,100	3,500	17.6%
65-69	16,900	3,600	21.2%
70+	34,100	7,400	21.8%
Insurance			
Private	188,100	9,100	4.8%
Government[3]	110,200	14,200	12.9%
Uninsured	28,300	1,400	4.9%

Data source: ACS (2016), BRFSS (2015-2016), MCBS (2013), CMS MDS (2015), NHIS (2014-2016) and U.S. Census Bureau (2016 & 2017).

[1] Numbers do not necessarily sum to totals because of rounding.

[2] Age 18 and older.

[3] Includes Medicare, Medicaid, Children's health Insurance Program and Indian Health Service.

SUPPLEMENTARY DATA

Supplementary Table A-3. Average cost per medical event (visit or day), by medical condition and type of service, 2017 (in actual dollars)

Medical Event	Diabetes	Chronic Complications[1]							General Medical[3]	Average
		Neurological	Peripheral vascular	Cardiovascular	Renal	Metabolic	Ophthalmic	Other[2]		
Hospital inpatient days	2,413	3,242	3,060	4,083	2,203	2,823	3,457	2,253	2,920	3,084
Hospital outpatient visits	617	712	929	638	1,171	353	1,224	2,205	1,062	894
Emergency visits	1,032	737	1,104	1,445	908	1,326	972	1,081	1,102	1,105
Physician office visits	211	237	320	237	401	179	304	221	249	247

Data source: NIS (2014), NAMCS (2013-2015), NHAMCS (2012-2014) and MEPS (2011-2015).
[1] See Supplementary Appendix 2 for diagnosis codes for each category of complications.
[2] Includes bacteremia, candidiasis of skin and nails, chronic osteomyelitis of the foot, other and unspecified noninfectious gastroenteritis and colitis, impotence of organic origin, infective otitis externa, degenerative skin disorders, candidiasis of vulva and vagina, cellulitis, diabetes with other specified manifestations, diabetes with unspecified complication, and other bone involvement in disease classified elsewhere.
[3] Includes all other health care use that is not a known comorbidity of diabetes.

Supplementary Table A-4. Health resource use attributed to diabetes in the U.S., by age group and type of service, 2017 (in thousands of units)

Health resource	Age (years)		
	<65 (N=13.7M)	≥ 65 (N=11.0M)	Total* (N=24.7M)
Institutional care			
Hospital inpatient days	8,256 (37%)	14,334 (63%)	22,590
Nursing/residential facility days	20,167 (35%)	37,142 (65%)	57,309
Hospice days	26 (9%)	257 (91%)	284
Physician office visits	40,252 (33%)	81,313 (67%)	121,566
Emergency department visits	3,888 (54%)	3,341 (46%)	7,228
Hospital outpatient visits	6,322 (47%)	7,149 (53%)	13,471
Home health visits	7,688 (76%)	2,379 (24%)	10,066
Medication prescriptions	202,422 (30%)	462,027 (70%)	664,449

Data source: NIS (2014), MCBS (2013), CMS MDS (2015), NAMCS (2013-2015), NHAMCS (2012-2014), MEPS (2011-2015) and NHHCS (2007).
* Numbers do not necessarily sum to totals because of rounding.

SUPPLEMENTARY DATA

Supplementary Table A-5. Health resource use attributed to diabetes in the U.S., by medical condition and type of service, 2017 (in thousands of units)

Medical Event	Diabetes	Chronic Complications[1]							General Medical[3]	Total*
		Neurological	Peripheral Vascular	Cardiovascular	Renal	Metabolic	Ophthalmic	Other[2]		
Hospital inpatient days	857 (4%)	1,792 (8%)	1,229 (5%)	4,955 (22%)	1,545 (7%)	73 (0%)	14 (0%)	1,910 (8%)	10,215 (45%)	22,590 (100%)
Physician office visits	26,682 (22%)	2,669 (2%)	2,144 (2%)	15,500 (13%)	3,725 (3%)	1,757 (1%)	7,415 (6%)	1,778 (1%)	59,895 (49%)	121,566 (100%)
Emergency department visits	404 (6%)	181 (3%)	126 (2%)	634 (9%)	451 (6%)	27 (0%)	26 (0%)	591 (8%)	4,787 (66%)	7,228 (100%)
Hospital outpatient visits	4,257 (32%)	284 (2%)	538 (4%)	1,486 (11%)	431 (3%)	106 (1%)	450 (3%)	347 (3%)	5,571 (41%)	13,471 (100%)

Data source: NIS (2014), NAMCS (2013-2015) and NHAMCS (2012-2014).

[1] See Supplementary Appendix 2 for diagnosis codes for each category of complications.

[2] Includes bacteremia, candidiasis of skin and nails, chronic osteomyelitis of the foot, other and unspecified noninfectious gastroenteritis and colitis, impotence of organic origin, infective otitis externa, degenerative skin disorders, candidiasis of vulva and vagina, cellulitis, diabetes with other specified manifestations, diabetes with unspecified complication, and other bone involvement in disease classified elsewhere.

[3] Includes all other health care use that is not a known comorbidity of diabetes.

* Numbers do not necessarily sum to totals because of rounding.

Supplementary Table A-6. Per capita health resource use attributed to diabetes in the U.S., by race/ethnicity and type of service, 2017 (in actual units)

Health resource	Race/ethnicity				
	NHW (N=15.1M)	NHB (N=4.0M)	NHO (N=1.9M)	Hispanic (N=3.7M)	Total* (N=24.7M)
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	25.20	21.17	22.25	26.89

Data source: NIS (2014), MCBS (2013), CMS MDS (2015), NAMCS (2013-2015), NHAMCS (2012-2014), MEPS (2011-2015) and NHHCS (2007). NHW=non-Hispanic white, NHB=non-Hispanic black and NHO=non-Hispanic other races.

* Numbers do not necessarily sum to totals because of rounding.

SUPPLEMENTARY DATA

Supplementary Table A-7. Per capita health resource use attributed to diabetes in the U.S., by insurance status and type of service, 2017 (in actual units)

Health resource	Insurance Status			
	Private (N=8.8M)	Government (N=14.6M)	Uninsured (N=1.4M)	Total* (N=24.7M)
Hospital inpatient days	0.48	1.23	0.51	0.91
Nursing/residential facility days	2.32	2.32	2.32	2.32
Hospice days	0.01	0.01	0.01	0.01
Physician office visits	4.47	5.51	1.78	4.92
Emergency department visits	0.19	0.33	0.51	0.29
Hospital outpatient visits	0.38	0.64	0.67	0.55
Home health visits	0.41	0.41	0.41	0.41
Antidiabetic agents	5.24	4.39	3.54	4.65
Medication prescriptions	20.28	32.75	9.77	26.89

Data source: NIS (2014), MCBS (2013), CMS MDS (2015), NAMCS (2013-2015), NHAMCS (2012-2014), MEPS (2011-2015) and NHHCS (2007).
* Numbers do not necessarily sum to totals because of rounding.

Supplementary Table A-8. Per capita health care expenditures attributed to diabetes in the U.S., by insurance status and type of service, 2017 (in actual dollars)

Cost Component	Insurance Status			
	Private (N=8.8M)	Government (N=14.6M)	Uninsured (N=1.4M)	Total* (N=24.7M)
Institutional care				
Hospital inpatient	1,796	3,611	1,383	2,819
Nursing/residential facility	261	261	261	261
Hospice	3	3	3	3
Outpatient care				
Physician office	1,290	1,256	254	1,213
Emergency department	366	287	419	323
Ambulance services[1]	13	13	13	13
Hospital outpatient	588	449	218	488
Home health[1]	137	137	137	137
Podiatry[1]	10	10	10	10
Outpatient medications and supplies				
Insulin	385	790	169	607
Diabetic supplies[1]	151	151	151	151
Other anti-diabetic agents[2]	527	749	188	641
Prescription medications	2,759	3,219	177	2,882
Other equipment and supplies[3, 1]	53	53	53	53
Total	8,338	10,998	3,436	9,601

Data source: NIS (2014), MCBS (2013), CMS MDS (2015), NAMCS (2013-2015), NHAMCS (2012-2014), MEPS (2011-2015), NHHCS (2007), NHIS (2014-2016), and U.S. Census Bureau (2016 & 2017).
[1] Estimates are unavailable by insurance type.
[2] Includes oral medications and non-insulin injectable anti-diabetic agents.
[3] Includes, but not limited to eyewear, orthopedic items, hearing devices, prosthesis, bathroom aids, medical equipment, and disposable supplies.
* Numbers do not necessarily sum to totals because of rounding.

SUPPLEMENTARY DATA

Supplementary Table A-9. Per capita health care expenditures attributed to diabetes in the U.S., by age group and type of service, 2017 (in actual dollars)

Cost Component	Age (years)			
	< 45 (N=3.0M)	**45-64 (N=10.7M)**	**≥ 65 (N=11.0M)**	**Total* (N=24.7M)**
Institutional care				
Hospital inpatient	1,497	1,903	4,069	2,819
Nursing/residential facility	166	194	351	261
Hospice	0.02	0.55	5	3
Outpatient care				
Physician office	626	721	1,852	1,213
Emergency department	504	255	339	323
Ambulance services	2	9	21	13
Hospital outpatient	462	367	611	488
Home health	175	193	73	137
Podiatry	4	8	14	10
Outpatient medications and supplies				
Insulin	767	611	558	607
Diabetic supplies	175	163	132	151
Other anti-diabetic agents[1]	480	657	671	641
Prescription medications	1,061	1,734	4,496	2,882
Other equipment and supplies[2]	60	56	48	53
Total	5,979	6,874	13,240	9,601

Data source: NIS (2014), MCBS (2013), CMS MDS (2015), NAMCS (2013-2015), NHAMCS (2012-2014), MEPS (2011-2015), NHHCS (2007), NHIS (2014-2016), and U.S. Census Bureau (2016 & 2017).

[1] Includes oral medications and non-insulin injectable anti-diabetic agents.

[2] Includes, but not limited to eyewear, orthopedic items, hearing devices, prosthesis, bathroom aids, medical equipment, and disposable supplies.

* Numbers do not necessarily sum to totals because of rounding.

SUPPLEMENTARY DATA

Supplementary Table A-10. Per capita health care expenditures attributed to diabetes in the U.S., by race/ethnicity and type of service, 2017 (in actual dollars)

Cost Component	Race/ethnicity				
	NHW (N=15.1M)	**NHB (N=4.0M)**	**NHO (N=1.9M)**	**Hispanic (N=3.7M)**	**Total* (N=24.7M)**
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
Outpatient care					
Physician office	1,294	1,046	1,070	1,143	1,213
Emergency department	291	531	149	318	323
Ambulance services[1]	13	13	13	13	13
Hospital outpatient	446	708	253	537	488
Home health[1]	137	137	137	137	137
Podiatry[1]	10	10	10	10	10
Outpatient medications and supplies					
Insulin	603	695	489	586	607
Diabetic supplies	167	138	167	90	151
Other anti-diabetic agents[2]	628	645	719	651	641
Prescription medications	3,130	2,702	2,269	2,385	2,882
Other equipment and supplies[3, 1]	53	53	53	53	53
Total	9,963	10,473	7,892	8,051	9,601

Data source: NIS (2014), MCBS (2013), CMS MDS (2015), NAMCS (2013-2015), NHAMCS (2012-2014), MEPS (2011-2015), NHHCS (2007), NHIS (2014-2016), and U.S. Census Bureau (2016 & 2017). NHW=non-Hispanic white, NHB=non-Hispanic black and NHO=non-Hispanic other races.

[1] Estimates are unavailable by race and Hispanic ethnicity.

[2] Includes oral medications and non-insulin injectable anti-diabetic agents.

[3] Includes, but not limited to eyewear, orthopedic items, hearing devices, prosthesis, bathroom aids, medical equipment, and disposable supplies.

* Numbers do not necessarily sum to totals because of rounding.

SUPPLEMENTARY DATA

Supplementary Table A-11. Total health care expenditures attributed to diabetes in the U.S., by insurance status and type of service, 2017 (in millions of dollars)

Cost Component	Insurance Status			
	Private (N=8.8M)	Government (N=14.6M)	Uninsured (N=1.4M)	Total* (N=24.7M)
Institutional care				
Hospital inpatient	16,385	51,396	1,879	69,661
Nursing/residential facility	2,376	3,708	354	6,439
Hospice	23	37	3	64
Physician office	11,765	17,880	345	29,990
Emergency department	3,334	4,087	569	7,990
Ambulance services[1]	123	191.22	18	332
Hospital outpatient	5,367	6,386	296	12,049
Home health[1]	1,250	1,951	186	3,388
Podiatry[1]	93	145	14	252
Insulin	3,512	11,239	230	14,981
Diabetic supplies[1]	1,374	2,144	205	3,723
Other anti-diabetic agents[2]	4,802	10,796	256	15,855
Prescription medications	25,167	45,826	243	71,235
Other equipment and supplies[3, 1]	484	755	72	1,310
Total	76,056	156,542	4,671	237,269

Data source: NIS (2014), MCBS (2013), CMS MDS (2015), NAMCS (2013-2015), NHAMCS (2012-2014), MEPS (2011-2015), NHHCS (2007), NHIS (2014-2016), and U.S. Census Bureau (2016 & 2017).

[1] Estimates are unavailable by insurance type.

[2] Includes oral medications and non-insulin injectable anti-diabetic agents.

[3] Includes, but not limited to eyewear, orthopedic items, hearing devices, prosthesis, bathroom aids, medical equipment, and disposable supplies.

* Numbers do not necessarily sum to totals because of rounding.

SUPPLEMENTARY DATA

Supplementary Table A-12. Health care expenditures attributed to diabetes in the U.S., by medical condition and type of service, 2017 (in millions of dollars)

Type of Service	Diabetes	Chronic Complications[1]							General Medical[3]	Total*
		Neurological	Peripheral Vascular	Cardiovascular	Renal	Metabolic	Ophthalmic	Other[2]		
Hospital inpatient	2,067	5,808	3,762	20,231	3,404	205	50	4,304	29,830	69,661
Physician office	5,626	633	687	3,671	1,494	314	2,253	393	14,920	29,990
Emergency department	417	134	139	916	409	36	26	640	5,273	7,990
Hospital outpatient	2,626	203	500	947	505	37	551	766	5,914	12,049
Retail prescriptions	18,560	1,827	1,469	11,486	2,925	963	2,710	1,089	30,207	71,235

Data source: NIS (2014), NAMCS (2013-2015), NHAMCS (2012-2014) and MEPS (2011-2015).
[1] See Supplementary Appendix 2 for diagnosis codes for each category of complications.
[2] Includes bacteremia, candidiasis of skin and nails, chronic osteomyelitis of the foot, other and unspecified noninfectious gastroenteritis and colitis, impotence of organic origin, infective otitis externa, degenerative skin disorders, candidiasis of vulva and vagina, cellulitis, diabetes with other specified manifestations, diabetes with unspecified complication, and other bone involvement in disease classified elsewhere.
[3] Includes all other health care use that is not a known comorbidity of diabetes.
* Numbers do not necessarily sum to totals because of rounding.

Supplementary Table A-13. Annual productivity loss per person with diabetes, by cause and race/ethnicity, 2017 (in billions of dollars)

	Race/ethnicity[1]			
	NHW (N=14.1M)	NHB (N=3.4M)	NHO (N=1.4M)	Hispanic (N=3.4M)
Work days absent	2.2	0.5	0.2	0.4
Reduced performance at work	18.0	3.3	2.3	3.4
Reduced productivity days for those not in labor force	1.3	0.5	0.2	0.3
Reduced labor force participation due to disability	17.9	11.0	3.0	5.5
Mortality	14.3	4.0	0.9	1.8
Total annual indirect cost	**53.8**	**19.3**	**6.6**	**11.4**
Total Per Capita Indirect cost[2]	**3,585**	**4,829**	**3,320**	**2,843**

Data source: Analysis of the NHIS (2014-2016), CPS (2016), CDC mortality data (2015), and Census Bureau 2015-2017).
[1] Non-Hispanic white (NHW), non-Hispanic black (NHB), non-Hispanic other (NH), and Hispanic. [2] In actual dollars.

SUPPLEMENTARY DATA

Supplementary Table A-14. Annual productivity loss per person with diabetes in the U.S., by age, sex, and cause, 2017 (in actual dollars)

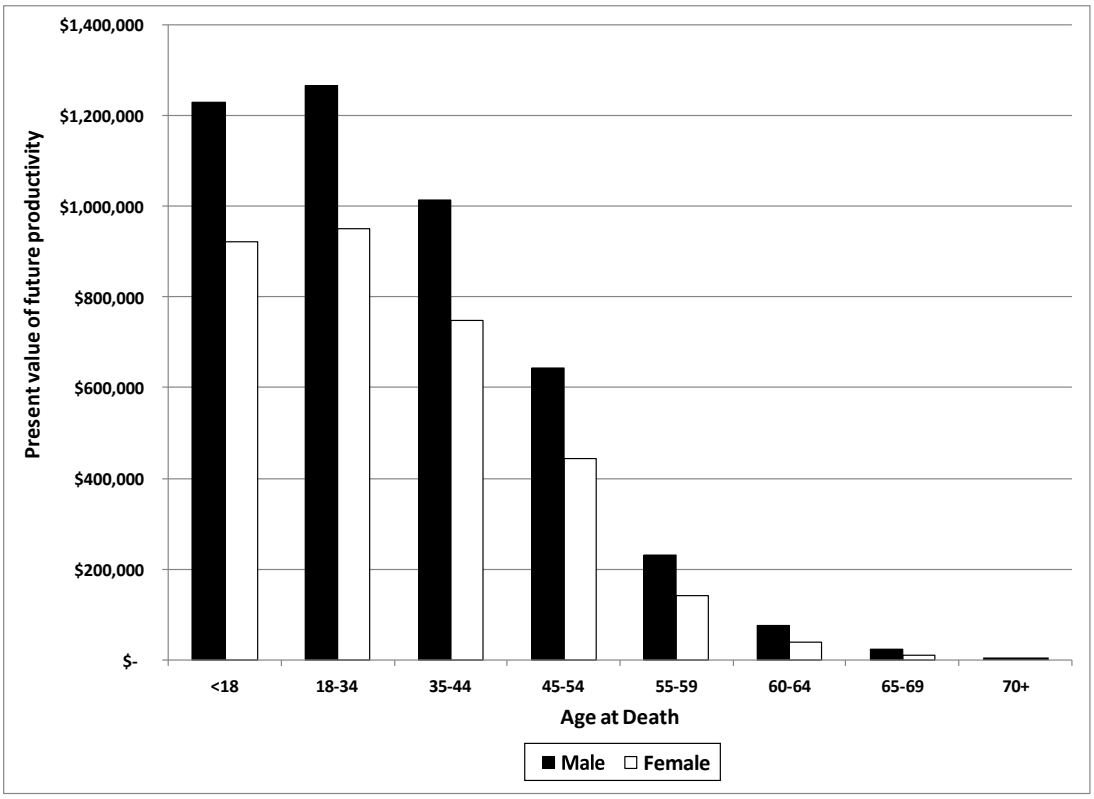
Sex	Age	Absenteeism	Presenteeism	Reduced productivity for those not in labor force	Unemployment from disability	Premature mortality	Total annual burden*
Male	18-34	10	1,670	<10	1,170	3,130	5,980
	35-44	210	2,850	60	1,820	2,760	7,700
	45-54	330	2,770	110	2,070	2,850	8,130
	55-59	540	2,040	270	2,640	1,530	7,020
	60-64	210	1,830	170	1,710	530	4,450
	65-69	80	950	-	710	200	1,940
	70+	-	590	-	1,480	-	2,070
	Total	**180**	**1,600**	**80**	**1,660**	**1,120**	**4,640**
Female	18-34	10	840	10	1,310	1,350	3,520
	35-44	120	1,290	100	1,920	1,440	4,870
	45-54	170	1,150	160	2,070	1,230	4,780
	55-59	250	730	350	2,510	550	4,390
	60-64	90	610	200	1,670	180	2,750
	65-69	30	270	-	690	60	1,050
	70+	-	60	-	640	-	700
	Total	**80**	**550**	**110**	**1,380**	**470**	**2,590**
All adults		**130**	**1,090**	**90**	**1,530**	**810**	**3,640**

Data source: Analysis of the NHIS (2014-2016), CPS (2016), and CDC mortality data (2015).
Note: No indirect costs are calculated for persons under the age of 18. For the age 70 and older population, the rate of labor force participation is low so indirect costs are relatively low for this population despite high prevalence of diabetes. The NHIS sample size of employed people over age 70 is small, and regression analysis with the NHIS found that diabetes is not associated with increased work days absent for illness among the employed population age 70 and older. We conservatively assume that for the population age 65 and older and not in the workforce there is no loss in societal productivity (e.g., from volunteer work) associated with diabetes.
* Numbers do not necessarily sum to totals because of rounding\

SUPPLEMENTARY DATA

Figure A-1 summarizes estimates of present value of future productivity (PVFP) if a person dies at that age. PVFP is the value in 2017 of expected future lifetime earnings if the person had lived to the average age as the cohort born in the same year. Differences in PVFP by demographic reflect differences in average earnings, propensity to be in the workforce, and number of years expecting to remain in the workforce.

Supplementary Figure A-1. Net Present Value of Future Lost Earnings from Premature Death



Data source: Analysis of the NHIS (2014-2016), CPS (2016), and CDC mortality data (2015).

SUPPLEMENTARY DATA

Supplementary Table A-15. Proportion of total health resource use attributed to diabetes in the U.S. by medical condition and type of service, 2017

Medical Event	Diabetes	Chronic Complications[1]							General Medical[3]	Average
		Neurological	Peripheral Vascular	Cardiovascular	Renal	Metabolic	Ophthalmic	Other[2]		
Hospital inpatient days	100%	38%	49%	34%	29%	44%	31%	49%	8%	14%
Hospital outpatient visits	100%	33%	28%	20%	28%	13%	27%	18%	8%	13%
Emergency department visits	100%	21%	20%	19%	13%	35%	17%	12%	4%	5%
Physician office visits	100%	37%	35%	21%	25%	13%	29%	22%	6%	12%
Prescription medications	100%	46%	37%	21%	33%	13%	27%	21%	10%	17%

Data source: NIS (2014), MCBS (2013), CMS MDS (2015), NAMCS (2013-2015), NHAMCS (2012-2014), MEPS (2011-2015), NHHCS (2007), NHIS (2014-2016) and U.S. Census Bureau (2016 & 2017).

[1] See Supplementary Appendix 2 for diagnosis codes for each category of complications.

[2] Includes bacteremia, candidiasis of skin and nails, chronic osteomyelitis of the foot, other and unspecified noninfectious gastroenteritis and colitis, impotence of organic origin, infective otitis externa, degenerative skin disorders, candidiasis of vulva and vagina, cellulitis, diabetes with other specified manifestations, diabetes with unspecified complication, and other bone involvement in disease classified elsewhere.

[3] Includes all other health care use that is not a known comorbidity of diabetes.

Estimating the direct and indirect costs attributed to diabetes by state

State-specific cost of diabetes was calculated by combining the population with diabetes in each state by age-sex-race/ethnicity stratum with the overall U.S. per capita expenditure attributed to diabetes by each aforementioned stratum. State-specific diabetes prevalence is estimated by applying a statistical matching procedure to match each person in the 2016 ACS with a person in the 2015 or 2016 BRFSS (community-based population) or an institutionalized person in the 2013 MCBS (residential care facility) or 2015 MDS (nursing home).

National estimates of diabetes costs by demographic and insurance strata were applied to the state diabetes prevalence estimates. This cost is further adjusted by the state-specific healthcare cost of living index published by Missouri Economic Research and Information Center (MERIC) for 2017.

Per capita indirect cost attributed to diabetes includes costs due to absenteeism, presenteeism, reduced productivity for those not in labor force, unemployment from disability and premature mortality. Similar to the methodology employed to estimate state-specific medical costs, per capita indirect cost and diabetes prevalence for each state are combined to estimate state-specific indirect costs owing to loss of productivity due to diabetes. Indirect cost was adjusted by overall cost of living index published by MERIC for 2017.

Table A-16 summarizes state diabetes prevalence and diabetes burden, with states sorted from largest total burden (California) to smallest total burden (Wyoming). California has the largest population with diabetes and thus incurs the largest cost ($39.47 billion). West Virginia has the highest prevalence rate of diabetes (10.1%).

SUPPLEMENTARY DATA

Supplementary Table A-16. State level prevalence and cost burden of diabetes, 2017

State	Prevalence	Population with Diabetes	Costs (Billions $)		
			Medical	Indirect	Total
California	6.9%	2,764,000	27.02	12.45	39.47
Texas	7.6%	2,163,000	18.91	6.70	25.60
Florida	9.3%	1,944,000	19.32	5.48	24.80
New York	7.4%	1,474,000	15.14	6.09	21.23
Pennsylvania	7.8%	1,006,000	9.34	3.54	12.88
Ohio	8.4%	970,000	9.02	3.33	12.35
Illinois	7.0%	902,000	8.73	3.17	11.89
Georgia	8.2%	853,000	7.78	3.14	10.92
North Carolina	7.8%	798,000	7.71	2.90	10.61
Michigan	7.7%	762,000	7.03	2.69	9.72
New Jersey	6.8%	616,000	6.66	2.51	9.17
Virginia	7.5%	639,000	6.05	2.33	8.38
Massachusetts	6.6%	449,000	5.49	2.13	7.62
Tennessee	8.8%	592,000	5.16	2.11	7.26
Maryland	8.1%	496,000	4.92	2.09	7.01
Arizona	7.8%	555,000	5.11	1.65	6.76
Washington	6.4%	473,000	5.04	1.69	6.74
Missouri	8.7%	535,000	4.92	1.80	6.71
Indiana	7.7%	512,000	4.70	1.79	6.49
Alabama	9.9%	483,000	4.19	1.72	5.90
South Carolina	8.8%	441,000	4.25	1.64	5.89
Louisiana	9.3%	441,000	4.23	1.45	5.68
Wisconsin	6.7%	389,000	4.10	1.36	5.46
Kentucky	9.2%	411,000	3.60	1.57	5.16
Minnesota	6.1%	339,000	3.53	1.17	4.70
Oregon	6.9%	285,000	3.14	1.17	4.31
Oklahoma	8.2%	322,000	2.76	1.07	3.83
Connecticut	6.6%	236,000	2.70	0.96	3.66
Colorado	4.8%	270,000	2.56	1.03	3.59
Mississippi	9.3%	278,000	2.42	0.99	3.41
Arkansas	8.8%	262,000	2.21	0.88	3.09
Nevada	6.8%	205,000	2.04	0.70	2.75
Iowa	6.4%	199,000	1.90	0.65	2.55
Kansas	6.6%	194,000	1.70	0.69	2.40
West Virginia	10.1%	184,000	1.66	0.64	2.30
New Mexico	8.2%	174,000	1.50	0.48	1.97
Utah	4.8%	148,000	1.25	0.50	1.75
Hawaii	6.9%	99,000	1.02	0.46	1.48
Nebraska	5.9%	112,000	0.99	0.38	1.38
Maine	6.9%	89,000	1.01	0.37	1.37
Idaho	6.2%	104,000	0.96	0.31	1.27
New Hampshire	6.5%	86,000	0.94	0.32	1.26
Rhode Island	7.1%	75,000	0.78	0.28	1.06
Delaware	7.5%	72,000	0.70	0.28	0.98

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State	Prevalence	Population with Diabetes	Costs (Billions $)		
			Medical	Indirect	Total
Montana	6.2%	64,000	0.63	0.19	0.82
District of Columbia	6.1%	42,000	0.43	0.27	0.70
South Dakota	6.5%	55,000	0.51	0.18	0.69
North Dakota	6.6%	49,000	0.47	0.19	0.66
Alaska	4.7%	34,000	0.42	0.16	0.57
Vermont	5.7%	35,000	0.36	0.16	0.52
Wyoming	5.8%	34,000	0.31	0.11	0.42
U.S. Total *	**7.6%**	**24,714,0**	**237.3**	**89.9**	**327.2**

Data source: NIS (2014), MCBS (2013), CMS MDS (2015), NAMCS (2013-2015), NHAMCS (2012-2014), MEPS (2011-2015), NHHCS (2007), NHIS (2014-2016), ACS (2016), BRFSS (2015-2016), and U.S. Census Bureau (2016 & 2017).
* Numbers do not necessarily sum to totals because of rounding.

Appendix 2. Chronic Complications of Diabetes and Diagnosis Codes

Chronic Complications of Diabetes	ICD-9 codes	ICD-10 codes
Neurological Symptoms		
Myasthetic syndromes in diseases classified elsewhere (amyotrophy)	358.1	G733, G737
Other specified idiopathic peripheral neuropathy	356.8	G608
Mononeuritis of upper and lower limbs	354, 355	G5620, G5642, G5622, G587, G5690, G5680, G5612, G5610, G580, G5692, G5630, G5602, G5632, G5621, G5682, G5641, G5600, G5691, G5611, G5640, G5681, G5601, G5631, G5780, G5712, G5732, G5782, G5700, G5792, G5702, G5762, G5721, G5791, G589, G5770, G5750, G5761, G5701, G5740, G5731, G5752, G5711, G5781, G5720, G5772, G5771, G59, G5722, G588, G5751, G5742, G5710, G5790, G5741, G5760, G5730, G5643, G5603, G5693, G5683, G5713, G5753, G5773, G5783, G5793, G589
Arthropathy associated w/neurological disorders (Charcot's arthropathy)	713.5	M14632, M14629, M14662, M14649, M14641, M14612, M14621, M14611, M14661, M14669, M1469, M14619, M14672, M14642, M14671, M14652, M14631, M1468, M14659, M14622, M14639, M1460, M14651, M14679, M14812, M14819, M14821, M14822, M14829, M14831, M14832, M14839, M14841, M14842, M14849, M14851, M14852, M14859, M14861, M14862, M14869, M14871, M14872, M14879, M1488, M1489
Peripheral autonomic neuropathy	337.1	G990
Polyneuropathy in diabetes	357.2	E1042, E1043, E1142, E1143, E1342, E1343
Neuralgia, neuritis, and radiculitis, unspecified	729.2	M792, M5418, M5410, M542, M5400, M5401, M5402, M5403, M5404, M5405, M5406, M5407, M5408, M5409, M5481, M5414, M5415, M5416, M5417, M545
Diabetes with neurological complications	250.6	E1040, E1041, E1044, E1049, E1140, E1141, E1144, E1149, E1340, E1341, E1343, E1344, E1349, E10610, E11610, E13610
Occlusion of cerebral arteries	434	I6621, I63313, I63323, I63429, I63522, I63432, I63331, I63333, I63343, I63542, I63311, I63449, I63541, I6349, I6602, I6612, I63319, I639, I63412, I6350, I6629, I6623, I669, I63521, I663, I63339, I63411, I63322, I63342, I668, I63413, I63419, I63423, I63433, I63513, I63529, I63341, I63321, I63532, I6611, I6340, I6613, I6601, I63431, I63439, I63312, I6339, I63512, I63549, I63422, I638, I63442, I63349, I6619, I63329, I63511, I63523, I63533, I63543, I636, I63421, I63519, I63539, I63531, I6359, I6603, I6609, I63441, I63332, I6622, I6330
Hemorrhagic stroke	430-432	I6031, I6032, I6002, I6011, I602, I6050, I604, I6052, I6051, I6010, I6012, I6000, I607, I606, I6030, I608, I609, I610, I611, I612, I613, I614, I615, I616, I618, I619, I6202, I6203, I6201, I621, I629, I6200
Late effects of cerebrovascular disease	438	I69351, I69090, I69243, I69041, I69169, I69943, I69869, I69021, I69839, I69923, I69992, I69965, I69390, I69265, I69853, I69221, I69941, I69354, I69023, I69120, I69153, I69944, I69292, I69244, I69341, I69092, I69065, I69049, I69820, I69262, I69359, I69044, I69241, I69142, I69139, I69223, I69043, I69062, I69398, I69322, I69859, I69962, I69343, I69949, I69921, I69321, I69349, I69822, I69854, I69122, I69249, I69842, I69993, I69344, I69991, I69851, I69198, I6920, I69362, I69963, I69144, I69093, I69841, I69064 I69293, I69232, I69159, I69151, I69932, I69233, I69261, I69898, I69141, I69032, I69192, I69063, I69934, I69890, I69933, I69031, I69091, I69228, I69165, I69154, I69332, I69121, I69231, I69323, I69392, I69252,

SUPPLEMENTARY DATA

Chronic Complications of Diabetes	ICD-9 codes	ICD-10 codes
		I69061, I69123, I69931, I69928, I69821, I69862, I6910, I69823, I69052, I69865, I69920, I69143, I6930, I69393, I69843, I69264, I69844, I69028, I69020, I69969, I69939, I69964, I69892, I69291, I69190, I69952, I69352, I69033, I69149, I69832, I69034, I69361, I69333, I6900, I69365, I69331, I69263, I69334, I69069, I69364, I69998, I69922, I69328, I69022, I69391, I69234, I69039, I69849, I69954, I69953, I69220, I69961, I69042, I69951, I6980, I69363, I69239, I6990, I69098, I69164, I69191, I69833, I69222, I69831, I69942, I69861, I69828, I69054, I69193, I69269, I69132, I69959, I69162, I69863, I69298, I69051, I69864, I69161, I69242, I69342, I69891, I69259, I69339, I69369, I69353, I69290, I69251, I69163, I69893, I69131, I69320, I69852, I69253, I69152, I69053, I69990, I69128, I69059, I69254, I69134, I69133, I69834, I69010, I69011, I69012, I69013, I69014, I69015, I69018, I69019, I69110, I69111, I69112, I69113, I69114, I69115, I69118, I69119, I69210, I69211, I69212, I69213, I69214, I69215, I69218, I69219, I69310, I69311, I69312, I69313, I69314, I69315, I69318, I69319, I69810, I69811, I69812, I69813, I69814, I69815, I69818, I69819, I69910, I69911, I69912, I69913, I69914, I69915, I69918, I69919
Occlusion of stenosis of pre-cerebral arteries	433	I6329, I63239, I63031, I63033, I63013, I63019, I63219, I63112, I63113, I6300, I63132, I63133, I6501, I63111, I6509, I6312, I6522, I6302, I6503, I6320, I63139, I6319, I63119, I63131, I63012, I63039, I6309, I651, I6529, I63212, I659, I6502, I63232, I6521, I658, I63211, I6310, I63032, I6523, I63011, I6322, I63231, I63213, I63233
Other and ill-defined cerebrovascular disease	437	G468, G466, G467, I675, I672, I674, I6781, I671, G465, G464, I679, I676, I688, G463, I6782, I677, I680, G454, I682
Acute, but ill-defined, cerebrovascular disease	436	I6789
Transient ischemic attack (TIA)	435	G450, G451, G452, G458, G459, G460, G461, G462, I67848, I67841
Peripheral Vascular Disease		
Atherosclerosis	440	I70708, I70301, I70319, I70369, I70738, I70303, I70598, I70543, I7025, I70661, I70245, I70334, I70432, I70298, I70518, I70718, I70613, I708, I70768, I70603, I70633, I70663, I70743, I70218, I70628, I70402, I70568, I70345, I70523, I70268, I70461, I70508, I70693, I70411, I70309, I70399, I70723, I70634, I70339, I70331, I70669, I70631, I70549, I7045, I70541, I70639, I70601, I70609, I70744, I70242, I70792, I70521, I70691, I70741, I70413, I70493, I70243, I70463, I70619, I70342, I70431, I70712, I70244, I70491, I70322, I70419, I70428, I700, I70448, I70732, I70535, I70562, I70721, I70699, I70538, I70648, I70223, I70544, I70238, I70439, I70403, I70645, I70221, I70398, I70499, I70611, I70433, I7090, I70749, I70208, I70229, I70323, I70642, I70592, I70762, I70308, I70401, I70529, I70202, I70212, I70222, I70532, I70512, I70368, I70341, I70713, I70638, I70344, I70438, I70513, I70735, I70434, I70591, I7035, I70599, I70442, I70318, I70445, I70643, I70329, I70502, I70698, I7065, I70241, I70731, I70729, I70321, I70793, I70469, I70701, I7092, I70528, I70232, I70763, I70422, I70668, I70349, I70468, I70548, I70418, I70733, I70299, I70711, I70335, I70644, I70262, I70409, I70343, I70313, I70533, I70511, I70213, I70728, I70703, I70608, I70443, I70519, I70748, I70261, I70791, I70362, I70622, I70293, I70263, I70623, I70569, I70709, I70769, I70408, I70761, I70719, I70332, I70302, I701, I70498, I70702, I70799, I7075, I70228, I70201, I70534, I70235, I70234, I70629, I70501, I70412, I70291, I70392, I70292, I70641, I70231, I70692, I70545, I70621, I70338, I70219, I70509, I70722, I70561, I70249, I70734, I70444, I70539, I70612, I70441, I70563, I70531, I70449, I70503, I70593, I70393, I70211, I70423, I7055, I70462, I70312, I70618, I70635, I70361, I70745, I70328, I70209, I70742, I70348, I70492, I70233, I70363, I7091, I70435, I70522, I70649, I70602, I70269, I70542,

SUPPLEMENTARY DATA

Chronic Complications of Diabetes	ICD-9 codes	ICD-10 codes
		I70203, I70421, I70632, I70333, I70429, I70391, I70248, I70739, I70662, I70798, I70239, I70311
Embolism and thrombosis, structure of artery	444, 447.1	I743, I744, I7401, I749, I7411, I7409, I7419, I7410, I748, I742, I745, I771
Other peripheral vascular disease	443	I7381, I798, I7389, I7301, I7779, E0852, E0951, I7772, I7300, E0851, E0859, E0952, E0959, I731, I791, I7774, I7773, I7771, I739, I670
Other disorders of circulatory system	459	I87339, I87022, I87322, I87309, I998, I87021, I872, I87029, I87092, I87023, I87392, I87012, I87321, I871, I87302, I87093, I87323, I87329, I87033, I87013, I87001, I87002, I87032, I87312, I87091, I87003, I87099, R58, I879, I87303, I87011, I87311, I87332, I87393, I999, I87039, I87009, I87019, I87301, I87333, I87031, I87319, I87391, I87399, I878, I87331, I87313
Phlebitis and thrombophlebitis, portal vein throbosis and thrombolism and venous thrombolism	451,452	I8010, I80223, I8000, I80221, I80292, I80202, I80232, I80212, I8002, I803, I8012, I809, I80229, I80213, I80219, I80233, I80211, I80293, I80231, I8013, I8001, I80201, I80239, I8011, I80203, I80291, I80209, I80299, I808, I80222, I8003, I81
Other venous embolism and thrombolism	453	I82719, I8290, I82599, I82A29, I82701, I82291, I82441, I82A21, I82711, I82C22, I825Z3, I82511, I82539, I82211, I825Z9, I82501, I824Y2, I82A12, I82533, I82519, I82612, I82623, I825Z1, I82629, I82C21, I82503, I82709, I82443, I82703, I82412, I82602, I82531, I82542, I82492, I82621, I82449, I82890, I82A13, I82522, I82603, I82509, I82613, I82B22, I82421, I82220, I824Z2, I82423, I82C23, I82812, I82722, I8291, I820, I82429, I82C29, I82811, I824Z3, I82611, I825Y2, I82543, I82523, I82B21, I824Y9, I82B12, I82432, I82A11, I82413, I82521, I82402, I82493, I82601, I82B23, I82433, I82491, I82A19, I82541, I824Y3, I825Y1, I82729, I82C13, I82819, I824Z9, I82403, I82C12, I82419, I82721, I82512, I82B13, I82C11, I824Y1, I82431, I82C19, I821, I82A22, I82549, I82290, I82B29, I82619, I82411, I82221, I824Z1, I82813, I82702, I82529, I82592, I82891, I82723, I82210, I82609, I825Z2, I82532, I823, I82499, I82422, I82409, I82622, I82442, I82B19, I82A23, I82713, I82502, I82439, I825Y3, I82B11, I82593, I82401, I82712, I82591, I82513, I825Y9
Varicose veins of lower extremities	454	I83024, I83212, I83015, I83215, I83021, I83005, I83012, I83029, I83202, I8390, I83228, I83013, I8310, I83205, I83002, I83203, I83229, I83001, I8392, I83219, I83812, I83214, I83892, I83003, I83213, I83011, I83004, I83014, I83211, I83028, I83009, I83201, I83225, I83222, I83008, I83019, I8312, I83813, I83209, I8311, I83891, I83893, I83025, I83204, I83899, I83018, I8391, I83208, I83811, I83023, I83221, I8393, I83218, I83022, I83223, I83819, I83224
Gangrene and amputations	785.4, 885-887, 895-897	I96, S68019A, S68011A, S68511A, S68519A, S68022A, S68029A, S68522A, S68021A, S68012A, S68512A, S68521A, S68529A, S68126A, S68626A, S68629A, S68621A, S68123A, S68128A, S68614A, S68129A, S68612A, S68120A, S68114A, S68121A, S68628A, S68620A, S68127A, S68112A, S68623A, S68611A, S68125A, S68111A, S68113A, S68110A, S68616A, S68619A, S68618A, S68118A, S68116A, S68627A, S68119A, S68622A, S68122A, S68613A, S68124A, S68624A, S68617A, S68115A, S68117A, S68610A, S68625A, S68615A, S68429A, S48021A, S68412A, S58111A, S58911A, S68421A, S58919A, S48122A, S48922A, S48029A, S58021A, S68719A, S68411A, S68711A, S58922A, S58119A, S68722A, S48012A, S58029A, S48929A, S58012A, S68419A, S48019A, S48121A, S68422A, S58122A, S48129A, S48112A, S58019A, S58112A, S48921A, S68721A, S48011A, S48912A, S58929A, S58921A, S58912A, S48919A, S58129A, S68729A, S58121A, S48111A, S48911A, S48119A, S58022A, S58011A, S68712A, S48022A, S98122A, S98211A, S98219A, S98222A, S98132A, S98121A, S98212A, S98229A, S98142A, S98129A, S98131A, S98112A, S98221A, S98139A, S98149A, S98141A, S98119A, S98111A, S98029A, S98922A, S98021A, S98319A, S98311A, S98912A, S98929A,

SUPPLEMENTARY DATA

Chronic Complications of Diabetes	ICD-9 codes	ICD-10 codes
		S98012A, S98019A, S98322A, S98921A, S98011A, S98911A, S98022A, S98321A, S98919A, S98312A, S98329A, S78022A, S88011A, S88121A, S88112A, S78911A, S78919A, S88022A, S88111A, S78111A, S78119A, S88919A, S88119A, S88029A, S88922A, S78122A, S88911A, S78029A, S88021A, S78021A, S78012A, S88122A, S78912A, S78929A, S88012A, S78922A, S78921A, S78112A, S78019A, S78121A, S88929A, S88129A, S78011A, S88019A, S78129A, S88912A, S88921A
Chronic ulcer of skin	707	L97512, L89100, L89013, L97119, L89624, L97804, L97101, L97403, L89810, L89014, L97322, L89520, L97104, L89329, L89110, L97419, L89519, L89600, L8993, L89501, L97223, L97819, L97404, L89509, L97803, L89621, L89203, L97411, L97924, L89302, L97109, L89629, L89504, L89143, L89149, L97921, L97414, L89602, L97401, L97524, L8991, L89213, L97502, L97809, L89150, L89004, L97801, L97221, L89522, L97529, L89123, L97224, L89204, L89141, L89214, L97103, L89311, L89211, L98422, L89019, L89892, L97521, L89613, L89219, L89132, L89209, L89020, L89130, L97212, L89001, L89314, L97511, L89812, L89144, L97902, L97122, L97409, L89201, L89003, L89603, L97912, L97929, L8994, L89313, L89220, L89129, L89112, L89303, L89893, L89011, L97202, L89222, L89500, L89102, L97501, L89113, L89124, L97503, L89009, L89891, L97923, L89612, L89121, L97123, L89601, L89894, L89811, L97213, L98492, L89119, L89614, L97513, L97514, L97422, L8942, L97229, L98429, L89521, L97822, L89134, L89814, L89301, L8940, L98423, L89114, L97914, L97919, L89322, L89131, L89152, L97913, L89813, L89319, L97312, L97324, L97321, L8945, L89529, L89604, L97323, L89103, L97121, L89320, L89523, L89022, L89899, L98424, L89524, L97911, L97124, L89101, L89619, L97812, L89512, L97424, L97821, L89309, L97302, L97519, L89200, L97412, L97211, L97329, L89010, L89133, L98412, L97909, L89310, L89109, L97823, L89153, L89139, L89304, L98421, L97102, L89609, L89622, L97504, L97214, L98413, L97423, L89510, L89111, L89620, L89104, L97903, L97303, L97201, L97829, L97203, L97311, L89819, L89000, L89323, L97509, L89611, L97314, L89023, L97209, L98491, L97522, L97824, L89151, L89140, L89210, L97802, L89122, L89154, L89120, L8944, L89223, L89142, L89221, L97301, L8941, L97313, L8992, L98411, L89224, L97129, L89012, L98493, L97114, L8943, L97429, L97219, L97112, L97922, L97421, L97813, L97111, L89029, L98494, L97204, L97222, L89502, L89229, L89321, L97413, L98499, L89212, L97304, L8990, L97402, L97904, L89312, L89324, L89021, L89503, L97901, L98414, L97319, L97523, L89610, L89002, L89159, L89513, L89511, L89514, L8995, L98419, L89890, L89202, L97309, L89623, L97113, L89024, L97811, L97814, L89300
Diabetes w/peripheral circulatory disorders	250.7	E1051, E1052, E1059, E1151, E1152, E1159, E1351, E1352, E1359
Cardiovascular Disease		
Aortic and other aneurysms	441, 442	I718, I790, I716, I7103, I715, I712, I7101, I714, I713, I719, I7100, I7102, I711, I724, I721, I723, I729, I720, I728, I722
Hypotension	458	I951, I9589, I959, I953, I950, I952, I9581
Angina	413	I25708, I25738, I209, I25721, I25729, I25791, I208, I25728, I25731, I25701, I25719, I25799, I25711, I25739, I201, I25709, I25798, I25718, I25700, I25710, I25720, I25730, I25750, I25760, I25790 , I25751, I25758, I25759, I2518
Conduction disorders and cardiac dysrhythmias	426-427	I4430, I4519, I4581, I4589, I450, I4460, I440, I4510, I442, I447, I445, I452, I455, I4469, I459, I454, I453, I4439, I444, I441, I456, I4940, I482, I4901, I4892, I470, I472, I499, I493, I491, I481, I484, I483, I469, I479, I471, I4891, R001, I468, I4949, I498, I495, I492, I480, I4902, I462

SUPPLEMENTARY DATA

Chronic Complications of Diabetes	ICD-9 codes	ICD-10 codes
Arteriosclerotic cardiovascular disease	429.2	I2510
Cardiomegaly	429.3	I517
Cardiomyopathy	425	I428, I426, I427, I420, I425, I422, I421, I424, I43, I429, I423
Other acute and subacute forms of ischemic heart disease	411	I249, I241, I200, I248, I240
Heart failure	428	I5020, I5040, I5031, I5022, I5042, I5043, I5021, I5023, I5030, I5041, I5032, I501, I509, I5033
Myocardial degeneration	429.1	I515
Myocardial infarction	410, 412	I222, I2121, I2102, R0989, I2111, I213, I229, I214, I2101, I221, I2129, I2119, I220, I2109, I228, I252
Other chronic ischemic heart disease	414	I253, I25111, I2584, I2583, I25119, I2589, I25811, I259, I2542, I25118, I256, I25110, I25812, I2541, I2582, I25810, I25761, I25769, I25768, I255
Hypertension	401-405	I10, I119, I110, I120, I129, I1311, I130, I1310, I132, I152, I150, I151, I159, I158
Renal Complications		
Infections of kidney	590	N118, N136, N110, N2886, N119, N111, N10, N2885, N12, N2884, N151
Other disorders of bladder	596	N323, N321, N329, N312, N99518, N33, N99510, N319, N3644, N320, N311, N99511, N99512, N322, N3289, N3281, N310, N318
Cystitis	595	N3090, N3030, N3010, N3041, N3000, N3021, N3080, N3091, N3040, N3081, N3031, N3011, N3020, N3001
Renal sclerosis, unspecified	587	N261, N262, N269
Glomerulonephritis, nephrotic syndrome, nephritis, and nephropathy	580-583	N005, N011, N013, N014, N002, N001, N003, N009, N018, N004, N019, N006, N008, N010, N016, N017, N007, N015, N000, N012, N029, N046, N026, N048, N028, N027, N040, B520, N047, N025, N020, N045, N042, N044, N022, N024, N043, N023, N021, N049, N041, N035, N032, N031, N033, N039, N034, N038, N036, N030, N037, N070, N056, N057, N143, N050, N058, N077, N064, E0922, N063, N072, N141, N144, N159, N158, N069, N053, N075, N073, N052, N071, N055, N061, N150, N16, N079, E0929, N08, N066, N051, N054, N067, N060, N078, N068, N074, N142, N059, N140, N062, N076, N065
Proteinuria	791.0	R808, R800, R801, R803, R809
Renal failure and its sequelae	584, 586, 588	N179, N178, N170, N172, N171, N19, N250, N2581, N251, N2589, N259
Other disorders of kidney and ureter	593	N13732, N13729, N2889, N138, N135, N281, N289, N13731, N1370, R802, N13739, N134, N13722, N2882, N1371, N29, N2881, N280, N2883, N13721
Urinary tract infection	599.0	N390
Diabetes and renal complications	250.4	E1021, E1022, E1029, E1121, E1122, E1129, E1321, E1322, E1329
Chronic renal failure (ESRD)	585	N185, N186, N182, N183, N181, N189, N184
Endocrine/metabolic complications		
Glycogenosis and galactosemia	271.0, 271.1	E739, E7402, E7253, E7411, E7419, E738, E7409, E744, E7403, E7431, E730, E7401, E7420, E7404, E749, E7412, E7439, E7421, E748, E7400, E7252, E7429, E7410, E731, E7250, E7251, E7259
Hypercholesterolemia	272.0	E7800, E7801
Hyperchylomicronemia	272.3	E783
Hyperkalemia	276.7	E875
Hypertriglyceridemia	272.1	E781
Macroglobulinemia	273.3	C880
Lancereaux's disease	261	E43, E41

SUPPLEMENTARY DATA

Chronic Complications of Diabetes	ICD-9 codes	ICD-10 codes
Lipidoses	272.7	E753, E771, E75240, E7521, E75242, E779, E75241, E75243, E75249, E778, E770, E75248, E7500, E7501, E7502, E7509, E7510, E7511, E7519, E756, E755, E7522
Other specified endocrine disorders	259.8	E341, E348, E349
Other and unspecified hyperlipidemia	272.4	E784, E785
Mixed hyperlipidemia	272.2	E782
Renal glycosuria	271.4	E748
Ophthalmic complications		
Other retinal disorders	362	G453, H31101, H31102, H31103, H31109, H31111, H31112, H31113, H31119, H31121, H31122, H31123, H31129, H3400, H3401, H3402, H3403, H3410, H3411, H3412, H3413, H34211, H34212, H34213, H34219, H34231, H34232, H34233, H34239, H348110, H348111, H348112, H348120, H348121, H348122, H34813, H348190, H348191, H348192, H34821, H34822, H34823, H34829, H348310, H348311, H348312, H348320, H348321, H348322, H348330, H348331, H348332, H348390, H348391, H348392, H349, H3500, H35011, H35012, H35013, H35019, H35021, H35022, H35023, H35029, H35031, H35032, H35033, H35039, H35041, H35042, H35043, H35049, H35051, H35052, H35053, H35059, H35061, H35062, H35063, H35069, H35071, H35072, H35073, H35079, H3509, H35101, H35102, H35103, H35109, H35111, H35112, H35113, H35119, H35121, H35122, H35123, H35129, H35131, H35132, H35133, H35139, H35141, H35142, H35143, H35149, H35151, H35152, H35153, H35159, H35161, H35162, H35163, H35169, H35171, H35172, H35173, H35179, H3520, H3521, H3522, H3523, H3530, H353110, H353111, H353112, H353113, H353114, H353120, H353121, H353122, H353123, H353124, H353130, H353131, H353132, H353133, H353134, H353190, H353191, H353192, H353193, H353194, H353210, H353211, H353212, H353213, H353220, H353221, H353222, H353223, H353230, H353231, H353232, H353233, H353290, H353291, H353292, H353293, H3533, H35341, H35342, H35343, H35349, H35351, H35352, H35353, H35359, H35361, H35362, H35363, H35369, H35371, H35372, H35373, H35379, H35381, H35382, H35383, H35389, H3540, H35411, H35412, H35413, H35419, H35421, H35422, H35423, H35429, H35431, H35432, H35433, H35439, H35441, H35442, H35443, H35449, H35451, H35452, H35453, H35459, H35461, H35462, H35463, H35469, H3550, H3551, H3552, H3553, H3554, H3560, H3561, H3562, H3563, H3570, H35711, H35712, H35713, H35719, H35721, H35722, H35723, H35729, H35731, H35732, H35733, H35739, H3581, H3582, H3589, H359, H36, H31001, H31002, H31003, H31009, H31011, H31012, H31013, H31019, H31021, H31022, H31023, H31029, H31091, H31092, H31093, H31099, H3120, H3121, H3122, H3123, H3129, H31301, H31302, H31303, H31309, H31311, H31312, H31313, H31319, H31321, H31322, H31323, H31329, H31401, H31402, H31403, H31409, H31411, H31412, H31413, H31419, H31421, H31422, H31423, H31429, H318, H319, H31129
Vascular disorders of the iris and ciliary body	364.0, 364.4	H21352, H2020, H21319, H21303, H21253, H21523, H20012, H21273, H21309, H21251, H20029, H2182, H21242, H21529, H2022, H21259, H21543, H2181, H20021, H21521, H21342, H2102, H21322, H21562, H21301, H21559, H21223, H21512, H21541, H21351, H21549, H20049, H21271, H20013, H21241, H20032, H21249, H21222, H20812, H21212, H20823, H20822, H20011, H21221, H21353, H21279, H2140, H21323, H21359, H20829, H20031, H21243, H2021, H20821, H21532, H21262, H2010, H21229, H2103, H21232, H20811, H20039, H219, H2189, H21561, H21321, H21502, H20033, H21349, H21511, H21341, H21563, H2000, H20052, H2101, H21569, H21272, H21312, H22, H211X2, H209, H20019,

SUPPLEMENTARY DATA

Chronic Complications of Diabetes	ICD-9 codes	ICD-10 codes
		H21533, H21501, H21343, H20022, H2142, H21231, H2013, H20042, H2141, H20051, H21552, H20053, H211X1, H21513, H2023, H20813, H21211, H21213, H21531, H20819, H21233, H21519, H21553, H21239, H21329, H211X3, H2100, H21522, H21503, H21539, H21542, H21219, H2012, H20043, H20059, H2011, H21263, H21302, H21269, H21313, H21252, H20023, H20041, H21509, H2143, H21551, H2129, H211X9, H21261, H21311
Disorders of the optic nerve and visual pathways	377	H47521, H47339, H4710, H47631, H4741, H47022, H4749, H4601, H4712, H4603, H479, H47639, H47322, H47642, H4743, H468, H47619, H47622, H47023, H47142, H47529, H47512, H47292, H47029, H4610, H47392, H4711, H47321, H47532, H4713, H47213, H47212, H47012, H47531, H47091, H47021, H47629, H47312, H47511, H47032, H47323, H4720, H4600, H47291, H47232, H47211, H4612, H47293, H47522, H47033, H47519, H47329, H47649, H47233, H462, H47313, H47143, H47332, H47092, H47612, H47632, H47231, H47099, H47093, H47149, H4613, H47391, H47393, H47013, H47539, H47641, H47621, H4602, H4742, H47333, H47219, H47239, H4722, H47011, H47319, H4611, H469, H47311, H47019, H47299, H47141, H47399, H47039, H47611, H47031, H463, H47331
Diabetes with ophthalmic complications	250.5	E10311, E10319, E1136, E11311, E13321, E11331, E13329, E13341, E13349, E11351, E1339, E13331, E13339, E1336, E13351, E1139, E11321, E11341, E13359, E103211, E103212, E103213, E103219, E1036, E1033, E10341, E10351, E133521, E133522, E133523, E133529, E133531, E133532, E133533, E133539, E133541, E133542, E133543, E133549, E13311, E13319, E133211, E133212, E133213, E133219, E133291, E133292, E133293, E133299, E133311, E133312, E133313, E133319, E133391, E133392, E133393, E133399, E133411, E133412, E133413, E133419, E133491, E133492, E133493, E133499, E133511, E133512, E133513, E133519, E133591, E133592, E133593, E133599, E1337, E1037X1, E1037X2, E1037X3, E1037X9, E1039, E13355, E10329, E10339, E10349, E10359, E11319, E11329, E11339, E11349, E11359
Cataract	366	H26132, H2522, H26239, H26413, H26493, H26222, H26051, H26113, H25043, H26039, H26042, H25819, H28, H25041, H26053, H26131, H26102, H2523, H26133, H26491, H2510, H2512, H25012, H26111, H26411, H2620, H2631, H2640, H25049, H2633, H26223, H26009, H26101, H26419, H26221, H26119, H26059, H2521, H26062, H26499, H25033, H26043, H25093, H26122, H2609, H25092, H269, H26041, H26229, H26139, H25812, H26103, H25031, H25013, H26049, H25032, H26032, H25019, H26232, H26212, H26002, H26012, H25011, H2511, H25091, H26109, H26013, H2513, H2520 H26019, H25099, H26063, H259, H25813, H26233, H26129, H2589, H26052, H2630, H26121, H26219, H26231, H25042, H26031, H26492, H26069, H26033, H26412, H26001, H26112, H26123, H26213, H26061, H26211, H26003, H25811, H268, H2632, H26011, H25039
Glaucoma	365	H4043X4, H40811, H4060X1, H401330, H402210, H4051X1, H401390, H4020X4, H401310, H4051X4, H401321, H4020X1, H40819, H401212, H40243, H4041X2, H40051, H4063X3, H4062X4, H40022, H40059, H4061X2, H4030X2, H4033X2, H4032X2, H40241, H402292, H401324, H4011X2, H401292, H4033X0, H401422, H402223, H40831, H402224, H40043, H4063X4, H4043X3, H409, H40041, H402230, H40839, H40833, H4032X4, H401392, H4052X0, H4041X3, H40021, H4041X1, H401294, H4050X0, H4060X4, H401490, H4030X3, H401213, H401312, H4011X3, H40151, H401214, H4020X3, H4051X3, H4011X1, H4063X1, H401423, H401293, H402212, H402232, H4061X3, H4032X1, H401424, H401492, H40249, H402293, H401410, H4031X2, H40232, H4030X4, H4031X0, H4043X1, H402221, H401232, H4032X3, H401334, H4061X4, H40023,

Chronic Complications of Diabetes	ICD-9 codes	ICD-10 codes
		H402213, H40159, H40049, H401233, H4041X4, H42, H4033X1, H401291, H4061X1, H40821, H401412, H401323, H401394, H401333, H40011, H4052X2, H40152, H401220, H402214, H401211, H4062X0, H4050X2, H401421, H40212, H401314, H401432, H4010X0, H40153, H4060X2, H401231, H40029, H401311, H40213, H40233, H40032, H401391, H40823, H4053X0, H40211, H4033X4, H402291, H4060X0, H40052, H401222, H40063, H402234, H401493, H401331, H401313, H4042X2, H401491, H4011X4, H4030X1, H401430, H4062X2, H4053X2, H40822, H401393, H40069, H401210, H402211, H40012, H40013, H40002, H401332, H4031X4, H4042X0, H4051X0, H4043X0, H401411, H40061, H40062, H401414, H4031X1, H40019, H4040X2, H401494, H4033X3, H402233, H401234, H4062X3, H401434, H402231, H4010X2, H402220, H40832, H40033, H4011X0, H40231, H4020X0, H4042X3, H4043X2, H4050X4, H401413, H4040X3, H40003, H4061X0, H40239, H40009, H401431, H4062X1, H4051X2, H40829, H4031X3, H4052X3, H402222, H4020X2, H4030X0, H4042X1, H40031, H4040X0, H4063X0, H4041X0, H402294, H401223, H4052X1, H40219, H4032X0, H4053X4, H401320, H401433, H401221, H40001, H401230, H401290, H4063X2, H40053, H4052X4, H4053X1, H40039, H4040X4, H4010X1, H4050X1, H401224, H401322, H4042X4, H4089, H40042, H4040X1, H401420, H4050X3, H4060X3, H4010X3, H40242, H40813, H4010X4, H4053X3, H40812, H402290
Visual disturbance, low vision, blindness	368-369	H5359, H5351, H53439, H53012, H53122, H53489, H532, H5354, H53453, H53021, H5310, H5316, H5360, H53422, H5330, H53142, H53029, H53459, H53032, H5362, H53451, H5315, R441, H53123, H53141, H53421, H53011, H53001, H53002, H53143, H53121, H53149, H539, H5332, H53033, H53423, H53009, H53003, H53013, H53412, H5372, H53432, H5355, H5311, H5350, H53429, H5334, H5361, H53132, H53129, H538, H5331, H53413, H53039, H5352, H53131, H53462, H53019, H53031, H53133, H5340, H53482, H5319, H5347, H5333, H53481, H53452, H5363, H53022, H53469, R483, H53139, H53483, H53433, H5369, H53419, H5371, H53431, H53411, H53461, H53023, H5353, H5440, H548 H5442 H547 H540 H5451, H542, H5460, H5410, H5412, H5462, H5441, H5461, H5450, H5411, H543, H5452
Other complications		
Bacteremia, bacterial infection	079.2, 790.7	R7881
Candidiasis of skin and nails	112.3	B372
Chronic osteomyelitis of the foot	730.17	M86679, M86479, M86572, M86471, M86571, M86372, M86579, M86371, M868X7, M86672, M86671, M86379, M86472
Other and unspecified noninfectious gastroenteritis and colitis	558.9	K5289, K529
Impotence of organic origin	607.84	N5201, N5202, N5203, N521, N522, N5231, N5232, N5233, N5234, N5239, N528, N529
Infective otitis externa	380.1	H603, H6000, H6010, H60319, H60329, H60399, H6193, H60339; H6240; H6020; H628X1; H60399
Degenerative skin disorders	709.3	L921, L942, L988
Candidiasis of vulva and vagina	112.1	B373
Cellulitis	681, 682	L03022, L03041, L03029, L03012, L03021, L03011, L03031, L03032, L03019, L03049, L03039, L03042, L03811, L03114, L03126, L03891, L03322, L02212, L03325, L03221, L02818, L03119, L03111, L0390, L03212, L03317, L03323, L02213, L03316, L0211, L02511, L0291, L02215, L0201, L03818, L03125, L02219, L02214, L03116, L02415, L02211, L03329, L0391, L02612, L0231, L03898, L02519, L02412, L02416, L03124, L03123, L03314, L03315, L03122, L03211, L03324,

SUPPLEMENTARY DATA

Chronic Complications of Diabetes	ICD-9 codes	ICD-10 codes
		L03121, L03112, L03321, L02611, L03115, L983, L02811, L03129, L03312, L02413, L02216, L02419, L03311, L03222, L02411, L02512, L03326, L02414, L03113, L03319, L03327, L02619, L03313, k122, L03213
Diabetes with other specified manifestations	250.8	E13638, E10622, E10620, E13618, E13621, E1069, E13649, E11628, E10630, E10618, E13630, E11620, E10621, E10638, E10649, E1169, E13628, E1369, E13620, E11622, E11621, E11649, E11630, E11618, E10628, E11638, E13622
Diabetes with unspecified complication	250.9	E118, E138, E108
Other bone involvement in disease classified elsewhere	731.8	M90852, M90839, M90869, M90872, M90831, M90871, M90822, M9089, M9088, M90851, M90819, M90842, M90821, M9080, M90879, M90812, M90841, M90862, M90859, M90832, M90829, M90849, M90861, M90811
Hypoglycemic coma	251.0	E162, E169, E164, E163, E15, E161, E168, E160, E11641, E13641, E10641
Gastroparesis	536.3	K3184

SUPPLEMENTARY DATA

Chronic Complications of Diabetes	ICD-9 codes
Arteriosclerotic cardiovascular disease	429.2
Cardiomegaly	429.3
Cardiomyopathy	425
Other acute and subacute forms of ischemic heart disease	411
Heart failure	428
Myocardial degeneration	429.1
Myocardial infarction	410, 412
Other chronic ischemic heart disease	414
Hypertension	401-405
Renal Complications	
Infections of kidney	590
Other disorders of bladder	596
Cystitis	595
Renal sclerosis, unspecified	587
Glomerulonephritis, nephrotic syndrome, nephritis, and nephropathy	580-583
Proteinuria	791.0
Renal failure and its sequelae	584, 586, 588
Other disorders of kidney and ureter	593
Urinary tract infection	599.0
Diabetes and renal complications	250.4
Chronic renal failure (ESRD)	585
Endocrine/metabolic complications	
Glycogenosis and galactosemia	271.0, 271.1
Hypercholesterolemia	272.0
Hyperchylomicronemia	272.3
Hyperkalemia	276.7
Hypertriglyceridemia	272.1
Macroglobulinemia	273.3
Lancereaux's disease	261
Lipidoses	272.7
Other specified endocrine disorders	259.8
Other and unspecified hyperlipidemia	272.4
Mixed hyperlipidemia	272.2
Renal glycosuria	271.4
Ophthalmic complications	
Other retinal disorders	362
Vascular disorders of the iris and ciliary body	364.0, 364.4
Disorders of the optic nerve and visual pathways	377
Diabetes with ophthalmic complications	250.5
Cataract	366
Glaucoma	365
Visual disturbance, low vision, blindness	368-369
Other complications	
Bacteremia, bacterial infection	079.2, 790.7
Candidiasis of skin and nails	112.3
Chronic osteomyelitis of the foot	730.17
Other and unspecified noninfectious gastroenteritis and colitis	558.9
Impotence of organic origin	607.84
Infective otitis externa	380.1

SUPPLEMENTARY DATA

Chronic Complications of Diabetes	ICD-9 codes
Degenerative skin disorders	709.3
Candidiasis of vulva and vagina	112.1
Cellulitis	681, 682
Diabetes with other specified manifestations	250.8
Diabetes with unspecified complication	250.9
Other bone involvement in disease classified elsewhere	731.8
Hypoglycemic coma	251.0
Gastroparesis	536.3

ICD-9, International Classification of Diseases, Ninth Revision. ICD-10 codes are available upon request.