Hospitalizations for Diabetes-Related Complications by Race, Gender, and Age in Maryland

Tracy Rone

Received: 3 February 2021 Accepted: 28 February 2021 Published: 15 March 2021

Abstract

Objective: We investigated variations in prevalence rates of potentially preventable diabetes-related hospitalizations between African Americans and Whites using outcome measures selected by the Agency for Healthcare Research and Quality (AHRQ) as prevention quality indicators related to diabetes care. Methods: We analyzed Maryland hospital discharge data for patients in 2012 (n=10,136) with a primary diagnosis of uncontrolled diabetes; short-term complications of diabetes; long-term complications of diabetes; and lower limb amputations. The results were provided in crude data and data adjusted for the Maryland population. Standardized rates (SRs) per 10,000 persons, standardized rate ratios (SRRs), and standardized rates were reported on the adjusted hospital data. Methods:We analyzed Maryland hospital discharge data for patients in 2012 (n=10,136) with a primary diagnosis of uncontrolled diabetes; short-term complications of diabetes; long-term complications of diabetes; and lower limb amputations. The results were provided in crude data and data adjusted for the Maryland population. Standardized rates (SRs) per 10,000 persons, standardized rate ratios (SRRs), and standardized rates were reported on the adjusted hospital data.

Index terms— diabetes, quality of care, hospitalizations, adverse outcomes.

1 Introduction

iabetes is the seventh-leading cause of death in the United States. 1 It presents a major public health problem because it affects an estimated 29.1 million people. 1 People who are diagnosed with diabetes are 1.8 times more likely to die from all causes and are more likely to experience heart attacks, kidney failure, lower limb amputation, and adult-onset blindness. 1,2 According to the Centers for Disease Author ?: e-mail: s5brown@odu.edu Control (CDC), in 2012 the estimated financial cost of diabetes in the United States was $245 billion. 1 Over $176 billion of diabetes-related expenses were spent on direct medical expenditures and $69 billion was spent on indirect costs (disability, work loss, premature death). 3 While the goals of Healthy People 2020 are national in scope, local solutions are needed to address the wide variations in diabetes incidence and prevalence rates by state. In Maryland, diabetes is the sixth-leading cause of death, higher than the national figure. 12 In the first decade of the 21 st century, Maryland's age-adjusted diabetes mortality rate was also higher than the national rate. 12 From 2006 to 2008, the diabetic mortality rate was 81 per 100,000 in Maryland and 74.4 per 100,000 nationwide. 12 African American females in Maryland were nearly twice as likely as White females to be diabetic (12.5% vs. 6.8%). 12 The Behavioral Risk Factor Screening System (BRFSS) for Maryland estimated that as Maryland's population ages, residents are more likely to be diagnosed with diabetes, with the older working age population (50-64) experiencing the fastest rate of For at least two decades the health community has known that preventive diabetes care leads to improvements in health complications and better longterm outcomes. 4 The American Diabetes Association (ADA), has established clinical guidelines directed at improving preventive care for patients with diabetes, including glycosylated hemoglobin (HbA1c) testing at least twice per year, foot examinations, and dilated eye examinations annually. 5 Despite the clinical advances in the prevention, diagnosis and treatment of

diabetes, the underprivileged communities and racial minorities tend to have higher prevalence rates of diabetes and are more likely to experience diabetes-related complications. 6,7,8,9,10 As a result, federal agencies including the CDC and the NIH have delineated national goals related to diabetes in the Healthy People 2020 Objectives. Included in these objectives are reducing the number of new cases of diagnosed diabetes in the population and improving glycemic control among people with diabetes. 11 The Healthy People 2020 Objectives also established a set of goals related to diabetes incidence, mortality, and lower-extremity amputations.

growth in the state. 12 According to this data, income, education, race and ethnicity are closely associated with diabetes prevalence in Maryland. The percentage of adults 18 years and older diagnosed with diabetes was higher for African Americans (12.3%) than for Whites (7.5%). 12 Income was inversely related to a diabetes diagnosis among people 18 years and older, with the highest prevalence occurring among people with an annual household income below $15,000. 12 In 2009-2010, the lowest prevalence of diabetes was among college and technical school graduates and the highest was among people without a high school diploma. 13 In the past 20 years, the United States has seen a decline in the rates of major complications among adults diagnosed with diabetes due to prevention efforts. 13 This trend does not reflect Maryland, where from 2004 to 2008, the number of hospital discharges for coronary heart disease (CHD), a potential complication from diabetes, increased with CHD morbidity and mortality. 13 The percentage of CHD hospitalizations related to diabetes is also on the rise. We analyzed a state-level hospital discharge dataset to identify the relationship between race, age and sex and rates of diabetes-related hospitalizations to examine how changes in social determinants could alter the course of the public health problem of diabetes.

2 II.

3 Methods

This study uses Maryland's hospital inpatient discharge data for 2012 from the Health Services Cost Review Commission and U.S. Census Data for Maryland. We conducted a retrospective analysis and it is limited to patients who lived in Maryland at the time of admission in 2012 with a principal diagnosis of uncontrolled diabetes (ICD-9-CM code 250.02 or 250.03); short-term complications of diabetes (ICD-9-CM codes 250.10-250. 13 defined as one of the following procedures based on the primary procedure code and up to 14 secondary procedure codes(ICD-9-CM codes 84. 10-84.19). The focus of this study is to determine whether there are any differences in avoidable hospitalization rates of diabetes patients based on sociodemographic characteristics.

The Health Services Cost Review Commission is an independent state agency responsible for collecting and maintaining patient-level case mix data, such as hospital inpatient discharge information containing medical record abstracts of clinical demographic and billing data in Maryland. Since 1977, the agency has also set rates for hospital services. Maryland is now the only state in the nation to retain an all-payer hospital system through a federal waiver with approval from the Centers for Medicare and Medicaid Services. This unique system has led to substantial cost savings by reimbursing all payers at the same rate for hospital services, including Medicare, Medicaid, and private insurers.

The patients chosen for the study were at least 18 years of age and were categorized into five cohorts: 18-29, 30-39, 40-49, 50-50, and 60+. In terms of race, patients who were not listed as White or African American were excluded because they comprised a small percentage of patients. Since African Americans constitute 70% of the minority population in Maryland, this allowed for a more statistically significant dichotomous comparison between African Americans and Whites. 14 There were four insurance groups based on the patient's primary payer: Medicare, Medicaid, private (Blue Cross and other Commercial Insurance) and the uninsured.

The results are provided in crude data and data adjusted for the Maryland population. Standardized rates (SRs) per 10,000 persons, standardized rate ratios (SRRs), and standardized rates are reported on the adjusted hospital data. The first analysis examines diabetes-related hospitalizations and discharges to assess the effects of gender, while controlling for age and race/ethnicity. The reference groups are White, male, and patients with Medicare. The subsequent analyses explore the same effects for each of the four avoidable kinds of hospitalization: short-term complications, long-term complications, uncontrolled diabetes, and lower-limb amputation. The reference groups are White, male, Medicare for the avoidable types of hospitalization as well.

4 III.

5 Results

We used four adverse outcome measures to assess avoidable hospitalizations among Marylanders with diabetes because the Agency for Healthcare Research and Quality (AHRQ) has selected them as Prevention Quality Indicators (PQI) related to diabetes care. 15 These outcome measures include (1) hospital admission for uncontrolled diabetes (PQI1), (2) hospital admission for short-term complications of diabetes (PQI2), (3) hospital admission for long-term complications of diabetes (PQI3), and (4) lower limb amputation (PQI4). A patient whose blood glucose level falls within an unacceptable range is diagnosed with "uncontrolled" diabetes. A diagnosis of short-term complications is made when a patient's complications include diabetic ketoacidosis, hyperosmolarity, and coma. Alternately, a diagnosis of long-term complications is assigned when a patient develops renal, eye, neurological, and circulatory disorders. A lower limb amputation can be below the knee, above the knee, or

through the foot. In 2012, there were more than 694,000 reported hospital discharges in Maryland. Of these, more than 139,000 (20%) were diabetes-related; 10,136 listed one of the four AHRQ Quality Indicators as the first diagnosis. When compared to the total number of hospital admissions where patients were coded as having any diagnosis of diabetes (142,000), the number of those with a principal diagnosis of diabetes was relatively small (10,136). There were, however, significant differences by race, insurance status and sex. In 2012, African Americans had higher hospital admission rates for preventable adverse outcomes than Whites.

In 2012, 7 percent of all diabetes-related hospital admissions were for an adverse but preventable condition. Of those admitted with an adverse event, 6.4 percent had uncontrolled diabetes (such as severe hyperglycemia); 17.5 percent had a lower-limb amputation; 31.6 percent had short-term complications, such as ketoacidosis; and 55.7 percent had long-term complications of diabetes-such as cardiovascular or renal complications-as the most frequent diagnosis (11.2 percent had a combination of lower-limb amputation procedure and a primary diagnosis of a complication of diabetes).

For the discharges with a principal diagnosis of diabetes considered preventable by AHRQ, the mean patient age was 55 years, the average stay was 5.1 days, and the mean inpatient charge was $13,882. Table 1 summarizes the sociodemographic characteristics for these patients by age, sex, race/ethnicity and insurance status. There is a clear dichotomy between White and African American patients with diabetes-related hospitalizations for analyzing other sociodemographic characteristics and their effects on preventable admissions.

By race, 45 percent of patients were White, and 55 percent were African American. By gender, 46.6 percent were female, and 53.4 percent were male. Combining race and gender, more White males were admitted for diabetes-related conditions than White females, and more African American males were admitted than African American females. By age, most were 64 and under; however, African American patients tended to be younger than White patients. The mean age of White patients was 57; that of African American patients was 53. In terms of insurance status, the majority of patients had Medicare. However, African Americans were more likely to be covered by Medicaid.

6 a) Diabetes-related Hospitalizations by Age, Sex, Race and Insurance

Diabetes-related hospital discharge rates increased with age (Table 1). Patients over 60 years of age with diabetes had more than 2.65 times the rate of preventable hospital admissions for diabetes-related conditions than did patients in the 18-to-29-year-old age group (SRD 27.02, SRR 2.67). Women had fewer diabetes-related hospitalizations and a lower rate of hospitalizations than men (SRD -6.04, SRR 0.80).

When adjustments for age and sex were computed (Table 1), African Americans were more than twice as likely as Whites to be admitted to a Maryland hospital for a preventable diabetes-related condition (SRD 25.99, SRR 2.37). The racial differences were more pronounced when examined in combination with gender. African American men had a higher rate of preventable hospitalizations than any other race/sex category (Table 1).

After adjustments for race and gender, African American males with diabetes had more than three times as many hospital admissions for adverse conditions (SRD 34.13 SRR 3.11) than White males. These race and gender differences were noted in each sex category. African American females had a higher rate of hospital admissions for adverse conditions than White females (Table 1).

A very similar pattern emerged among dually eligible patients admitted with insurance coverage under Medicare and Medicaid (because of their low-income status), and among those with no insurance coverage. African American males with no insurance were more likely to be admitted to a Maryland hospital in 2012 for potentially preventable adverse events (SRD 6.42, SRR 9.92); dually eligible African American females also were most likely to be admitted for one of these conditions (SRD 5.17, SRR 4.02).

7 b) Outcomes for Prevention Quality Indicator 1:

Uncontrolled Diabetes Hospital admissions for uncontrolled diabetes (PQI1) were greater among older people with diabetes. Differences in admission rates per 10,000 people statewide were greatest (SRD 1.94) and four times higher among patients 60 and over than among discharges among patients in the 18-to-29-year-old age group (Table 2). Admissions were higher among men than women (SRD 0.34, SRR 1.22). Differences in PQI1 hospital admission rates by race were similar to the patterns observed in the overall hospitalization rates. African Americans had rates of potentially avoidable hospitalizations for uncontrolled diabetes that were nearly four times those of Whites (Table 2). The racial differences persisted along gender lines: African American males had higher admission rates for PQI1 than all other race/gender categories. African American females had a higher rate than White females (Table 2). Medicare patients had higher rates than all other insurance categories.

8 c) Outcomes for Prevention Quality Indicator 2: Shortterm Complications of Diabetes

With the exception of the risk-factor of age, similar differences were observed for preventable hospitalization rates for short-term complications of (D D D D) F diabetes (PQI2). Patients in the 18-to-29-year-old category had the highest admission rate (SRD 5.97, SRR 1.99), and men had a higher rate than women (SRD 1.38, SRR

1.18). The rate of hospitalizations for short-term complications of diabetes among African Americans was almost three times that of Whites (SRD 8.79, SRR 2.68). African American females had more admissions for PQI2 than White females, and African American males had the highest rate (SRD 11.56, SRR 3.21). Given the large number of younger patients admitted for short-term complication of diabetes, Medicaid was the largest provider of insurance coverage for these admissions (SRD 1.02, SRR 1.83).

9 d) Outcomes for Prevention Quality Indicator 3: Longterm Complications of Diabetes

Hospital admissions for the long-term complications of diabetes (PQI3) had similar differences as those for PQI1 (uncontrolled diabetes). Patients over 60 years of age had the highest rate of preventable hospitalizations (SRD 25.08, SRR8.06), and men had a higher rate than women (SRD 2.62, SRR 1.19). African Americans with diabetes experienced more preventable hospitalizations than Whites with diabetes (SRD 13.46, SRR 2.24). African American females experienced more preventable hospital admissions than White females (SRD 14.82, SRR 2.68). Medicare covered the cost of more preventable hospitalizations for PQI3 than all other insurers (Table 4).

10 e) Outcomes for Prevention Quality Indicator 4: Uncontrolled Diabetes (PQI1)

The patterns observed for uncontrolled diabetes (PQI4) were consistent with those of most previous PQIs (Table 4). Patients over 60 years of age experienced the highest rate of preventable hospitalizations for lowerlimb amputations (SRD 10.6, SRR 54), and men had a higher rate than women (SRD 3.56, SRR 2.12). African Americans had a higher rate of amputations than Whites (SRD 2.28, SRR 1.55), although this difference was largely driven by the large disparity between African American and White men; White men had a higher rate of preventable hospitalization for lower-limb amputations than African American women. Medicare was most often the insurance provide for hospital admission for PQI4.

11 IV.

12 Discussion

From 1980 through 2014, there was a fourfold increase in the number of Americans with diagnosed diabetes. 1 This increased prevalence has resulted in corresponding adverse impacts on clinical outcomes and the cost of diabetes care. 16,17 Significantly higher health care utilization and costs have been associated with people with diabetes because of the related comorbidities. 17,18 Between 2007 and 2011, researchers noted that type 2 diabetics on insulin had more comorbidities, higher hospitalization rates 19 because poor glycemic control is associated with more neurological complications, renal complications and peripheral vascular disease. 20 Diabetes has been associated with increased morbidity and mortality. 21 It is a risk factor for cognitive changes, 22 and is often linked with patients who experience concomitant heart failure (HF). 23 Among patients with chronic HF, diabetes has been associated with worsening conditions. 23 Another risk factor of diabetes is its impact on the incidence of hospital admissions for foot ulcers. From 2005 to 2010, hospital costs increased tenfold because of the association of hospital admissions for foot ulcers and lower limb amputations. 24 People with diabetes are nearly twice as likely to experience premature death than people in the same age groups but without diabetes. 25 These factors result in higher levels of poor health outcomes, more health care utilization, and higher health care costs for patients with diabetes. For these reasons, they demand the attention of policymakers and providers.

For the past 30 years at least, African Americans have had a higher prevalence of diabetes and more complications than Whites with diabetes. **??**6 Racial differences have been consistently reported for diabetes-related hospitalizations. Our analysis of a statewide hospital discharge dataset uncovered differences in hospitalization rates along demographic and insurance lines. Among Maryland hospital discharges, African Americans had significantly higher diabetes-related adverse outcomes. The racial disparity was more pronounced for African American males. The hospitalization ratio of African Americans to Whites ranged from 1.55 for lower limb amputation to 3.77 for uncontrolled diabetes. There were also significant differences in hospitalization rates across jurisdictions. Baltimore City and Prince George's County, jurisdictions with large African American population, and several rural counties, had higher hospitalization rates for diabetesrelated conditions. These results indicate that race is a strong predictor of preventable hospitalizations among Marylanders with diabetes. Adjustments in the analysis were made for demographic and socioeconomic factors and the racial disparities persisted.

The social determinants of the health model could explain the observed racial differences in our data. Diabetes-related preventive services could prevent hospitalizations for adverse events by delaying or preventing the onset of diabetes complications. 27 For diabetics, continuous medical care and patient selfmanagement are needed to prevent short-term complications and reduce the risk of long-term complications that often result in substantial increases in the economic burden of diabetes. 28 Short-term complications include hypoglycemic or hyperglycemic episodes, foot ulcers, or hospital admissions. Long-term complications include kidney disease (nephropathy),

nervous system damage (neuropathy), amputation or end-stage renal disease. Preventive services such as the annual hemoglobin A1c test have been associated with fewer adverse cardiovascular outcomes in Medicare populations. 29 Hospital admission rates are also related to periodic hemoglobin A1c testing. When diabetics adhere to the recommended guidelines for HbA1c, low-density lipoprotein cholesterol, and retinal eye exam, they are less likely to have diabetes-related hospital admissions. 30 The differences we observed in our hospital discharge data may be a consequence of disparities in the utilization of preventive services.

Since we examined discharge data from the State of Maryland, there are limits to the generalizability of the study. Our findings could be confirmed with broader national sampling of discharge data, and examination of longitudinal data to overcome the limitations of this cross-sectional study. The lack of individual patient identifiers in the Maryland discharge data could have affected the results because the data are at the diagnosis and procedure levels of discharge and could reflect multiple admissions for the same patient. The observed racial differences might be biased downward because some patients are less likely to respond to questions about race and ethnicity. The lack of a racial designation has been found to be biased toward White patients. 31 In light of the disproportionate burden of diabetes and its complications for African Americans who have higher rates of diabetes, experience more adverse outcomes, and receive fewer preventive services, it seems appropriate to develop interventions to increase the provision of preventive services and reduce diabetes prevalence among high-risk groups.

13 Implications for Policy & Practice

? Our findings suggest that racial disparities exist in the treatment of diabetes-related illnesses and hospitalizations can be avoided by selfmanagement by patients and routine medical care services. [1]

[1]© 2021 Global JournalsHospitalizations for Diabetes-Related Complications by Race, Gender, and Age in Maryland

Characteristic		Frequency
All		10,136
Age Group (years)		
	18-29	1,045
	30-39	958
	40-49	1,617
	50-59	2,437
	60 & over	4,075
Sex	Male	5,408
	Female	4,728
Race		
White Black White Male Race/Gender Black Male White female Black Female *Each category adj		

Volume XXI Issue V Version I

D D D D) (Medical Research

Global Journal of

SRR=standardized rate ratio.

Figure 1: ?

1

Figure 2: Table 1 :

2

		Insurance 2012		
Characteristic	Frequency	SR	SRD	SRR
All	618	1.69		
Age Group (years)				
18-29	38	0.58	Reference	Reference
30-39	65	1.11	0.53	1.91
40-49	125	1.74	1.16	3
50-59	152	2	1.42	3.45
60 & over	238	2.52	1.94	4.34
Sex				
Male	175	1.87	0.34	1.22
Female	290	1.53	Reference	Reference
Race				
White	211	0.88	Reference	Reference
Black	407	3.28	2.4	3.73

Figure 3: Table 2 :

3

Characteristic	Frequency	SR	SRD	SRR
All	3,004	8.2		
Age Group (years)				
18-29	776	11.98	5.97	1.99
30-39	451	7.73	1.72	1.29
40-49	586	8.16	2.15	1.36
50-59	621	8.2	2.19	1.36
60 & over	570	6.01	Reference	Reference
Sex				
Male	1,566	8.95	1.38	1.18
Female	1,438	7.57	Reference	Reference
Race				
White	1264	5.24	Reference	Reference
Black	1740	14.03	8.79	2.68
Race/Gender				
White Male	626	5.26	0.03	1.01
Black Male	940	16.79	11.56	3.21
White female	638	5.23	Reference	Reference
Black Female	800	11.76	6.53	2.25
Insurance				
Medicare	730	2	0.77	1.63
Medicaid	823	2.25	1.02	1.83
Private	760	2.08	0.85	1.69
Uninsured	450	1.23	Reference	Reference

*[Note: *Each category adjusted for other variables in the table. SR=standardized rate; SD=standardized rate difference; SRR=standardized rate ratio. F © 2021 Global Journals]*

Figure 4: Table 3 :

4

Characteristic	Frequency	SR	SRD	SRR
All	5,622	15.4		
Age Group (years)				
18-29	230	3.55	Reference	Reference
30-39	419	7.18	3.63	2.02
40-49	814	11.33	7.78	3.19
50-59	1,456	19.22	15.67	5.41
60 & over	2,703	28.63	25.08	8.06
Sex				
Male	2,934	16.77	2.62	1.19
Female	2,688	14.15	Reference	Reference
Race				
White	2610	10.83	Reference	Reference
Black	3012	24.29	13.46	2.24
Race/Gender				
White Male	1531	12.87	4.03	1.46
Black Male	1403	25.05	16.21	2.83
White female	1079	8.84	Reference	Reference
Black Female	1609	23.66	14.82	2.68
Insurance				
Medicare	3002	8.22	7.33	9.24
Medicaid	908	2.49	1.6	2.8
Private	1038	2.84	1.95	3.19
Uninsured	326	0.89	Reference	Reference

*[Note: *Each category adjusted for other variables in the table.SR=standardized rate; SD=standardized rate difference; SRR=standardized rate ratio.]*

Figure 5: Table 4 :

5

Characteristic	Frequency	SR	SRD	SRR
All	1,783	4.88		
Age Group (years)				
18-29	13	0.2	Reference	Reference
30-39	58	0.99	0.79	4.95
40-49	207	2.88	2.68	14.4
50-59	485	6.4	6.2	32
60 & over	1,020	10.8	10.6	54
Sex				
Male	1,179	6.74	3.56	2.12
Female	604	3.18	Reference	Reference
Race				
White	991	4.11	Reference	Reference
Black	792	6.39	2.28	1.55
Race/Gender				
White Male	677	5.69	3.12	2.21
Black Male	502	8.96	6.39	3.49
White female	314	2.57	Reference	Reference
Black Female	290	4.26	1.69	1.66
Insurance				
Medicare	1046	2.87	2.63	11.96
Medicaid	249	0.68	0.44	2.83
Private	307	0.84	0.6	3.5
Uninsured	86	0.24	Reference	Reference

*[Note: *Each category adjusted for other variables in the table.SR=standardized rate; SD=standardized rate difference; SRR=standardized rate ratio.]*

Figure 6: Table 5 :

[(2015)] , 10.1089/pop.2014.0115. 2015 Feb 3. 18 p. .

[Agency for Healthcare Quality and Research and Quality] *Agency for Healthcare Quality and Research and Quality*, (Rockville (MD)

[AHRQ Quality Indicators-Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions] 'AHRQ Quality Indicators-Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions'. *Agency for Healthcare Research and Quality*, (Rockville, MD) 2001. AHRQ Pub. p. .

[Hicks et al. (2016)] 'Burden of infected diabetic foot ulcers on hospital admissions and costs'. C W Hicks , S Selvarajah , N Mathioudakis . 10.1016/j.avsg.2015.11.025.Epub. *Ann Vasc Surg* 2016. 2016 Feb 22. 33 p. .

[Romeo] *Cardiovascular events after bariatric surgery in obese patients with type 2 diabetes. Diabetes Care*, S Romeo . 2012 p. .

[Center for Disease Control and Prevention. National diabetes statistics report: Estimates of diabetes and its burden in the Unite *Center for Disease Control and Prevention. National diabetes statistics report: Estimates of diabetes and its burden in the United States*, 2014. 2014. Atlanta, GA. U.S. Department of Health and Human Services

[Schimming et al. ()] 'Cognitive performance of older adults in a specialized diabetes clinic'. C Schimming , X Luo , C Zhang , M Sano . 10.1111/1753-0407.12503. *J Diabetes* 2016. 9 (10) p. . (Epub ahead of print)

[Goodney et al. ()] 'Consistency in hemoglobin A1c testing and cardiovascular outcomes in Medicare patients with diabetes'. P P Goodney , K A Newhall , K Bekelis . 10.1161/JAHA.116.003566. *J Am Heart Assoc* 2016. 5 (8) .

[Lopez et al. ()] 'Demographic disparities among Medicare beneficiaries with type 2 diabetes mellitus in 2011: Diabetes prevalence, comorbidities, and hyperglycemic events'. J M Lopez , R A Bailey , M F Rupnow . *PopulHealthManag* 2015.

[US (2010)] 'Department of Health and Human Services'. US . `http://healthypeople.gov/2020/Topics-Objectives/topic/diabetes/objectives.Accessed` *Healthy People* 2020. 2010. June 10, 2017.

[Diabetes Information. What is the prevalence of diabetes? (2019)] *Diabetes Information. What is the prevalence of diabetes?*, `https://phpa.health.maryland.gov/img1/Prevalence.aspx` Accessed February 6, 2019. Maryland Department of Health and Mental Hygiene

[Seahasai and Kaptage ()] 'Diabetes mellitus, fasting, glucose, and risk of specific death'. S R Seahasai , S Kaptage . *N Engl J Med* 2011. 64 p. .

[Kirk ()] 'Disparities in HbA1c levels between africanamerican and non-hispanic white adults with diabetes'. J R Kirk . *Diabetes Care* 2016. 29 p. .

[Fonseca et al. ()] 'Economic burden of hypoglycemia with basal insulin in type 2 diabetes'. V Fonseca , E Chou , H W Chung , C Gerrits . *Am J ManagCare* 2017.

[Economic cost of diabetes in the U.S. in 2012 Diabetes Care] 'Economic cost of diabetes in the U.S. in 2012'. *Diabetes Care* American Diabetes Association. 2013 p. .

[Chung et al. ()] 'Impact of a clinical pharmacy program on changes in hemoglobin A1c, diabetes-related hospitalizations, and diabetes-related emergency department visits for patients with diabetes in an underserved population'. N Chung , K Rascati , D Lopez , J Jokerst , A Garza . *J ManagCare Spec Pharm* 2014. 20 (9) p. .

[Dei Cas et al. ()] 'Impact of diabetes on epidemiology, treatment, and outcomes of patients with heart failure'. A Dei Cas , S S Khan , J Butler . 10.1016/j.jchf.2014.08.004. *J Am Coll Cardiol: Heart Failure* 2015. 3 (2) p. .

[Xu et al. ()] 'Insurance coverage and health care among nearelderly women'. X Xu , D A Patel , A Vahratian , S B Ransom . *Women Health Issues* 2006. 16 (3) p. .

[Chen et al. (2019)] *Maryland Chartbook of Minority Health and Minority Health Disparities Data. Project Report. Maryland Department of Health and Mental Hygiene*, J C Chen , D A Mann , Hussein . `http://healthequity.lib.umd.edu/4117/1/Maryland_Health_Disparities_Data_Chartbook_2012_021413.pdf` Accessed February 10, 2019.

[Krisna ()] *One Illness Away, Why People Become Poor and How They Escape Poverty*, A Krisna . 2010. Oxford: Oxford University Press.

[Escalada et al. (2016)] 'Outcomes and healthcare resource utilization associated with medically attended hypoglycemia in older patients with type 2 diabetes initiating basal insulin in a US managed care setting'. J Escalada , L Liao , C Pan , H Wang , M Bala . Doi: 10.1080/ 03007995.2016.1189893. *Curr Med Res Opin* 2016. 2016 Jun 13. 32 (9) p. .

[Pu and Chewning ()] 'Racial difference in diabetes preventive care'. J Pu , B Chewning . *Res Social Adm Pharm* 2013. 9 (6) p. .

[Ferdinand and Nasser ()] 'Racial/ethnic disparities in prevalence and care of patients with type 2 diabetes mellitus'. K C Ferdinand , S A Nasser . 10.1185/03007995.2015.1029894.26. *Centers for Disease Control and Prevention. Diabetes Report Card* 2015. 2014. 2015. Center for Disease Control and Prevention. 31 (5) p. . (Curr Med Res Opin)

[Menzin et al. ()] 'Relationship between glycemic control and diabetes-related hospital costs in patients with type 1 or type 2 diabetes mellitus'. J Menzin , J R Korn , J Cohen . *J ManagCare Pharm* 2010. 16 (4) p. .

[Standards of medical care-2014 Diabetes Care ()] 'Standards of medical care-2014'. *Diabetes Care* 2014. American Diabetes Association. 37 (1) p. .

[Summary: Burden of Diabetes in Maryland (2019)] *Summary: Burden of Diabetes in Maryland*, `https://phpa.health.maryland.gov/ccdpc/Reports/Documents/Report-Diabetes.pdf` Accessed February 6, 2019. Maryland Department of Health and Mental Hygiene

[The Diabetes Control and Complications Trial Research Group. Lifetime benefits and costs of intensive therapy as practical in d 'The Diabetes Control and Complications Trial Research Group. Lifetime benefits and costs of intensive therapy as practical in diabetes control and complications trial'. *JAMA* 1996. 276 p. .

[Heisler ()] 'The second annual primary care conference-programming to eliminate health disparities among ethnic minority populations: An introduction to the Proceedings'. M Heisler . *Ethn Dis* 2003. 13 (3) . (supplement 3) 5 summer)

[Dall et al. ()] 'Type 2 diabetes detection and management among insured adults'. T M Dall , W Yang , P Halder . *PopulHealthMetr* 2016. 2016. 14 (43) .

[Kozack ()] 'Underreporting of race in the National Hospital Discharge Survey'. L J Kozack . *Adv Data* 1995. 265 p. .

[Smedley et al. ()] *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Institute of Medicine. U.S. Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care*, B D Smedley , Stith , Nelson Ay , AR . 2003. Washington (D.C.: National Academies Press.

[Virnig et al. ()] 'Use of and access to health care by Medicare beneficiaries with diabetes: impact of diabetes type and insulin use'. B A Virnig , N D Shippee , B O'donnell , J Zeglin , S Parashuram . *Data Points Publication Series*, 2007-2011. 2014 Jan 29. (Data Points #18. Internet)