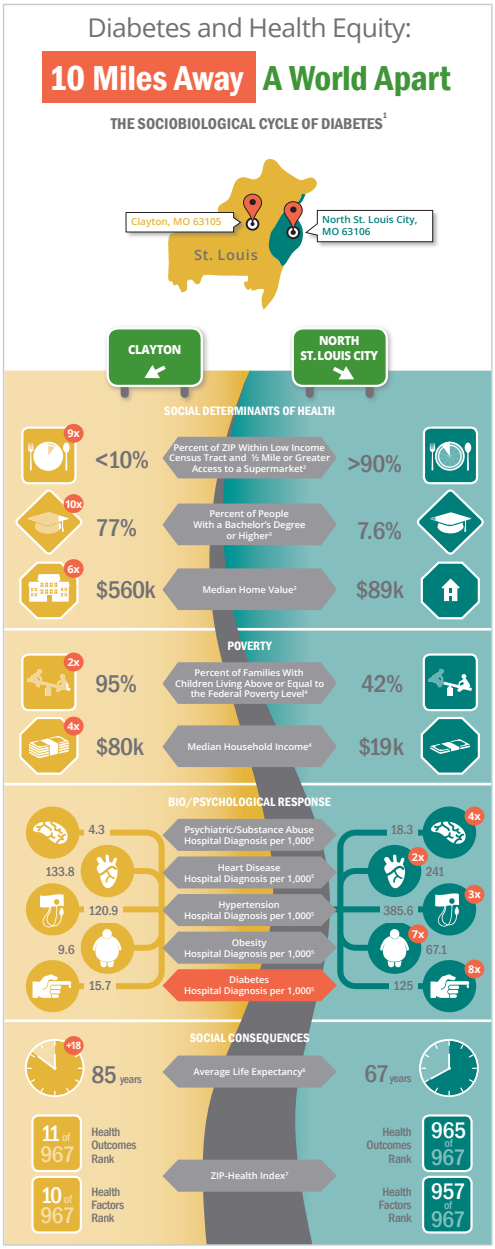
HIDI HealthStats

Statistics and Analysis From the Hospital Industry Data Institute

APRIL 2016

HOW DIABETES AFFECTS MISSOURI COMMUNITIES DIFFERENTLY: OPPORTUNITIES TO PROMOTE HEALTH EQUITY

The infographic below details health disparities between two St. Louis communities. A Kansas City version also is available.



Background

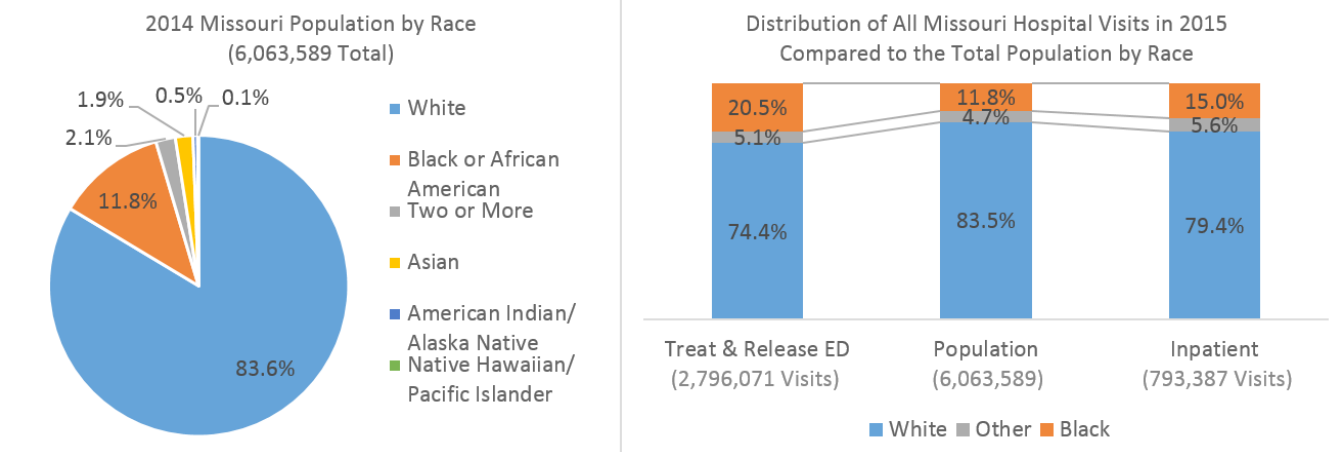
Health disparities and inequalities occur when notable differences in health factors or health outcomes are observed between different populations. In the U.S., significant differences exist between populations of different demographic, socioeconomic and geographic strata in key health outcomes, such as average life expectancy.[i] The study of health disparities dates to 1714 Italy, when Bernardino Ramazzini observed and documented an abnormally high incidence of breast cancer among a group of Catholic nuns compared to married women.[ii] The first known linkage of health disparities to social determinants of health occurred in 1840 when statistician Edwin Chadwick quantified significantly lower life expectancy for the working poor in Liverpool, England.[iii]

Although the U.S. spends more on health care than any other World Health Organization member nation — 17 percent of gross domestic product in 2012 — health parity remains elusive.[iv] The U.S. consistently ranks last in an annual comparison of the health systems of 11 developed countries in terms of quality, access, efficiency, expenditures, health-related quality of life and health equity.[v] Health disparities are powerful determinants of poor health outcomes and excessive health expenditures in the U.S. A notable health disparity in Missouri is that black patients are overrepresented in hospital utilization compared to the total population (Figure 1).

Diabetes has a significant direct and indirect role in health disparities. Cardiovascular disease is the most common cause of death for the entire population in the U.S. The risk of premature death from heart disease or stroke is 50 percent higher for black males than for white males.[i] Moreover, there is a strong correlation between diabetes and cardiovascular health. Cardiovascular death rates are 2 to 4 times higher for individuals with diabetes, and the primary cause of death for 65 percent of all patients with diabetes is heart disease or stroke.[vi]

One in 10 health care dollars is attributed to diabetes care in the U.S.[viii] The total economic burden of diabetes in the U.S. was estimated to be **$245 billion** in 2012.[x] Adjusting this figure for the Missouri population with diabetes (Centers for Disease Control and Prevention Behavioral Risk Factor Surveillance System), suggests the total economic burden of diabetes for Missouri may be in excess of **$5.1 billion** annually.

Figure 1: Distribution of Missouri's Population and Hospital Utilization by Race



Sources: Hospital Industry Data Institute, 2015 Hospital Inpatient and Outpatient (Emergency Department) Discharge Databases. U.S. Census Bureau, Missouri QuickFacts.

CALL TO ACTION

Your organization can become more involved in reducing the burden of health disparities in Missouri.

- Join MHA in taking the American Hospital Association's #123forEquity Pledge to Eliminate Health Care Disparities.
- Register for the four-part health equity webinar series hosted by MHA.

For more information visit http://web.mhanet.com/quality-initiatives-health-equity.

Diabetes Health Disparities

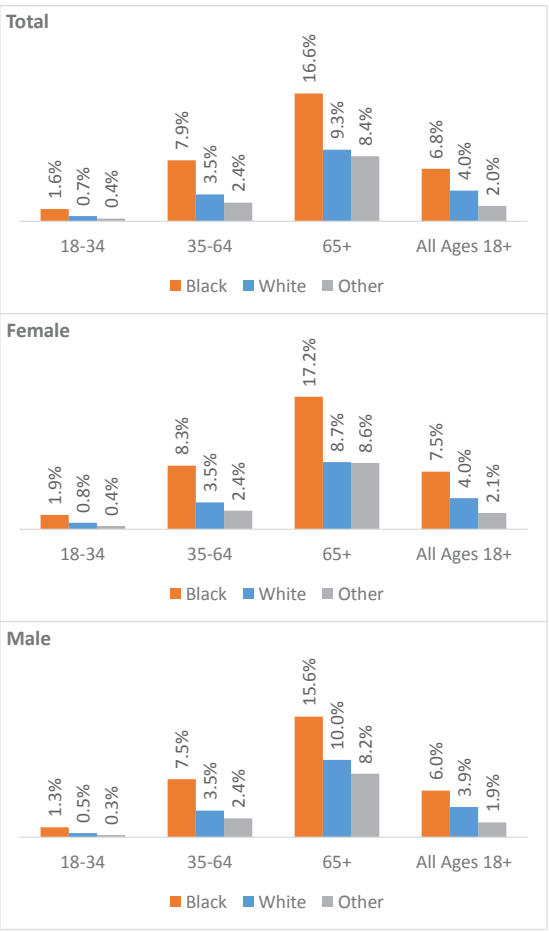
The burden of diabetes is disproportionately high for racial and ethnic minorities in the U.S.[vii] In addition to behavioral and physiological factors, social determinants of health such as income, education, housing and access to nutritious food are key drivers of the extreme growth in the incidence of Type 2 diabetes in the U.S., particularly among racial and ethnic minorities.[viii] It is estimated that 26 million adults ages 20 and older in the U.S. live with diabetes.[ix] In 2010, the age-adjusted prevalence of diabetes for non-Hispanic blacks was 11.3 percent and for Hispanics, the prevalence was 11.5 percent — nearly 70 percent higher than the prevalence for non-Hispanic whites at 6.8 percent. For individuals with less than a high school education, the prevalence was 11.6 percent — twice the rate of individuals with a college degree (5.8 percent).[ix]

Last year in Missouri, 6.8 percent of the black adult population ages 18 and older were diagnosed with diabetes during an inpatient hospitalization or emergency department visit. In relative terms, that is 71 percent higher than the 4 percent of white adults diagnosed in a hospital setting. Stratifying diabetes-related hospital patients by age, race and gender revealed that black patients had significantly higher rates of diagnosis in every sub-population evaluated. The largest observed disparity in the prevalence of hospital-based diabetes diagnoses was among black women ages 65 and older. For this group, 17.2 percent of the total population in Missouri experienced a diabetes diagnosis in a hospital setting last year. That is nearly twice the rate experienced by other women in the same age group (Figure 2).

The overall rate of growth for disparities in hospital-based diabetes diagnoses also is growing for black Missourians. One adverse outcome of uncontrolled diabetes is extremity amputation. Last year in Missouri, black men ages 35 and older accounted for just 2.4% of the total population and 11.9% of diabetes-related limb amputations — a health disparity factor of 5x.

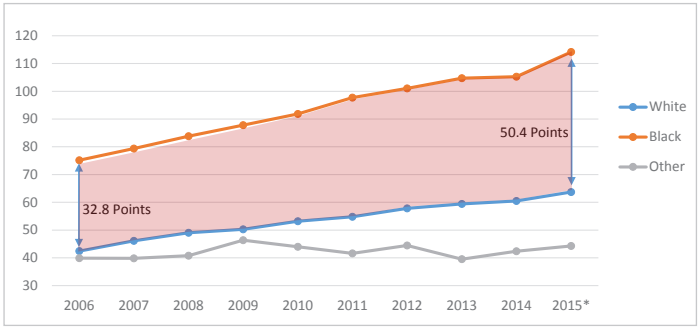
Throughout the last 10 years, the rate of diagnoses per 1,000 among the black population in Missouri increased from **75.2** in 2006 to **114.1** in 2015. For white Missourians, the rate was 42.4 in 2006 and 63.7 in 2015. The gap between the population-based rate of black and white diagnoses in Missouri widened from **32.8** points in 2006 to **50.4** points in 2015 (Figure 3).

Figure 2: Percent of the Total Missouri Population Diagnosed With Diabetes During a Hospitalization or ED Visit During Fiscal Year 2015 by Age, Race and Gender



Sources: Hospital Industry Data Institute, 2015 Hospital Inpatient and Outpatient (ED) Discharge Databases. Nielsen-Claritas 2015 PopFacts Premier.

Figure 3: Missouri Hospital Inpatient and ED Visits for Diabetes: Rate per 1,000 by Race



*Sources: Hospital Industry Data Institute, 2006-2015 Hospital Inpatient and Outpatient (ED) Discharge Databases. U.S. Census Bureau, 2006-2014 Intercensal Population Estimates Program. *Population estimates for 2015 estimated with linear projection.*

Table 1: Age-Adjusted Prevalence of Diabetes for Adults Ages 18 and Older by Region, 2006-2010

	2006		2010		
	Age-Adjusted Prevalence	Relative Difference From the Northeast	Age-Adjusted Prevalence	Relative Difference From the Northeast	Relative Difference 2006-2010
Northeast	6.2%	-	6.3%	-	1.6%
West	6.6%	6.5%	7.3%	15.9%	10.6%
Midwest	7.1%	14.5%	7.9%	25.4%	11.3%
South	7.1%	14.5%	8.8%	39.7%	23.9%

Source: Centers for Disease Control and Prevention, 2013[ix]
See endnote for states by region.

One adverse outcome of uncontrolled diabetes is extremity amputation. Last year in Missouri, black men ages 35 and older accounted for just **2.4%** of the total population and **11.9%** of diabetes-related limb amputations – a health disparity factor of **5x**.

Geographically in the U.S., the age-adjusted rates of diabetes are highest in the South and Midwest, and lowest in the Northeast and West. In 2010, the percent of adults in the Midwest with medically-diagnosed diabetes was 7.9 percent, which was 25.4 percent higher than the Northeast region and marked a four-year growth rate of 11.3 percent (Table 1).

Geographically in Missouri, the highest overall rates of diabetes diagnosis during a hospital visit in 2015 were in Iron and Jasper counties, where 6.6 and 6.2 percent of the total adult population experienced a diagnosis last year (Appendix 1). The county-level rates of hospital-based diabetes diagnoses for black adults in Missouri were significantly higher than the total adult population for the majority of counties with at least 100 black adult residents in 2015. In particular, more than one out of every 10 black adults in Monroe and Pettis counties were diagnosed with diabetes during a hospital visit last year. High diagnosis rates for the black population also were observed in Lincoln, Warren, Lafayette, Bates

and Jasper counties, where more than 8 percent of the total black adult population experienced a hospital-based diabetes diagnosis during 2015 (Appendix 2).

Evaluating the major metropolitan areas at the census-tract level revealed that the rate of hospital visits for diabetes per 1,000 in 2015 closely resembled the racial composition of the community (Appendix 3 and 4). **The average diabetes-related hospital utilization rate for census tracts with a majority black population was 125 visits per 1,000. For census tracts with a minority black population (less than 50 percent), the rate fell by more than half to just 56.8 visits per 1,000 total population.**

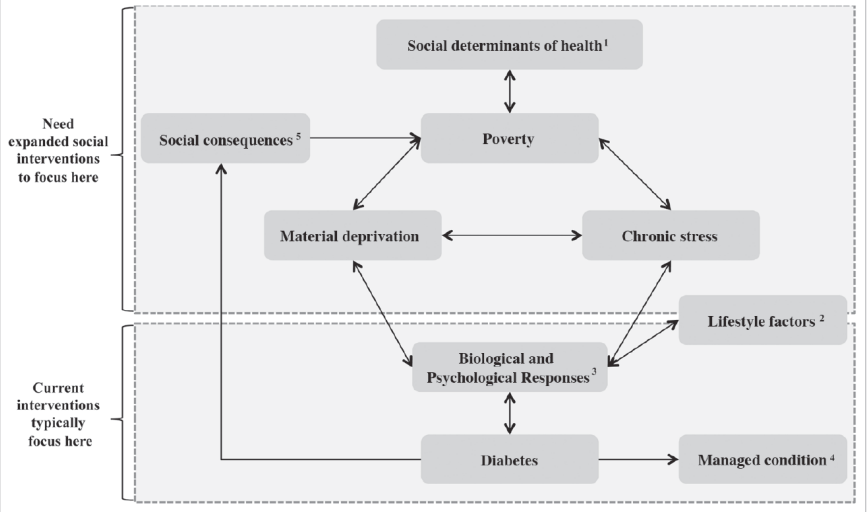
The Sociobiologic Cycle of Diabetes

Multiple determinants from an individual's physical and social surroundings have complex interactions that can lead to a higher risk of developing Type 2 diabetes, which accounts for 95 percent of all cases. These factors and interactions are referred to as the social determinants of health that are the most influential predictors of individual and population health outcomes (Diagram 1).[viii] The development and consequences of diabetes is a cyclical process known as the sociobiologic cycle. Type 2 diabetes is both caused by, and results in, adverse social and health-related outcomes for individuals with the disease. Social determinants of health — such as socioeconomic status, environmental context, access to nutritious food and material deprivation — result in behavioral traits and chronic biological and psychological stress, which increase the risk of developing diabetes. In turn, individuals' bio-psychological responses to the disease result in social consequences that exacerbate the social determinants influencing adverse outcomes, and the sociobiologic cycle repeats[viii] (Infographics referenced on page 1 demonstrate the cycle using two Missouri ZIP codes in both St. Louis and Kansas City).

To evaluate contributors to the sociobiologic cycle of diabetes in Missouri, a logistic regression model was developed to highlight risk factors of being diagnosed with diabetes in a hospital setting prior to age 65 (Table 2). The model was based on 928,138 unique patients between the ages of 18 and 64 who had at least one ED visit or hospitalization during fiscal year 2015. The modeled response variable was whether the patient had a diabetes-related diagnosis in any position on the discharge record at any time during the study period.[x] The model adjusted for demographic (age and race-gender interactive terms), behavioral (obesity, cigarette smoker and alcohol abuse) and socioeconomic (Medicaid status) factors. The social determinants in the models each had significant effects after controlling for age and behavioral risk factors. Compared to other patients, black males were 36 percent more likely to be diagnosed with diabetes (OR=1.36, P<.0001). Black females had a 25 percent higher risk of diabetes diagnosis, all else equal (OR=1.25, P<.0001). Low-SES patients, as indicated by Medicaid status, were nearly twice as likely to experience a diabetes diagnosis compared to patients with other payers (OR=1.98, P<.0001). The strongest predictor of diabetes was obesity, which was estimated to increase the patient's risk of diagnosis by a factor of five (OR=5.01, P<.0001).

The social consequences of diabetes were evaluated as adverse health outcomes related to diabetes care in terms of 30-day readmissions

Diagram 1: Sociobiologic Cycle of Diabetes[viii]



[1] Social determinants of health encompass factors such as income, education, housing and access to nutritious food.
[2] Lifestyle factors incorporate dietary choices, physical activity levels and access to primary health care services.
[3] Biologic responses refer to increased allostatic load, cortisol, blood pressure and blood glucose levels, while psychological responses connote increased depression and anxiety, as well as decreased self-esteem, energy and motivation.
[4] Managed condition implies individuals are able to ensure their diabetes is approximately controlled by clinical standards.
[5] Social consequences include increased health care costs and employment complications, as well as decreased productivity and educational attainment potential.

Table 2: Risk of Developing Diabetes Before Age 65 Disparities Model

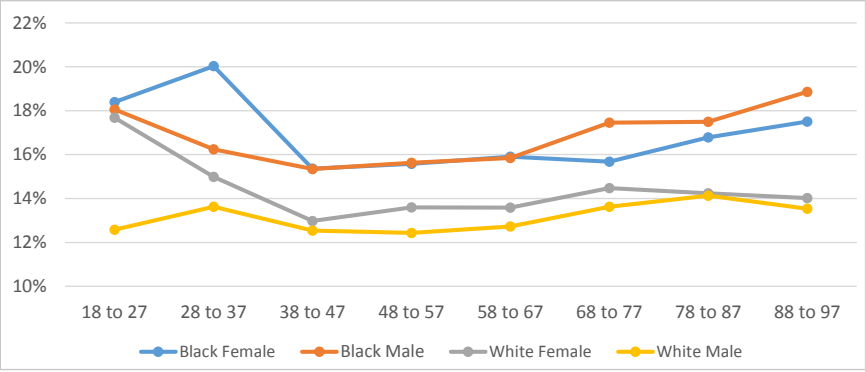
	Frequency by Race					Model Results	
	Black		White				
	Male	Female	Male	Female	Total	Odds Ratio	P-Value
Unique Patients 18-64	77,280	107,124	321,034	394,572	928,138	-	-
Diagnosed With Diabetes	12.5%	12.4%	11.5%	10.0%	11.0%	-	-
Model Covariates							
Average Age	38.3	37.4	41.2	40.3	40.0	1.07	<.0001
Black Male	100.0%	0.0%	0.0%	0.0%	8.3%	1.36	<.0001
Black Female	0.0%	100.0%	0.0%	0.0%	11.5%	1.25	<.0001
Diagnosed Obesity	6.9%	10.6%	6.5%	8.2%	7.7%	5.01	<.0001
Diagnosed Smoker	49.3%	34.8%	43.6%	37.6%	39.9%	1.33	<.0001
Diagnosed Alcohol Abuse	8.9%	3.1%	7.8%	3.7%	5.5%	0.99	0.3719
Medicaid Status	21.1%	36.9%	14.5%	24.8%	22.0%	1.98	<.0001

$R^2 = 0.231$ $C = 0.798$

Table 3: 30-Day Readmissions for Diabetes by Race and Gender

	Index Admissions	30-Day Readmissions	Observed Rate
Black	**70,305**	**11,393**	**16.2%**
Female	40,822	6,591	16.1%
Male	29,483	4,802	16.3%
White	**341,657**	**46,519**	**13.6%**
Female	174,563	24,466	14.0%
Male	167,094	22,053	13.2%
Other Race	**11,668**	**1,479**	**12.7%**
Female	5,770	723	12.5%
Male	5,898	756	12.8%
Total	**423,630**	**59,391**	**14.0%**

Figure 4: Missouri Diabetes-Related 30-Day Readmission Rates by Age, Race and Gender: September 2012 to August 2015



following an inpatient hospitalization for diabetes and the diabetes-related mortality rate per 1,000 inpatient hospitalizations. Health disparities were detected by stratifying each health outcome by age, race and gender.

Black patients hospitalized for diabetes had the highest observed 30-day readmission rates at 16.2 percent. This was 19 percent higher than the observed readmission rate of 13.6 percent for white patients and 28 percent higher than the 12.7 percent readmission rate for patients of other races (Table 3). During the life course, readmission rates for black and white female patients are relatively high between the ages of 18 and 37 and somewhat flat between ages 38 and 67. Past age 68, the rates for black patients increase while white patients experience lower readmission rates (Figure 4).

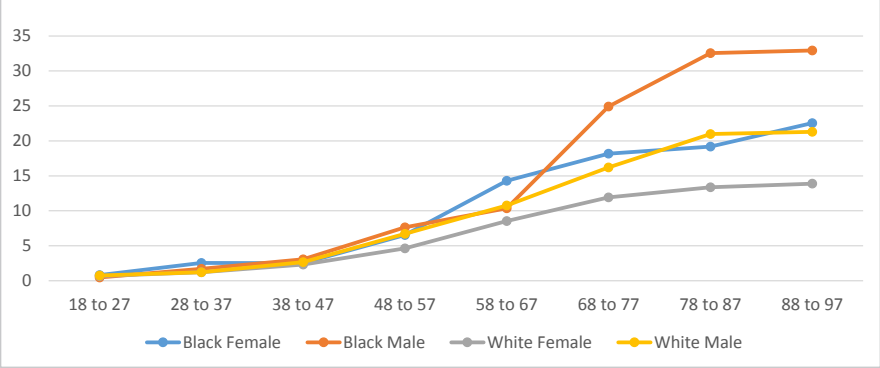
Patients of other races in Missouri experienced the highest overall diabetes-related mortality rates at 11.67 per 1,000 total inpatient discharges during fiscal year 2015, and black patients had slightly higher rates than did white patients (Table 4).

The risk of diabetes-related mortality increases significantly for black men after age 67, when the mortality rate diverges sharply from the rest of the population. Black men between the ages of 68 and 97 had an average diabetes-related mortality rate over 30 per 1,000 discharges in Missouri last year. **That is 72 percent higher than the average rates for white men and women, and black women of the same age range combined** (Figure 5).

Table 4: Diabetes-Related Mortality by Race and Gender

	Inpatient Hospitalizations	Diabetes-Related Deaths	Rate Per 1,000
Black	**85,622**	**867**	**10.13**
Female	45,692	461	10.09
Male	39,930	406	10.17
White	**482,330**	**4,762**	**9.87**
Female	255,813	2,200	8.60
Male	226,517	2,562	11.31
Other Race	**17,224**	**201**	**11.67**
Female	8,428	92	10.92
Male	8,796	109	12.39
Total	**585,176**	**5,830**	**9.96**

Figure 5: FY 2015 Missouri Rate of Diabetes-Related Deaths per 1,000 Hospitalizations by Age, Race and Gender



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[i] Centers for Disease Control and Prevention. *CDC health disparities and inequalities report—United States, 2013.* Morbidity and Mortality Weekly Report 2013;62(Suppl 3):1-3.

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[vi] Brown, D. & Unrein, C. (2007, November). A review of cardiovascular comorbidities of diabetes. *American Journal of Managed Care.* Retrieved from http://www.ajmc.com/journals/supplement/2007/2007-11-vol11-n2preventivemedicine/nov07-2647ps03-s10

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[viii] Hill, J., Nielsen, M. & Fox, M. (2013). Understanding the social factors that contribute to diabetes: A means to informing health care and social policies for the chronically ill. *The Permanente Journal, 17*(2), 67-72. Retrieved from http://dx.doi.org/10.7812/TPP/12-099

[ix] Centers for Disease Control and Prevention. CDC health disparities and inequalities report—United States, 2013. Diabetes—United States, 2006 and 2010. Morbidity and Mortality Weekly Report 2013;62(Suppl 3): 99-104.

[x] Fiscal year 2015 includes discharges occurring between Oct. 1, 2014, and Sept. 30, 2015. The ICD-9 CM diagnosis codes used to identify individuals diagnosed with diabetes were: 24900, 24901, 24910, 24911, 24920, 24921, 24930, 24931, 24940, 24941, 24950, 24951, 24960, 24961, 24970, 24971, 24980, 24981, 24990, 24991, 25000, 25001, 25002, 25003, 25010, 25011, 25012, 25013, 25020, 25021, 25022, 25023, 25030, 25031, 25032, 25033, 25040, 25041, 25042, 25043, 25050, 25051, 25052, 25053, 25060, 25061, 25062, 25063, 25070, 25071, 25072, 25073, 25080, 25081, 25082, 25083, 25090, 25091, 25092, 25093, 7902, 79021, 79022, 79029, 7915, 7916.

Table 1 endnote: Northeast: Connecticut, Maine, Massachusetts, New Jersey, New Hampshire, New York, Pennsylvania, Rhode Island and Vermont; Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin; South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia; West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington and Wyoming.

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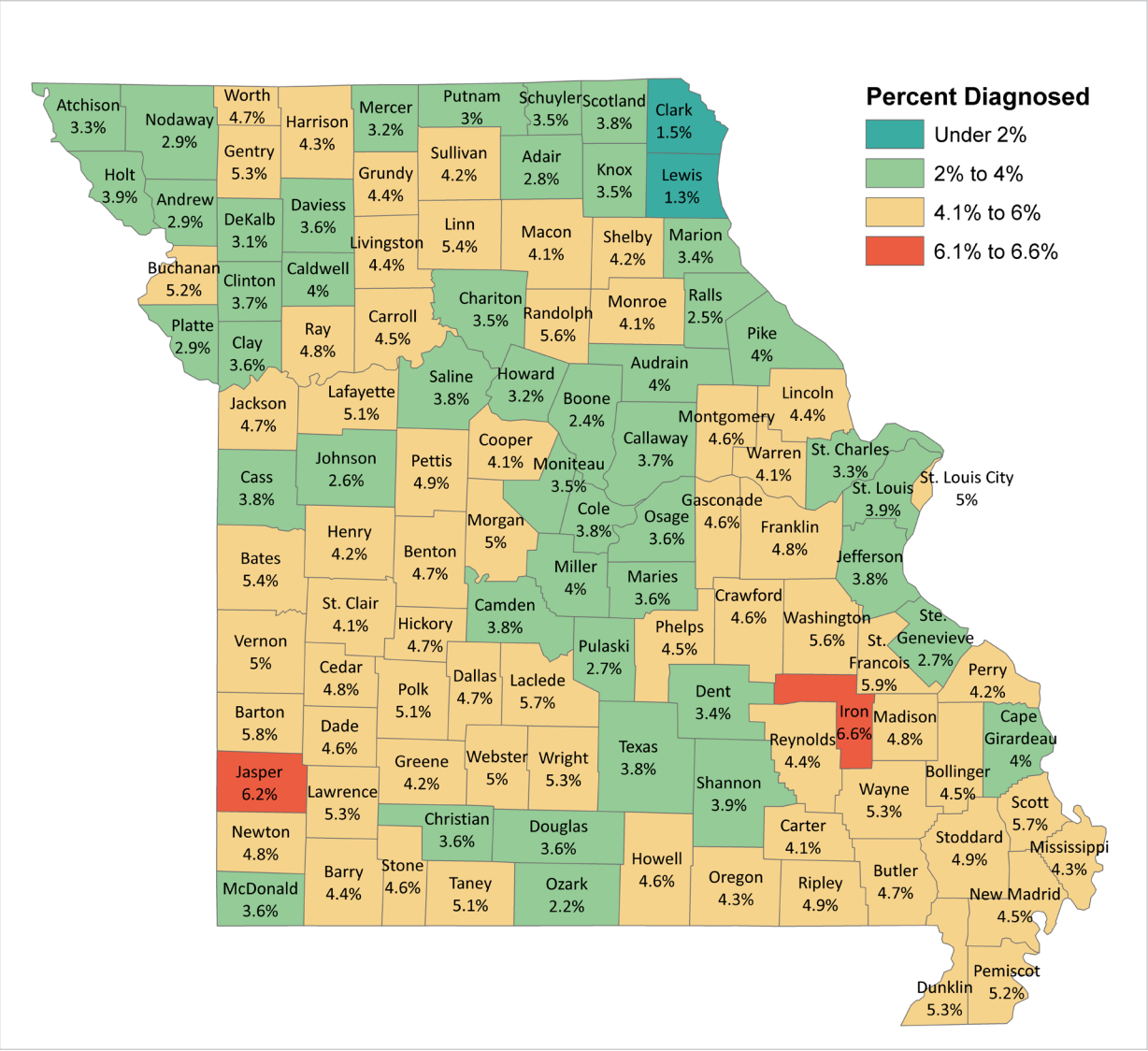
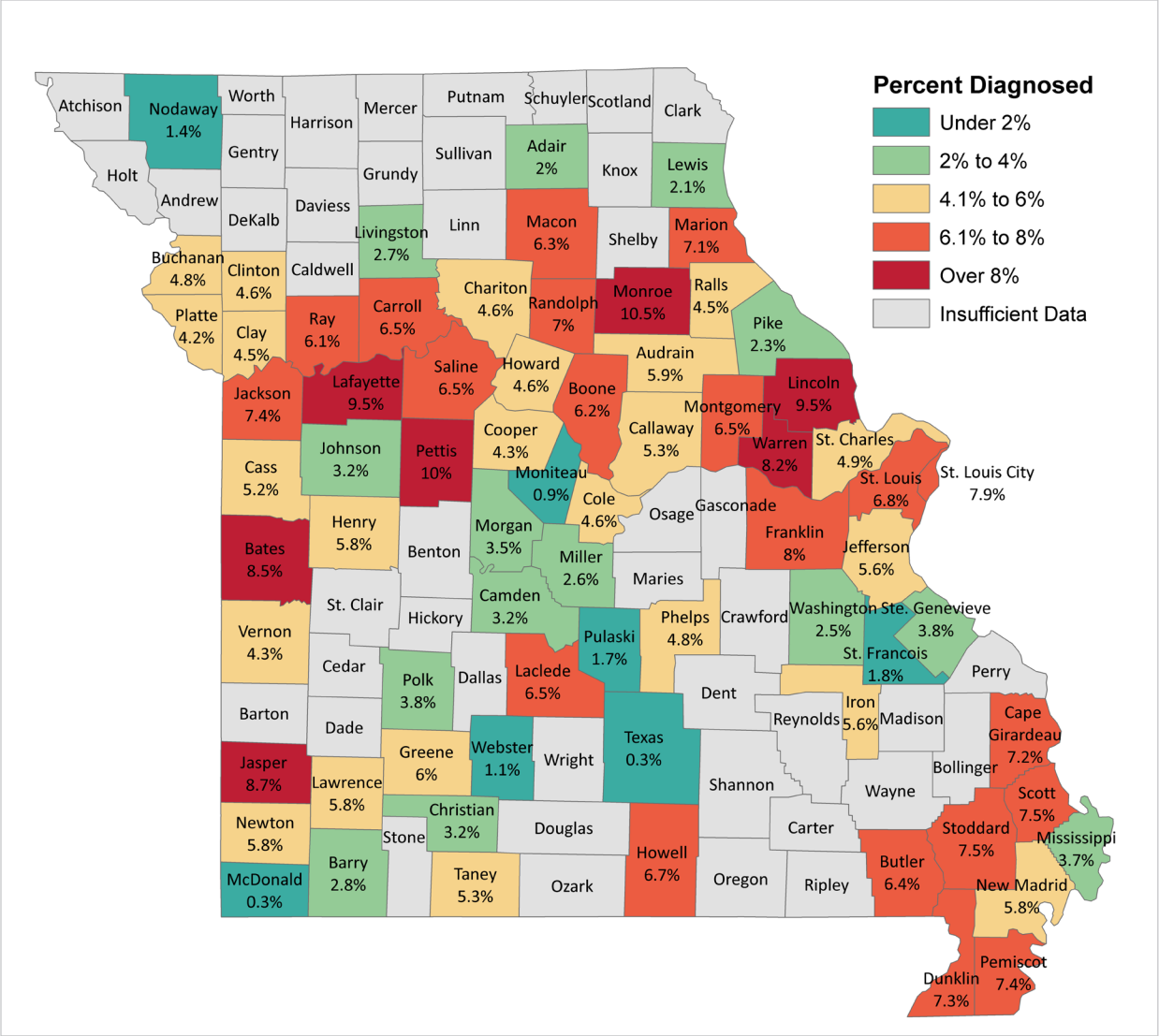
Appendix 1: Percent of the Total Population Ages 18 or Older Diagnosed With Diabetes in 2015 During a Hospitalization or ED Visit



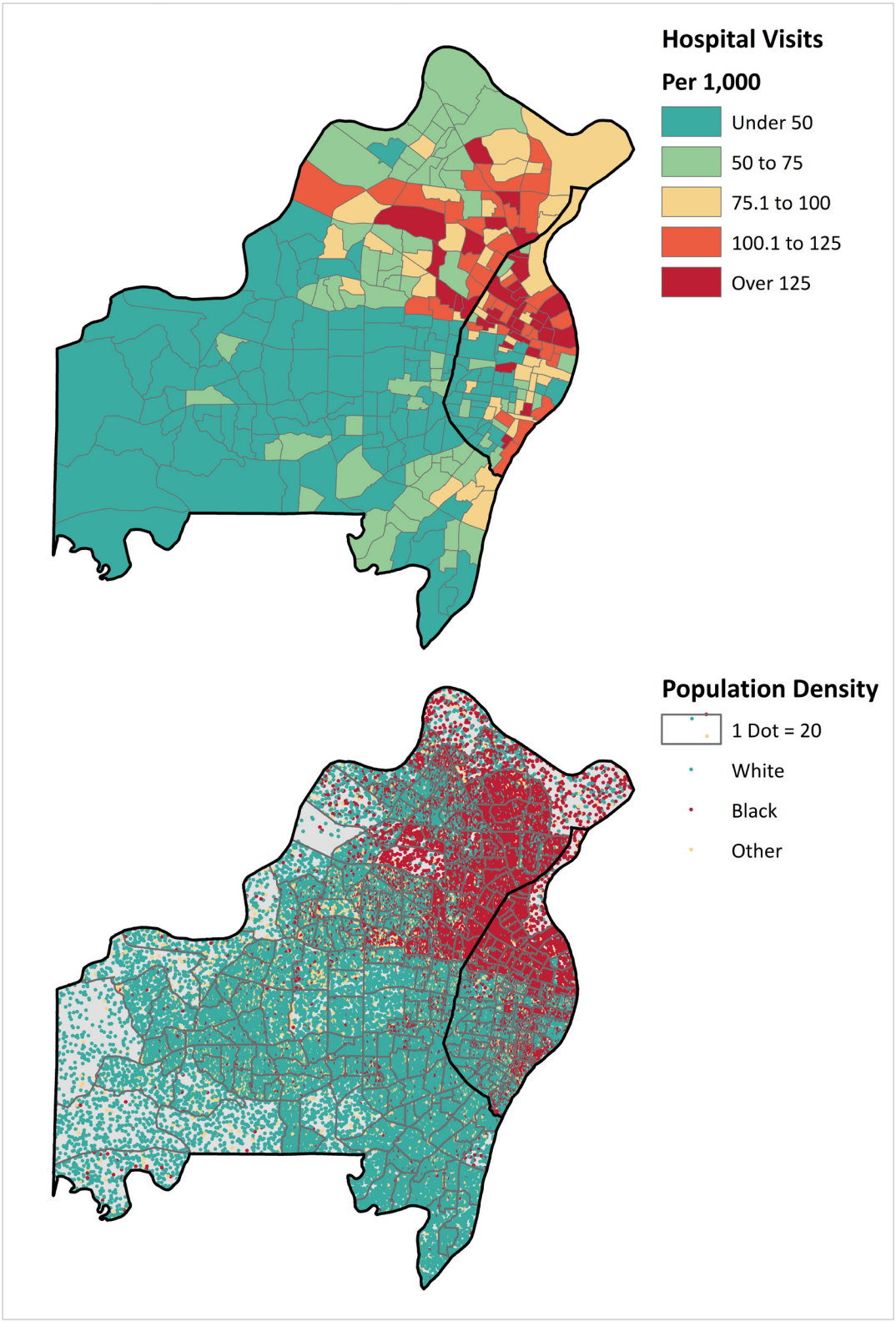
Sources: Hospital Industry Data Institute FY 2015 Hospital Inpatient and Outpatient (ED) Discharge Databases and Nielsen-Claritas 2015 PopFacts Premier. Rates were calculated with the total number of unique patients ages 18 or older with a diabetes diagnosis occurring anywhere on the discharge record as a percent of the total population ages 18 or older for each county.

Appendix 2: Percent of the Black Population Ages 18 or Older Diagnosed With Diabetes in 2015 During a Hospitalization or ED Visit



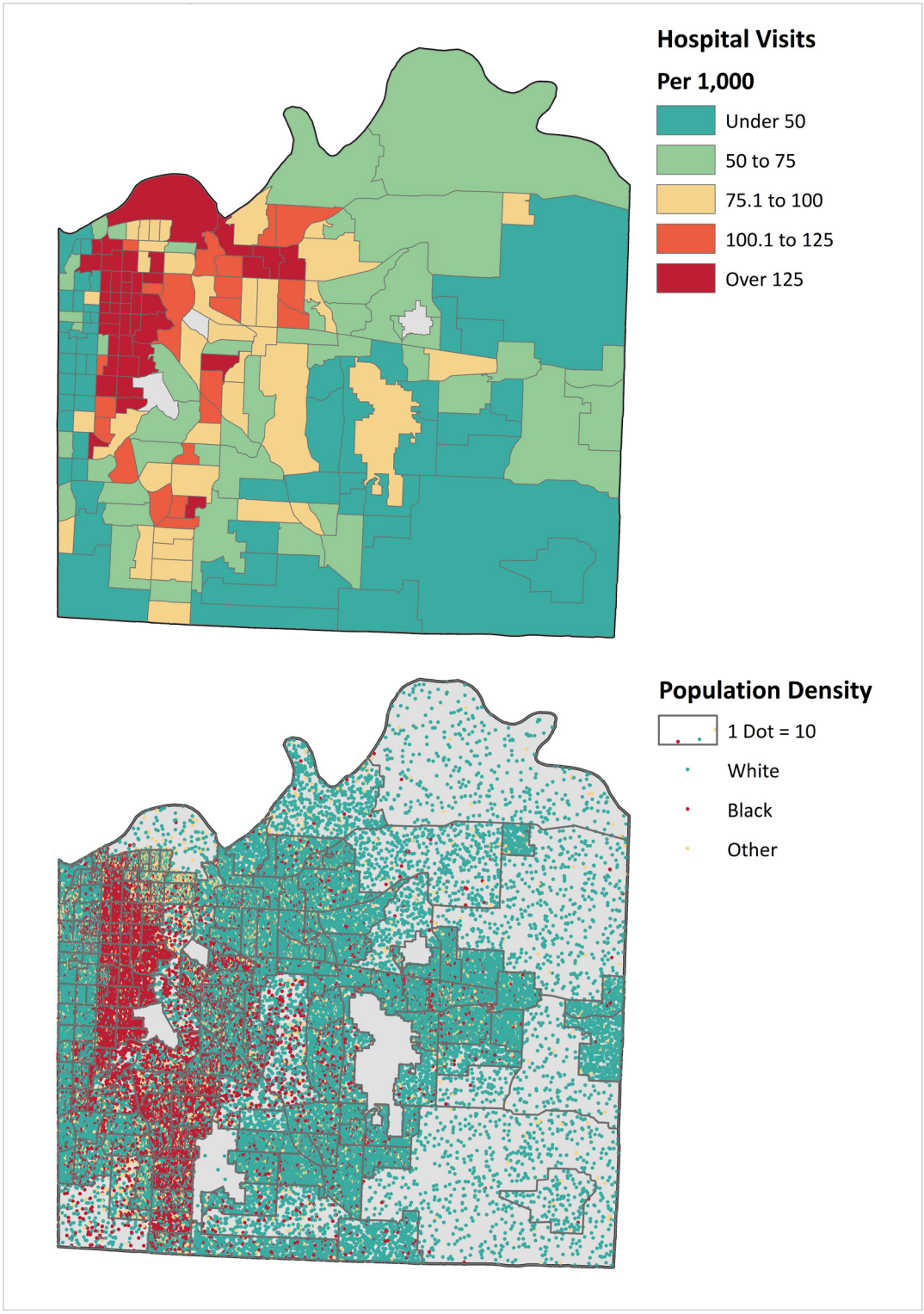
Sources: Hospital Industry Data Institute FY 2015 Hospital Inpatient and Outpatient (ED) Discharge Databases and Nielsen-Claritas 2015 PopFacts Premier. Rates were calculated with the total number of unique black patients ages 18 or older with a diabetes diagnosis occurring anywhere on the discharge record as a percent of the total black population ages 18 or older for each county. Values for counties with fewer than 100 black adult residents in 2015 were withheld.

Appendix 3: 2015 Diabetes Hospitalization or ED Visit Rate and Population Density by Race: St. Louis City and St. Louis County Census Tracts



Sources: Hospital Industry Data Institute FY 2015 Hospital Inpatient and Outpatient (ED) Discharge Databases and Nielsen-Claritas 2015 PopFacts Premier.

Appendix 4: 2015 Diabetes Hospitalization or ED Visit Rate and Population Density by Race: Jackson County Census Tracts



Sources: Hospital Industry Data Institute FY 2015 Hospital Inpatient and Outpatient (ED) Discharge Databases and Nielsen-Claritas 2015 PopFacts Premier.