MARYLAND DIABETES ACTION PLAN
EXECUTIVE SUMMARY

***NOTE* - This document will be updated throughout the 30-day comment period. Changes to the document are highlighted in yellow.**

EXECUTIVE SUMMARY

In Maryland, over 10 percent of the adult population has diabetes. An additional 34 percent of adults are estimated to have prediabetes, a condition of high blood sugar not quite high enough to be diabetes. As diabetes is the sixth leading cause of mortality in Maryland, and the fifth leading cause of death for Black Marylanders in 2017, it is imperative to launch a coordinated and meaningful initiative to address the prevention and management of diabetes in Maryland. The leading cause of diabetes is overweight and obesity, the rate of which has steadily increased to over 64 percent of Maryland adults. Sedentary lifestyle is also a risk; only 50 percent of Marylanders said they participated in 150 minutes or more of physical activity per week in 2017. Additionally, there are disparities in how diabetes and its risk factors affect Marylanders with racial/ethnic minorities, those with less education, lower income, and various disabilities disproportionately affected. Diabetes and its complications cost the State over $4.92 billion per year, and an additional $2 billion in lost productivity.

The Maryland Diabetes Action Plan (the Plan) includes details on the current burden of diabetes and the factors impacting diabetes risk. The Plan presents action steps that organizations and partners can implement to prevent and manage diabetes in Maryland. These actions steps are categorized using a systems change model approach, working upstream to people at a healthy weight, then progressing as the risk increases with people who are overweight and obese, followed by those with prediabetes or history of gestational diabetes, and finally includes steps to improve outcomes in those identified with diabetes and diabetes complications.

Our vision is to work with all Maryland partners, across multiple sectors, to identify areas where they currently work or have the capability of working, to align their efforts, resources, and funds to make strides in reducing diabetes burden in the State. The Plan includes action tables that contain strategies and actions steps targeted to:

- People at a healthy weight, so they may prevent overweight and obesity;
- People who are overweight and obese, so they may achieve a healthy weight;
- People with prediabetes and gestational diabetes, so they may easily take part in prevention programs to halt disease progression; and
- People with diabetes, so they may control their disease, get the proper medical care they need to manage their disease and enjoy their optimum health.

In preparation of this Diabetes Action Plan, a process was completed to inventory obesity, prediabetes, and diabetes programs in Maryland. The aim of the inventory is to assess the availability of programs across Maryland that address diabetes prevention, care, and

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management. While the required level of service provision across the state cannot be determined through the inventory alone, the Maryland Department of Health aims to use this process to begin to identify resource gaps and opportunities to expand efforts to address diabetes moving forward. The scope of the inventory is all programs serving Marylanders, including those that serve Medicaid enrollees, Medicare enrollees, commercial and small business health insurance enrollees, and the uninsured population.

As Maryland seeks to prevent and better manage diabetes, all partners are encouraged to implement action steps, while also sharing innovative and best practices for expansion across the state that aligns with the Diabetes Action Plan and improves the health of all Marylanders.

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I. The Burden and Consequences of Diabetes in Maryland

What is Diabetes?

Diabetes is a chronic disease that affects the way the body handles glucose, which is the sugar in the blood used by the body for energy.[1] An inability of cells to properly absorb glucose, due to inadequate insulin production or a resistance of cells to the action of insulin, or both, results in high blood glucose levels, which is called diabetes. There are several types of diabetes, the most common of which is type 2 diabetes. The other major types are type 1 diabetes, which usually occurs in children and adolescents, and gestational diabetes, which occurs during pregnancy.[2]

Type 1 diabetes results from an autoimmune attack against the cells in the pancreas that produce insulin. This leads to an almost complete lack of insulin, early severe symptoms, and a dependence on insulin treatment to sustain life. About 4% of diabetes in the United States is Type 1 diabetes.[3] The risk factors and interventions discussed in this Plan may not all apply to Type 1 diabetes.

Type 2 diabetes results in most cases from a resistance to the action of insulin on cells. This insulin resistance is related to overweight and obesity, particularly fat located in the abdomen. The degree to which the insulin resistance manifests as high blood sugar depend on how well, and for how long, the pancreas can overproduce insulin to compensate for the insulin resistance in the cells. A decline in the insulin production capacity with older age is one reason that type 2 diabetes often emerges at older ages. Type 2 diabetes can exist without symptoms for years, which is why approximately 24% of persons with diabetes don't know that they have it.[4] About 95% of diabetes in the United States is type 2 diabetes. The risk factors and interventions discussed in this plan are designed for type 2 diabetes.

Most public health surveillance data do not distinguish between type 1 and type 2 diabetes but refer to the two combined. However, since type 2 diabetes is 95% of the total[5], patterns seen in the surveillance data are the patterns of type 2 diabetes. Public health data also often only measure persons who know that they have diabetes, which means that true diabetes prevalence may be approximately one third higher than the estimates of diagnosed diabetes prevalence.

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[1] Maryland Department of Health, Center for Chronic Disease Prevention and Control, Diabetes https://phpa.health.maryland.gov/ccdpc/diabetes/Pages/about.aspx
[2] Diabetes Care. January 01 2019; volume 42 issue Supplement 1.
[3] ADA website https://www.diabetes.org/resources/statistics/statistics-about-diabetes
[4] Id
[5] Id

Prediabetes is a condition where blood sugar levels are higher than normal, but not high enough to be considered diabetes.[1] Prediabetes is a precursor condition on the pathway from normal glucose levels to type 2 diabetes; the development of type 1 diabetes is usually so rapid that there is no "prediabetes" state that precedes type 1 diabetes. A fasting glucose level of 110 to 125 mg/dL, a hemoglobin A1c level of 5.7% to 6.4%, or a two-hour glucose level in an oral glucose tolerance test of 140 to 199 mg/dL defines prediabetes.[6]

Prediabetes often goes unrecognized by both individuals and their health care providers; nine of 10 adults who have prediabetes do not know they have it.[7] CDC estimates that 34 percent of U.S. adults have prediabetes.[8] Diabetes and prediabetes are serious conditions that can lead to complications including heart disease and stroke, blindness, amputations, nerve damage, and kidney disease.[1]

A disease is important to public health if it is both common and has serious consequences. Diabetes is both common and serious in Maryland.

How Common is Diabetes in Maryland?

Adults with Diagnosed Diabetes and Its Precursor Conditions in Maryland

An estimated 10.5% of the adult population in Maryland, or 488,942 adults, have diabetes.[9,10] In Maryland an estimated 1.6 million adults or 34 percent of the adult population have prediabetes (see Figure 1 below).[11,12]

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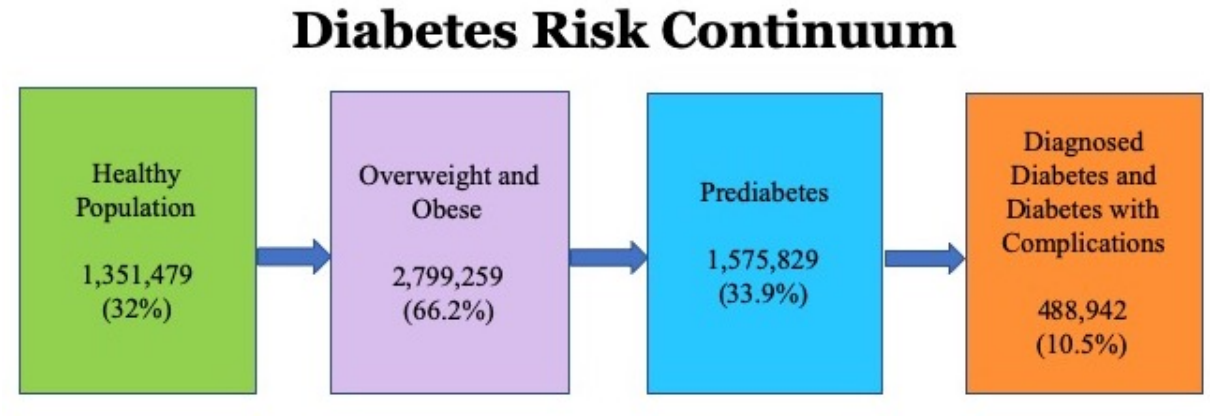
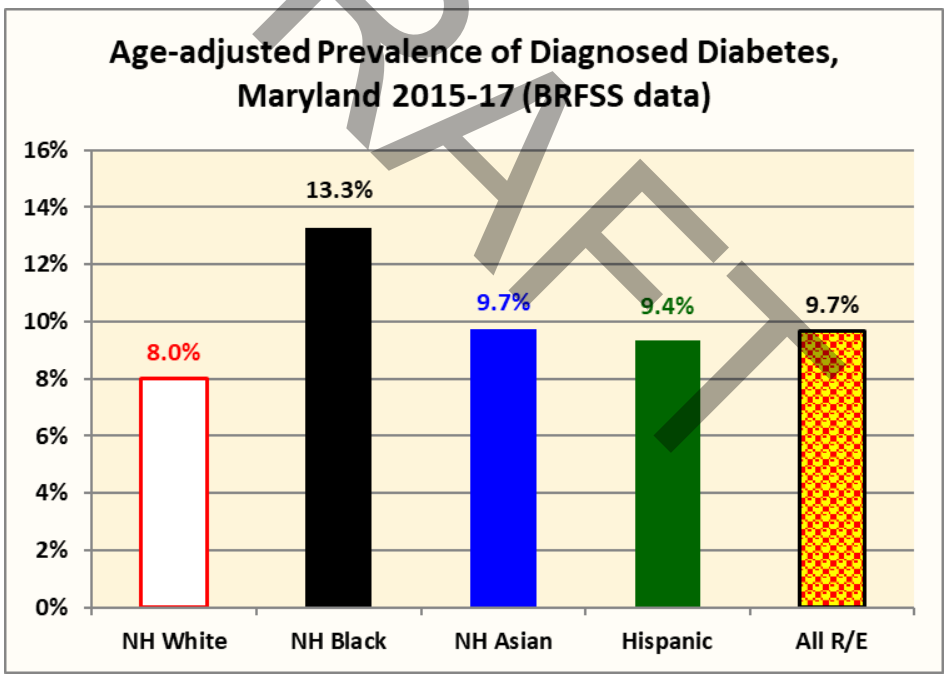
[6] https://www.cdc.gov/diabetes/basics/getting-tested.html
[7] https://www.cdc.gov/diabetes/basics/prediabetes.html
[8] Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2017. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services; 2017.
[9] Maryland Behavioral Risk Factor Surveillance System (BRFSS), 2017.
[10] United States Census, 2017.
[11] Diabetes Care. January 01 2019; volume 42 issue Supplement 1.
[12] Based on Maryland Adult Population, sources: US 2017 Census; 2017 Maryland BRFSS; and Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2017. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services; 2017.

Figure 1: Diabetes Risk Continuum[13]



The adult prevalence of diagnosed diabetes is highest in Non-Hispanic (NH) Blacks, followed by Non-Hispanic Asians and Hispanics, and lowest in NH Whites, as shown in Figure 2 below.

Figure 2: Age-adjusted Adult Prevalence of Diagnosed Diabetes by Race/Ethnicity (R/E), Maryland 2015-17 (BRFSS)



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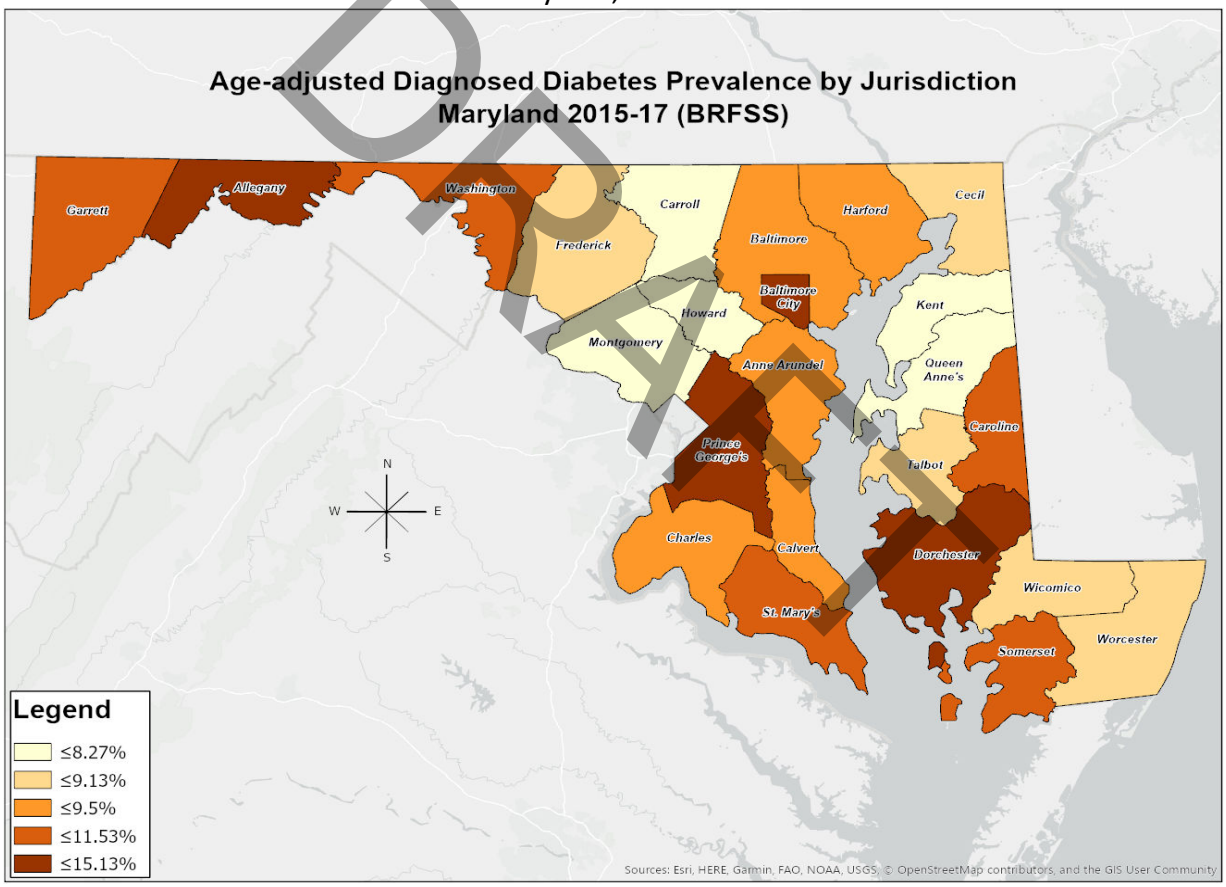
[13] Based on Maryland Adult Population, sources: US 2017 Census; 2017 Maryland BRFSS; and Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2017. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services; 2017. Categories are not equal, percentages in this figure do not equal 100.

Geographic Distribution of Diabetes in Maryland

Adult prevalence of diagnosed diabetes is mapped in Figure 3 below. As shown in Figure 4 on the next page, the jurisdictions with prevalence rates of adults with diagnosed diabetes that exceed the Maryland Statewide rate are Dorchester, Allegany, Prince George's, Garrett, Washington, Somerset, and Caroline Counties and Baltimore City.[14] These high rates of diabetes are seen in jurisdictions with high minority populations (Baltimore City, Prince George's County) and in certain rural jurisdictions in Western and Southern Maryland and on the Eastern Shore. Notably, all three jurisdictions in Western Maryland are among the six highest prevalence rates.

Figure 3: Map of Age-Adjusted Adult Prevalence of Diagnosed Diabetes by Jurisdictions, Maryland, 2015-2017



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There are several reasons for the high diabetes prevalence rates in rural jurisdictions. Many rural residents experience risk factors for diabetes and may lack access to services to prevent diabetes or manage their diabetes. Rural residents, as well as the urban poor, experience barriers to adequate physical activity and healthy eating. Additional challenges revolve around

[14] Maryland BRFSS, 2015-2017.

access to health care, including shortages of physicians and providers located in rural areas. Workforce shortages in rural areas may decrease provider referral to National DPP, Diabetes Self-Management Education and Support (DSMES) programs, and nutrition programs, as well as the availability of these programs. Other challenges include limited access to transportation to travel to appointments with primary care or specialty care providers.

Figure 4: Age-adjusted Adult Prevalence of Diagnosed Diabetes by Jurisdiction, Maryland 2015-17 (BRFSS)

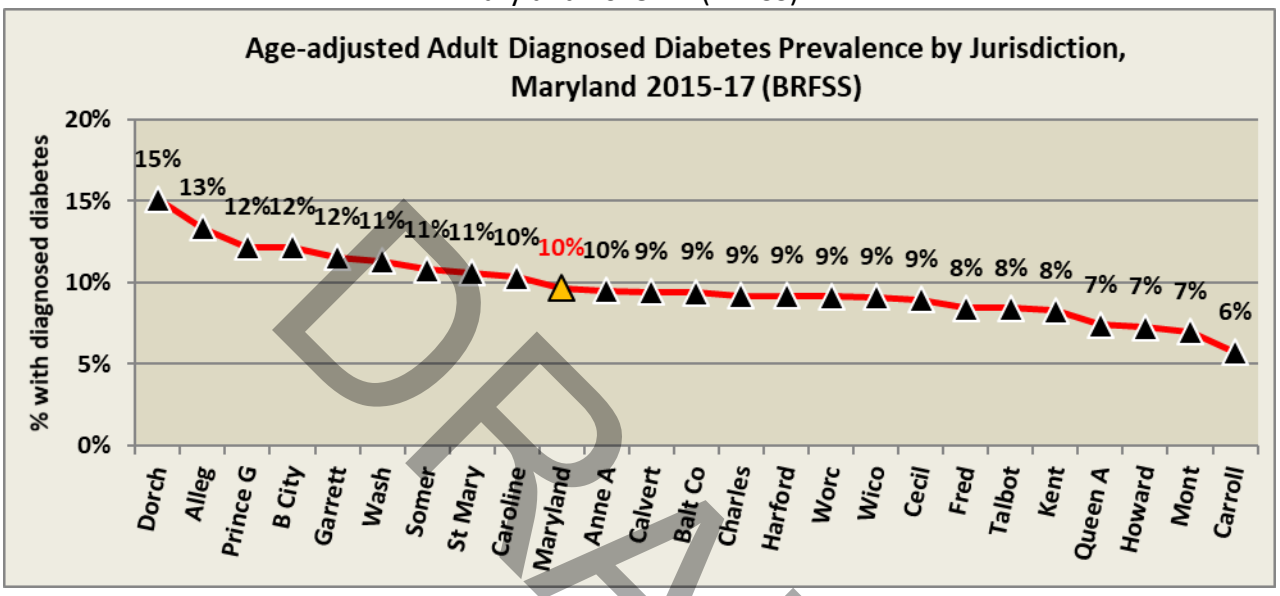
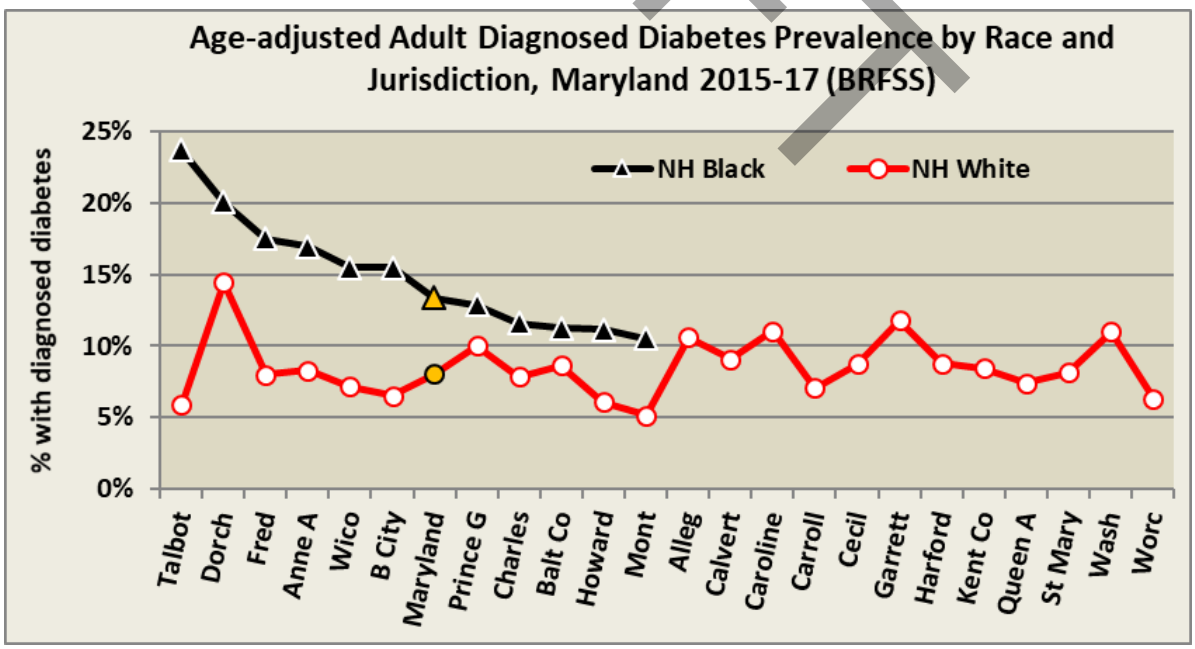


Figure 5: Age-adjusted Adult Prevalence of Diagnosed Diabetes by Race and Jurisdiction, Maryland 2015-17 (BRFSS)



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The range of adult diabetes prevalence rates becomes even greater when rates by race and jurisdiction are examined, as shown in Figure 5. The NH White rate in Dorchester County is particularly high at 14%, with other NH White rates ranging from 5% to 12%. The Black rates start at a low of about 11% in Howard and Montgomery counties and rise to a high of 20% and 24% in Dorchester and Talbot counties respectively (among the jurisdicitons where the NH Black rate is reportable). Of note, Dorchester County has the highest NH White rate, and the second highest NH Black rate.

These data indicate that diagnosed diabetes is common in Maryland, and that the burden of diabetes prevalence varies by race and place. The consequences of diabetes for Maryland are presented below.

How Serious are the Consequences of Diabetes for Maryland?

Diabetes as a Cause of Death

Diabetes is the sixth leading cause of death in Maryland; in 2017, 2.9 percent of all deaths in the State were due to diabetes.[15] Diabetes is also a risk factor for heart disease (leading cause of death in Maryland) and stroke (third leading cause of death in Maryland), and so contributes to even more deaths in Maryland than those specifically attributed to diabetes on death certificates.[16]

Figure 6 below shows that the age-adjusted diabetes mortality rate in Maryland declined from 21.7 in 2008 to a recent low of 18.3 in 2015, but then rose to 20.3 per 100,000 people in 2017. This increase from 2015 to 2017 occurred in the Black population but not in the White population. Consistent with the greater burden of diabetes prevalence in the Black community, the diabetes mortality rate for Blacks is about twice as high as the mortality rate for Whites.[17]

Comparing Maryland to the United States (Figure 7), death rates were essentially identical in 2008. From 2008 to 2015, Maryland improved more rapidly than the US. . However, after 2015, the rising Black diabetes death rate in Maryland has resulted in the overall Maryland rate converging toward the national rate.[18,19]

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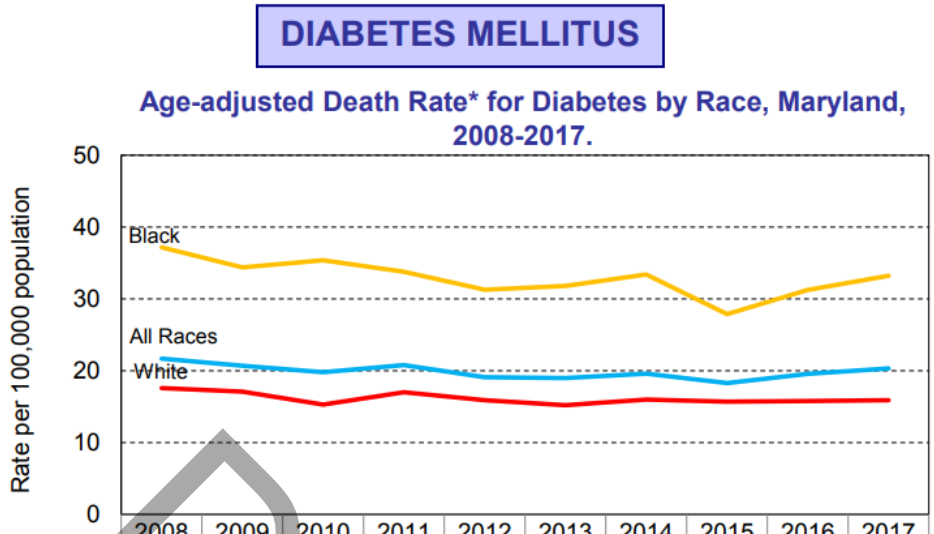
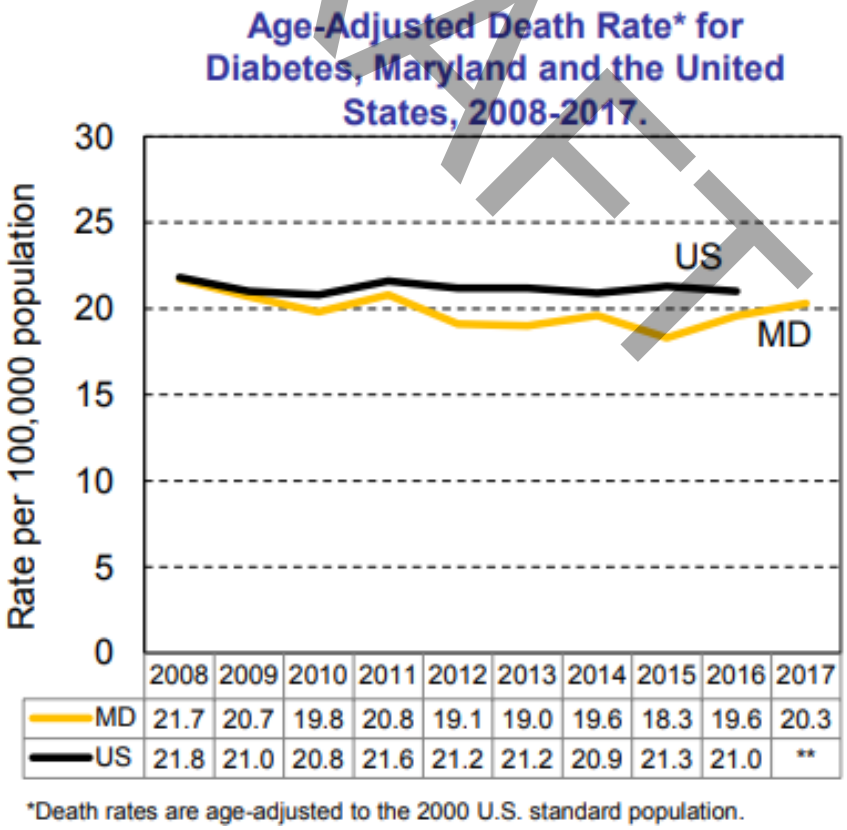
[15] Maryland Vital Statistics Annual report (2017): https://health.maryland.gov/vsa/Documents/Reports%20and%20Data/Annual%20Reports/2017annual_revised.pdf
[16] https://www.cdc.gov/diabetes/diabetesatwork/pdfs/DiabetesWhatIsIt.pdf
[17] Id fn 11
[18] Id fn 11
[19] Id fn 11

Figure 6: Age-Adjusted Death Rate for Diabetes, by Race, Maryland 2008-2017



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
All Races	21.7	20.7	19.8	20.8	19.1	19.0	19.6	18.3	19.6	20.3
White	17.6	17.1	15.3	17.0	15.9	15.2	16.0	15.7	15.8	15.9
Black	37.2	34.4	35.4	33.8	31.3	31.8	33.4	27.9	31.3	33.2

Figure 7: Age-adjusted Death Rate for Diabetes, Maryland and the United States, 2008-2017



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
MD	21.7	20.7	19.8	20.8	19.1	19.0	19.6	18.3	19.6	20.3
US	21.8	21.0	20.8	21.6	21.2	21.2	20.9	21.3	21.0	**

*Death rates are age-adjusted to the 2000 U.S. standard population.

Source: Maryland Vital Statistics Annual report (2017)

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Complications of Diabetes

Diabetes causes a variety of serious complications related to its effects on large and small blood vessels. Diabetes promotes atherosclerosis, the process where cholesterol builds up in the larger blood vessels. This increases the risk of heart disease, heart attacks, strokes, and peripheral vascular disease (blocked arteries in the arms and legs). The effects of diabetes on small blood vessels leads to eye disease, blindness, kidney disease, end-stage kidney failure that requires transplant or dialysis, and nerve disease. The combination of nerve disease and vascular disease in the legs results in amputations caused by diabetes.[20]

Utilization Rates and Costs for Diabetes

Diabetes-related hospital discharges in Maryland

In 2017, a total of 11,735 hospital discharges (inpatient and observation stays greater than or equal to 24 hours) were reported with diabetes as the primary diagnosis among Maryland adults aged 18 years or older. This is equivalent to 2.5 hospital discharges per 1000 Maryland adults. [21] [22]

Table 1: Diabetes-related Hospital Discharge Count and Rate per 1000 Adult Marylanders

	2013	2014	2015	2016	2017	2018
Discharges	10,676	10,689	10,357	10,823	11,735	11,738
Discharges per 1000 adults	2.38	2.35	2.26	2.35	2.52	2.53

The numerator is discharges with diabetes-related primary diagnosis code at Maryland hospitals among adults with valid Maryland zip codes, denominator is adult Maryland population based on 5-year American Community Survey. 2017 denominator is used for 2018.

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[20] https://www.cdc.gov/diabetes/diabetesatwork/pdfs/DiabetesWhatIsIt.pdf
[21] Trends between the ICD9 period (2013-2015) and ICD 10 period (2016-2018) should be treated with caution due to ICD transition. For this section, diabetes refers to Type 1 and Type 2 diabetes.
[22] MATCH, Health Service Cost Review Commission (HSCRC), Maryland Hospital Discharges and Ambulatory Care Data.

Diabetes-related Prevention Quality Indicators (PQIs)

PQIs reflect admissions for ambulatory-care sensitive conditions that could have been prevented with access to high-quality outpatient care. The Agency for Healthcare Research and Quality has specified 4 individual PQIs[23,24] for diabetes and one composite:

- PQI 01 Diabetes Short-Term Complications Admission Rate (primary diagnosis code of diabetes with: ketoacidosis, hyperosmolarity, or coma)
- PQI 03 Diabetes Long-Term Complications Admission Rate (primary diagnosis code of diabetes with: renal, eye, neurological, circulatory, or complications not otherwise specified)
- PQI 14 Uncontrolled Diabetes Admission Rate (primary diagnosis code of diabetes without mention of short term or long-term complications)
- PQI 16 Lower-Extremity Amputation among Patients with Diabetes Rate (any-listed diagnosis of diabetes and any-listed procedure of lower-extremity amputation)
- PQI 93 Diabetes Composite (includes any of the four above PQIs)

As indicated in the table below, the number of Diabetes PQIs in Maryland and the rate of Diabetes PQIs per 1000 adults have fluctuated over time but have generally increased since 2013.[25]

Table 2: PQI 93 Discharge Frequency and Rate per 1000 Adult Marylanders

	2013	2014	2015	2016	2017	2018
PQI 93 Discharges	10,494	10,511	10,045	9,539	10,484	11,571
Discharges per 1000 adults	2.34	2.34	2.24	2.13	2.34	2.58

The disease burden of diabetes also reflects a healthcare disparity by race (see Figure 8). Black Marylanders experience a higher rate of diabetes-related avoidable hospitalizations compared to white Marylanders, with 434 people having diabetes-related avoidable hospitalizations for every 100,000 Black Marylanders (or 4.34 per 1000) compared to 170 for every 100,000 White Marylanders (or 1.7 per 1000) in 2017.[26] This means that the

[23] https://www.healthypeople.gov/2020/topics-objectives
[24] Many, but not all, discharges with a primary diagnosis of diabetes are included in the PQI counts. For example, Marylanders younger than 18 and those transferred from another institution are not included in the PQI counts
[25] MATCH, Health Service Cost Review Commission (HSCRC), Maryland Hospital Discharges and Ambulatory Care Data.
[26] MATCH, Health Service Cost Review Commission (HSCRC), Maryland Hospital Discharges and Ambulatory Care Data.

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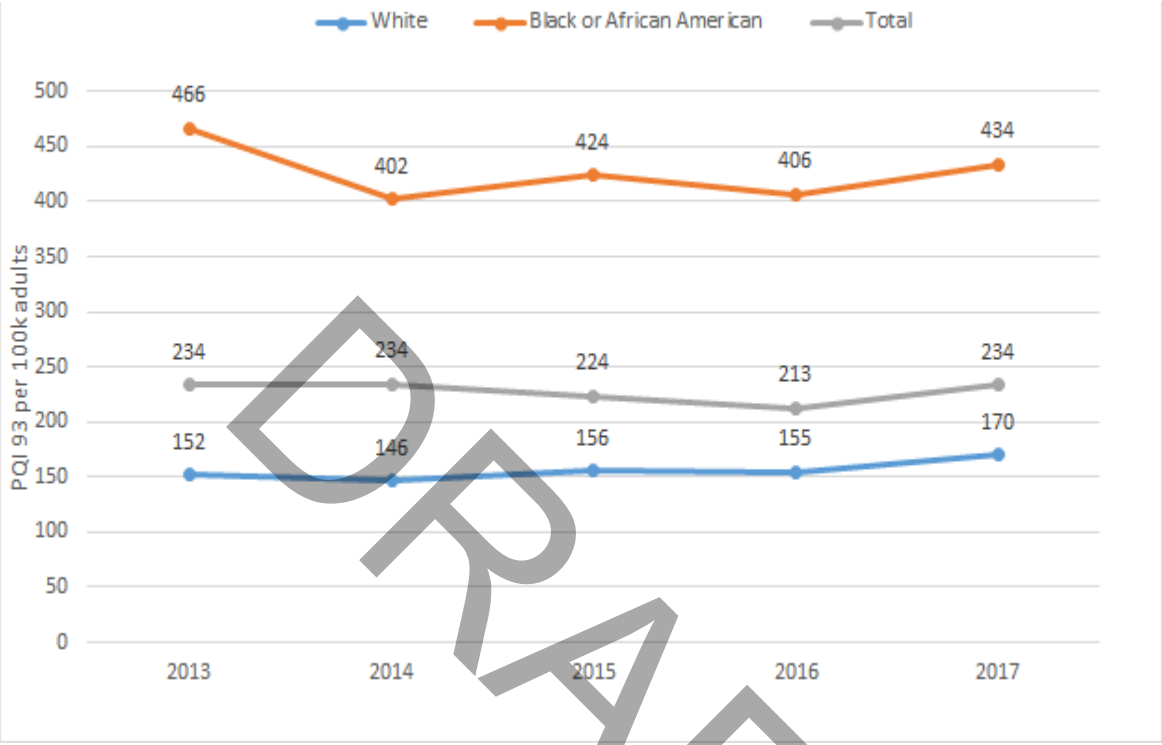
Black rate is 2.6 times as high as the White rate, and that 62% of Black discharges are excess (would not occur if Black rate was the same as White rate).

Figure 8: Diabetes Composite (PQI 93) per 100,000 Population Aged 18+



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Diabetes Inpatient Hospital Charges

In 2017, Maryland hospitals charged approximately $197 million for diabetes-related hospital stays for Marylanders, compared to $150 million dollars in 2013, an increase of more than 30%. This estimate includes Maryland residents of all ages with a primary diagnosis of diabetes or a diabetes-related complication (such as lower-extremity amputation). The estimate excludes patients seen in the ED and released without an inpatient stay.

Diabetes Emergency Department Visits

In 2017, there were a total number of 121,301 ED visits related to Diabetes.[27] This indicates a rate of 20.23 visits per 1,000 Marylanders.

[27] Defined based on CCS categories among all patients at Maryland hospitals

Table 3: Diabetes-related ED Visit Count and Rate per 1,000 Population

	2013	2014	2015	2016	2017
Number of ED visits	122,439	123,875	124,928	124,420	121,301
Population	5,834,299	5,887,776	5,930,538	5,959,902	5,996,079
Visit Rate per 1,000	20.99	21.04	21.07	20.88	20.23

Utilization Differences for Medicaid Enrollees With vs. Without Diabetes

- Compared to Medicaid enrollees without diabetes, enrollees with diabetes (
- Table 4):
- Are 2.4 times as likely to have an inpatient admission;
- Have four times as many admissions per enrollee;
- Are 1.3 times as likely to have an ED visit;
- Have 1.7 times as many ED visits per enrollee;
- Are 1.1 times as likely to have an ambulatory visit;
- Have 2.3 times as many ambulatory visits per enrollee;
- Have 3.1 times the level of average fee-for-service payment; and
- Have 2.5 time the level of average MCO payment.

Table 4: Admission, ED Visit, and Ambulatory Visit Prevalence and Rates; and Average Payments Comparing Medicaid Enrollees with and without Diabetes, Maryland, 2017

Calendar Year 2017	Medicaid Enrollees with Diabetes	Medicaid Enrollees without Diabetes	Ratio: Diabetes to No Diabetes
% with One or More Inpatient Admissions	**24.8%**	**10.3%**	**2.4**
Average Admissions per Enrollee	**0.4**	**0.1**	**4.0**
% with One or More ED visits	**42.7%**	**33.2%**	**1.3**
Average ED visits per Enrollee	**1.2**	**0.7**	**1.7**
% with One or More Ambulatory Visits	**93.4%**	**87.0%**	**1.1**
Average Ambulatory Visits per Enrollee	**11.8**	**5.1**	**2.3**
Average Fee-for-Service Payment	**$12,334**	**$3,961**	**3.1**
Average MCO Payment	**$9,794**	**$3,909**	**2.5**

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Cost Burden of Diabetes in Maryland

Diabetes and prediabetes cost an estimated $7.01 billion in Maryland each year.[28] Serious complications of diabetes include heart disease, stroke, amputation, end-stage kidney disease, blindness, and death.

People with diabetes have medical expenses approximately 2.3 times higher than those who do not have diabetes. [29]Total direct medical expenses for diagnosed and undiagnosed diabetes, prediabetes and gestational diabetes in Maryland was estimated at $4.92 billion in 2017.[29] In addition, another $2.09 billion was spent on indirect costs from lost productivity due to diabetes.[29]

People with diabetes cost the State's Medicaid program twice as much as those without the chronic condition, a study commissioned by MedChi, the Maryland State Medical Society has found.[30]

Medicaid Costs of Diabetes in Maryland

Diabetes has a significant financial impact on the Maryland Medicaid program. In CY 2017, total expenditures for Medicaid participants with diabetes amounted to nearly $1.9 billion dollars. Between CY 2013 and CY 2017, total Medicaid per-member-per-month (PMPM) expenditures for individuals with diabetes was two to three times higher than users without diabetes ($1,652 vs. $688 in CY 2017). Similar to the PMPM expenditures, average Medicaid expenditures among eligible individuals with diabetes was two to three times higher than for individuals without diabetes ($18,202 vs. $7,516 in CY 2017).[31] For individuals with diabetes, the average Medicaid PMPM expenditure reduced from $1,746 to $1,652 among users between CY 2013 and CY 2017. This decrease in PMPM indicates the potential success of the HealthChoice program in proactively targeting diabetes management, reducing the need for potentially avoidable advanced treatment due to diabetes complications.

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[28]https://www.medchi.org/Portals/18/files/pdfs/Cost%20of%20Diabetes%20to%20MD%20Taxpayers_MedChi%20Portion_FINAL_.pdf?ver=2016-10-27-143221-833
[29] American Diabetes Association
[30] Id fn 28
[31] The average Medicaid expenditure does not adjust for participants for the length of enrollment in Medicaid (*i.e.*, the costs for the one cohort could be higher because the cohort is enrolled for longer periods in Medicaid and has more opportunity to receive services). The PMPM method adjusts for length of Medicaid enrollment.

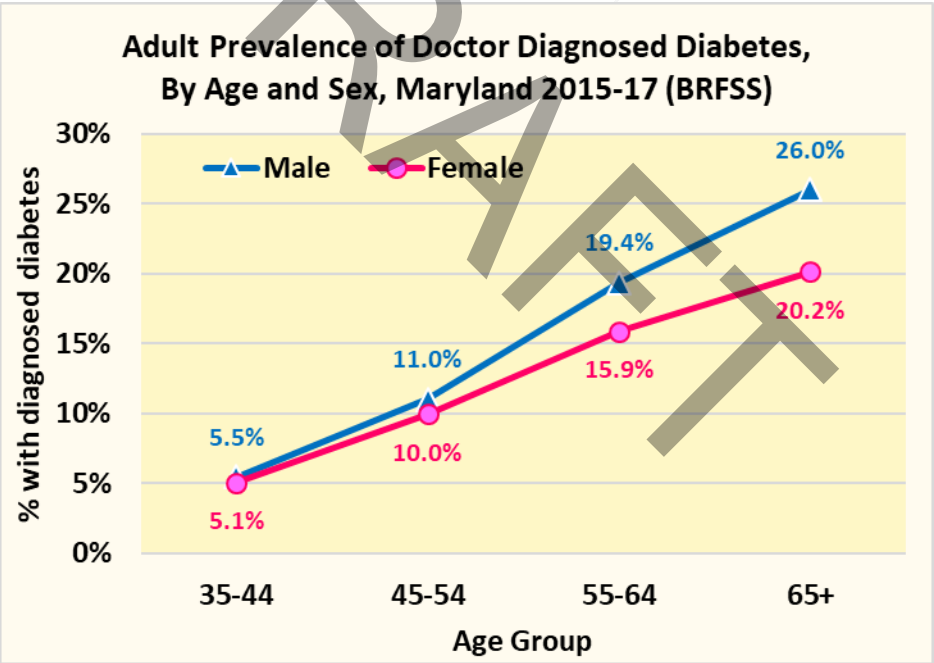
II. Determinants and Risk Factors for Diabetes: Opportunities for Intervention

Diabetes by Age and Sex

Diabetes is more common in older adults. In Maryland, in 2015-17 combined, about 26 percent of men and 20.2 percent of women aged 65 and older had been diagnosed with diabetes compared to about 5 percent of adults aged 35-44 (Figure 9: Adult Prevalence of Doctor-Diagnosed Diabetes, by Age and Sex, Maryland 2015-17 (BRFSS)

).[32] Diabetes in older adults has been linked to reduced functional status, higher mortality, and increased risk of institutionalization.

Figure 9: Adult Prevalence of Doctor-Diagnosed Diabetes, by Age and Sex, Maryland 2015-17 (BRFSS)



The increasing prevalence of diabetes with increasing age is part of the natural history of the disease, which means that these age differences are not an "age disparity." Obesity is more common at older ages, which increases insulin resistance, and reduction of insulin secretion also occurs at older ages.

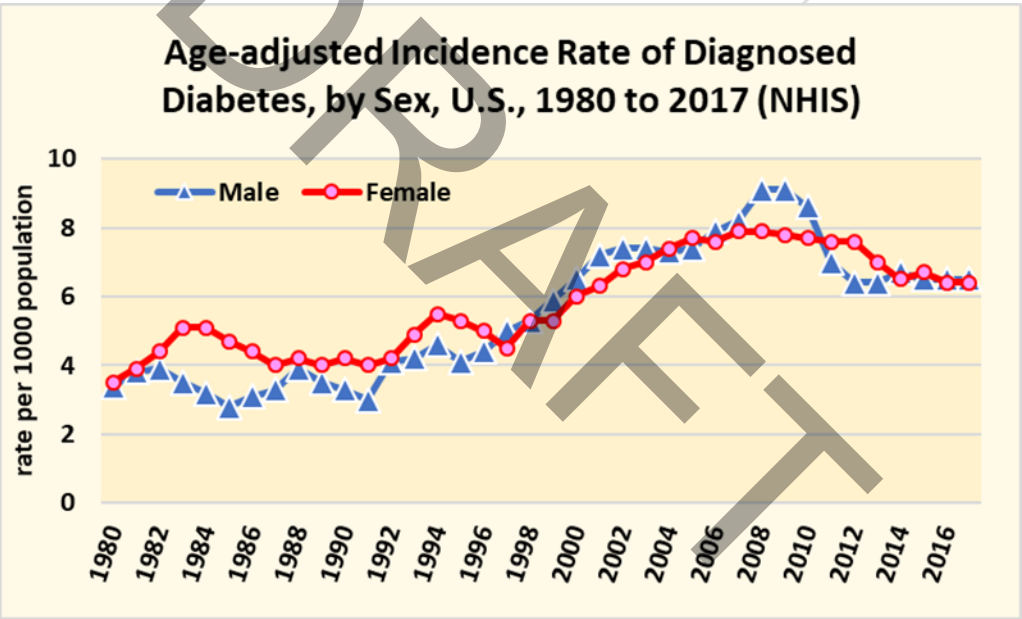
[32] Maryland BRFSS, 2015-17.

Age is not a modifiable factor but understanding age effects is important to evaluating other determinants and risk factors. Because of this strong age effect, the remaining analyses will display age-adjusted diabetes prevalence rates to disentangle the effects of age from the effects of other determinants and risk factors.

Gender is generally not considered to be a risk factor for diabetes. In Figure 9: Adult Prevalence of Doctor-Diagnosed Diabetes, by Age and Sex, Maryland 2015-17 (BRFSS)

above, male and female prevalence is essentially the same below age 55. While there are somewhat higher rates for males at ages 55 and older, this does not mean that females should be considered a "low risk" group.

Figure 10: Age-adjusted Adult Incidence Rate of Diagnosed Diabetes, by Sex, U.S., 1980 to 2017 (National Health Interview Survey)



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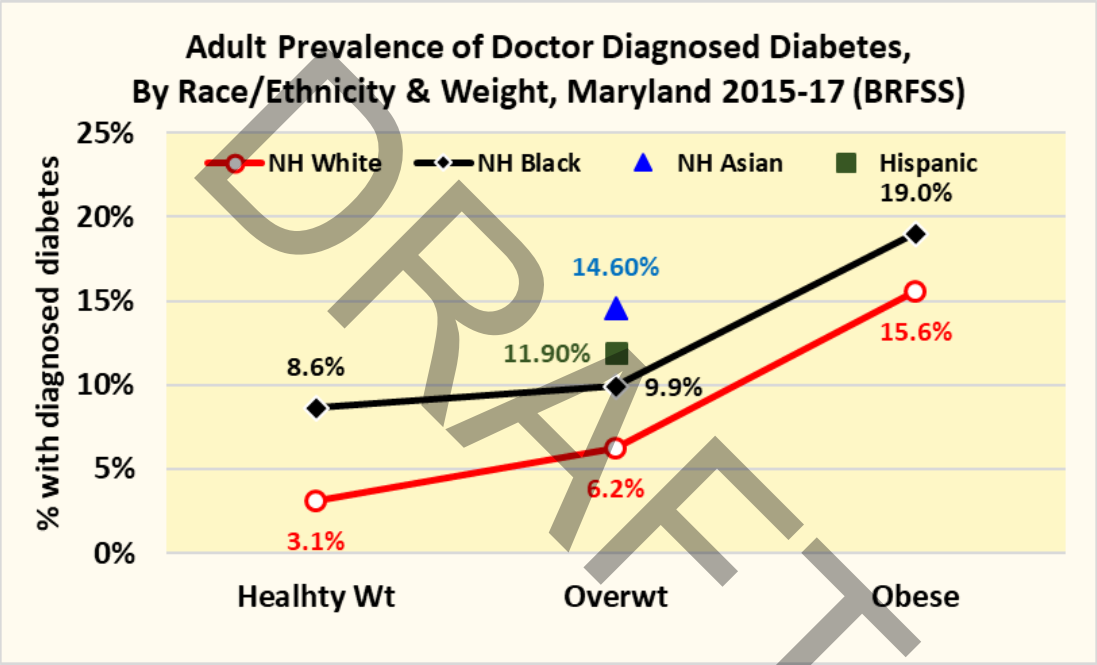
Diabetes and Weight

In Maryland, as in the nation, the prevalence of diabetes increases as weight classification moves from healthy weight, through overweight, and to obesity. As seen in Figure 11 below, in Maryland there is a small step-up in diabetes prevalence between healthy weight and overweight, and a larger step-up in prevalence between overweight and obesity. This relationship of prevalence to weight status is similar for Non-Hispanic Blacks and Non-Hispanic Whites.

In addition, Figure 11 shows that the higher diabetes prevalence for minorities presented earlier (Figure 2) persists within weight categories, with NH Black diabetes prevalence higher than NH White in all weight categories, and Hispanic and Asian prevalence higher at

overweight (the only category with reportable data for those populations in this analysis). This indicates that the racial/ethnic disparity in diabetes prevalence is not simply an issue of more excess weight in minority populations, although for some groups that contributes to the disparity.

Figure 11: Age-adjusted Adult Prevalence of Doctor-Diagnosed Diabetes, by Race/Ethnicity and Weight Status, Maryland 2015-17 (BRFSS)



Higher BMI correlates with greater abdominal fat, and abdominal fat increases insulin resistance, which can produce high levels of blood glucose.[33] Insulin is produced by the pancreas and is the hormone that moves the sugar out of the blood and into the cells. When an individual has excess body fat, the body's cells become resistant to insulin, which is why overweight, and obesity are risk factors for diabetes. The body's response to insulin-resistant cells increases insulin production to the point that the pancreas begins to fail to keep up with the insulin demand. Failure to produce and/or utilize enough insulin results in diabetes.

[33] NIDDK, https://www.niddk.nih.gov/health-information/diabetes/overview/preventing-type-2-diabetes

Adult Prevalence of Excess Weight in Maryland

Based on data from 2017, in Maryland, 34.6 percent of the population is overweight, and 30.8 percent of the population is obese.[29] Five-year trend data shows that the proportion of Marylanders who are obese is increasing, and the proportion of Marylanders who are overweight has been relatively stable. In addition, the healthy weight population in Maryland is decreasing from 35.1 percent in 2013 to 32.7 percent in 2017. [34]

Table 5: Trend in Age-adjusted Adult Prevalence of Weight Classification (BMI groups), Maryland 2013-2017

Adult Weight Classification by Body Mass Index (BMI) Age-Adjusted Prevalence and Trend, Maryland 2013-2017[35]					
	2013	**2014**	**2015**	**2016**	**2017**
Obese	27.6%	29.0%	28.2%	29.4%	30.8%
Overweight	35.5%	34.9%	35.7%	34.1%	34.6%
Healthy Weight	35.1%	34.5%	33.7%	34.8%	32.7%
Underweight	1.9%	1.6%	2.4%	1.8%	1.9%

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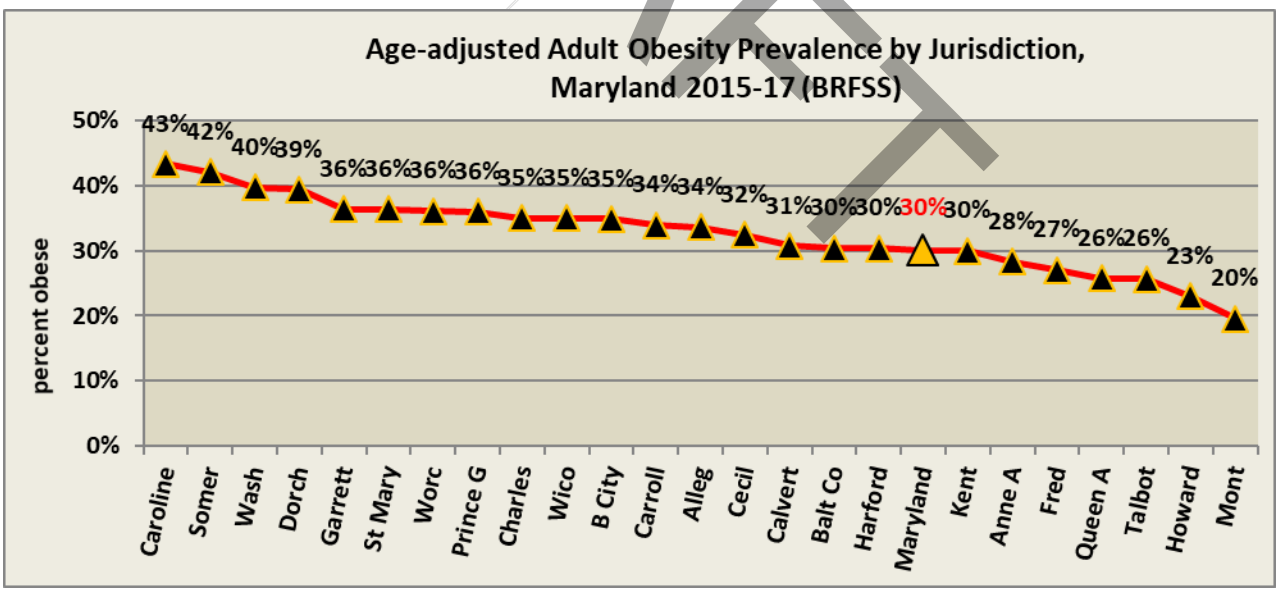
Figure 12: Age-adjusted Adult Obesity Prevalence by Jurisdiction, Maryland 2015-17 (BRFSS)



[34] Maryland Behavioral Risk Factor Surveillance System (BRFSS), 2017.
[35] Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health. BRFSS Prevalence & Trends Data. https://www.cdc.gov/brfss/brfssprevalence/.

Figure 12 shows a wide range of obesity prevalence rates by jurisdiction in Maryland, ranging from a low of 20% in Montgomery County to a high of 43% in Caroline County. Several factors influence the obesity prevalence rate in a jurisdiction, including the racial and ethnic mix and the socio-economic status of the population.

Overweight/Obesity in Women of Childbearing Age

The prevalence of overweight and obesity among women of childbearing age is of particular interest since this will determine the prevalence of pre-pregnancy diabetes and the incidence of gestational diabetes among pregnant women. Both conditions increase the risk of adverse infant and maternal outcomes.

Error! Reference source not found. below shows the weight category distribution of women age 18-44 for Non-Hispanic Whites and Non-Hispanic Blacks. For NH Whites, a slight majority of the women are in the healthy weight category (50.9%) while for NH Blacks the most prevalent weight category is obesity (40.8%). Both racial groups have similar prevalence of overweight, but very different prevalence in the healthy weight and obese categories.

Figure 13: Weight Category Distribution of Women of Childbearing Age, by Race

Maryland 2015-17 (BRFSS)

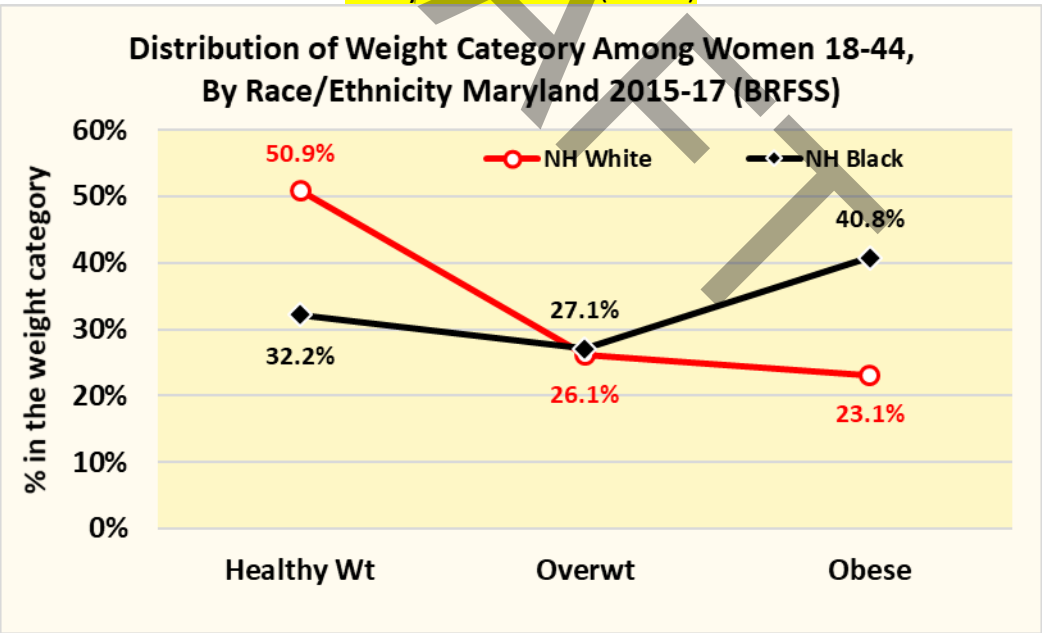


Table 6 below shows the pre-pregnancy BMI classification for pregnant women active in the Women Infants and Children (WIC) program Statewide and by jurisdiction. Statewide, 36%

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have an obese BMI, with a range of 29% in Montgomery and Garrett counties to 46% in Talbot, 48% in Dorchester and 61% in Somerset counties.

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Table 6: Pre-pregnancy BMI of Active Pregnant Women as of 10/7/2019, Maryland WIC Program

COUNTY	Underweight BMI < 18.5	Normal Weight BMI 18.5-24.9	Overweight BMI 25.0-29.9	Obese BMI ≥ 30.0
Allegany	4%	43%	21%	32%
Anne Arundel	2%	35%	26%	36%
Baltimore City	4%	31%	24%	40%
Baltimore County	4%	35%	25%	36%
Calvert	4%	35%	28%	33%
Caroline	1%	35%	28%	35%
Carroll	6%	38%	24%	32%
Cecil	5%	36%	23%	35%
Charles	6%	35%	27%	33%
Dorchester	2%	29%	21%	48%
Frederick	3%	37%	30%	30%
Garrett	8%	44%	19%	29%
Harford	7%	31%	26%	36%
Howard	1%	35%	34%	30%
Kent	5%	30%	24%	41%
Montgomery	3%	34%	34%	29%
Prince George's	3%	31%	31%	35%
Queen Anne's	0%	35%	29%	36%
Somerset	7%	20%	12%	61%
St. Mary's	3%	33%	22%	42%
Talbot	6%	12%	36%	46%
Washington	4%	35%	21%	39%
Wicomico	3%	35%	23%	40%
Worcester	5%	32%	29%	34%
State	3%	33%	28%	36%
Total Pregnant Women = 10,015				

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Children and Overweight

Maryland currently does not have state-level data on diabetes in children. The SEARCH for Diabetes in Youth study is aimed at understanding more about diabetes among children and young adults in the United States; the incidences of both type 1 and type 2 diabetes among

youths increased significantly in the 2002–2012 period, particularly among youths of minority racial and ethnic groups.[36]

State level data on overweight and obesity is available. In children and adolescents, overweight and obesity are defined by comparing weight for height (the Body Mass Index or BMI) to a reference population that precedes the recent rise in rates of childhood obesity. Comparisons are made to the corresponding age and sex of the child. Underweight is falling below the 5th percentile of that reference population, normal weight is being 5th to below 84th percentile, overweight but not obese is being 85th to below 95th percentile, and obese is being 95th percentile or above.[37]

The Maryland Youth Risk Behavior Survey (YRBS) is an on-site survey of Maryland students in a sample of middle and high school classrooms focusing on health-related behaviors and tobacco-use prevalence. The survey does not include elementary schools. The survey is conducted every two years and is self-reported. According to the 2016 Youth Risk Behavior Survey, 26.4 percent of Maryland high school students are overweight or obese.[38] The percentage of high school students who are overweight and obese were 11.5 percent and 14.9 percent, respectively. Based on this data, interventions and strategies to address overweight and obesity must be targeted to children and youth as well as adults to prevent diabetes.

The Women Infant and Children (WIC) program childhood participants (children 2 to 5 years of age, July–December 2018) have their height and weight checked during regular WIC visits. Table 6 below show that of these children, 17 percent were at or above 95th percentile BMI (obese), and 16 percent were of 85th to below 95th percentile BMI (overweight but not obese).

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[36] Incidence Trends of Type 1 and Type 2 Diabetes among Youths, 2002–2012. Elizabeth J. Mayer-Davis, Ph.D., Jean M. Lawrence, Sc.D., M.P.H., M.S.S.A., Dana Dabelea, M.D., Ph.D., Jasmin Divers, Ph.D., Scott Isom, M.S., Lawrence Dolan, M.D, Giuseppina Imperatore, M.D., Ph.D., Barbara Linder, M.D., Ph.D., Santica Marcovina, Ph.D., Sc.D., David J. Pettitt, M.D., Catherine Pihoker, M.D., Sharon Saydah, Ph.D., M.H.S., and Lynne Wagenknecht, Dr.P.H. et al., for the SEARCH for Diabetes in Youth Study*

[37] https://www.cdc.gov/obesity/childhood/defining.html

[38] Maryland Department of Health, Youth Behavior Risk Survey, 2016. https://phpa.health.maryland.gov/ccdpc/Reports/Pages/yrbs.aspx

Table 7: Prevalence of Weight Classes Among Children Participating in WIC in Maryland (by Jurisdiction, July-December 2018; 40,935 Total Children)

County	Under WT BMI <5th Percentile	Healthy WT BMI between 5th to < 84th percentile	Overweight BMI between 85th to < 94th percentile	Obese BMI ≥ 95th percentile
Maryland	**3%**	**63%**	**16%**	**17%**
Allegany	3%	67%	17%	13%
Anne Arundel	3%	65%	17%	14%
Baltimore City	3%	70%	15%	12%
Baltimore	3%	62%	17%	18%
Calvert	4%	62%	15%	20%
Caroline	3%	68%	15%	14%
Carroll	3%	58%	18%	21%
Cecil	1%	69%	15%	16%
Charles	5%	63%	18%	15%
Dorchester	3%	60%	18%	19%
Frederick	3%	62%	17%	18%
Garrett	5%	68%	15%	12%
Greater Baden	5%	62%	14%	18%
Harford	4%	69%	14%	13%
Howard	3%	64%	15%	17%
Johns Hopkins	3%	65%	14%	17%
Kent	4%	66%	16%	14%
Montgomery	2%	59%	18%	21%
Prince Georges	4%	62%	15%	18%
Queen Anne's	1%	64%	13%	22%
Somerset	7%	63%	13%	17%
St. Mary's	3%	67%	17%	13%
Talbot	1%	66%	15%	18%
Washington	4%	62%	18%	16%
Wicomico	4%	64%	15%	17%
Worcester	2%	67%	14%	17%

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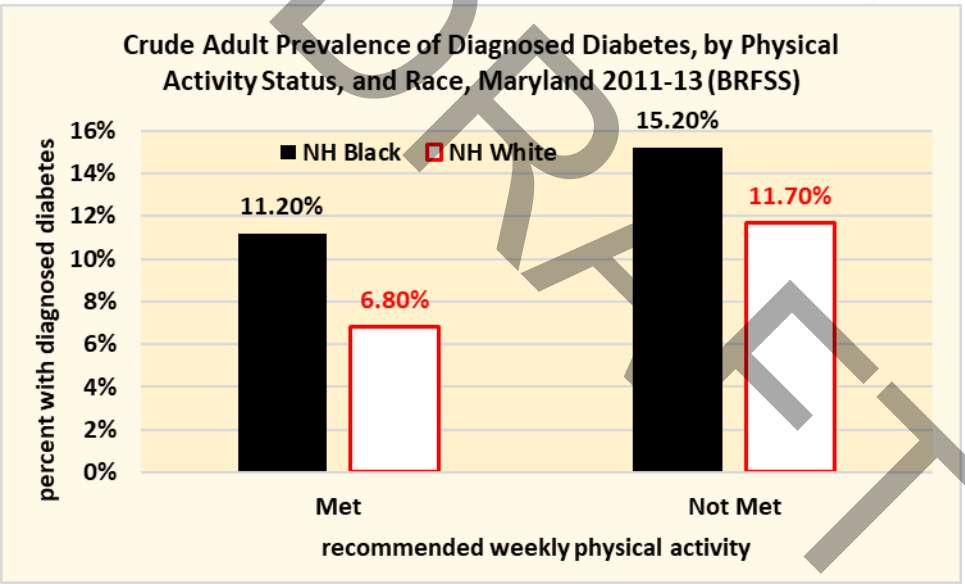
Diabetes and Physical Activity

Sedentary Lifestyle

The Physical Activity Guidelines for Americans encourages adults to move more and sit less. Adults should get at least 150 minutes of physical activity each week and children should be active for at least 60 minutes a day (preschool children should be moving throughout the day).[39] A sedentary lifestyle puts individuals at increased risk for developing a variety of chronic health conditions, including type 2 diabetes. Research shows that an active lifestyle reduces the risk of chronic health conditions like diabetes. The adult prevalence of diagnosed diabetes is higher in those who do not meet weekly physical activity guidelines compared to those who do meet those guidelines (Figure 14).[40]

Figure 14: Crude Adult Prevalence of Diagnosed Diabetes by Physical Activity Status and Race, Maryland 2011-13 (BRFSS)



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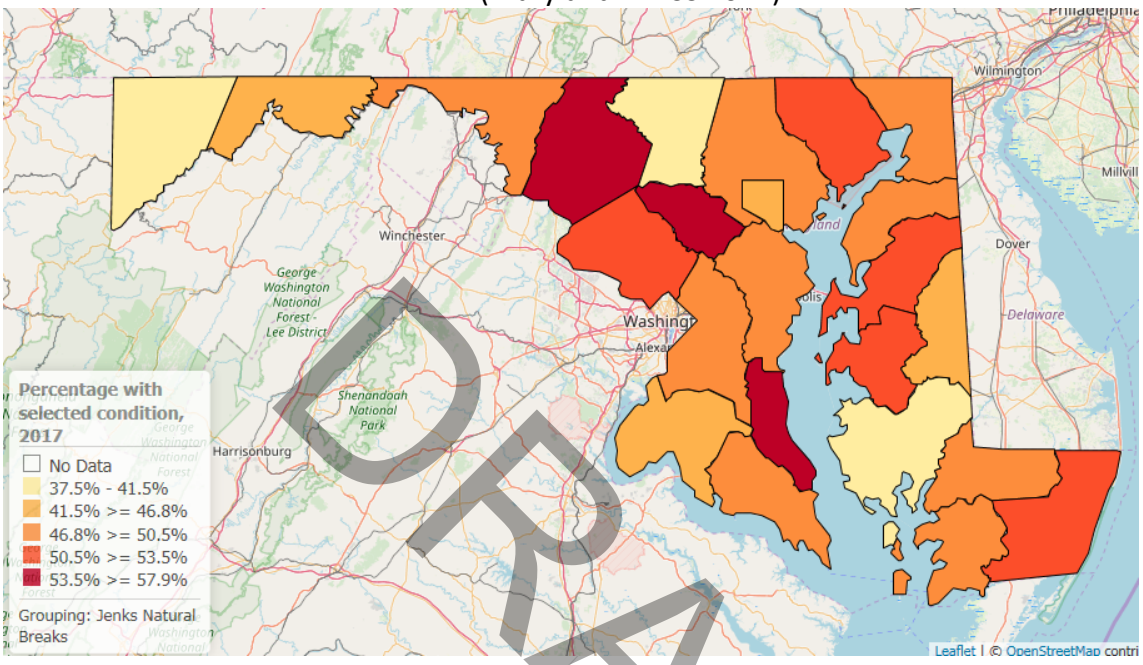
The pattern of lower diabetes prevalence in persons getting more physical activity is seen for both Non-Hispanic Whites and Non-Hispanic Blacks.

With physical activity being a determinant of diabetes, the distribution of physical activity participation across the State is important to program planning. In Maryland, adults without diabetes were more likely to participate in at least 150 minutes of moderate physical activity each week (51.9 percent) versus those with diabetes (44.2 percent). Meeting the physical

[39] https://www.cdc.gov/physicalactivity/index.html
[40] Maryland BRFSS 2011-13

activity recommendation is more common for NH Whites and Blacks compared with Hispanics.[41] The jurisdiction-specific prevalence of meeting the 150 minute per week physical activity recommendation is mapped in Figure 15 below.

Figure 15: Age -adjusted Prevalence of 150 Minutes per Week of Physical Activity (Maryland BRFSS 2017)



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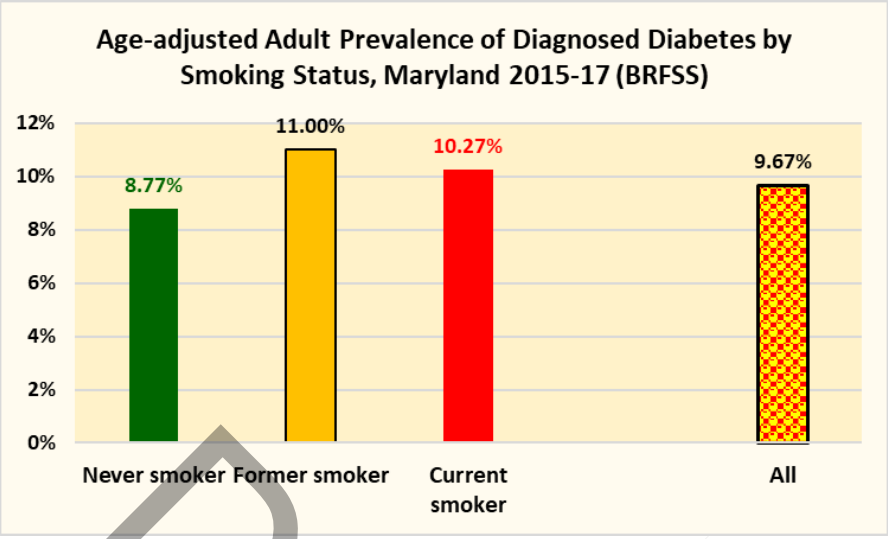
Diabetes and Tobacco

Smokers have a 30% to 40% higher risk of developing diabetes compared to non-smokers.[42] Studies have shown that smoking can increase blood sugar levels and decrease the body's ability to use insulin. People with diabetes who smoke need larger doses of insulin to control their blood sugar than those who do not smoke. Smoking can increase the risk of certain diabetes complications,[43] particularly the large blood vessel effects related to atherosclerosis (cholesterol deposits). These complications are heart disease, heart attacks, stroke, peripheral vascular disease, and amputations.

In Maryland, the adult prevalence of diagnosed diabetes is higher in current and former smokers than it is in non-smokers (Figure 17): about 8.8% of non-smokers have diagnosed diabetes, compared to 11.0% and 10.3% of former and current smokers, respectively.[44]

[41] Maryland BRFSS 2017
[42] https://www.cdc.gov/tobacco/campaign/tips/diseases/diabetes.html
[43] https://www.cdc.gov/diabetes/library/features/smoking-and-diabetes.html
[44] Maryland BRFSS 2015-2017

Figure 16: Age-adjusted Adult Prevalence of Diagnosed Diabetes by Smoking Status, Maryland 2015-17 (BRFSS)



Because smoking is a synergistic cause with diabetes for large blood vessel complications (heart attacks, strokes, leg artery blockage and amputations), smoking is an important risk factor to target among persons with diabetes. In 2017, 17.9% of Maryland adults with diabetes were current smokers, compared to the 13.9% proportion of current smokers among adults without diabetes (Figure 18).45

Figure 17: Age-adjusted Adult Prevalence of Current Smoking, by Diabetes Status, Maryland 2017 (BRFSS)

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[45] Maryland BRFSS 2017

The Maryland Department of Health manages the MD Quitline, a free service for Maryland residents 13 years and older to help quit tobacco use. The MD Quitline tracks information about smokers with diabetes. In fiscal year 2019, approximately, 1,500 of Quitline participants reported being told by a provider they have prediabetes, 160 participants reported type 1 diabetes and 1,000 participants reported type 2 diabetes. In fiscal year 2019, the Quitline was used by a total of 8,155 phone participants and 1,340 web participants.

Diabetes and Income

The prevalence of diabetes is strongly determined by income. Diabetes, along with many other chronic diseases, shows a higher prevalence among groups that have a lower socioeconomic status. Patients with diabetes and a lower socioeconomic status may present with health outcomes such as poorer glycemic control, more diabetes-related complications, higher cardiovascular risk factors, and poorer self-rated health. Interventions specifically targeting populations in lower socioeconomic classes may reduce social inequalities in health. The figure below shows the occurrence of diabetes in the adult population by income level. As this chart illustrates, people with lower levels of income had a higher percentage of being diagnosed with diabetes in comparison to people with higher income levels.[46]

Figure 18: Diabetes Prevalence by Income (Maryland BRFSS 2017)

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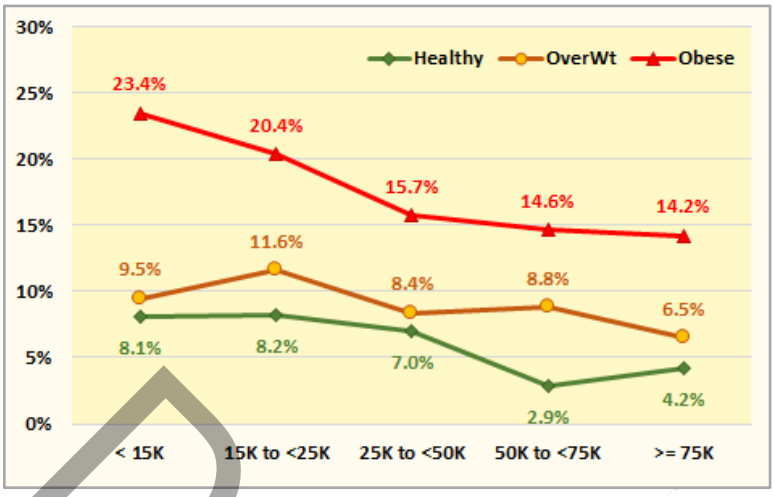
[46] Maryland BRFSS, 2017.

Figure 19: Age-adjusted Prevalence of Doctor Diagnosed Diabetes, by Income and BMI Status (Maryland BRFSS 2015-2017)



Diabetes and Level of Education

The prevalence of diabetes is strongly determined by level of education. As seen in Figure 20: Age-adjusted Adult Prevalence of Diagnosed Diabetes, by Education and Black or White Race, Maryland 2015-17 (BRFSS) below, adult prevalence of diagnosed diabetes is more than twice as high for persons with less than high school education compared to persons with a college degree or more education.

This gradient of higher diabetes prevalence at lower levels of education is seen in both Non-Hispanic Blacks and Non-Hispanic Whites. In addition, Figure 20: Age-adjusted Adult Prevalence of Diagnosed Diabetes, by Education and Black or White Race, Maryland 2015-17 (BRFSS) shows that for every level of education, NH Black diabetes prevalence is higher than NH White diabetes prevalence. This means that education does not fully explain the disparity in diabetes prevalence between NH Blacks and NH Whites.

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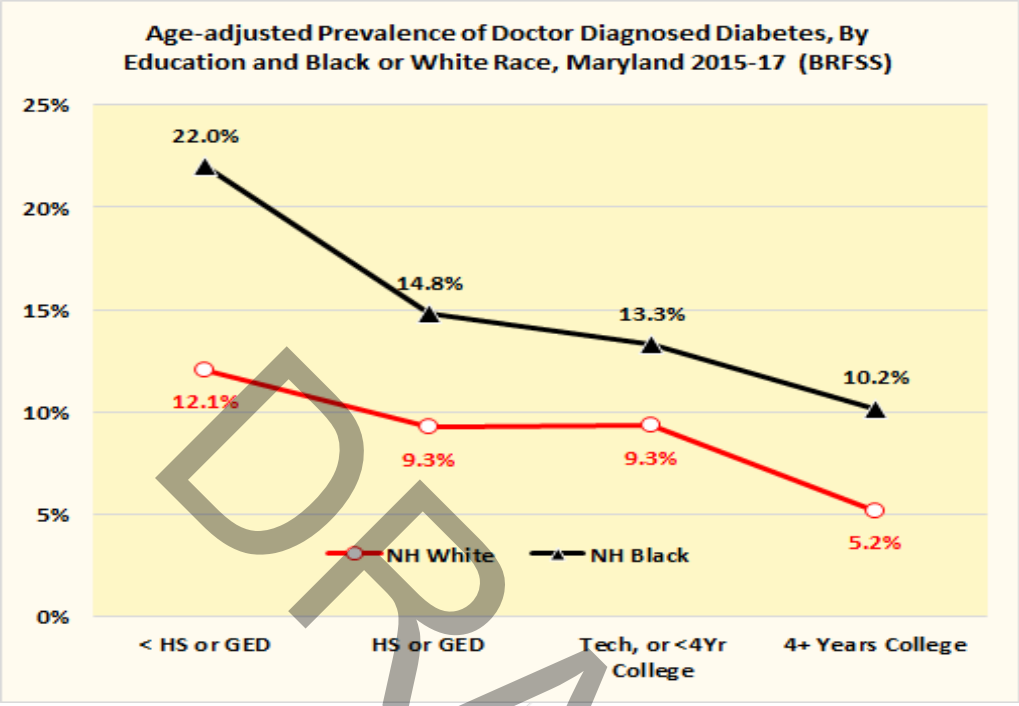
Figure 20: Age-adjusted Adult Prevalence of Diagnosed Diabetes, by Education and Black or White Race, Maryland 2015-17 (BRFSS)



Education level is linked to diabetes; in 2017, approximately 12 percent of Marylanders with diabetes had not graduated from high school. An individual who has less than a high school education has a 6 percent higher chance of being diagnosed with diabetes in comparison to a college degree (Figure 13).[47]

Level of education does contribute to the Black vs. White disparity in diabetes prevalence since NH Whites are more likely than NH Blacks to have four or more years of college/graduate school education, as shown in Figure 20: Distribution of Education Level, for NH Black and NH White Adults, Maryland 2011-13 (BRFSS) below. About 37% of the NH White adult population has a college degree, compared to only about 25% of the NH Black population.

Figure 21: Distribution of Education Level, for NH Black and NH White Adults, Maryland 2011-13 (BRFSS)

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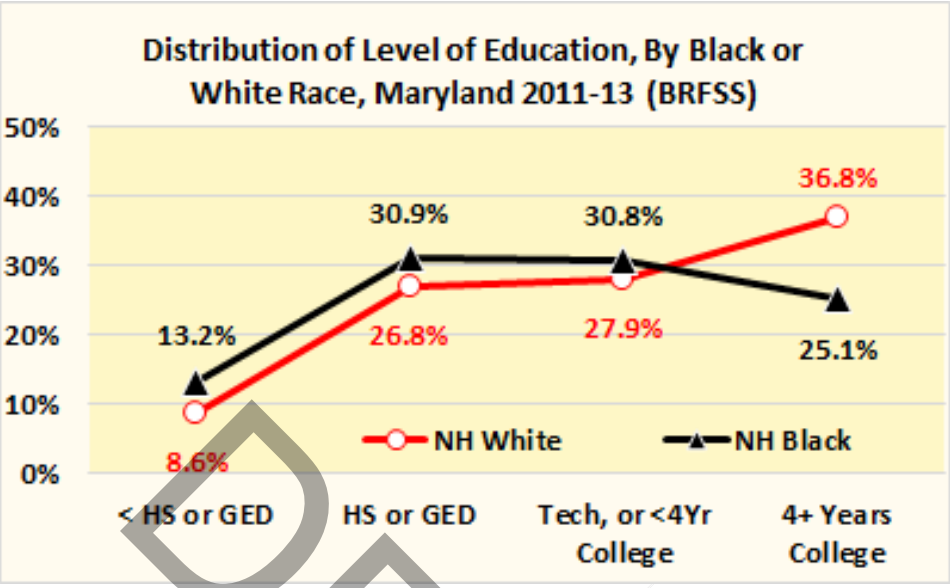
[47] United States Census, 2017.

Figure 21: Distribution of Education Level, for NH Black and NH White Adults, Maryland 2011-13 (BRFSS)



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In addition to NH Blacks having higher diabetes prevalence at each level of education, NH Blacks are more likely to have the lower levels of education, which have higher risk.

Income and education are closely related to each other, with higher educational attainment being associated with higher income at the population level.

Diabetes and Disability

A disability is any condition or impairment of the body or mind that makes it more difficult for the person with the condition to do certain activities and interact with the world around them.[48] More than 21 million US adults 18–64 years of age have a disability. These are adults with serious difficulty walking or climbing stairs, hearing, seeing, or concentrating, remembering, or making decisions. [49] Disability and diabetes are interrelated.

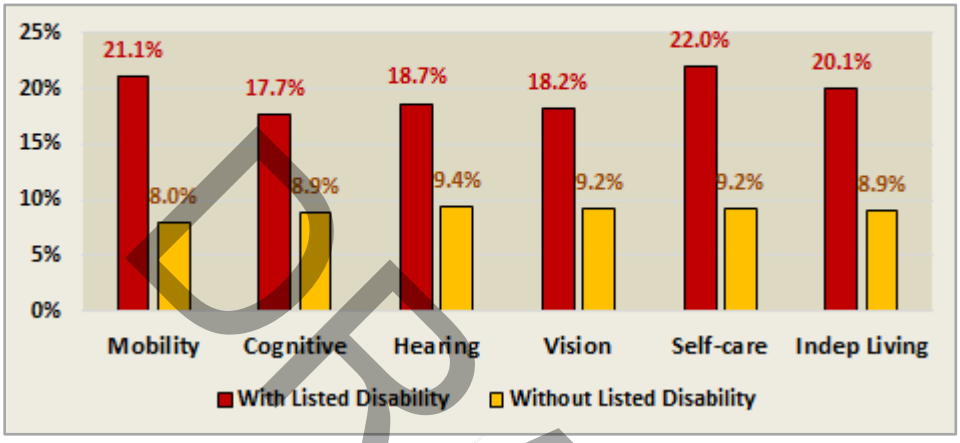
The adult prevalence of diagnosed diabetes in Maryland is consistently about twice as high among persons with mobility, cognitive, hearing, vision, self-care, or independent living disabilities compared to persons without those disabilities (22). In some cases, disability may cause the diabetes, as in the situations where the disability limits physical activity and thus increases the risk of overweight or obesity. In other cases, the disability may be the result of the diabetes, for example when diabetes causes vision loss and produces vision disability. It is also possible that in some cases, a factor that causes both diabetes and a disability will result in

[48] https://www.cdc.gov/ncbddd/disabilityandhealth/disability.html
[49] https://www.cdc.gov/vitalsigns/disabilities/index.html

the two conditions occurring together, even without a causal relationship between the diabetes and the disability in that case.

Disabled people with diabetes often have higher rates of unemployment, absenteeism on the job, and health care utilization, and lower income levels and capabilities in personal care and activities of daily living.[50]

Figure 22: Age-adjusted Adult Prevalence of Doctor Diagnosed Diabetes, By Presence or Absence of Selected Disabilities (Maryland BRFSS 2015-2017)



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Diabetes and Mental Health

Research shows that people with diabetes are at increased risk for diabetes distress, which refers to the negative emotional and psychosocial worries and burden individuals with the diagnosis of diabetes experience. Diabetes distress could manifest as depression, anxiety disorders, eating disorders, inappropriate stress responses, substance use disorders, and alcohol abuse.[51]

The relationship of a diagnosis of depression with a diagnosis of diabetes among adults in Maryland is shown in Figure 23below: the percent ever diagnosed with depression is about twice as high for adults with a diagnosis of diabetes (34%) as for adults without a diagnosis of diabetes (17%).

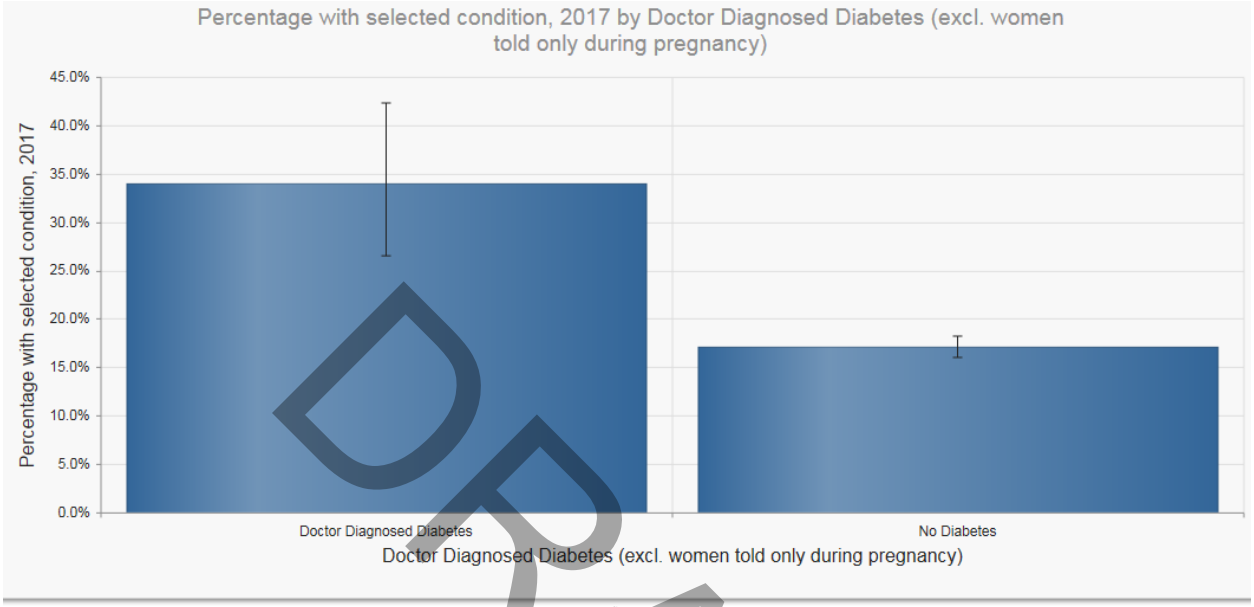
People who have mental health conditions are at an increased risk for developing diabetes and untreated mental health conditions can make the management of diabetes more difficult. People with untreated mental health conditions often deal with issues like poor self-care,

[50] Maryland Vital Statistics Annual report (2017): https://health.maryland.gov/vsa/Documents/Reports%20and%20Data/Annual%20Reports/2017annual_revised.pdf

[51] Frayne, S.M., Halaynch, J.H., Miller, D.R., Wang, F., Lin, H., Pogach, L., et al. (2005). Disparities in diabetes care: Impact on mental illness. Archives of Internal Medicine, 165, 2631-2638

improper nutrition, barriers to accessing primary care, and lack of exercise. Mental illness reduces the likelihood a person with diabetes will be properly treated.[52]

Figure 23: Age-Adjusted Percent of Adults Ever Diagnosed with Depression, by Diagnosed Diabetes Status, Maryland 2017 (BRFSS)



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Gestational Diabetes

Gestational diabetes is diabetes that starts during pregnancy and occurs when a pregnant woman is not able to make and use all the insulin needed during pregnancy, which results in high blood sugar. Pregnant women with gestational diabetes tend to have larger babies, and mothers have an increased risk of high blood pressure and infections during pregnancy. Women with a history of gestational diabetes are at risk of developing gestational diabetes for future pregnancies. Although gestational diabetes usually resolves after pregnancy, women who have gestational diabetes in their pregnancies are at an increased risk for developing type 2 diabetes later in life.[53]

Providers usually test for and identify gestational diabetes between the 24th and 28th weeks of pregnancy.[54] In Maryland, the rate of gestational diabetes increased from 5.4 percent in 2013 to 7.3 percent in 2017, and has far-reaching consequences for the health of women, as well as the health of their babies by increased risk for diabetes.[55] Factors such as multiple pregnancies

[52] Disability in Diabetics, Thomas Songer, PHD, Chapter 12, 1996
[53] NIDDK, https://www.niddk.nih.gov/health-information/diabetes/overview/preventing-type-2-diabetes
[54] ACOG Releases Planline on Gestational Diabetes, American Family Physician, 2014 Sept 15; 90(6): 416-417
[55] Percentage of Women Delivering a Live Birth Who Developed Gestational Diabetes, Maryland Vital Statistics, 2013-2017.

and being overweight or obese at the beginning of the pregnancy greatly increase the risk of gestational diabetes.

Prediabetes

Prediabetes is a condition where blood sugar levels are higher than normal, but not high enough to be considered diabetes.[1] Prediabetes is a precursor condition on the pathway from normal glucose levels to type 2 diabetes; the development of type 1 diabetes is usually so rapid that there is no "prediabetes" state that precedes type 1 diabetes. A fasting glucose level of 110 to 125 mg/dL, a hemoglobin A1c level of 5.7% to 6.4%, or a two-hour glucose level in an oral glucose tolerance test of 140 to 199 mg/dL defines prediabetes. [56]

Prediabetes often goes unrecognized by both individuals and their health care providers; nine of 10 adults who have prediabetes do not know they have it.[57] CDC estimates that 34 percent of U.S. adults have prediabetes.[58] Diabetes and prediabetes are serious conditions that can lead to complications including heart disease and stroke, blindness, amputations, nerve damage, and kidney disease.[1]

Prediabetes and gestational diabetes indicate higher risk for the development of diabetes, as well as higher risk for some other bad health outcomes. Prediabetes and gestational diabetes

do not cause diabetes *per se*. Rather, they represent points in the chain of progression to diabetes that are very near to crossing the threshold to a diagnosis of diabetes. More information on these conditions is found in Section III.

Social Determinants of Health and Diabetes Risk

Social Determinants of Health (SDOH) are the conditions in which people are born, grow, live, work and age. SDOH have an impact on many chronic diseases like diabetes. The Maryland data above show an increased prevalence of diabetes among people with lower levels of income and education, and among racial and ethnic minorities. People in these categories often may not have the financial means to pay for healthier foods, may struggle with food security, and may not have safe areas for physical activity. The stress related to poverty and racism has physiologic effects that can promote the progression to diabetes as well as impacting diet and physical activity behaviors. All these societal issues affect a person's health.[59] Figure 24 below depicts the five main categories of social determinants of health which is the framework used by Healthy People 2020[60]

[56] https://www.cdc.gov/diabetes/basics/getting-tested.html
[57] https://www.cdc.gov/diabetes/basics/prediabetes.html
[58] Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2017. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services; 2017.
[59] https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health
[60] https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health

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Figure 24: Social Determinants of Health

Source: Healthy People 2020, Office of Disease Prevention and Health Promotion

Diabetes and Health Equity

Healthy People 2020 defines ***health equity*** as the "attainment of the highest level of health for all people. Achieving health equity requires valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities, historical and contemporary injustices, and the elimination of health and health care disparities." [61]

Healthy People 2020 defines a ***health disparity*** as "a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group; religion; socioeconomic status; gender; age; mental health; cognitive, sensory, or physical disability; sexual orientation or gender identity; geographic location; or other characteristics historically linked to discrimination or exclusion."[62]

The Maryland data presented above have shown differences in diabetes prevalence by age, by race/ethnicity, by geography, by level of income and by level of education. Differences by other factors likely exist as well, which cannot be documented in our current data systems.

[61] https://www.healthypeople.gov/2020/about/foundation-health-measures/Disparities
[62] https://www.healthypeople.gov/2020/about/foundation-health-measures/Disparities

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The data presented above suggest the following multiple opportunities to intervene to move toward health equity with respect to diabetes incidence, morbidity and mortality.

Factors on which to intervene include:

The physiologic determinants of diabetes:

- Unhealthy diet
- Low physical activity
- Stress

The social determinants of diabetes:

- Income
- Education
- Housing
- Unsafe neighborhoods
- Food insecurity
- Lack of transportation
- Lack of health care access

Populations to target with interventions on the factors listed above:

- Certain racial/ethnic minority populations
- Certain urban populations
- Certain rural populations
- Low income population
- Low educational attainment population
- The population with mental health conditions
- The population with disabilities

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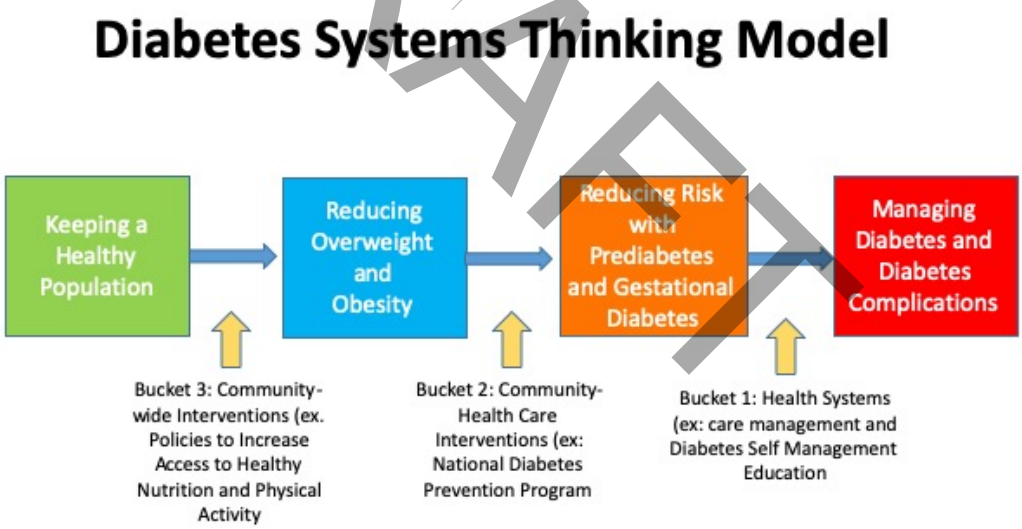
III. Intervention Strategies and Actions Steps for Diabetes Prevention and Control

Rationale Behind Four Risk Populations for Diabetes

Action Plan Framework

The natural progression of type 2 diabetes is a risk continuum from healthy weight, overweight and other risk factors, normal glucose, impaired glucose, and glucose intolerance to diabetes.[63] The Maryland Diabetes Action Plan uses a systems-thinking model approach to frame the actions and strategies needed to address all components and populations along the continuum (Healthy; Overweight/Obese; Prediabetes/Gestational Diabetes; and Diabetes and Diabetes Complications). This approach recognizes upstream factors which affect the full population (those factors that can benefit all risk level components) to those at highest risk downstream (Diabetes and Diabetes Complications) (Figure 25).[64] In the systems-thinking model (Figure 1), the actions take place between the risk factors.

Figure 25: Diabetes Systems Thinking Model



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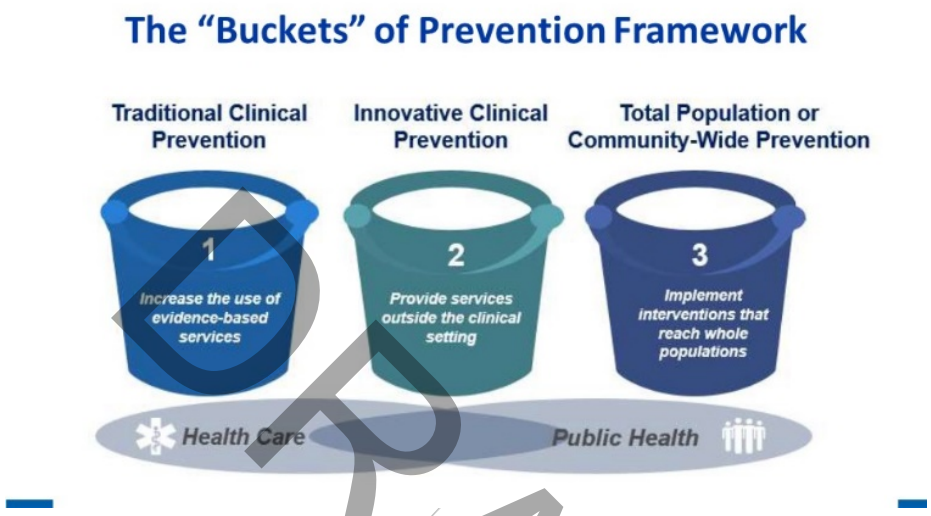
[63] Meigs, JB, Muller, DC, Nathan, DM, Blake, DR, Andres, R. The Natural History of Progression From Normal Glucose Tolerance to Type 2 Diabetes in the Baltimore Longitudinal Study of Aging. Diabetes 2003 Jun; 52(6): 1475-1484. https://doi.org/10.2337/diabetes.52.6.1475.
[64] Kim, D., https://thesystemsthinker.com/introduction-to-systems-thinking.

Using additional public health frameworks, such as the Three Buckets of Prevention, categorizes actions to be taken in healthcare, at the intersection of the community and healthcare, and at the community-wide level (Figure 26).[65] The "buckets" show sectors for action, between the health care system, the community and public health.

Figure 26: Three Buckets of Prevention



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A brief description of evidence which informs the development of action steps in the four components in Section III is listed below. The vision is for all Maryland partners, across multiple sectors, to identify areas where they currently work or have the capability of working, to align their efforts to make strides in reducing diabetes burden in the state.

Interventions for the Healthy Weight Population

In Maryland, over 32.7 percent of the adult population is of a healthy weight. [66] The Keeping a Healthy Weight population actions focus on community-wide approaches, which will also impact the health of the other three population components downstream by implementing multi-faceted, multi-sector collaborations to make healthy eating and active living accessible, affordable, and convenient.

What is a Healthy Weight: Healthy weight is a weight at which an individual is considered at a low or reduced risk for adverse health conditions. Body Mass Index (BMI) is used as a screening tool to determine if an individual is overweight or obese based on their height and weight. For

[65] Auerbach J. The 3 Buckets of Prevention. *J Public Health Manag Pract*. 2016;22(3):215–218. doi:10.1097/PHH.0000000000000381.
[66] Maryland BRFSS, 2017

adults it is a BMI of 18-24. A child whose BMI is between the 5th percentile to 84th percentile is in the healthy weight range.

Trust for America's Health and the Robert Wood Johnson Foundation recommend three guiding principles to address healthy weight (reducing obesity): 1)Promote polices and scale programs that take a multi-sector approach; 2) Adopt and implement policies that help make healthy choices easy; and 3) Invest in programs that level the playing field for all individuals and families.[67] Additionally, the movement around Health in All Policies (HiAP) recognizes that health is created by a multitude of factors beyond healthcare and, in many cases, beyond the scope of traditional public health activities.[68]

Interventions targeted at keeping all people at a healthy weight specifically creates access to healthy nutrition and physical activity, using broad and large-scale actions which include environmental change and policies to reach all citizens. For example, the 2040 Maryland Bicycle and Pedestrian Master Plan addresses actions to increase use of and access to bike and pedestrian usage in the state.[69] Other system level change actions in this component can also include improving access and polices within institutions, such as worksites and schools. Worksites can implement breastfeeding policies which include dedicated space and time for employees to breastfeed, as well as policies to increasing available healthy food options in cafeterias and working with food service vendors to supply low fat/low sodium products. Increasing farm production statewide and access to farmers markets with Electronic Benefits Transfer (EBT) access for healthy foods are actions also recommended by Trust for America's Health and the Robert Wood Johnson Foundation.[70]

Targeting healthy weight in specific populations, such as women of childbearing age, should be encouraged for preconception healthy weight.[71] Increasing breastfeeding initiation and duration have lasting benefits for infants, reducing the risk of obesity, and also reducing the risk of diabetes and other chronic diseases for mothers.[72] Healthy People 2020 targets are to increase the proportion of those infants who were ever breastfed from 74 percent to 81.9 percent, in Maryland 89.4 percent of live births were ever breastfed in 2017. [73,74]

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[67] tfah.org/stateofobesity2018. Accessed August 18, 2019.
[68] https://www.cdc.gov/policy/hiap/index.html. Accessed August 18, 2019.
[69] http://www.mdot.maryland.gov/newMDOT/Planning/Bike_Walk/Bike_Ped_Plan_Update.html. Accessed August 18, 2019.
[70] Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2017. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services; 2017.
[71] Diabetes Care. January 01 2019; volume 42 issue Supplement 1.
[72] https://www.cdc.gov/breastfeeding/about-breastfeeding/index.html, accessed August 29, 2019.
[73] https://www.healthypeople.gov/2020/topics-objectives/topic/maternal-infant-and-child-health/objectives, accessed August 29, 2019.
[74] Maryland PRAMS Report, 2017 Births

Interventions for the Overweight and Obese Populations

Reducing Overweight and Obesity

In Maryland, over 65.4 percent of the adult population is overweight or obese, the leading risk factor in diabetes.[75]As the model moves downstream according to risk, all people in this population will be impacted by the broad actions in the Healthy Weight component.

What is Overweight or Obesity: In children, overweight is defined as a BMI measurement greater than the 85th percentile for age and sex of the child. Obese is defined as a BMI measurement greater than the 95th percentile for age and sex. Adult overweight is defined as a BMI equal to or greater than 25, while obesity is a BMI equal to or greater than 30. In adolescents, a BMI >25/30 or above 85/95 percent, whichever is lower. There are three classes of obesity, ranging from BMI 30-34 for Class 1, BMI 35-39 for Class 2, and BMI greater than 40 for Class 3.

In the Overweight/Obese component, the focus is to reduce the risk of diabetes by moving the population back to a healthy weight through behavior change and health system intervention for weight loss in adults and to slow weight gain in children. Action steps addressed in this component focus on specific actions which target those Marylanders who are overweight and obese, while acknowledging the action steps in the earlier Healthy Weight component will be available to support Marylanders in the actions in this component.

Obesity is a complex, adiposity-based chronic disease, where management targets both weight-related complications and adiposity to improve overall health and quality of life. Recommendations allow for clinical decision-making for patients with obesity, which include screening, diagnosis, and evaluation, selection of therapy, treatment goals, and individualization of care with the goal of facilitating high-quality care of patients with obesity and provide a rational, scientific approach to management that optimizes health outcomes and safety.[76] Strategies for treating overweight include preventing progressive weight gain and lifestyle change; obesity treatment weight loss, lifestyle change, considering/adding pharmacotherapy and considering bariatric surgery.[77]

Providers need resources and tools to address the complicated needs of patients who are overweight or obese. Increasing use of billing for weight management is one strategy to help providers afford the additional time needed to counsel and refer patients. Some prescription programs which link patients to healthy lifestyles have proved successful; one example is the

[75] Maryland BRFSS 2017
[76] Endocr Pract. 2016;22:Supp3;1-205.
[77] Maryland Vital Statistics Annual report (2017): https://health.maryland.gov/vsa/Documents/Reports%20and%20Data/Annual%20Reports/2017annual_revised.pdf

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Montgomery County Parks program which implements a park prescription program, linking health care providers and patients to parks for physical activity.[78]

Recommendations for assessing and managing childhood obesity center on prevention, structured weight management, a comprehensive multi-disciplinary approach, and if needed, tertiary care interventions. Supporting lifestyle change with the patient and the family using supports, such as a diverse team trained in motivational interviewing, is appropriate and helpful.[79]

Interventions for the Gestational Diabetes and Prediabetes Populations

Reducing Risk with Prediabetes and Gestational Diabetes Populations

Among Maryland adults who have never received a diagnosis of diabetes, 58.9 percent report having a blood sugar test in the previous three years. In Maryland residents age 45 and older, for whom risk of prediabetes is increased, 69.5 percent report having been tested in the previous three years. Screening and testing rates need to be improved so providers will be able to refer at-risk people to resources to prevent progression to type 2 diabetes. Based on 2014 Maryland BRFSS data, 10.5 percent of Maryland adults ages 18 and older had been told they have prediabetes. This number is far below the CDC estimate of 37 percent of adults ages 20 and older with prediabetes, which suggests there are many Maryland adults who have prediabetes who do not know their status.[302]

What is Prediabetes and Gestational Diabetes: Prediabetes occurs when people have elevated blood glucose (sugar) levels, which places them at higher risk for developing type 2 diabetes. This group includes people with A1C of 5.7-6.4 percent, or fasting plasma glucose between 100 and 125 mg/dL, regardless of BMI. Gestational Diabetes occurs in pregnant women who have high blood glucose levels during pregnancy with no history of diabetes mellitus prior to pregnancy. Gestational diabetes is typically tested between 24-28 weeks with Oral Glucose Tolerance Test (OGTT) levels exceeding normal range fasting, 1 hour, and 2 hours. Even if the blood glucose reduces back to normal levels after delivery, the woman has an increased risk for type 2 diabetes mellitus later in life as does the child.

It is estimated that approximately 1 in 4 people with diabetes do not know they have it.[80] In Maryland, only 13 percent of the adult population has been told they have prediabetes, however, CDC estimates that 34 percent of adults has prediabetes.[81] Screening and testing asymptomatic people for prediabetes and diabetes can be done by informally evaluating risk

[78] https://www.montgomeryparks.org/about/parks/park-prescription/. Accessed August 18, 2019.
[79] https://ihcw.aap.org/resources/Documents/algorithm_brightfutures_032819.pdf. Accessed August 27, 2019.
[30] https://www.cdc.gov/brfss/
[80] CDC 2017 https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf. Accessed August 18, 2019.
[81] Maryland BRFSS, 2018.

factors with simple risk tests, as those available from the ADA and CDC.[82,83] Screening tools are recommended at age 45 for people with no symptoms and for people who are overweight and obese. The screening results can help determine whether blood tests are needed to further evaluate for abnormal blood sugars. Screening and testing with blood tests should be considered at any age for people who are overweight or have obesity (BMI ≥25 kg/m^2 or ≥23 kg/m^2 in Asian Americans) *and* who also have one or more of the following risk factors:

- First-degree relative with diabetes;
- High-risk race/ethnicity (e.g., African American, Latino, Native American, Asian American, Pacific Islander);
- History of cardiovascular disease;
- Hypertension (≥140/90 mmHg or on therapy for hypertension);
- HDL cholesterol level <35 mg/dL and/or a triglyceride level >250 mg/dL;
- Women with polycystic ovary syndrome;
- Physical inactivity; and
- Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans).[84]

Four blood tests are used to diagnose diabetes. The most common are the fasting blood glucose and the hemoglobin A1C, but an oral glucose tolerance test (OGTT) may also be used. The fourth diagnostic test is non-fasting blood sugar, which if over 200 mg/dL in the presence of typical signs and symptoms of diabetes, indicates diabetes. Two positive tests are required to confirm a diagnosis of diabetes, which can be two different tests on the same blood sample (such as fasting glucose and A1c from the same blood draw). Intensive adherence to authoritative clinical guidelines and use of EHR tools should be encouraged with providers and health systems.[85]

CDC estimates over 34% of the adult population has prediabetes, which translates to approximately 1.6 million adults in Maryland.[86,87] In 2017, 1.7 percent of Maryland adult women reported a history of gestational diabetes.[88] Both prediabetes and gestational diabetes significantly increase the risk of progression to diabetes.[11]

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[82] https://www.diabetes.org/risk-test
[83] https://www.cdc.gov/prediabetes/takethetest
[84] Diabetes Care. January 01 2019; volume 42 issue Supplement 1.
[85] https://amapreventdiabetes.org/tools-resources
[86] CDC 2017 https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf. Accessed August 18, 2019.
[87] US Census 2016.
[88] Maryland BRFSS 2017

Prediabetes and Diabetes Screening in Adults

Testing to detect prediabetes and diabetes is recommended for adults of any age who are overweight or obese and who have one or more additional risk factors for diabetes. For all others, especially those who are overweight, testing should begin at age 45. People with prediabetes who are at risk for type 2 diabetes can prevent or delay the disease by making modest lifestyle changes to lose five to seven percent of body weight and increasing physical activity to at least 150 minutes per week.[89] In Maryland, people with prediabetes can participate in a National Diabetes Prevention Program (National DPP). The National DPP is an evidence-based lifestyle change program designed to help participants make these lifestyle changes to avoid developing type 2 diabetes.

As the model continues to move downstream, people with prediabetes and a history of gestational diabetes will be impacted by the broad actions in the Healthy Weight component, as well as the targeted weight control/reduction actions in the Overweight and Obesity component. In the Prediabetes/Gestational Diabetes component, the focus is to test those at risk and refer to aggressive risk reduction resources, such as the National DPP.

The original DPP study was shown to reduce the risk by 58 percent in those who made behavior change that resulted in a 7 percent weight loss and at least 150 minutes a week of moderate physical activity. The metformin (low cost drug to lower blood glucose) group showed a 34 percent decrease.[90] The research into practice for this program demonstrated similar outcomes from small group sessions led by lay health coaches.[91] The CDC launched the National DPP in 2012 to set standards and assure fidelity and create a recognition registry of programs throughout the country. Maryland currently has 53 National DPP lifestyle programs (12 fully recognized); since 2012, 5,296 citizens participated in the program.[92]

Public payer reimbursement for the National DPP is a step toward sustainability. In July 2016, Maryland Medicaid implemented a CDC-funded demonstration to implement a delivery model for the National DPP in Medicaid managed care organizations (MCOs). Four of Maryland's nine HealthChoice MCOs participated, successfully enrolling 637 enrollees into a participating CDC-recognized lifestyle change program. Key outcomes of the demonstration, which concluded in January 2019, included the creation of an eligibility algorithm, and a sustainability plan culminating in Medicaid applying to CMS for a Section 1115 demonstration waiver amendment that would authorize continued provision of the National DPP lifestyle change program in HealthChoice. CMS approved the waiver request in April 2019, and HealthChoice DPP will be

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[89] Diabetes Prevention Program Research Group, Reduction in the Incidence of Type 2 Diabetes with Lifestyle Intervention or Metformin; N Engl J Med 2002; 346:393-403.
[90] Diabetes Prevention Program Research Group, Reduction in the Incidence of Type 2 Diabetes with Lifestyle Intervention or Metformin; N Engl J Med 2002; 346:393-403.
[91] Ackermann RT, Finch EA, Brizendine E, Zhou H, Marrero DG. Translating the Diabetes Prevention Program into the community. The DEPLOY Pilot Study. *Am J Prev Med*. 2008;35(4):357–363. doi:10.1016/j.amepre.2008.06.035.
[92] DPRP State-Level Evaluation Report, CDC, July 2019.

implemented statewide effective September 1, 2019. Also, in April 2018, Medicare DPP services became available to eligible beneficiaries nationwide.

As the prevalence for Maryland adults who are told their prediabetes status by providers is dramatically lower (11.6 percent) than those estimated through national clinical studies, implementing mechanisms or tools within provider practice systems to increase testing for those at risk of diabetes is the first step for provider practices to essential.[93]

The Maryland Primary Care Program (MDPCP) is driving the adoption of advanced primary care in Maryland practices including management and prevention of chronic disease. Currently, practice performance is measured on critical chronic disease areas including diabetes and hypertension management. A focus of the program is aligning with the State's population health goals which includes reducing the incidence of diabetes. MDPCP is working on adding a performance measure for 2020 to drive diabetes prevention efforts that would emphasize BMI and blood glucose assessment and making subsequent referrals to evidence-based programs such as the National DPP. The MDPCP anticipates regular training for its practice coaches and the participating practices and Care Transformation Organizations, entities that provide staffing and technical assistance to practices as well as provider referral mechanisms to increase referrals.

The National Nurse Study showed an increased risk of the conversion to diabetes in those with a history of diabetes.[94] Priority actions for women with gestational diabetes focus on postpartum testing to rule out undiagnosed prediabetes, or type 1 or type 2 diabetes. Postpartum continued follow-up for women with a history of gestational diabetes should include regular testing, healthy lifestyle support and potentially use of metformin.[95]

Working with the healthcare team to ensure postpartum testing of women with gestational diabetes is a standard of care practice that is underutilized. In 2016, Maryland Medicaid and Maryland Public Health engaged two MCOs to develop and implement system level tools and/or policies to ensure testing for women with a history of gestational diabetes.

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Interventions for the Diabetes Population, Including Diabetes with Complications

Managing Diabetes and Diabetes Complications

The ADA recommends population health approaches for managing diabetes be timely, evidence-based, and in collaboration with each patient.[94] The health care system should use the

[93] Maryland BRFSS 2017
[94] Kim C, Newton KM, Knopp RH. Gestational diabetes and the incidence of type 2 diabetes; a systematic review. Diabetes Care 2002;25:1862-1868.
[95] Diabetes Care. January 01 2019; volume 42 issue Supplement 1.

Chronic Care Model (CCM) as a framework for achieving high quality care of people with diabetes which encourages six essential elements to move health systems toward having a prepared, proactive team and an informed, activated patient. These core elements are: community resource mobilization; health system that operates with safe, high quality care as part of its culture; self-management support to strengthen decision-making and agency; delivery system design to assess what care is needed and deliver it to keep patients as healthy as possible; evidence-based decision-making and patient-centered care; and clinical information systems that are comprehensive and facilitate effective and efficient care.[96]

What is Diabetes and Diabetes Complications: This group includes people with a diagnosis that is confirmed by two tests; fasting plasma glucose over 126 mg/dL or A1C of 6.5 percent or higher, regardless of BMI. Diabetes is also diagnosed with an oral glucose tolerance test result greater than 200mg/dL or random plasma glucose greater than 200mg/dL with typical symptoms of diabetes (blurred vision, excess thirst, excess hunger, frequent urination). When not well managed or when it has been present for many years, diabetes slowly damages the blood vessels in the body and results in problems of organs or organ systems in the body, including the heart, eyes, kidneys, skin, and nerves. The resulting complications, like blindness, kidney failure, nerve pain, and extremity amputations, can be debilitating and significantly impact quality of life.

Actions for managing diabetes and controlling complications are complex and rely on a team-based approach, which includes behavior change for self-care and a healthy lifestyle. Diabetes self-care requires daily decisions about food, physical activity, stress management, and daily self-monitoring of glucose levels. Self-management education facilitates the knowledge, skill, and confidence for individuals with diabetes to manage their own health, a concept known as patient activation. Self-management education is designed to help individuals adopt and sustain the necessary skills and behaviors to achieve proper diabetes self-care on an ongoing basis, and has been shown to positively affect outcomes, and all people with diabetes should participate in diabetes self-management education and support programs.[97] Telemedicine is an opportunity to improve patient access to primary care and to community supports and services, and telehealth strategies have been effective for improving patient self-activation and engagement, for increasing patient blood glucose self-monitoring and dietary adherence, and for decreasing A1C in many settings.[98,99,100]

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[96] http://www.improvingchroniccare.org/index.php?p=The_Chronic_Care_Model&s=2 Accessed July 18, 2019.
[97] Diabetes Care. January 01 2019; volume 42 issue Supplement 1.
[98] Siminerio L, Rubbert K, Huber K, Toledo FGS. Telemedicine for Reach, Education, Access, and Treatment (TREAT): Linking Telemedicine with Diabetes Self-management Education to Improve Care in Rural Communities, The Diabetes Educator.
[99] Ciemins E, Coon P, Peck R, Halloway B and Min SJ. Using Telehealth to Provide Diabetes Care to Patients in Rural Montana: Findings from the Promoting Realistic Individual Self-Management Program. Telemedicine Journal and e-Health. 2011 Oct; 17(8):596-602. Doi: 10.1089/tmj.211.0028.
[100] Lee SWH, Chan CKY, Chua SS, Chairyakunapruk N. Comparative Effectiveness of Telemedicine Strategies on Type 2 Diabetes Management: A Systematic Review and Network Meta-analysis. Scientific Reports. 2017 Oct4;7(1):12680. Doi: 10.1038/s41598-017-12987-z.

Diabetes and Oral Health

Diabetes impacts almost every part of the body and can result in several complications, including the increased likelihood of oral health complications. The American Dental Association has identified periodontal disease as the most common dental disease affecting those living with diabetes, affecting nearly 22 percent of those diagnosed. This is especially true with increasing age. Poor blood sugar control increases the risk for gum problems. Similarly, oral health affects overall health and has far reaching implications for many chronic diseases, including diabetes. People with diabetes are twice as likely to develop periodontitis (gum disease), and periodontitis can also elevate blood sugar levels.[101]

Periodontal disease is more common in people with diabetes, so people with diabetes need to be especially diligent about getting regular dental examinations. [102] According to the CDC, diabetes can increase the risk of periodontitis for the following groups:

- Among young adults, those with diabetes have about twice the risk of developing periodontitis as those without diabetes.
- Adults ages 45 or older with poorly controlled diabetes (A1C >9 percent) are 2.9 times more likely to have severe periodontitis than those without diabetes.
- People who smoke and have persistently elevated glucose levels have a 4.6 times greater risk for developing periodontitis.[103] Regular dental visits are important, and research suggests that treating gum disease can help improve blood sugar control in patients living with diabetes, decreasing the progression of the disease.[46]

Managing and Controlling Diabetes

The American Medical Association and the American Diabetes Association (ADA) recommend individuals diagnosed with diabetes should be aware of how to manage their disease, and nearly all general practitioners and their staff should be trained on diabetes management. Once a person is diagnosed with diabetes, they ideally should be trained on how to monitor their blood glucose levels, administer insulin injections if necessary, take other diabetes medications, receive annual eye and foot exams, and be vaccinated for influenza, pneumonia and other vaccinations based on clinical protocols. Blood levels should be checked daily for glucose levels. In addition, A1C testing should be performed at least twice yearly in patients who have achieved stable glycemic control. For those patients who are not at goal or for whom therapy recently changed, quarterly A1C testing is recommended.[104]

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[101] "The Economic Burden of Elevated Blood Glucose Levels in 2012", Diabetes Care, December 2014, vol. 37.
[102] Centers for Disease Control and Prevention. National diabetes fact sheet: National estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011.
[103] American Dental Association, https://www.mouthhealthy.org/en/az-topics/d/diabetes
[104] American Diabetes Association Clinical Planlines

According to self-reported data from BRFSS, in 2017, 10.2 percent of Maryland adults with diagnosed diabetes did not visit their doctor regularly, 4.0 percent did not have dilated eye examinations, 5.2 percent did not receive A1C testing, 21.1 percent did not have foot examinations, 31.6 percent did not receive an influenza or a pneumonia shot at any time, and 47.5 percent never attended a diabetes self-management course, which are offered regularly at hospitals and doctors' offices.[105]

Action Tables for Diabetes Prevention and Control

The Diabetes Action Team developed actions in each of the four components, and the next section contains detailed action tables. The actions are separated in two main categories—Priority State Action Steps and Suggested Action Steps for the State and its Partners. The Priority action steps are those MDH has prioritized and for which MDH will assume responsibility. The "other" steps are those where partners have influence to impact change and assume a lead. Additionally, data-related Action Steps are included where there may be gaps in important diabetes data and sources.

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[105] CDC Wonder Online Database, Underlying Cause of Death, Multiple Cause of Death files, 2014-2016

Action Steps by Population Category: State Priority Action Steps, Data Action Steps, and Other Suggested Action Steps for the State and its Partners

Healthy weight is a weight at which an individual is considered at a low or reduced risk for adverse health conditions. Body Mass

Keeping a Healthy Weight Population

Index (BMI) is used as a screening tool to determine if an individual is overweight or obese based on their height and weight. For adults it is a BMI of 18-25. A child whose BMI is between the 5th percentile to 85th percentile is in the healthy weight range.

GOAL: By 2024, 32 percent of Maryland adults will be of healthy weight.

Objective: Increase access to healthy nutrition
Priority State Action Steps
1. Implement policies that support healthy eating in institutions, such as worksites, health systems and school cafeterias. 2. Assess the food supply chain for opportunities to address healthy food pricing, cost of fresh fruits and vegetables, and access to healthy foods.
Data Action Steps
1. Assess and forecast access to fresh fruits and vegetables by geography.
Other Suggested Actions Steps for the State and its Partners
1. Create unified healthy nutrition messages to be used to promote knowledge and awareness of healthy eating. 2. Assess the feasibility of implementing digital platforms to improve school nutrition programs (i.e. allowing parents and students to electronically pre-order nutritious school meals). 3. Expand implementation of healthy cooking and healthy eating education and skill-building offered by evidence-based programs in the community, health providers, schools, and employers. 4. Promote initiation of and length of breastfeeding. 5. Promote healthy lifestyle family planning within OB/GYN practices with women of childbearing age. 6. Encourage health systems to implement healthy eating strategies as part of their population health plans. 7. Develop and sustain a unified statewide summer feeding program (breakfast and lunch through summer months) in underserved communities. 8. Increase access to farmers markets and the number of farmers and urban farms participating in markets. 9. Advocate for and promote legislation that institutes incentives for grocery stores to provide affordable, healthy food options in underserved communities.

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Objective: Achieve and maintain recommended physical activity levels for all Marylanders.
Priority State Action Steps
1. Implement statewide policies that increase opportunities for students to be physically active throughout the school day and after school. 2. Promote policies that improve the built environment to link people to everyday destinations such as work, school, parks and green spaces. 3. Incentivize employers to encourage multiple modes of transportation and commuting.
Suggested Actions Steps for the State and its Partners
1. Implement the Maryland (MDOT) Pedestrian and Bicycle Plan. 2. Encourage worksites to implement policies that support physical activity. 3. Encourage community collaboration to implement formal walking plans. 4. Expand the number of physical activity and healthy eating offerings and attendance at parks and recreation centers, community and civic centers, and senior centers. 5. Sponsor weight loss competitions by partnering with community groups, faith-based groups, and worksites. 6. Promote the replace of screen time with increased physical activity alternatives. 7. Engage healthcare professionals to promote increased physical activity and decreased sedentary activity. 8. Promote opportunities to use shared community green spaces for physical activity. 9. Assess the feasibility of subsidizing gym memberships through public-private partnerships. 10. Assess the feasibility of increasing the use of wearables (fitness trackers) to increase physical activity. 11. Establish community investment to support healthy lifestyles in communities. 12. Encourage health systems to implement strategies to increase physical activity as part of their population health plan.

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Reducing Overweight and Obese Populations

In children, overweight is defined as a BMI measurement greater than or equal to the 85th percentile for age and sex of the child. Obese is defined as a BMI measurement greater than or equal to the 95th percentile for age and sex. Adult overweight is defined as a BMI equal to or greater than 25, while obesity is a BMI equal to or greater than 30. In adolescents, the definitions are a BMI of 25 or 30 or above 85 and 95 percent respectively, whichever is lower. There are three classes of obesity, ranging from BMI 30-34 for Class 1, BMI 35-39 for Class 2, and BMI greater than 40 for Class 3.

GOAL: By 2024, maintain the percentage of adults with a BMI >25 at 66.5%; and reduce by 10% percent the BMI >85th percentile in high school students.

Objective: Improve clinical care services for overweight and obese children and adults.
Priority State Action Steps
1. Encourage healthcare providers to refer overweight children and adults to appropriate evidence-based weight and lifestyle counseling. 2. Establish referral mechanisms in healthcare system to refer obese children and adults to obesity specialists for treatment. 3. Explore expanded public and private insurance coverage for clinically supervised weight loss for obese children and adults without secondary co-morbidities.
Data Action Steps
1. Establish a reliable population-level data source for child body mass index.
Suggested Actions Steps for the State and its Partners
1. Establish screening and documentation processes for annual BMI for children older than 2 years of age and adults. 2. Establish medical homes for screening and treatment of overweight/obesity for members of higher-risk groups. 3. Establish universal SDOH screening tools and promote providers use of z-codes in primary care and pediatrician practices for overweight/obese patients (food insecurity, poverty, housing instability, neighborhood safety, and provide social and case-management support). 4. Implement policies for third party reimbursement for nutrition counseling for overweight/obese children and adults. 5. Establish use of mobile and telehealth technology by case managers, registered dieticians, and healthcare providers to monitor high risk patients to help them achieve weight management goals.

Objective: Improve the availability of health lifestyle options for overweight and obese children and adults
Priority State Action Steps
1. Engage MSDE and others to seek greatly increased opportunities for physical activity as a required element of a student's life.

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2. Support counties in assessment of county food environment by mapping healthy food priority areas to elucidate relationship between food insecurity/inadequate healthy food access and obesity in each county (Ex. https://planning.baltimorecity.gov/baltimore-food-policy-initiative/food-environment).

Data Action Steps

1. Identify prevalence of school districts in the State with a minimum time requirement for physical education.
2. Assess the percentage of third-party payers covering comprehensive obesity management services for adults and children.

Suggested Actions Steps for the State and its Partners

1. Build nutrition counseling skills in primary care providers and increase those billing for nutrition counseling.
2. Encourage primary care providers to perform or arrange for healthy behavior screening for overweight/obese patients, including a 24-hr dietary recall, food diary, and assessment of food security and prescribe dietary and physical activity interventions for weight management.
3. Establish physical activity opportunities specifically for overweight/obese children and adults outside work and school.
4. Expand the implementation of healthy cooking, teaching kitchens and healthy eating education and skill-building opportunities amongst overweight/obese adults and children.
5. Require medical schools to include nutrition education and obesity pathophysiology and prevention/treatment into curriculum to maintain accreditation by professional associations.

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Prediabetes and Gestational Diabetes Populations

Prediabetes occurs when people have elevated blood glucose (sugar) levels, which places them at higher risk for developing type 2 diabetes. This group includes people with A1C of 5.7-6.4 percent, or fasting plasma glucose between 100 and 125 mg/dL, regardless of BMI. Gestational Diabetes occurs in pregnant women who have high blood glucose levels during pregnancy with no history of diabetes mellitus prior to pregnancy. Gestational diabetes is typically tested between 24-28 weeks with Oral Glucose Tolerance Test (OGTT) levels exceeding normal range fasting, 1 hour, and 2 hours. Even if the blood glucose reduces back to normal levels after delivery, the woman has an increased risk for type 2 diabetes mellitus later in life as does the child.

GOAL: By 2024, increase the prevalence of Maryland adults who know their prediabetes status by 30%.

Objective: Improve prediabetes outcomes
Priority State Action Steps
1. Increase capacity of evidence-based lifestyle change programs, such as the CDC-recognized lifestyle change program, in the state to deliver and bill payers and insurers for lifestyle change programs. 2. Build knowledge and ability of healthcare providers to identify risk, test at-risk people, diagnose (using ICD-10 codes) prediabetes, and implement practice mechanisms to assure referral of patients to interventions. 3. Develop and train providers to utilize an e-referral application within CRISP to facilitate referrals to the BeHealthyMaryland.org referral page and National DPP Lifestyle Change Programs. 4. Implement a communication campaign on prediabetes to increase screening and testing, with targeted messages to enroll and retain HealthChoice DPP and Medicare enrollees. 5. Engage partners to build evidence for diabetes prevention outcomes on new and existing weight management and loss programs.
Data Action Steps
1. Align quality metrics across health care programs in Maryland to require at-risk screening (e.g., MDPCP has proposed to CMS to add weight assessment and counseling as a P4P measure in 2020) 2. Complete return on investment (ROI) for Maryland diabetes prevention efforts to track progress.
Suggested Actions Steps for the State and its Partners
1. Increase number of people at risk for prediabetes who are tested, referred and complete and reach evidence-based lifestyle change program target goals.

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2. Maintain and foster a statewide network to increase the number of evidence-based lifestyle change programs, including group, virtual and blended programs.
3. Increase existing CDC-Recognized Organization's capacity to bill for new coverage (i.e. Medicaid and Medicare) and business acumen.
4. Establish insurance regulations and engage elected officials to introduce new legislation related to preventing and treating prediabetes.
5. Address barriers to participation in lifestyle programs (i.e. transportation, childcare, healthy food, exercise programs).

Objective: Reduce risk of diabetes in women with a history of gestational diabetes

Priority State Action Steps

1. Engage healthcare and WIC providers to implement mechanisms and tools within provider practices to test for diabetes at 4-12 weeks postpartum for women with history of gestational diabetes.
2. Build knowledge and ability of providers to adhere to clinical guidelines for women with history of gestational diabetes for regular testing, healthy lifestyle support and potential use of medication to reduce risk.
3. Engage providers and health systems to implement coordinated strategies to encourage women with a history of gestational diabetes to breastfeed.

Data Action Steps

1. Establish data source for women with gestational diabetes and postpartum testing.

Suggested Actions Steps for the State and its Partners

1. Increase the number of women with a history of gestational diabetes referred to the evidence-based lifestyle change programs such as CDC-Recognized lifestyle change programs or nutrition counseling.
2. Promote education and awareness of national clinical guidelines for testing, follow-up, and referral for women with a history of gestational diabetes.
3. Develop and train providers to utilize the CRISP e-referral to refer women with gestational diabetes history to evidence-based lifestyle change programs or interventions.
4. Ensure adherence to clinical postpartum glucose testing guidelines for women who have a history of gestational diabetes.

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Managing Diabetes and Controlling Diabetes with Complications

This group includes people with two confirmed tests; fasting plasma glucose over 126 mg/dL or A1C of 6.5 percent or higher, regardless of BMI. Diabetes, when not well managed or when it has been present for many years, slowly damages the blood vessels in the body and results in problems of organs or organ systems in the body, including the heart, eyes, kidneys, skin, and nerves.

GOAL: By 2024 reduce the age-adjusted diabetes mortality by 5%.

Objective 1: Improve the use of standardized quality of care for people with diabetes at all levels of the health care system by increasing the number of healthcare systems statewide that utilize the chronic care model (CCM), as recommended by the American Diabetes Association's 2019 Standards of Medical Care in Diabetes.
Priority State Action Steps
1. Engage partners across the state to support payment mechanisms, in adoption of the CCM, that support high quality, state of the art diabetes care and prevention, including the use of telemedicine, case managers, and community workers; and implement payment incentives to encourage the use of Diabetes Self-Management Education and Supports (DSMES), Chronic Disease Self-Management Program (CDSMP), and Diabetes Self-Management Program (DSMP) among people with diabetes. 2. Explore reimbursement of DSMES for Medicaid enrollees. 3. Develop and encourage use of standardized social determinants of health screening tools for use statewide for all patients with diabetes. 4. Explore opportunities by which certified Community Health Workers can specialize in and join care teams to provide a range of diabetes-related community work, including prevention, referral and patient support.
Data Action Steps
1. Establish a diabetes platform to collect and track data on aggregated patient care outcomes, coordinate care across specialties, identify gaps in data, and assure quality care. 2. Enable CRISP to collect and aggregate electronic health record data from participating clinical partners to facilitate population health decision-making actions for diabetes.
Suggested Actions Steps for the State and its Partners
1. Encourage use of CCM model and adherence to clinical guidelines and increase use of EHR best practice advisories, dashboards, and provider referencing of guidelines to achieve better compliance with routine care items such as A1c, eye/foot exams, oral health, urine proteinuria/nephropathy screening.

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2. Refer patients appropriately for vision, oral, or podiatry services.
3. Ensure patients are appropriately linked with case management.
4. Following the delivery system design principle of the CCM, engage clinical team members to improve efficiency in quality care delivery by (i.e. dentists, optometrists/ophthalmologists, podiatrists, pharmacists, nurses, medical assistants, social workers, case managers, lab technicians), to achieve more intensive disease management and decrease delays in implementing the most effective care for each person with diabetes.
5. Use available telemedicine services to improve patient access to primary care and to assist in self-management of diabetes.
6. Establish increased dental-to-primary care provider partnerships to refer patients a high risk to primary care providers for potential diabetes diagnosis/management.
7. Implement standard clinical education for all health professional trainees on all aspects of the CCM, as supported by the American Diabetes Association's Standards of Medical Care in Diabetes -2019.
8. Support persons with diabetes in the workplace through coverage of self-management services and wellness programs, and encouragement to remain engaged with primary care providers.
9. Implement mechanisms and tools in provider practices to ensure referral to self-management and lifestyle management programs.
10. Implement system mechanisms in provider practices to assure all patients with diabetes have an Emergency Preparedness plan.

Objective: Reduce the number of hospitalizations and emergency department visits each by 5% for people with diabetes in the state of Maryland.

Priority State Action Steps

1. Engage partners across the state to support payment mechanisms, in adoption of the CCM, to align payment mechanisms for all clinical entities to support quality, state of the art diabetes care and prevention, including patient engagement using case management and community health workers.
2. Encourage the use of Diabetes Self-Management Education and Supports (DSMES), Chronic Disease Self-Management Program (CDSMP), and Diabetes Self-management Program (DSMP) among patients with diabetes and the use of telemedicine/virtual methods to improve support for self-management of diabetes, as needed.

Data Action Steps

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1. Support CRISP and the Maryland Institute for Emergency Medical Services Systems (MIEMSS) in efforts to identify and track diabetes-related patient encounters that do not result in emergency department visits or hospital admissions.

Suggested Actions Steps for the State and its Partners

1. Assure patients are appropriately linked with case management based on screening and risk-stratification.
2. Implement mechanisms and tools in provider practices to ensure the adherence to clinical guidelines, and use of evidence-based decision making and increase use of EHR best practice advisories, dashboards, and provider referencing of guidelines to achieve better compliance with routine care items such as A1C, eye/foot exams, eye exams, vaccinations, oral health, urine proteinuria/nephropathy screening.
3. Implement mechanisms and tools in provider practices to ensure appropriate referral for vision/oral/podiatry services.
4. Encourage clinical team engagement to improve efficiency in quality care delivery (i.e. dentists, optometrists/ophthalmologists, podiatrists, pharmacists, nurses, medical assistants, social workers, case managers, lab technicians), to achieve more intensive disease management and prevent therapeutic inertia.
5. Use telemedicine services to improve access to primary care and specialists for high-needs patients and to assist in self-management of diabetes.
6. Establish increased dental-to-primary care provider partnerships to refer high-risk patients screened for elevated blood glucose during dental visits to primary care providers for potential diabetes diagnosis/management.
7. Encourage adherence to Community Preventive Services Task Force (CPSTF) recommendations for intensive lifestyle interventions (based on Look Ahead trial/DPP model) for overweight/obese patients with type 2 diabetes to prevent complications.
8. Engage registered dieticians, behavioral therapists, and exercise physiologists to participate in care teams, and provide additional diabetes related training.

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IV. Inventory of Diabetes-related Resources

Development of a Diabetes Program Inventory

In June 2019, the Maryland Department of Health (the Department) initiated a process to inventory obesity, prediabetes, and diabetes programs in Maryland. The aim of the inventory is to assess the availability of programs across Maryland that address diabetes prevention, care, and management. While the required level of service provision across the state cannot be determined through the inventory alone, the Department aims to use this process to begin to identify gaps and opportunities to expand efforts to address diabetes.

The scope of the inventory is all programs serving Marylanders, including those that serve Medicaid enrollees, Medicare beneficiaries, commercial and small business health insurance enrollees, and the uninsured population. The inventory includes programs that serve specific minority groups. The programs are categorized according to where the target population is situated along the disease progression continuum: 1) Keeping a Healthy Weight Population; 2) Reducing Overweight and Obese Populations; 3) Prediabetes and Gestational Diabetes Populations; 4) Managing Diabetes and Controlling Complications. The normal clinical management of diabetes patients within a primary care or hospital setting was excluded from the scope.

The Department conducted a review of a wide range of available resources, initially including: Community Health Needs Assessments (CHNAs); Local Health Improvement Plans (LHIPs); Hospital Community Benefit Reports; Maryland Hospital Association's (MHA) "Innovations for Better Health" website; the Centers for Disease Control and Prevention's (CDC) national registry of all recognized diabetes prevention programs; Maryland Community Health Resources Commission (CHRC) grantees; Minority Outreach and Technical Assistance (MOTA) grantees; the American Diabetes Association website; the American Association of Diabetes Educators website; the Supplemental Nutrition Assistance Program Education (SNAP-Ed) program; the Expanded Food and Nutrition Education Program (EFNEP); the Curves program; the Take Off Pounds Sensibly program (TOPS Club); and the WW (formally Weight Watchers) program.

The Department sought input from Local Health Departments (LHDs), Local Health Improvement Coalitions (LHICs), and minority outreach groups in the development of the inventory. The Department presented its plans for a Diabetes Program Inventory at the July 2019 Local Health Officers (LHO) Roundtable and incorporated the feedback received at this meeting into its approach. Jurisdiction-specific reports of programs were shared in advance of publication with Local Health Officers; LHIC leaders, where these are different; and MOTA partners. Information on additional programs received because of this outreach is included in the draft inventory. Through the publication of the Maryland State Diabetes Action Plan, the Department is now seeking input from a wider range of stakeholders. The Diabetes Inventory is published in PDF format.

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The inventory will continue to be refined and updated. As a next step, the Department aims to gather more details on the reach and capacity of diabetes programs. Along with available data on obesity and diabetes, the Department will use a final inventory to generate a detailed assessment of gaps in service provision and promote action to address these gaps. Emphasis will be placed on identifying data sources, including from the school system, and developmentally appropriate interventions for children.

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Diabetes Prevention and Care

While diabetes care services have long been part of Maryland Medicaid's comprehensive benefits package (COMAR 10.9.67),[106] diabetes prevention services were recently approved by Centers for Medicare and Medicaid (CMS) and added as part of the HealthChoice benefit package.

HealthChoice Diabetes Prevention Program (HealthChoice DPP)

Maryland Medicaid has been a leader in integrating diabetes prevention into its HealthChoice program through its MCOs. In 2016, through a cooperative agreement with CDC, the National Association of Chronic Disease Directors (NACDD) awarded funding to Maryland Medicaid in collaboration with the Center for Chronic Disease Control and Prevention (the Center) to implement the Maryland Medicaid and National DPP demonstration. The purpose of the demonstration was to promote Medicaid delivery models for the National DPP through Managed Care Organizations. Maryland enrolled 637 HealthChoice enrollees into the National DPP lifestyle change program during the demonstration period. As a result of this demonstration, the Department applied for and received a §1115 HealthChoice demonstration waiver amendment that authorizes Medicaid to offer the National DPP lifestyle change program to HealthChoice enrollees beginning September 1, 2019. By identifying beneficiaries early through screening and testing for prediabetes and referring them to the National Diabetes Lifestyle Change Program, the Department hopes to reduce the incidence of diabetes and increase the quality of life for individuals at-risk for Type 2 diabetes in the HealthChoice program.

Investing in Prevention Programs

From 2016-2018, Maryland Medicaid, in collaboration with Maryland State Health Department's Center for Chronic Disease Prevention and Control, was funded to implement the National DPP Medicaid Demonstration project in Maryland. The National DPP Lifestyle Change Program is an evidence-based program established by CDC to prevent or delay the onset of type 2 diabetes through healthy eating and physical activity. Diabetes prevention programs that are recognized by the CDC, known as CDC-recognized type 2 diabetes prevention programs, participated with MCOs to establish a reimbursement mechanism within Medicaid to administer the program. Adults with prediabetes between the ages of 18 and 64 were eligible to participate.

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[106] 10.09.67 Maryland Medicaid Managed Care Program: Benefits Authority: Health-General Article, Title 15, Subtitle 1, Annotated Code of Maryland, .24 Benefits — Diabetes Prevention and Care Services (2019).

Acronyms

A1C	Glycosylated Hemoglobin
ADA	American Diabetes Association
BRFSS	Behavioral Risk Factor Surveillance System
BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
CDSMP	Chronic Disease Self-Management Plan
CHNA	Community Health Needs Assessment
CHRC	Community Health Resource Commission
CMS	Centers for Medicare and Medicaid Services
CPSTF	Community Preventive Services Task Force
CY	Calendar Year
DPP	Diabetes Prevention Program
DSMES	Diabetes Self-Management Education and Support
DSMP	Diabetes Self-Management Plan
EBT	Electronic Benefit Transfer
ED	Emergency Department
EFNEP	Expanded Food and Nutrition Education Program
FPG	Fasting Plasma Glucose
HiAP	Health in All Policies
ICD	International Classification of Diseases
LHD	Local Health Department
LHIC	Local Health Improvement Coalition
LHIP	Local Health Improvement Plan
LHO	Local Health Officer
MCO	Managed Care Organization
MDOT	Maryland Department of Transportation
MDPCP	Maryland Primary Care Program
MHA	Maryland Hospital Association
MOTA	Minority Outreach and Technical Assistance
NACDD	National Association of Chronic Disease Directors
NH	Non-Hispanic
OGTT	Oral Glucose Tolerance Test
P4P	Pay for Performance
PMPM	Per-Member-Per-Month
PQI	Prevention Quality Indicator
SDOH	Social Determinants of Health
SNAP	Supplemental Nutrition Assistance Program
TOPS	Taking off Pounds Sensibly
WW	Weight Watchers
YRBS	Youth Risk Behavior Survey

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