

## Introduction

Diabetes is a chronic condition characterized by elevated levels of blood glucose (blood sugar) as a result of the body's decreased ability to use or produce insulin, a hormone secreted by the pancreas.<sup>1</sup> An estimated 34.2 million people in the U.S.– about 1 in 10 people – have diabetes; Type 2 diabetes accounts for 90 - 95% of all diagnosed cases of diabetes.<sup>2</sup> An additional 88 million people – more than 1 in 3 people – have prediabetes (or borderline diabetes), a preventable condition characterized by elevated blood sugar that is not high enough to be considered diabetes.<sup>2,3</sup> About 20% of people with diabetes and 80% of people with prediabetes are unaware of their conditions.<sup>2</sup> People who have diabetes are at higher risk of health complications, such as vision loss, heart disease, stroke, kidney failure, and nerve damage, than those without diabetes.<sup>2</sup> The medical costs for people with diabetes are more than twice as high as for people without diabetes, and the risk of early death for adults with diabetes is 60% higher.<sup>2</sup>

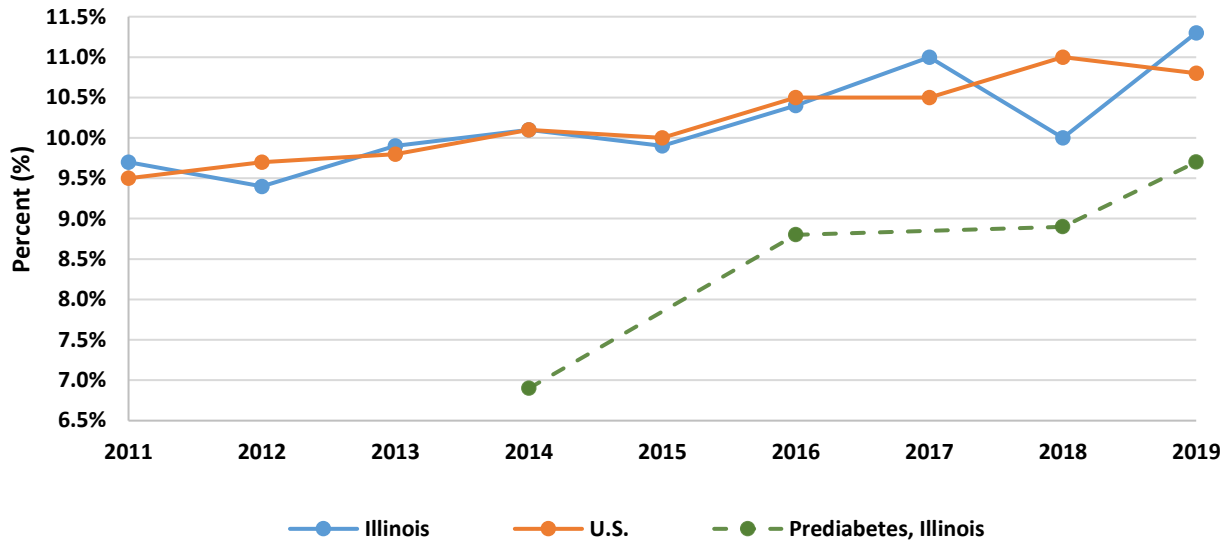
## Diabetes Trends in Illinois

The proportion of Illinois adults ever told by a health professional they had diabetes increased from 9.7% (95% CI: 8.5, 10.9) to 11.3% (95% CI: 10.4, 12.2) between 2011 and 2019 (Figure 1, *Crude Prevalence of Diabetes and Prediabetes Among Adults: Illinois and U.S., 2011-2019*).<sup>4,5</sup> These rates are comparable to the U.S. overall. In the same time period, the proportion of U.S. adults who were told they had diabetes increased from 9.5% to 10.7% (95% CI not available).<sup>3</sup> The prevalence of prediabetes in Illinois and the U.S. also continued to climb.<sup>3,4,6</sup> Clinicians are increasingly screening patients for prediabetes, providing education on the risks of diabetes, and referring patients to lifestyle change programs, such as the [National Diabetes Prevention Program](#)<sup>\*</sup>, a partnership of public and private organizations working to prevent or delay type 2 diabetes.

---

<sup>\*</sup><https://www.cdc.gov/diabetes/prevention/index.html>

**Figure 1. Crude Prevalence of Diabetes<sup>a</sup> and Prediabetes<sup>b</sup> Among Adults: Illinois and U.S., 2011-2019**



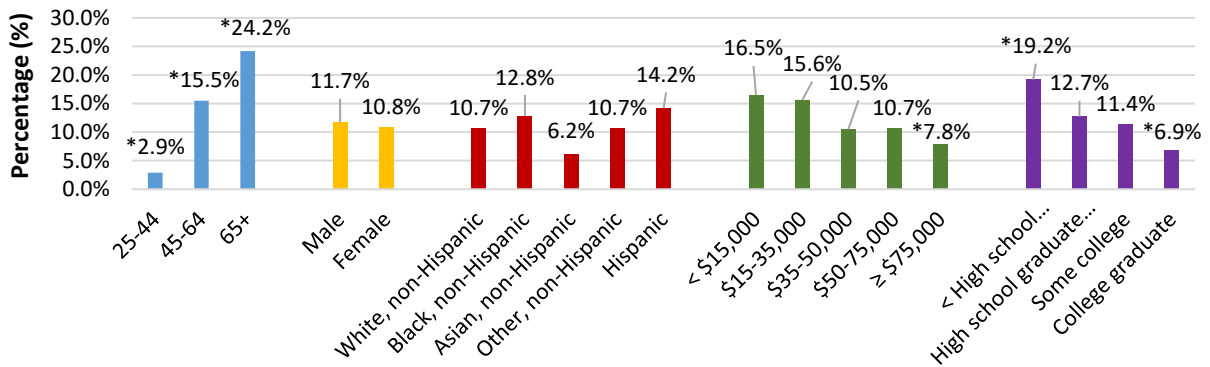
<sup>a</sup>Diabetes as diagnosed by a physician, <sup>b</sup>Asked only of respondents who did not report ever being told they have diabetes

Sources: Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance Survey (BRFSS) Prevalence & Trends Data. Illinois Department of Public Health (IDPH). 2019 Illinois Behavioral Risk Factor Surveillance System.

In Illinois in 2019, diabetes prevalence was significantly higher among adults aged 65 years or older (24.2%; 95% CI: 21.7, 26.9) compared to all other age groups (Figure 2, *Crude Prevalence of Diabetes Among Adults by Demographic Characteristics: Illinois 2019*). Males had a slightly higher diabetes prevalence than females. In comparing diabetes rates by race and ethnicity, individuals of Hispanic ethnicity had the highest diabetes prevalence (14.2%; 95% CI: 11.7, 17.2) followed by non-Hispanic Black populations (12.8%; 95% CI: 10.3, 15.7).

By socioeconomic status, those with an annual household income less than \$15,000 had the highest diabetes prevalence (16.5%; 95% CI: 12.8, 21.0) while those reporting \$75,000 or higher had the lowest diabetes prevalence (7.8%; 95% CI: 6.5, 9.2). Additionally, diabetes prevalence was significantly higher (19.2%; 95% CI: 15.5, 23.6) among those who completed less than a high school-level education compared to all other education levels.

**Figure 2. Crude Prevalence of Diabetes<sup>a</sup> Among Adults by Demographic Characteristics: Illinois 2019**



<sup>a</sup>Diabetes as diagnosed by a physician

\*Indicates statistically significant difference when compared to all other groups in the category

Note: Some age-group data are suppressed due to low counts (0-24)

Source: Illinois Department of Public Health (IDPH). 2019 Illinois Behavioral Risk Factor Surveillance System

## Geographic Differences in Disease Prevalence

Between 2015-2019, self-reported diabetes prevalence in Illinois was higher among adults in rural counties located in southeast Illinois (12.9% - 19.6%; statewide average: 10.5%\*) compared to other counties. *See Attachment 1: Prevalence of Adult Population Who Have Ever Been Told They Have Diabetes (Excluding Pregnant Females)*. The highest percentage of self-reported prediabetes among adults occurred in urban settings (Suburban Cook, Will, and Kendall counties) as well as 15 rural counties across the state (9.6% - 14.0%; statewide average: 9.1%\*). *See Attachment 2: Prevalence of Adult Population Who Have Ever Been Told They Have Pre-Diabetes or Borderline Diabetes*. Lastly, higher percentages of overweight/obesity were reported in 30 counties in predominately rural areas of the state (73.7% - 80.1%; statewide average: 65.8%\*)<sup>†</sup>. *See Attachment 3: Prevalence of Adult Population Overweight or Obese*.

Prior research shows differences in receipt of diabetes care and select outcomes between rural and urban persons living with diabetes in the U.S.<sup>7</sup> A significantly lower proportion of rural than urban individuals with diabetes reported receiving a foot examination (70.6% vs. 73.7%,  $p = 0.016$ ) or a dilated eye examination (69.1% vs. 72.4%,  $p = 0.005$ ) in the past year. Further, significantly higher proportions of rural individuals compared to urban reported having a foot sore that took more than four weeks to heal (13.2% vs. 11.2%,  $p = 0.036$ ) and diabetic retinopathy

\* Data Source: Illinois Counties Behavioral Risk Factor Survey (ICBRFS), Round 6 (2019).

<sup>†</sup> Body Mass Index (BMI)  $\geq 25$  is classified as overweight; a BMI  $= 30$  is classified as obese. BMI is calculated from reported height and weight.

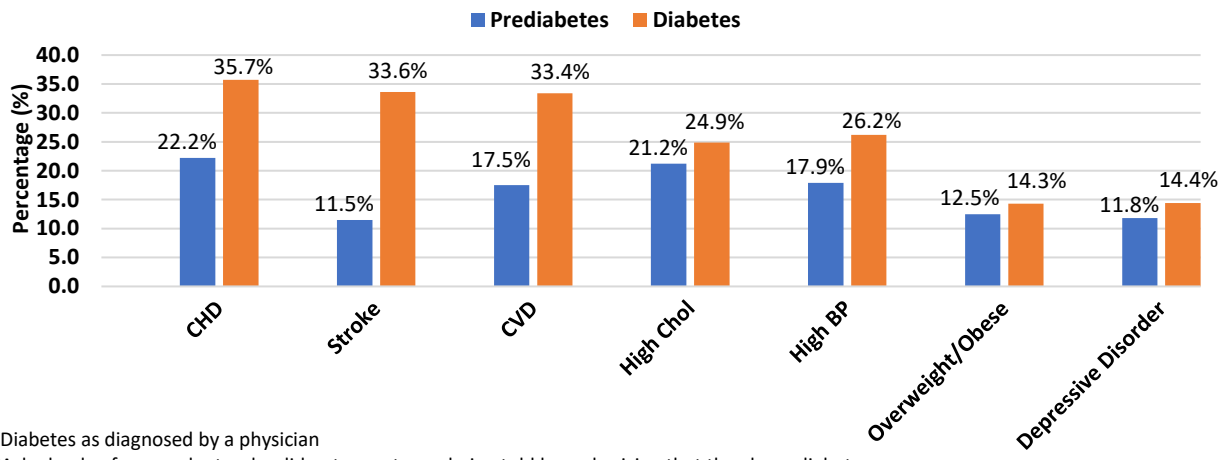
(25.8% vs. 22.0%,  $p = 0.007$ ). Finally, there are fewer Diabetes Self-Management and Education (DSME) programs in nonmetropolitan, socially disadvantaged counties in the U.S.<sup>8</sup>

## **Comorbidities and Health Risks Associated with Diabetes**

In Illinois in 2019, diabetes prevalence was 35.7% among adults diagnosed with coronary heart disease (CHD) (95% CI: 29.2, 42.8), 33.6% among adults diagnosed with stroke (95% CI: 26.1, 41.9), 33.4% among adults diagnosed with cardiovascular disease (CVD) (95% CI: 28.8, 38.3), 24.9% among adults diagnosed with high cholesterol (95% CI: 22.6, 27.4), 26.2% among adults diagnosed with high blood pressure (95% CI: 24.0, 28.5), 14.3% among adults diagnosed as overweight or obese (95% CI: 13.1, 15.7), and 14.4% among adults diagnosed with depressive disorder (95% CI: 12.3, 16.9) (Figure 3, *Crude Prevalence of Diabetes and Prediabetes Among Adults by Presence of Comorbid Conditions: Illinois 2019*). Prediabetes prevalence was 22.2% among adults diagnosed with CHD (95% CI: 15.8, 30.2), 11.5% among adults diagnosed with stroke (95% CI: 6.5, 19.8), 17.5% among adults diagnosed with CVD (95% CI: 13.4, 22.5), 21.2% among adults diagnosed with high cholesterol (95% CI: 18.7, 23.9), 17.9% among adults diagnosed with high blood pressure (95% CI: 15.6, 20.4), 12.5% among adults diagnosed as overweight or obese (95% CI: 11.1, 14.0), and 11.8% among adults diagnosed with depressive disorder (95% CI: 9.4, 14.8).

The majority of patients with diabetes have at least one comorbid condition (97.5%), and 88.5% of patients have at least two comorbid conditions.<sup>9</sup> While the comorbid conditions associated with type 2 diabetes vary by patient, the most common include hypertension, overweight/obesity, high cholesterol, chronic kidney disease, and CVD. The presence of comorbidities can profoundly affect a patient's ability to manage their diabetes, leading to ineffective diabetes control and diabetes-related health complications, including vision loss, heart disease, stroke, kidney failure, and nerve damage.<sup>2,10</sup>

**Figure 3. Crude Prevalence of Diabetes<sup>a</sup> and Prediabetes<sup>b</sup> Among Adults by Presence of Comorbid Conditions: Illinois 2019**



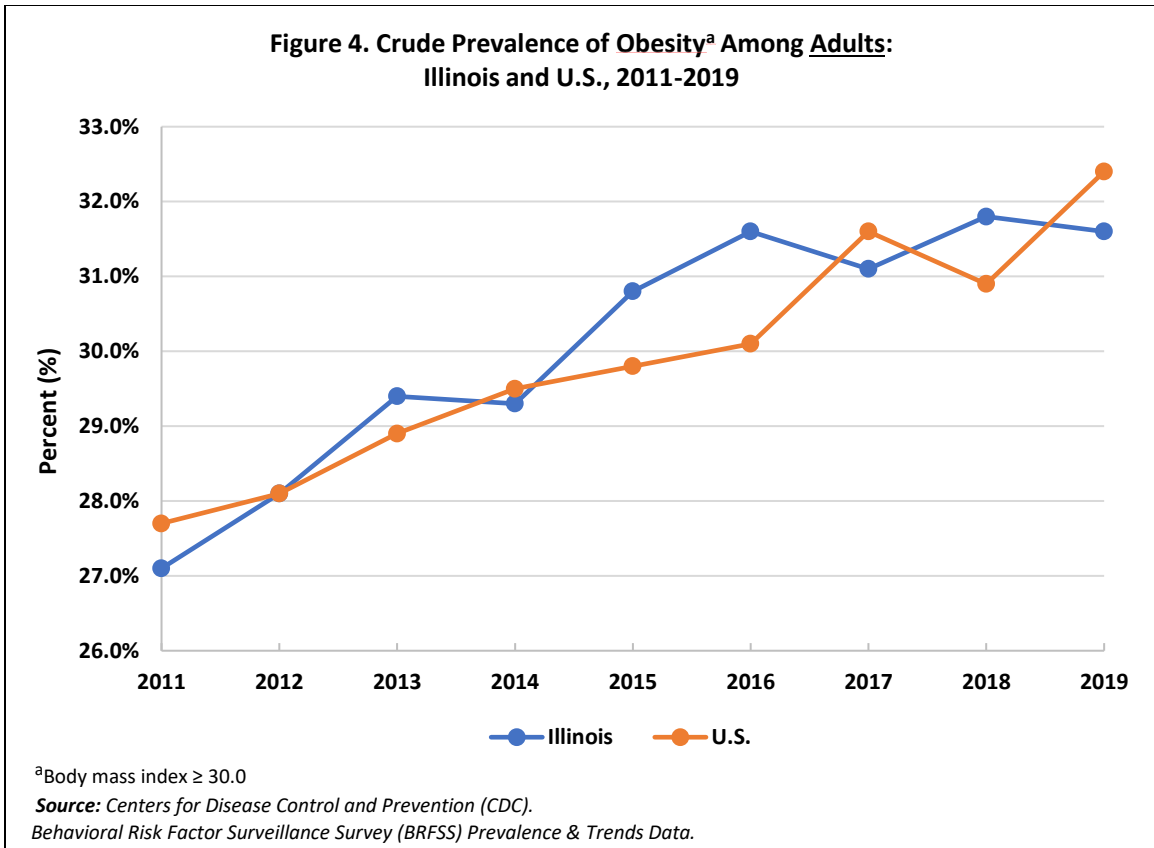
<sup>a</sup>Diabetes as diagnosed by a physician

<sup>b</sup>Asked only of respondents who did not report ever being told by a physician that they have diabetes

Source: Illinois Department of Public Health (IDPH). 2019 Illinois Behavioral Risk Factor Surveillance System

### Obesity as a Risk Factor for Diabetes/Prediabetes

In Illinois in 2019, the prevalence of overweight/obesity among persons with diabetes (14.3%; 95% CI: 13.1, 15.7) was significantly higher than under/normal weight adults (5.3%; 95% CI: 4.3, 6.6).<sup>4</sup> Obesity is a significant risk factor for diabetes.<sup>6</sup> Consequently, diabetes risk in Illinois is increasing. Overall, the percentage of Illinois adults who are obese has increased significantly from 27.1% (95% CI: 25.4, 28.9) to 31.6% (95% CI: 30.1, 33.1) between 2011 and 2019 (Figure 4, *Crude Prevalence of Obesity Among Adults: Illinois and U.S., 2011-2019*).<sup>3</sup> In the U.S., the prevalence of obese adults increased from 27.7% to 32.4% during the same time period.



## Diabetes Programs across Illinois

The Illinois Department of Public Health (IDPH) and its partners continue to focus on diabetes prevention and management through collaboration on the Centers for Disease Control and Prevention (CDC) DP18-1815 grant, *Improving the Health of Illinoisans Through Chronic Disease Prevention*.<sup>11</sup> Through these partnerships, evidence-based interventions are being implemented with a special focus on populations particularly vulnerable to this disease, including but not limited to older adults, Hispanic and non-Hispanic Black populations, and rural communities.

IDPH and its partners are finding new and innovative ways to offer virtual programs promoting diabetes prevention and self-management in central and southern Illinois, including the Chronic Disease Self-Management Program (CDSMP), Diabetes Self-Management Program (DSMP), and the National Diabetes Prevention Program, as well as enhanced training and engagement of licensed pharmacists and paraprofessionals (community health workers) to provide diabetes prevention and management programs and services.

In addition, IDPH has been working to promote and support the [Medicare Diabetes Prevention Program expanded model\\*](#), a structured behavior change intervention that aims to prevent the onset of diabetes among Medicare beneficiaries. Finally, IDPH is working with partners to target employer-based coverage of the National Diabetes Prevention Program, including state employees and developing a rate structure and state plan amendment for Medicaid reimbursement of the National Diabetes Prevention Program.

## Diabetes In the Era of COVID-19

Although it is unclear whether diabetes patients have a higher risk of contracting COVID-19, individuals with diabetes who do contract COVID-19 are at a higher risk of experiencing hospitalization and death compared to those without diabetes.<sup>12-15</sup> In a meta-analysis of 83 studies among 78,874 patients hospitalized due to COVID-19, patients with pre-existing diabetes had 2.10 times greater odds of severe/critical COVID-19 illness (95% CI: 1.71, 2.57) and 2.68 times greater odds of in-hospital mortality (95% CI: 2.09, 3.44) compared to patients without pre-existing diabetes.<sup>16</sup> Although diabetes prevalence is greater among older adults, the association between diabetes and COVID-19 severity has been found to be statistically significant even after adjusting for age.<sup>13, 14</sup> Further, higher glucose levels at hospital admission are positively associated with multiple indicators of COVID-19 severity, including hemodynamic, respiratory, hematologic, inflammatory, and tissue damage biomarkers.<sup>13</sup>

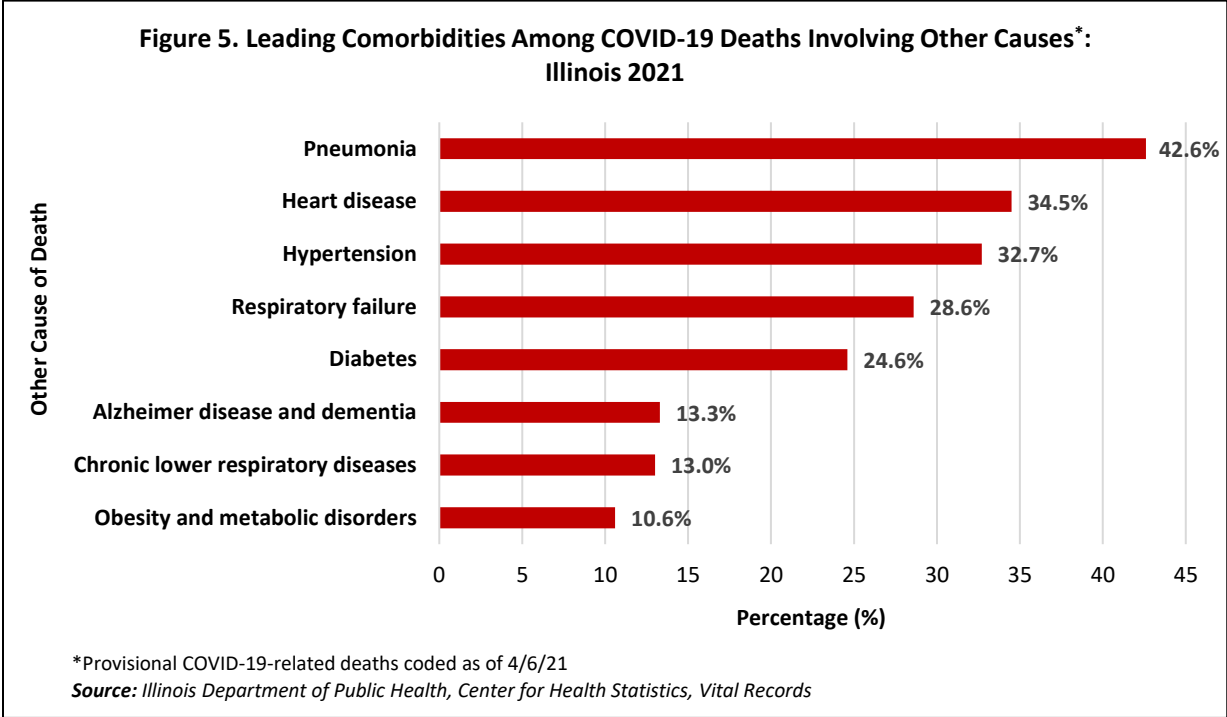
Various mechanisms have been proposed which may explain the increased severity of COVID-19 infection among individuals with diabetes. It is known that higher glucose levels in human immune cells facilitate replication of the virus.<sup>14</sup> Inflammation induced by the viral infection may increase insulin resistance, resulting in the progression of diabetic complications.<sup>11</sup> Changes in insulin sensitivity may also cause immunological dysregulation that results in cytokine storm, a dangerous and uncontrollable inflammatory response.<sup>15</sup> In addition to being a dangerous comorbidity for individuals who contract COVID-19, some evidence suggests that permanent diabetes may also be induced by COVID-19 infection.<sup>17</sup> Further study and long-term follow-up must be pursued to clarify the potential risk of diabetes induced by COVID-19 infection.

Illinois provisional death data indicate diabetes has been among the leading comorbidities reported in conjunction with COVID-19 deaths (Figure 5, *Leading Comorbidities Among COVID-19 Deaths Involving Other Causes: Illinois 2021*). Nearly 25% of individuals who have died from

---

\*[Medicare Diabetes Prevention Program \(MDPP\) Expanded Model | CMS Innovation Center](#)

COVID-19 had a diagnosis of diabetes. Although a causal link between diabetes and COVID-19 mortality cannot be established in all cases, especially since patients with diabetes often have additional risk factors, the heightened risk of COVID-19 complications among diabetes patients makes it clear that diabetes prevention and management efforts have a role to play in reducing severe illness and/or complications from COVID-19.



### Conclusion

Type 2 diabetes is a complex, chronic illness requiring continuous clinical and self-care. Screening, treatment, and prevention of complications from diabetes must be a shared responsibility between the patient, the clinical provider, and community-based programs. In addition, prevention and management programs that include a social support structure should be considered a routine part of the care continuum and coordinated across care specialties to address comorbidities. Specifically, programs should be targeted to the rural areas of Illinois as well as to populations at higher risk of obesity, prediabetes, and diabetes, such as Hispanic and Black/African American populations, as well as older adults.



Diabetes prevention and control can be accomplished through coordinated efforts including, but not limited to, the following: 1) offering no or low-cost chronic disease prevention and management programs; 2) coordinating programs with existing services and/or community programs; 3) promoting and hosting programs in places that are accessible to residents (e.g., senior centers, community centers, worksites, schools, and churches); 4) providing incentives for program participation; 5) making programs accessible through both in-person and virtual offerings, 6) connecting program promotion to trusted local champions, such as clinical providers, faith-based leaders, etc.; and 7) establishing social-support structures to enhance program participation and engagement.

Over the past year, the field of public health has been pushed to be innovative and attentive to the demands and concerns of its communities and constituents. The rapid response and innovative strategies that have been used to incrementally gain the confidence of highly vulnerable populations and communities should serve as a model for delivering programs around prevention and control of chronic diseases, such as diabetes. Connecting into the newly established trust, as well as the public health, health care, and community infrastructure, should be a core strategy for diabetes prevention and management programs led by IDPH and partners across the state. Lastly, continuing to identify and to address areas of need and coordinating across community programs will be critical to reducing diabetes prevalence and supporting disease management in Illinois.

## **Attachments**

Illinois County Behavioral Risk Factor Survey (ICBRFS) (2015 – 2019) prevalence data is available for the following chronic conditions:

**Attachment 1:** Prevalence of Adult Population Who Have Ever Been Told They Have Diabetes (Excluding Pregnant Females)

**Attachment 2:** Prevalence of Adult Population Who Have Ever Been Told They Have Pre-Diabetes or Borderline Diabetes

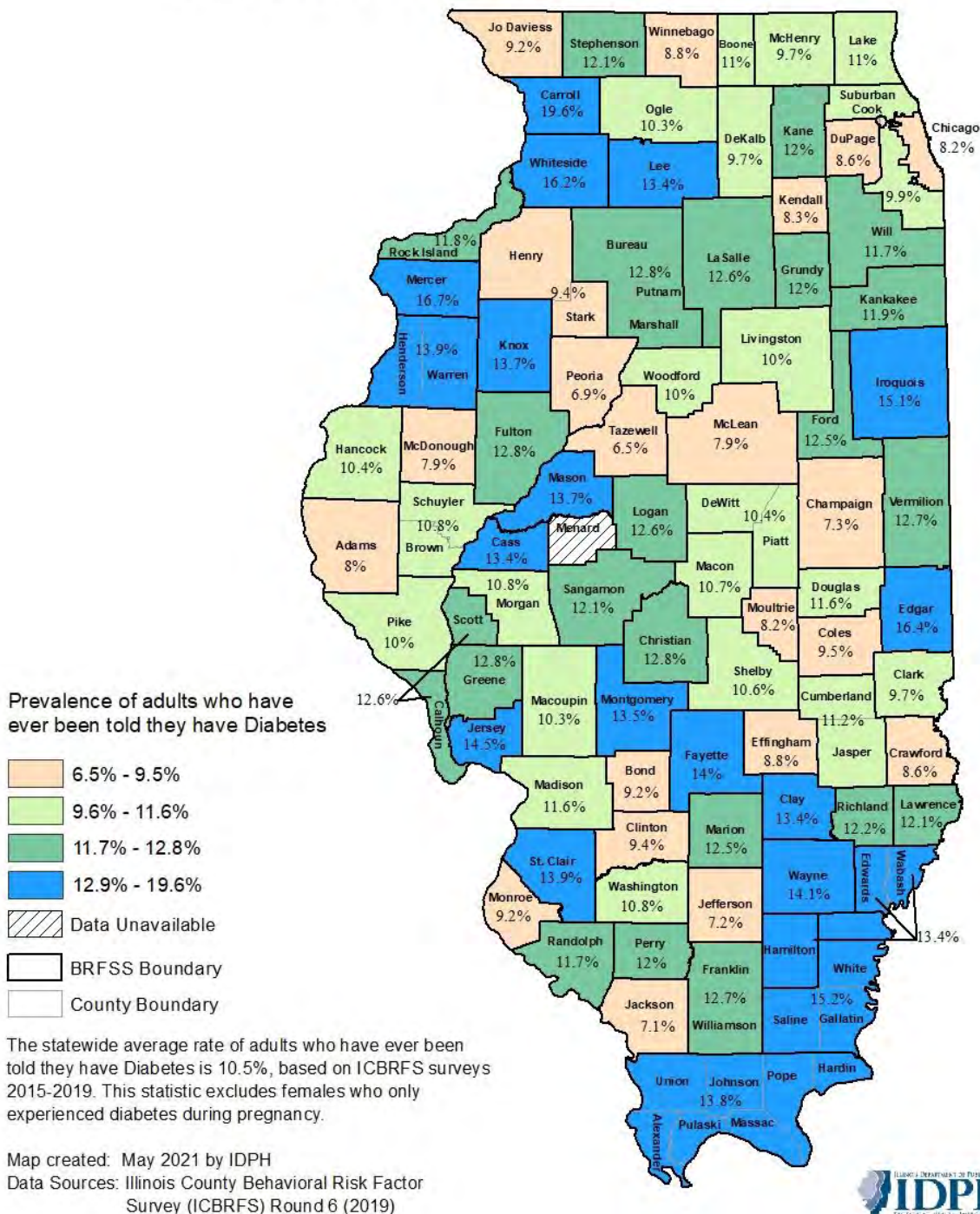
**Attachment 3:** Prevalence of Adult Population Overweight or Obese

## References:

---

- <sup>1</sup> Centers for Disease Control and Prevention (CDC). (2020). *What is Diabetes?* Retrieved January, 2021, from <https://www.cdc.gov/diabetes/basics/diabetes.html>
- <sup>2</sup> Centers for Disease Control and Prevention (CDC). (2020). *A Snapshot: Diabetes in the United States*. Retrieved January, 2021, from <https://www.cdc.gov/diabetes/library/socialmedia/infographics/diabetes.html>
- <sup>3</sup> Centers for Disease Control and Prevention (CDC). (2020). *Prediabetes – Your Chance to Prevent Type 2 Diabetes*. Retrieved June 2021. <https://www.cdc.gov/diabetes/basics/prediabetes.html>.
- <sup>4</sup> Centers for Disease Control and Prevention (CDC). (2019). *BRFSS Prevalence & Trends Data*. Retrieved January, 2021, from <https://www.cdc.gov/brfss/brfssprevalence/>
- <sup>5</sup> Illinois Department of Public Health (IDPH). (2019). *Illinois Behavioral Risk Factor Surveillance System (BRFSS)*. Retrieved January, 2021, from <http://www.idph.state.il.us/brfss/>
- <sup>6</sup> Centers for Disease Control and Prevention. (2020). *National Diabetes Statistics Report, 2020*. <https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf>
- <sup>7</sup> Hale N. L., Bennett K. J., Probst J. C. (2010). Diabetes care and outcomes: disparities across rural America. *J Community Health*, 35(4), 365-74. <https://doi.org/10.1007/s10900-010-9259-0>
- <sup>8</sup> Rutledge S. A., Masalovich S., Blacher R. J., Saunders M. M. (2017). Diabetes Self-Management Education Programs in Nonmetropolitan Counties — United States, 2016. *MMWR Surveill Summ*, 66 (No. SS-10), 1–6. <http://dx.doi.org/10.15585/mmwr.ss6610a1>
- <sup>9</sup> Iglay K., Hannachi H., Jowie P. J., Xu J., Li X., Engel S. S., Moore L. M., Rajpathak S. (2016). Prevalence and comorbidity of comorbidities among patients with type 2 diabetes mellitus. *Current Medical Research and Opinion*, 32(7), 1243-1252. <https://doi.org/10.1185/03007995.2016.1168291>
- <sup>10</sup> Piette J. D. & Kerr E. A. (2006). The Impact of Comorbid Chronic Conditions on Diabetes Care. *Diabetes Care*, 29(3), 725-731. <https://care.diabetesjournals.org/content/29/3/725>
- <sup>11</sup> Illinois Department of Public Health. (2020). *Fiscal 2020 in Review. Annual Report*. [https://www.ilga.gov/reports/ReportsSubmitted/2350RSGAEmail4048RSGAAttachIDPH\\_AnnualReport\\_FY2020.pdf](https://www.ilga.gov/reports/ReportsSubmitted/2350RSGAEmail4048RSGAAttachIDPH_AnnualReport_FY2020.pdf)
- <sup>12</sup> Lim, S., Bae, J. H., Kwon, H. S., & Nauck, M. A. (2021). COVID-19 and diabetes mellitus: from pathophysiology to clinical management. *Nature reviews. Endocrinology*, 17(1), 11–30. <https://doi.org/10.1038/s41574-020-00435-4>
- <sup>13</sup> Singh, A. K., Gupta, R., Ghosh, A., & Misra, A. (2020). Diabetes in COVID-19: Prevalence, pathophysiology, prognosis, and practical considerations. *Diabetes & metabolic syndrome*, 14(4), 303–310. <https://doi.org/10.1016/j.dsx.2020.04.004>.
- <sup>14</sup> Codo, A. C., Davanzo, G. G., Monteiro, L. B., de Souza, G. F., Muraro, S. P., Virgilio-da-Silva, J. V., Prodonoff, J. S., Carregari, V. C., de Biagi Junior, C., Crunfli, F., Jimenez Restrepo, J. L., Vendramini, P. H., Reis-de-Oliveira, G., Bispo Dos Santos, K., Toledo-Teixeira, D. A., Parise, P. L., Martini, M. C., Marques, R. E., Carmo, H. R., Borin, A., ... Moraes-Vieira, P. M. (2020). Elevated Glucose Levels Favor SARS-CoV-2 Infection and Monocyte Response through a HIF-1 $\alpha$ /Glycolysis-Dependent Axis. *Cell metabolism*, 32(3), 437–446.e5. <https://doi.org/10.1016/j.cmet.2020.07.007>.
- <sup>15</sup> Deng, M., Jiang, L., Ren, Y., & Liao, J. (2020). Can We Reduce Mortality of COVID-19 if We do Better in Glucose Control? *Medicine in drug discovery*, 7, 100048. <https://doi.org/10.1016/j.medidd.2020.100048>.
- <sup>16</sup> Mantovani A., Byrne C. D., Zheng M. H., Targher G. (2020). Diabetes as a risk factor for greater COVID-19 severity and in-hospital death: A meta-analysis of observational studies. *Nutr Metab Cardiovasc Dis*, 30(8), 1236-1248. <https://dx.doi.org/10.1016%2Fj.numecd.2020.05.014>.
- <sup>17</sup> Accili, D. (2021). Can COVID-19 cause diabetes? *Nature metabolism*, 3(2), 123–125. <https://doi.org/10.1038/s42255-020-00339-7>

## Attachment 1 Prevalence of Adult Population Who Have Ever Been Told They Have Diabetes (Excluding Pregnant Females)







### Attachment 3 Prevalence of Adult Population Overweight or Obese

