



Michigan Medicaid Part Two Diabetes during Pregnancy 2016 - 2019

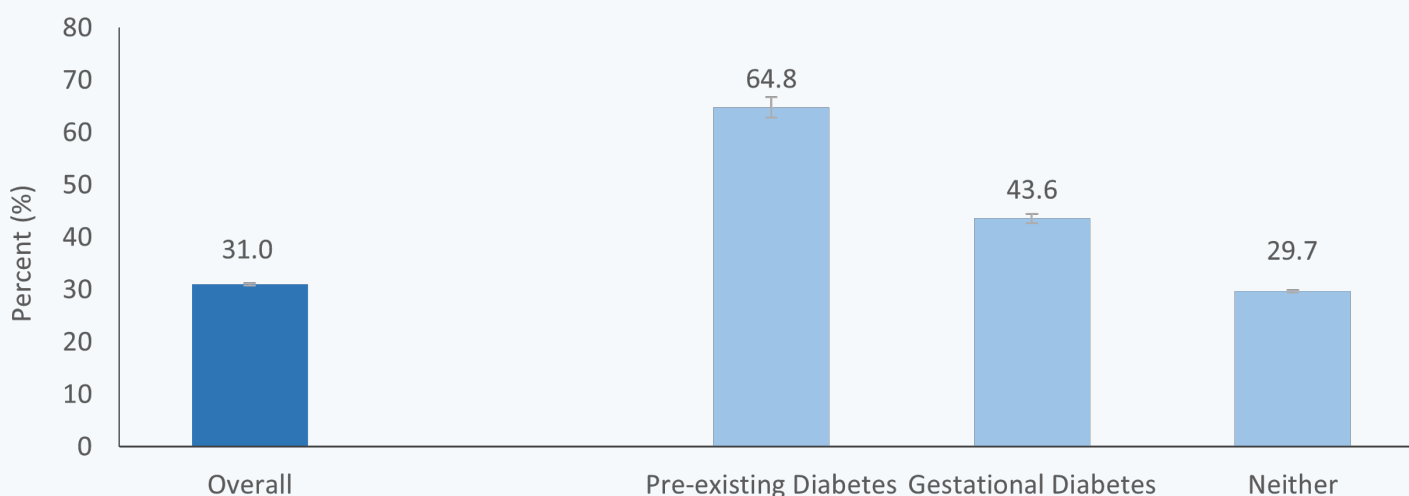
This brief reports complications at time of delivery by diabetes status. The complications presented are mode of delivery, gestation weeks, birthing placental/uterine/perineal complications, and select infections. Public health professionals and providers can use this brief to inform support to diabetes care services for pregnant people.

Background

- ❑ Diabetes during pregnancy increases the chance of adverse pregnancy outcomes including complications during delivery as well as abnormal conditions among newborns.¹⁻⁹
- ❑ Diabetes during pregnancy can be pre-existing or gestational only. Type 1 or type 2 diabetes prior to pregnancy is called pre-existing diabetes and is associated with increased risk of cesarean delivery, preterm birth, and certain infections.¹⁻⁴ Diabetes that develops during pregnancy is called gestational diabetes (GDM).^{1,2}
- ❑ Mothers (people who gave birth) with GDM have similar risks in complications as people with pre-existing diabetes.¹⁻⁹
- ❑ Research studies report mixed findings on whether mothers with diabetes and gestational diabetes have a higher risk of fungal and genital tract infections compared to those without diabetes.^{8,9}
- ❑ Insurance status has also been associated with delivery complications and long-term maternal outcomes. Uninsured mothers have higher risk of delivery complications compared to mothers with insurance.¹⁰
- ❑ The Michigan Health Data Warehouse affords the Diabetes Prevention and Control Program the opportunity to study the impact of diabetes among expectant mothers participating in a Michigan Medicaid program.
- ❑ This brief is part two in a multi-part series. Part one examined pre-existing diabetes and GDM burden and disparities in diabetes burden among age, racial/ethnic group, and urban/rural setting.

Mode of Delivery

*Cesarean Delivery by Diabetes Status Among Mothers in a Michigan Medicaid Program, 2016-2019 Combined**



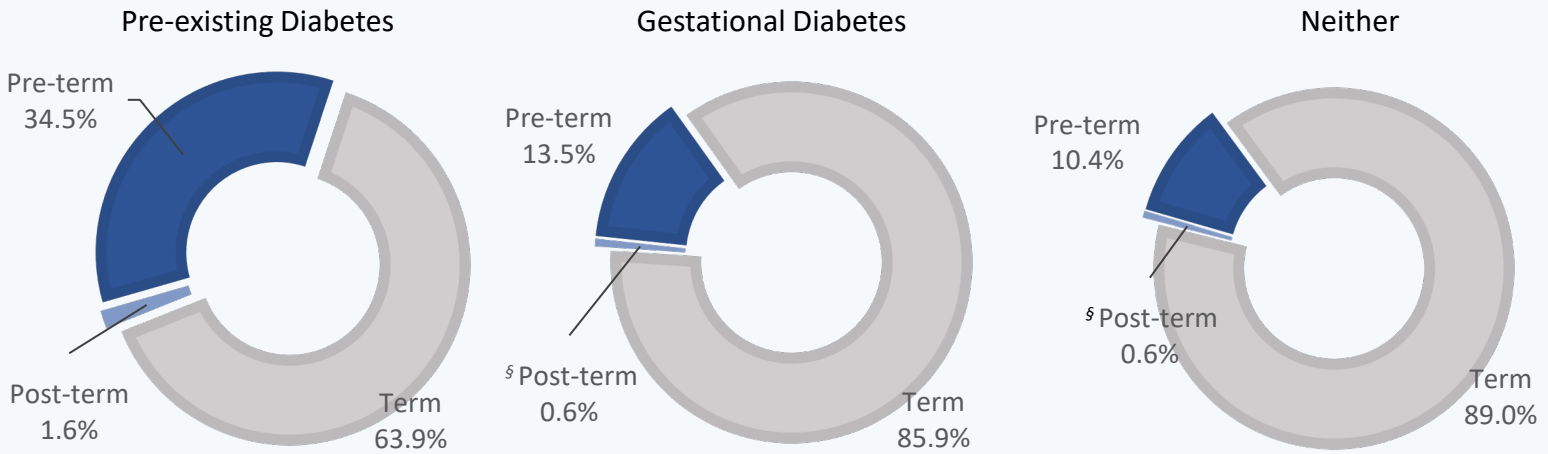
*Statistically significant difference ($p < 0.05$) between pairs unless otherwise indicated; § No evidence of statically significant difference ($p > 0.05$) between pair

Source: Michigan Health Data Warehouse (2016-2019 Combined)

- ❑ Approximately, two-thirds of mothers with pre-existing diabetes had a cesarean delivery (64.8%), 43.6% of mothers with GDM had a cesarean delivery, and 29.7% of mothers with no diabetes had a cesarean delivery.
- ❑ There was no evidence of a linear change from 2016 to 2019 ($p > 0.05$, Data Not Shown).

Pregnancy Length

Pregnancy Length by Diabetes Status Among Mothers in a Michigan Medicaid Program, 2016-2019 Combined*



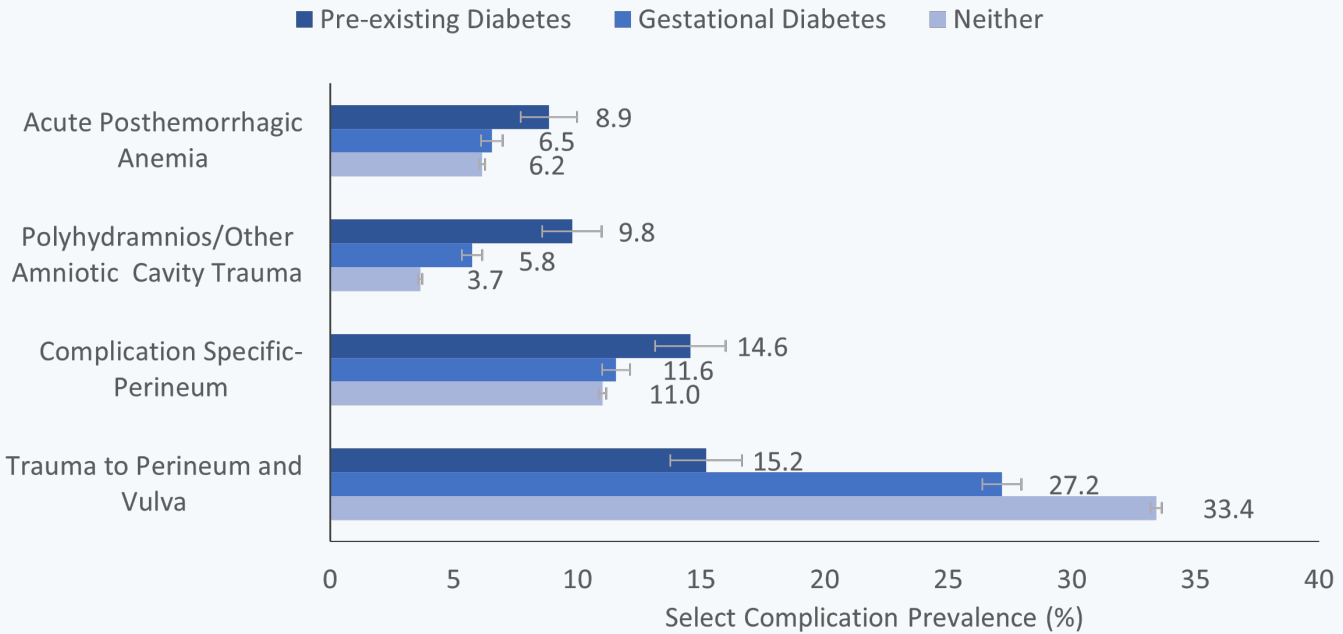
*Statistically significant difference ($p < 0.05$) between pairs unless otherwise indicated; § No evidence of statically significant difference ($p > 0.05$) between pair
Pregnancy length definition (See Methods)

Source: Michigan Health Data Warehouse (2016-2019 Combined)

- One-third of mothers with pre-existing diabetes had pre-term births (34.5%). This was significantly higher than mothers with gestational diabetes (13.5%), which was significantly higher than mothers without diabetes (10.4%).
- The prevalence of post-term births was also significantly higher among mothers with pre-existing diabetes (1.6%) compared to mothers with GDM or without diabetes (0.6% for both).

Select Birth Complications by Diabetes Status

Birth Complications by Diabetes Status Among Mothers in a Michigan Medicaid Program, 2016-2019 Combined*



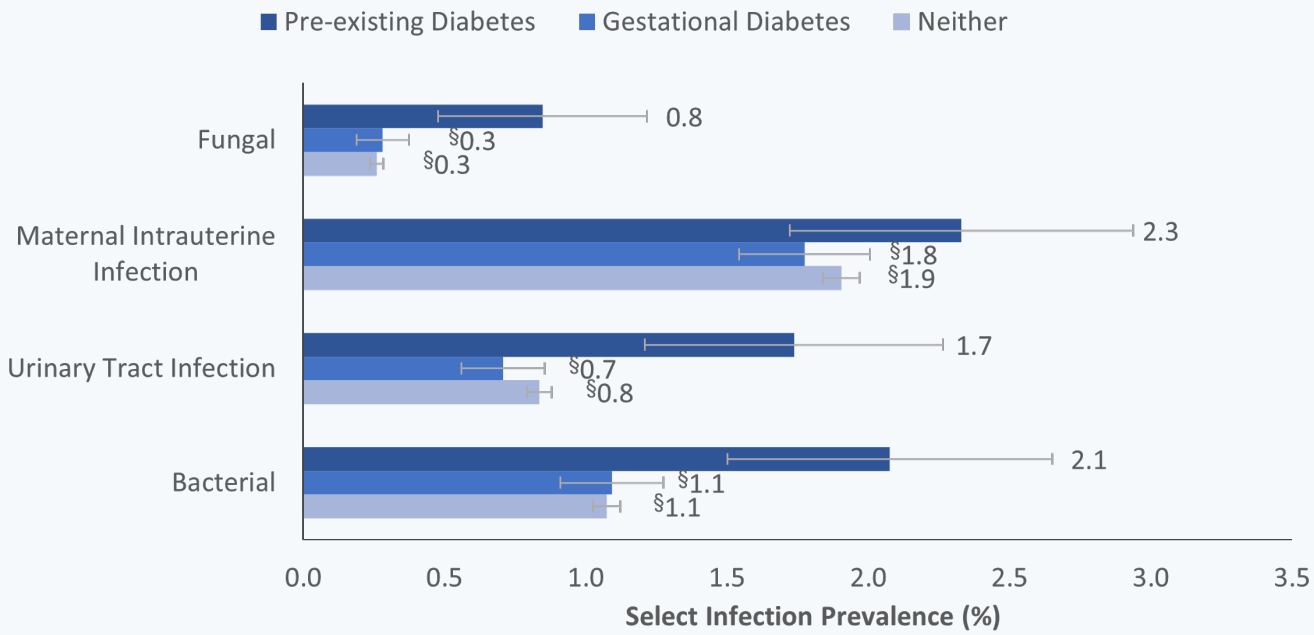
*Statistically significant difference ($p < 0.05$) between pairs unless otherwise indicated; § No evidence of statically significant difference ($p > 0.05$) between pair

Source: Michigan Health Data Warehouse (2016-2019 Combined)

- Complications specific to perineum, polydramnios/other amniotic cavity trauma, and acute posthemorrhagic anemia were statistically significantly higher among mothers with pre-existing diabetes compared to gestational diabetes and mothers without diabetes.
- Trauma to the perineum and vulva was significantly higher among mothers without diabetes compared to mothers with pre-existing diabetes and GDM (33.4%, 15.2%, and 27.2%, respectively).

Select Infections

Infections by Diabetes Status Among Mothers in a Michigan Medicaid Program, 2016-2019 Combined*



*Statistically significant difference ($p < 0.05$) between pairs unless otherwise indicated; \$ No evidence of statically significant difference ($p > 0.05$) between pair
Source: Michigan Health Data Warehouse (2016-2019 Combined)

- Mothers with pre-existing diabetes had significantly higher prevalences of bacterial, urinary tract (UTI), maternal intrauterine, and fungal infections compared to mothers with gestational diabetes or without diabetes.
- Infection prevalences were comparable between mothers with gestational diabetes and those without.

Summary

- In this analysis, cesarean delivery was highest among mothers with pre-existing diabetes, followed by gestational diabetes, then without diabetes.
- This brief also reports that post-term birth was significantly higher among mothers with pre-existing diabetes compared to mothers with GDM and no diabetes, which were comparable.
- In this work, complications specific to perineum, polydramnios/other amniotic cavity trauma, and acute posthemorrhagic anemia were significantly higher among mothers with pre-existing diabetes compared to mothers with GDM or no diabetes.
- Bacterial infections including UTI had a higher prevalence among mothers with pre-existing diabetes compared to mothers with GDM or no diabetes.
- Maternal intrauterine and fungal infections had a higher prevalence among mothers with pre-existing diabetes compared to mothers with GDM or without diabetes.

Public Health Impact and Recommendations

- These findings contribute to a better understanding of the complexity of diabetes in pregnancy among Michigan Medicaid recipients. Disparities in complications based on diabetes status may provide the following opportunities:
 - Increase support for and referral to [Diabetes Self-Management Education and Support \(DSMES\) Services](#), which provide an evidence-based foundation to help people with diabetes navigate self-management decisions and activities, including the control of glucose before and during pregnancy.¹
 - Coordinate care and enhance interventions that address comorbid conditions in order to reduce risks for adverse outcomes and complications.^{1,6}
 - Review and address the economic impact of pregnancy complications, including the potential for higher costs for cesarean and preterm births.⁶
 - Refine population-based systems to monitor and report comorbidities and complications.^{1,6}
- A limitation of the data is that it is pre-pandemic, and the effects of the public health crisis on diabetes and pregnancy are still to be determined. The long-term impacts will be explored through ongoing data analysis and partner engagement.

Methods

Data for this report was based on Medicaid claims data extracted from the Michigan Health Data Warehouse between January 1, 2016, and December 31, 2019. The unit of analyses was maternal deliveries that resulted in at least one live birth. These deliveries were identified by querying all hospital claims through a combination of DRG and ICD-10-CM diagnosis codes. No additional criteria related to the mother's Medicaid eligibility was applied to the query. The mother's diabetes status was determined if the hospital delivery claim included an ICD-10-CM diagnosis code of E10, E11, and E13 for pre-existing diabetes and O24 for gestational diabetes. Gestational diabetes can be reported as an incidence or prevalence. In this brief, the term prevalence is used.

Complications were based on the Clinical Classifications Software Refined (CCSR) for ICD-10-CM diagnosis codes. CCSR is one in a family of databases and software tools developed as part of the Healthcare Cost and Utilization Project (HCUP), a federal-state-industry partnership sponsored by the Agency for Healthcare Research and Quality. HCUP databases, tools, and software inform decision making at the national, state, and community levels.

Indicator (CCSR Category):

- PRG026 OB-related trauma to perineum and vulva
- PRG014 Polyhydramnios and other problems of amniotic cavity
- PRG027 Complications specified during the puerperium
- BLD004 Acute posthemorrhagic anemia
- INF003 Bacterial infections
- GEN004 Urinary tract infections
- PRG021 Maternal intrauterine infection
- INF004 Fungal infections

Pregnancy length was defined using ICD-10-CM diagnosis codes: Z3A01, Z3A08-Z3A42, and Z3A49. Pre-term was defined as 20 0/7 weeks to 36 6/7 weeks; term was 37 0/7 weeks to 41 6/7 weeks; post-term was 42 0/7 weeks and beyond.¹¹ Data was missing 1,431 (0.77%) records for gestation week.

A limitation is that the results reported were based on mother's who met the criteria. It is not representative of all mothers in a Michigan Medicaid program or the general population.

Cochran-Armitage trend test was used to determine statistically significant linear change over time. Chi-square test was used for hypothesis testing about whether complication by diabetes status was statistically significantly different ($\alpha < 0.05$). Statistical significance between two groups was determined using a two-proportion z-test where needed ($\alpha = 0.05$). Ninety-five percent confidence intervals were included. Estimates were not reported in cases where the numerator was non-zero less than 11 or the denominator was less than 20.

Note

In this publication, mothers were defined as people who gave birth assigned as female sex at birth.

References

- 1) American Diabetes Association: Clinical Practice Recommendations 2022. Standards of Medical Care in Diabetes—2022. *Diabetes Care* January 2022 Jan; 45 (Supplement 1).
- 2) Deputy NP, Kim SY, Conrey EJ, and KM Bullard. Prevalence and changes in preexisting diabetes and gestational diabetes among women who had a live birth-United States, 2012-2016. *Morbidity and Mortality Weekly Report* 2018; 67:1201-1207.
- 3) Köck K, Köck F, Klein K, Bancher-Todesca D, Helmer H. Diabetes mellitus and the risk of preterm birth with regard to the risk of spontaneous preterm birth. *J Matern Fetal Neonatal Med.* 2010 Sep;23(9):1004-8.
- 4) Busaidi IA, Al-Farsi Y, Ganguly S, Gowri V. Obstetric and non-obstetric risk factors for cesarean section in Oman. *Oman Medical Journal* 2012; 27(6): 478-481.
- 5) Waters T, Dyer AR, Scholtens D, et al. HAPO Cooperative Study Research Group. Maternal and neonatal morbidity for women who would be added to the diagnosis of GDM using IADPSG Criteria: A secondary analysis of the hyperglycemia and adverse pregnancy outcome study. *Diab Care* 2016; 39:2204-2210.
- 6) Sacks DA, Black MH, Li X, et al. Adverse pregnancy outcomes using the international association of the diabetes and pregnancy study groups criteria: glycemic thresholds and associated risks. *Obstet Gynecol* 2015; 126:67–73.
- 7) Metzger BE, Buchanan TA, Coustan DR, et al. Summary and recommendations of the Fifth International Workshop-Conference on Gestational Diabetes Mellitus. *Diabetes Care* 2007; 30(Suppl 2):S251–60.
- 8) Marschalek J, Farr A, et al. Risk of vaginal infections at early gestation in patients with diabetes conditions during pregnancy; A retrospective study. *PLOS One* 2016; 11:1-10.
- 9) Zhang, Liao Q, et al. Association of gestational diabetes mellitus and abnormal vaginal flora and adverse pregnancy outcomes. *Medicine* 2018; 97: 34.
- 10) Hoxha I, Braha M, Syrogiannouli L, et al. Cesarean section in uninsured women in the USA: systematic review and meta-analysis. *BMJ Open* 2019; 9.
- 11) Spong CY. Defining “term” pregnancy: recommendations from the Defining “Term” Pregnancy Workgroup. *JAMA* 2013; 309:2445-2446.

This publication was supported by the Grant Numbers 5 NU58DP006519-03, 5 NU58DP006519-04 , and 5 NU58DP006614-03 funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

The Michigan Department of Health and Human Services will not exclude from participation in, deny benefits of, or discriminate against any individual or group because of race, sex, religion, age, national origin, color, height, weight, marital status, partisan considerations, or a disability or genetic information that is unrelated to the person’s eligibility.