



# Preterm Birth in Utah 2019-2024



Department of Health Family  
Human Services Health

# Table of contents

Definitions & key findings	2
Recommendations	3-5
Background on preterm birth	6
What we studied & how	6-7
Results from birth records	8-11
Results from Utah Birth Defect Network (UBDN) data	13
Results from Pregnancy Risk Assessment Monitoring System (PRAMS) data	14-16
Demographic trends in risk factors	16-17
Conclusions & acknowledgments	17
References	18-19
Additional data tables	20-23

# Key findings

Babies born more than 3 weeks early (preterm) are more likely to need to go to the intensive care unit and stay in the hospital for more than 5 days.

Mothers who had diabetes or high blood pressure before getting pregnant and infants with a birth defect are at the highest risk of delivering too early.

The following may lower the risk of preterm birth:

- Making sure pregnant mothers have what they need to get to all health care appointments (offering transportation or telehealth options as needed)
- Educating mothers about the importance of gaining enough weight while they are pregnant
- Educating women about spacing pregnancies more than 1 year apart
- Taking care of chronic health problems like diabetes or high blood pressure, as well as mental health conditions
- Testing for and treating infections before and during pregnancy
- Connecting mothers to resources if they use substances, or have other known risk factors for preterm birth.

## Definitions

- A pregnancy is “term” when the baby is born at 37 weeks or later. If a baby is born before 37 weeks, it is called a **preterm birth**. These babies are born too early and may have more developmental and health problems.
- Babies born before 32 weeks are called **very preterm**, which has additional risks. Very preterm births are a subset of preterm births.
- A **birth defect** is a health problem that the baby is born with. It can affect how a part of the body is made or how it works. These problems can happen because of genes or something that happened before the baby was born.
- Gaining **enough weight** during pregnancy depends on a mother’s body mass index (BMI) before she is pregnant. It also depends on how long she is pregnant (gestational age at birth). The Institutes of Medicine recommends a certain amount of weight gain per week for different BMIs (1).
- **Pregnancy care** is when a woman gets regular checkups and tests while she is pregnant to make sure she and her baby are healthy. Having enough pregnancy care is based on when a mother starts seeing a doctor, how many times she goes, and if she has the recommended number of visits for how long she is pregnant.
- **Infections** in this study include chlamydia, cytomegalovirus, gonorrhea, hepatitis A, hepatitis B, hepatitis C, herpes, HIV/AIDS, and syphilis.

# Recommendations

We can try to lower the number of preterm births in Utah by taking the following steps, which are based on the findings of this study.

## Support women in getting health insurance

Not getting enough medical care during pregnancy is a leading risk factor for preterm birth. Women who have insurance are more likely to get the care they need (2). We can help women get and keep their insurance by doing outreach and media campaigns, especially for Medicaid and the Health Insurance Marketplace. The Baby Your Baby program can cover costs for women who are pregnant while they wait for their Medicaid application to be approved.



## Offer telehealth for pregnancy care

Women may not get enough pregnancy care because of transportation issues, not having enough providers or clinics nearby, or difficulty scheduling around childcare and other demands. Telehealth lets a doctor oversee care remotely while a nurse helps in person. This is especially helpful in rural areas, like San Juan and Tricounty local health districts, where women are less likely to get enough care (3).

## Help pregnant women access healthy, affordable food

Women who experience food insecurity are more likely to have a chronic health problem like diabetes or high blood pressure (4-6). Utah's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) helps eligible women get healthy food and learn about nutrition. Utah has lower WIC participation (37%) compared to the rest of the country (51%) (7). Nationally, women are more likely to enroll after giving birth (69%) than during pregnancy (46%) (8). Maternal providers should ask all pregnant patients about their food needs and refer to WIC as needed.



## Help providers care for patients with chronic conditions



From 2017 to 2019, the Utah Department of Health and Human Services (DHHS) Office of Maternal and Child Health worked with hospitals to improve care for pregnant women who have high blood pressure. This helped reduce severe pregnancy problems.

We can improve preterm birth rates and other poor birth outcomes if we continue this work, expand it to other settings, and focus on other health issues like diabetes and obesity.

## Reduce the risk of birth defects

Birth defects are not always preventable. However, doing the following before getting pregnant can reduce a woman's risk of having a baby with a birth defect:

- Taking 400 micrograms of folic acid daily
- Avoiding alcohol, tobacco, and harmful drugs
- Staying up-to-date on vaccinations and practicing safe sex to prevent infections
- Talking with a doctor about any known risks



There are resources to help women who use substances and want to quit. These include free tobacco cessation programs through Medicaid, Utah Tobacco Quit Line resources for women who are not covered by Medicaid, and National Cancer Institute resources specifically to help pregnant women quit smoking.

Some birth defects need treatment right after birth, and some can be tested for during pregnancy. Doctors recommend these tests for women who are 35 years or older, have had a previous pregnancy affected by a birth defect, have certain chronic conditions like diabetes, or use certain medications (9).

## Provide reproductive health care and education



Making sure people have access to family planning information and resources can help with several factors that can increase the risk of preterm birth, such as teenage pregnancy, unplanned pregnancy, short periods of time between pregnancies, and sexually transmitted infections.

The Power Your Life program offers education to help women plan for pregnancy, avoid unplanned pregnancy, and minimize risks of unplanned pregnancies. They promote information about birth spacing, preventing, testing for, and treating infections, and other reproductive health behaviors.



### **Increase access to mental health services**

Depression, anxiety, and stress are associated with higher risk of a preterm birth. The DHHS Office of Maternal and Child Health partners with hospitals, clinics, and community organizations to make sure mental health care is part of pregnancy care. Many areas in Utah do not have mental health providers. Even when providers are available they may not accept insurance or be trained to help pregnant and

Utah's [Behavioral Health Assessment & Master Plan](#) recommends growing and supporting a diverse mental health workforce throughout Utah.

The [Utah Maternal Mental Health Referral Network](#) is a directory of professionals and support groups with training in mental health during and after pregnancy. Patients can search for providers in their area, or who offer telehealth appointments.

### **Respectfully teach patients about risk factors**

Providers can help prevent preterm births by teaching patients about factors that may increase or decrease their risk. It can be hard for patients to talk about sensitive issues, like drug use or relationship problems, with their providers. They might worry about getting in trouble with the law or social services. Providers can help create a safe environment by helping patients understand why having certain kinds of health information helps providers watch for and treat issues that could come up.



It also helps them know what resources the patient may need but not be aware of. Providers should continually follow up with patients to make sure they access the resources shared.

Patients with known risk factors may need more checkups or to see a specialist who can manage high risk pregnancies. All patients should know the [warning signs](#) for when to get immediate medical help.



### **Promote existing maternal resources**

The [Maternal Resource Guide](#) has information about services that help with transportation, childcare, mental health, substance use, domestic violence, housing, and more.

# Background on preterm birth

Preterm birth is the leading cause of death and disability in infants in the U.S. (10). The infant mortality rate for term births was 2.1 deaths for every 1,000 term births in the U.S. from 2020 to 2023. In contrast, 35 of every 1,000 preterm births, and 173 of every 1,000 very preterm births resulted in an infant death in the U.S. (11).

The infant mortality rate for term births was slightly lower in Utah than the national rate, at 1.8 deaths per 1,000 term births from 2020 to 2023. For preterm and very preterm births, however, Utah had a slightly higher mortality rate, at 36 per 1,000 preterm births, and 204 per 1,000 very preterm births (Figure 1) (11).

**Figure 1. Infant mortality for very preterm births, Utah, 2020-2023**

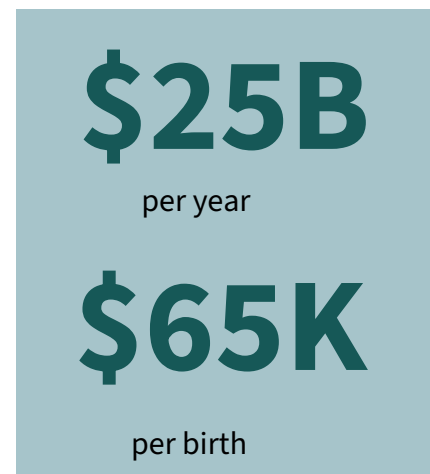
In Utah, 2 out of 10 very preterm infants die within a year of life



Data source: Centers for Disease Control and Prevention, National Center for Health Statistics, 2020-2023

Preterm birth is also costly. The U.S. spends \$25 billion more per year on preterm births than term births. This breaks down to \$64,815 more per preterm birth (<37 weeks), and \$531,086 more per very preterm birth (32 weeks) compared to term births (Figure 2) (12).

**Figure 2. Excess cost of preterm birth, U.S., 2016**



Source: Waitzman, Jalali, & Grosse (12)

Preterm birth is slightly less common in Utah than the U.S. From 2021 to 2024, the preterm birth rate was 9.5% in Utah and 10.4% in the U.S. The Utah rate has increased slightly over the last decade from 9.2% during the years 2013-2015. The rate reached a high of 9.9% in 2021 for a total of 4,621 preterm births (13).

## What we studied and how

Our study looked at who in Utah is at a higher risk of having a preterm birth. We studied factors that other research has shown can increase the risk of preterm birth. We also wanted to see if being born preterm increases the baby's chance of having to go to the intensive care unit or stay in the hospital longer.

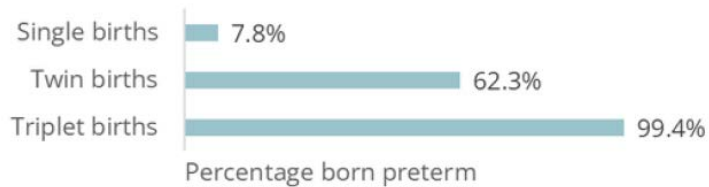
We used data from several different sources to get our answers. These include publicly available birth certificate data from 2021 to 2024 from the DHHS Indicator-Based Information System for Public Health website (3), raw birth certificate data files from 2021 to 2024 (14), responses to a survey called the Pregnancy Risk Assessment Monitoring System (PRAMS) from 2020 to 2023 (15), and records in the Utah Birth Defect Network (UBDN) from 2019 to 2022 (16).

We did not include births of twins or triplets in this study because their risk of being born preterm is much higher (Figure 3).

We also excluded records missing data for the length of pregnancy (gestational age), and age of the mother.

**Figure 3. Preterm birth risk is higher for twins and triplets**

Percentage of preterm births to Utah residents, 2021-2024 (N = 184,126)



Data source: Utah Birth Certificate Database (Indicator-Based Information System for Public Health website) (3)

Some babies are delivered early on purpose because it's safer for the mother or the baby. This report looks at all preterm deliveries, regardless of whether they were planned or not. We recognize that sometimes an early delivery is the best option, but preventing the need for early delivery is still a goal.

The factors we studied are shown in the tables on pages 20 to 23. The factors that had the strongest connection to preterm birth are shown in figures throughout the report.

We compared the risk\* of preterm birth for pregnancies with and without certain characteristics. For outcomes like neonatal intensive care unit (NICU) stays, we compared the risk for babies born preterm and very preterm to babies born term. We adjusted for the mother's age, meaning we made sure the higher risks were not just because of how old the mother was.

## Results from birth records

We used data from 178,153 single pregnancy babies (not twins or triplets) born to Utah residents with the data we needed for this analysis (not missing mother's age or length of pregnancy). Out of these, 7.8% were born preterm. This number is lower than the state rate because this study only looked at single pregnancy births. Multiples (twin, triplets) are much more likely to be born preterm (Figure 3). Only 1.0% of single births were very preterm, but these very preterm babies made up 13.0% of all preterm births (14).

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\*We used log-binomial regression to estimate risk ratios. Sensitivity analyses used Poisson regression and got similar results (17). P-values for all tests were adjusted for multiple comparisons using the Benjamini-Hochberg correction.

Mothers who are 40 years or older are twice as likely to deliver early compared to mothers aged 20 to 34 years. Mothers younger than 20 years are 30% more likely to deliver early (Figure 4).

**Figure 4. Mothers aged 40 years and older and teenage mothers have higher risk of preterm birth**

Single births to Utah residents, 2021-2024 (N = 178,153)

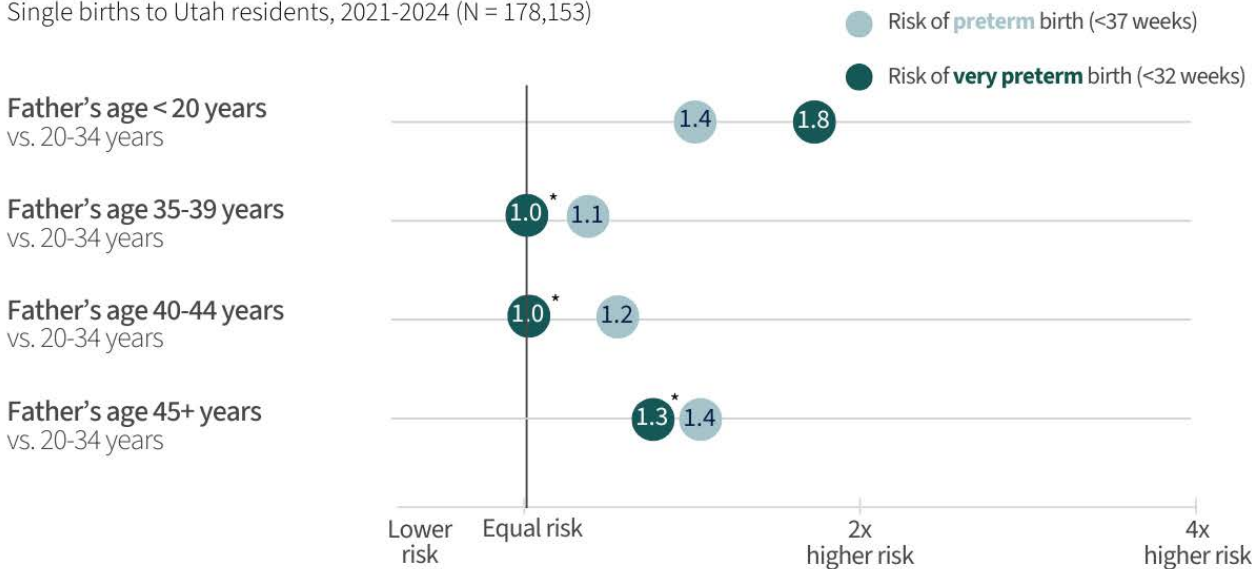


Data source: Utah Office of Vital Records and Statistics. Birth records data set (14).

Babies of fathers younger than 20 years are 40% more likely to be born preterm and 80% more likely to be born very preterm, regardless of the mother's age (Figure 5).

**Figure 5. Babies born to fathers aged 45 years and older and to teenage fathers have higher risk of preterm birth**

Single births to Utah residents, 2021-2024 (N = 178,153)



Data source: Utah Office of Vital Records and Statistics. Birth records data set (14).

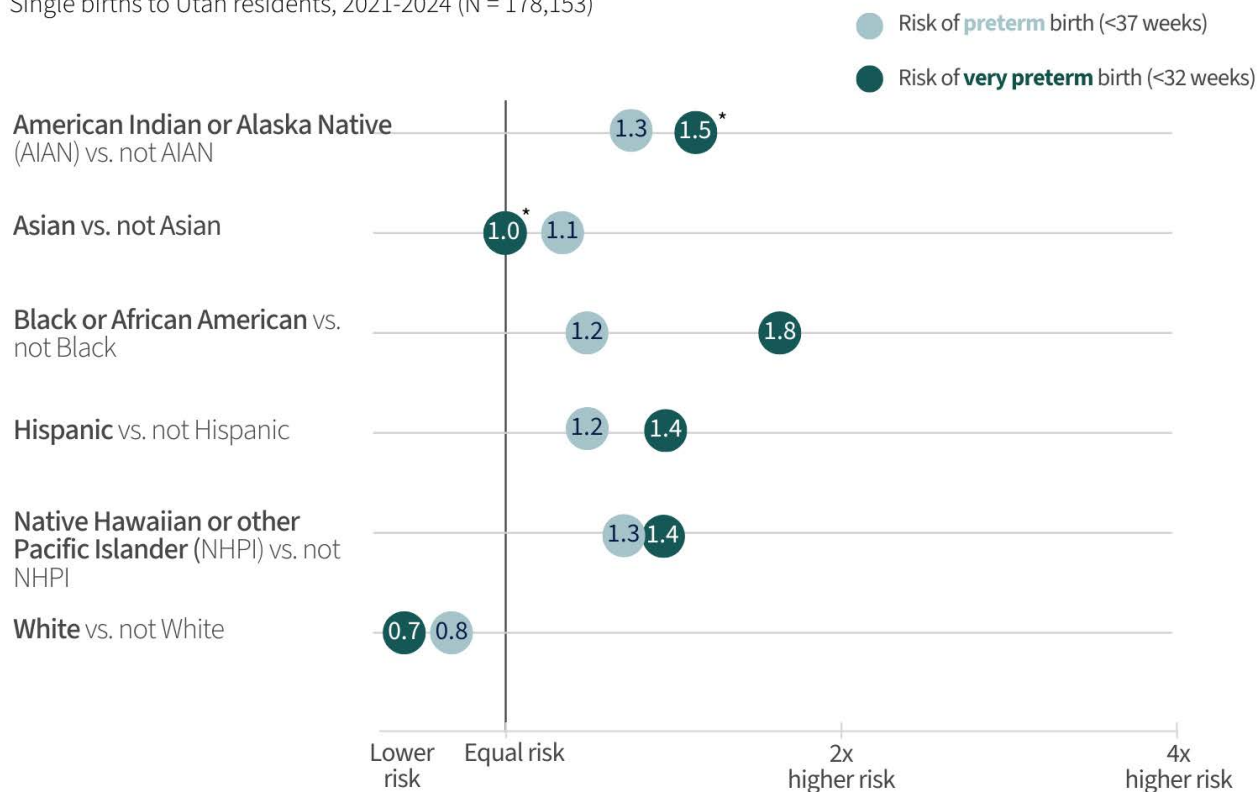
**Data notes:** Estimates for father's age are adjusted for, or regardless of, the mother's age.

\*Not statistically significant (p <= 0.01) after applying the Benjamini-Hochberg adjustment for multiple comparisons. All other estimates are significant.

A baby’s risk of being born very preterm is nearly double when their mother is Black compared to babies whose mothers are other races. Babies born to mothers who are Hispanic, Native Hawaiian or other Pacific Islander, and American Indian or Alaska Native also have a higher risk of being born very preterm (Figure 6). We found a similar association between a baby’s risk of preterm birth and their father’s race.

**Figure 6. Mother’s race and ethnicity are associated with preterm birth**

Single births to Utah residents, 2021-2024 (N = 178,153)



Data source: Utah Office of Vital Records and Statistics. Birth records data set (14).

**Data notes:** Relative risk estimates are adjusted for, or regardless of the mother’s age. Race and ethnicity categories are not mutually exclusive, meaning that individuals can identify as more than one race or ethnicity. We included open ended responses in race and ethnicity definitions (i.e., specified other race was recategorized if it fit into a pre-existing category).

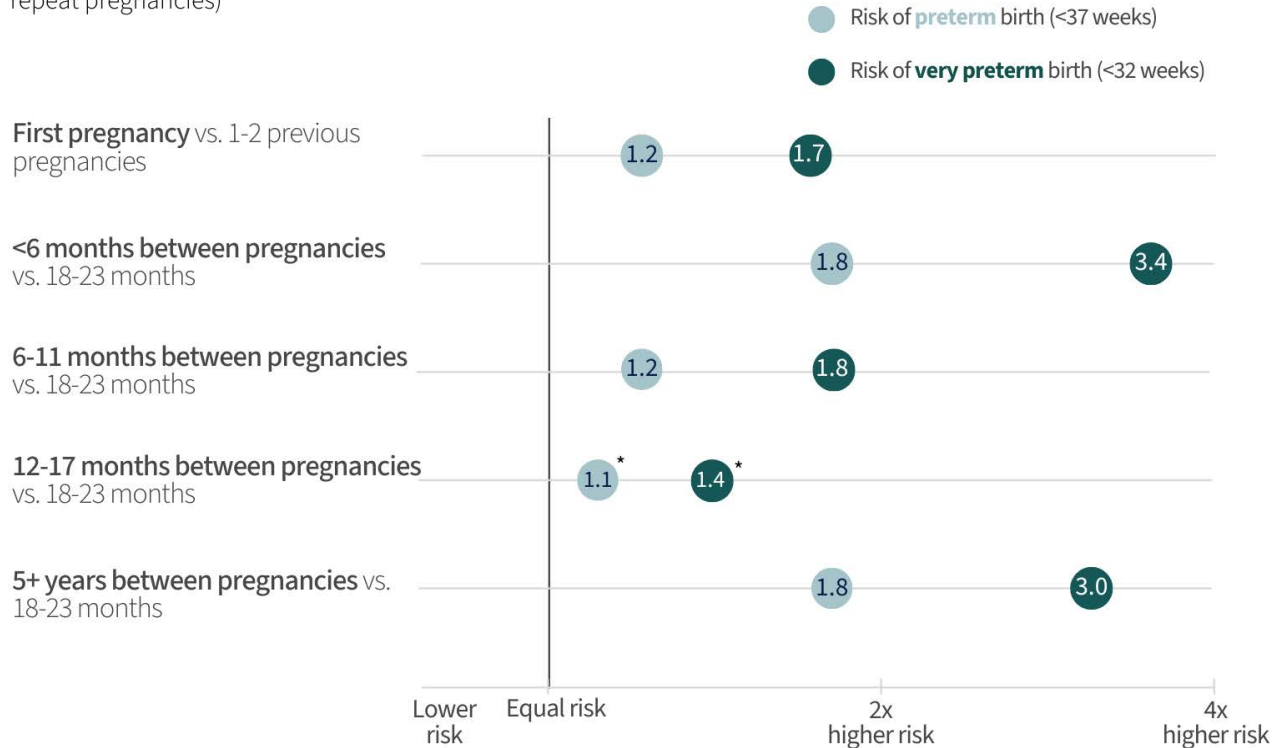
\*Not statistically significant ( $p \leq 0.01$ ) after applying the Benjamini-Hochberg adjustment for multiple comparisons. All other estimates are significant.

First pregnancies are 70% more likely to be very preterm. Having a gap of less than 6 months between pregnancies more than triples the risk of delivering very preterm. A gap of 6 to 11 months nearly doubles the risk of delivering very preterm (Figure 7).

Having 5 or more years between pregnancies is associated with a 3 times higher risk of delivering very preterm, regardless of the mother’s age (Figure 7). While longer gaps between pregnancies could be associated with other health conditions, such as infertility, that increase the risk of preterm birth, it may be a risk factor on its own (18).

**Figure 7. First pregnancies and pregnancies spaced less than 1 year apart are at higher risk of being preterm**

Single births to Utah residents, 2021-2024 (n = 65,312 first pregnancies, n = 83,839 second or third pregnancies, n = 112,853 repeat pregnancies)



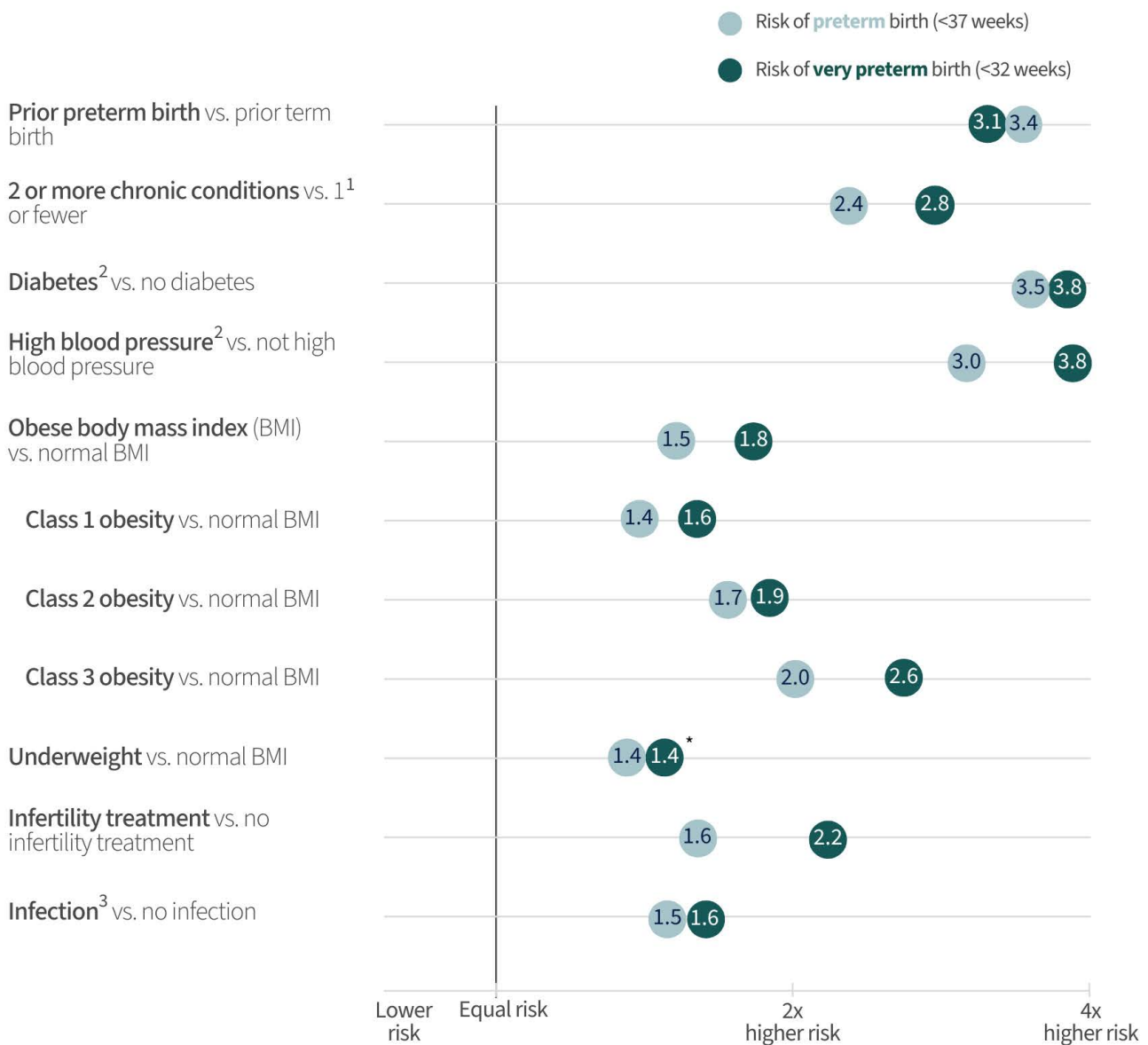
Data source: Utah Office of Vital Records and Statistics. Birth records data set (14).

**Data notes:** Relative risk estimates are adjusted for, or regardless of the mother’s age. Time between pregnancies (between the most recent delivery and subsequent conception) includes still and live births. \*Not statistically significant (p<=0.01) after applying the Benjamini-Hochberg adjustment for multiple comparisons. All other estimates are significant.

The risk of having a preterm birth is more than 3 times higher for mothers who have already had a preterm birth. Mothers who have high blood pressure, diabetes, obesity, or 2 or more chronic health problems have much higher risk of having a preterm and very preterm birth. The more severe a mother's obesity, the higher their risk of having a preterm baby. Using infertility treatment and having an infection are also risk factors for preterm birth (Figure 8).

### Figure 8. Mothers with pre-existing medical conditions and interventions had higher risk of preterm birth

Single births to Utah residents, 2021–2024 (N = 178,153, n = 112,853 repeat pregnancies)



Data source: Utah Office of Vital Records and Statistics. Birth records data set (14).

**Data notes:** Relative risk estimates are adjusted for, or regardless of the mother’s age.

1 Multiple chronic conditions include being classified as obese or underweight before pregnancy, having pre-existing high blood pressure, diabetes, or thyroid disease.

2 High blood pressure and diabetes include only pre-existing, not pregnancy-related conditions.

3 Infections studied include chlamydia, cytomegalovirus, gonorrhea, hepatitis A, hepatitis B, hepatitis C, herpes, HIV/AIDS, and syphilis.

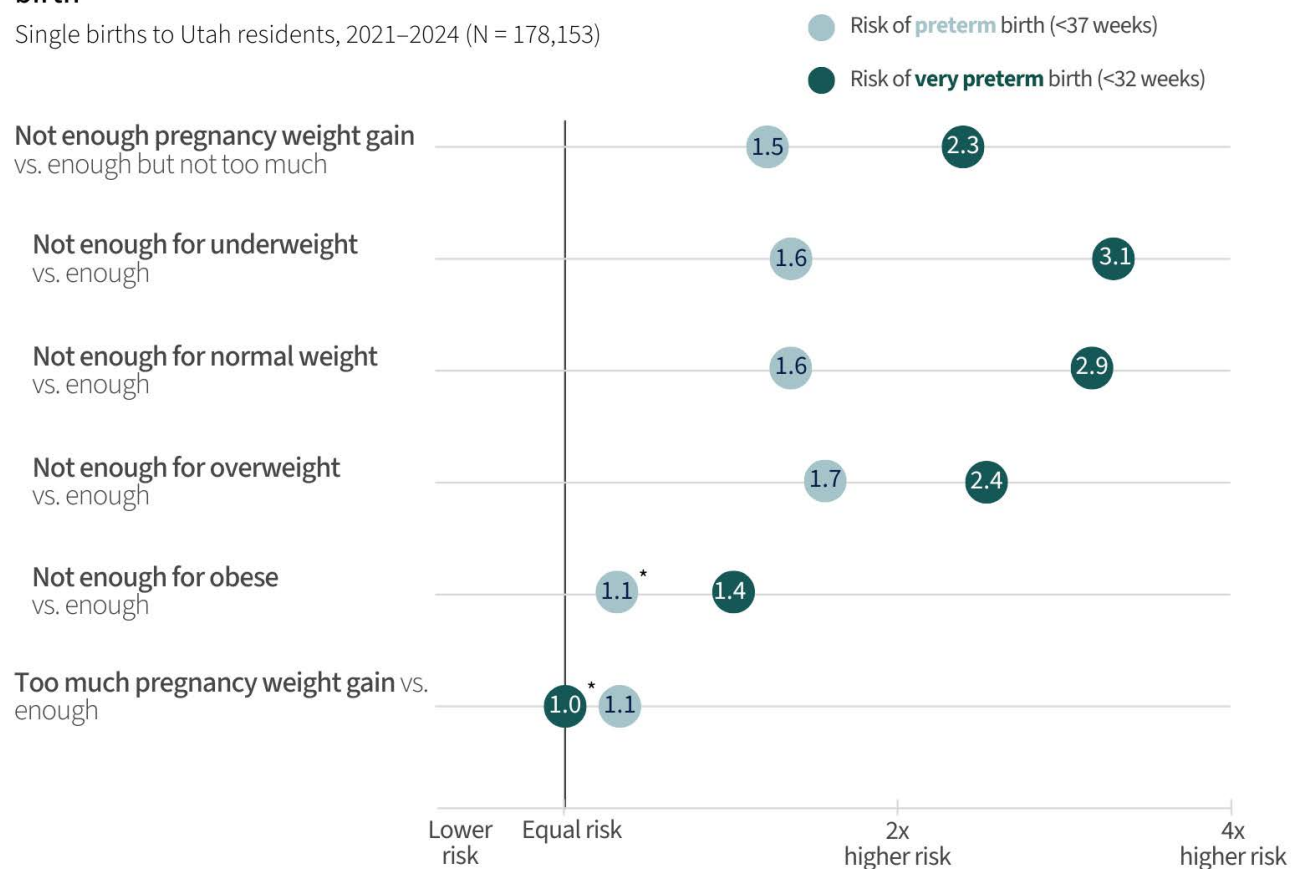
\*Not statistically significant (p<=0.01) after applying the Benjamini-Hochberg adjustment for multiple comparisons. All other estimates are significant.

Mothers who do not gain enough weight during pregnancy are 50% more likely to deliver preterm, and twice as likely to deliver very preterm. The risk of very preterm birth associated with not gaining enough weight is highest for mothers who are classified as underweight before pregnancy. This risk decreases as pre-pregnancy BMI increases, and there is no significant risk of preterm birth for mothers classified as obese, though there is a 40% higher risk of very preterm birth for mothers classified as obese (Figure 9).

The association between preterm birth is similar for women classified as overweight, normal weight, and underweight. Gaining too much weight in pregnancy is not significantly associated with higher risk of preterm birth for any BMI categories.

**Figure 9. Mothers who do not gain enough pregnancy weight have a higher risk of preterm birth**

Single births to Utah residents, 2021–2024 (N = 178,153)



Data source: Utah Office of Vital Records and Statistics. Birth records data set (14).

**Data notes:** Relative risk estimates are adjusted for, or regardless of the mother’s age. We defined enough pregnancy weight gain using recommendations from the Institutes of Medicine based on pre-pregnancy body mass index, and mean weight gain per week to account for gestational age (1).

\*Not statistically significant ( $p \leq 0.01$ ) after applying the Benjamini-Hochberg adjustment for multiple comparisons. All other estimates are significant.

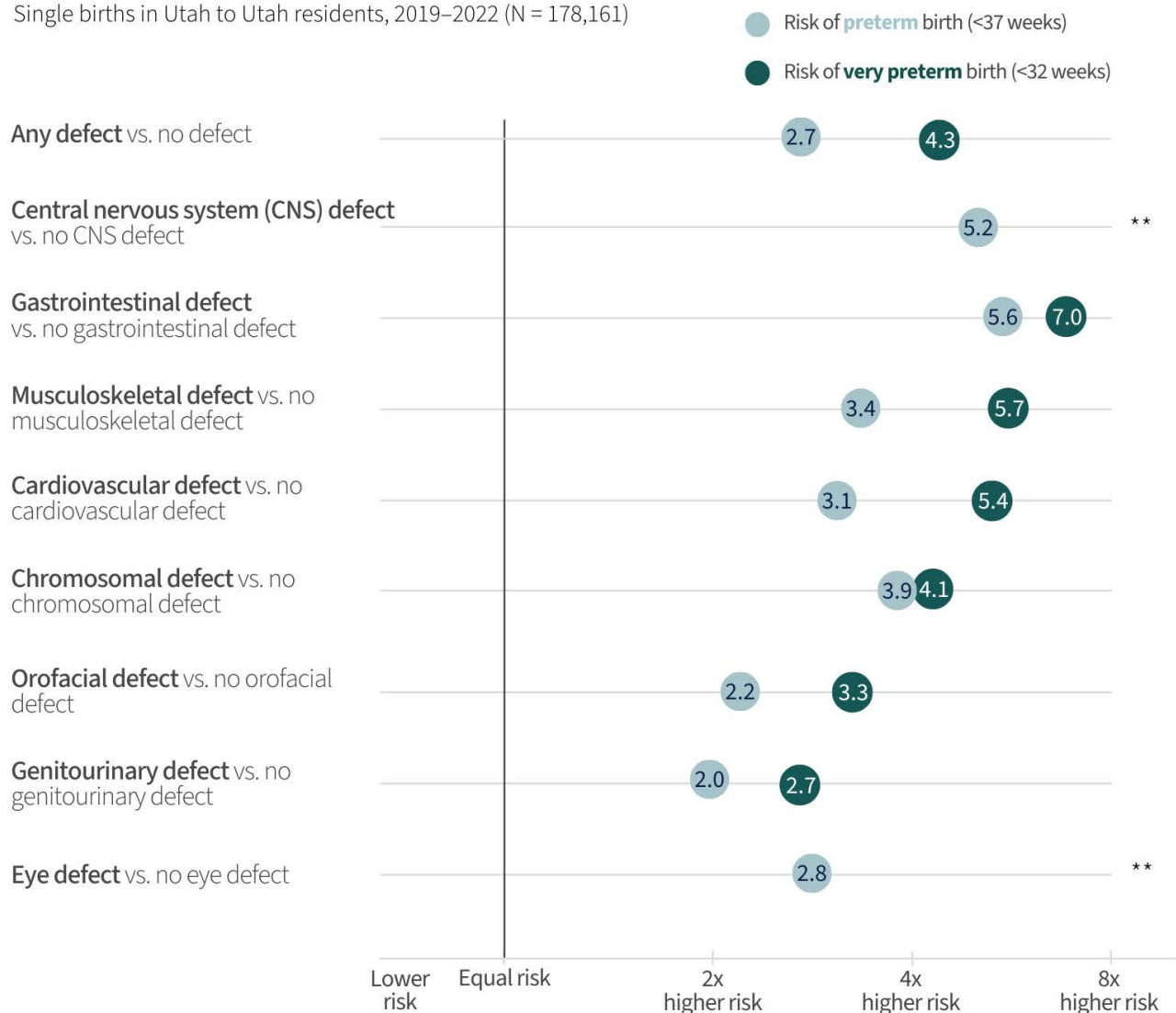
# Results from UBDN data

We included 178,161 single births in our analysis of birth defects. Of these, 7.6% were born preterm, and 1.0% were very preterm.

Birth defects of all body systems we looked at are highly associated with preterm birth. Babies with a central nervous system defect are 5 times as likely to be born preterm. Babies with a gastrointestinal defect are more than 5 times as likely to be born preterm and 7 times as likely to be born very preterm (Figure 10).

**Figure 10. Infants with birth defects are at higher risk of preterm birth**

Single births in Utah to Utah residents, 2019–2022 (N = 178,161)



Data source: Utah Birth Defect Network data set (16)

**Data notes:** Relative risk estimates are adjusted for, or regardless of the mother’s age. All estimates displayed are statistically significant ( $p \leq 0.01$ ) after applying the Benjamini-Hochberg adjustment for multiple comparisons.

\*\* Suppressed because the observed number of events is very small and not appropriate for publication.

# Results from PRAMS data

We used PRAMS data from 2020 to 2023 to look at other risk factors for preterm birth. These risk factors either aren't found on birth certificates or are more likely to be reported accurately in a survey than in a medical form. Out of the 176,435 single births represented in the PRAMS data, 7.2% were preterm. This is slightly lower than our birth certificate estimate of 7.6%. Like the birth certificate estimate, 1.0% of PRAMS births were very preterm. This is 14% of preterm births (15).

Not getting enough pregnancy care is the biggest risk factor we found in this data. Mothers who do not get enough pregnancy care are more than twice as likely to deliver preterm, and 3 times as likely to deliver very preterm (Figure 11).

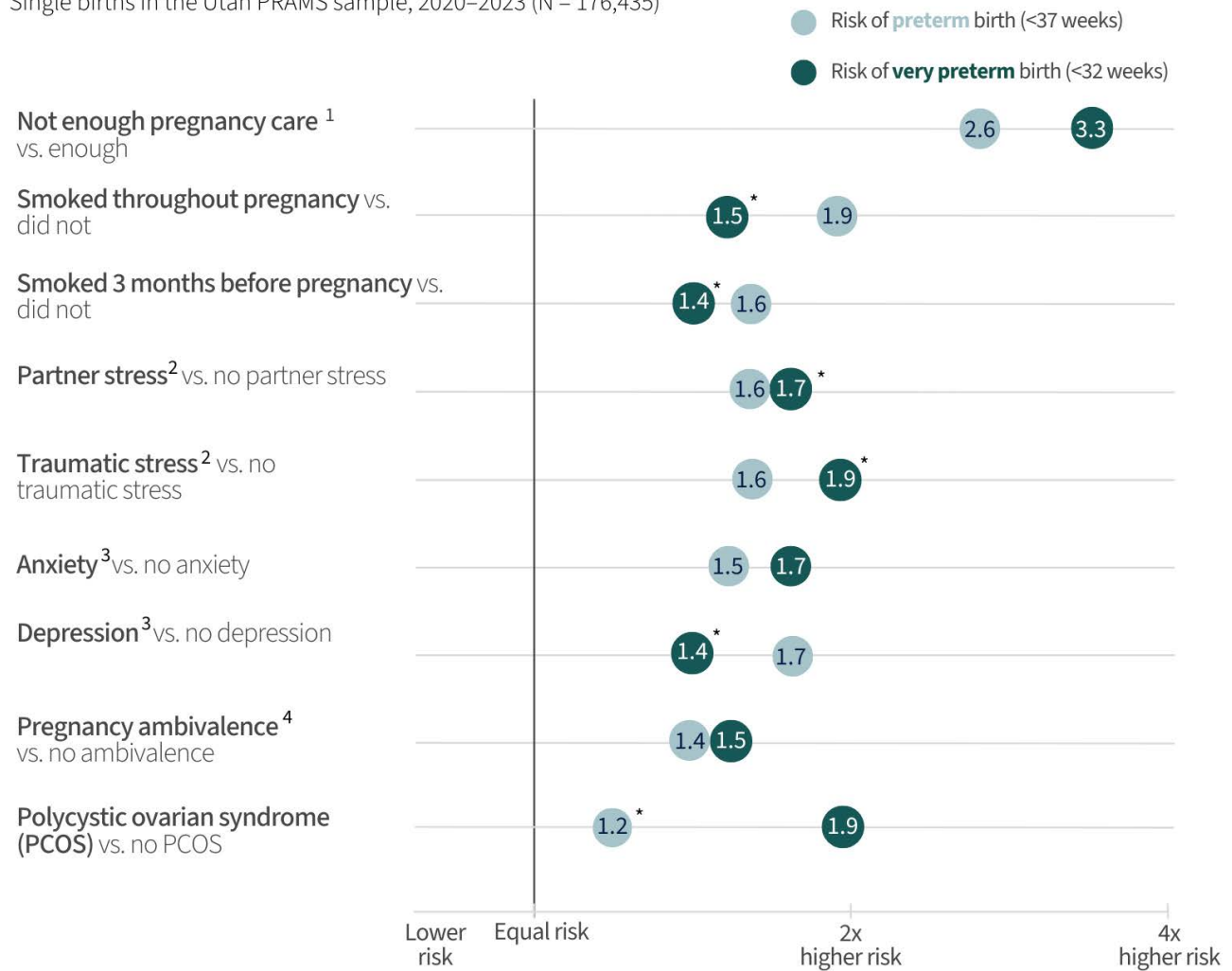
Mental and behavioral health factors are also associated with preterm birth. Smoking is known to cause preterm birth, and is associated with nearly double the risk in this analysis. Mothers who have anxiety, depression, partner-related stress, and traumatic stress are also more likely to have a preterm birth, however we don't know if these conditions directly cause preterm birth (Figure 11).

Pregnancy ambivalence, defined as being unsure about becoming pregnant or wanting to wait longer, is also associated with higher risk of preterm birth (Figure 11). We also found in this data that mothers who are ambivalent are more likely to not get enough pregnancy care.

We also looked at the risk of preterm birth associated with polycystic ovarian syndrome (PCOS). PCOS is a set of symptoms caused by a hormone imbalance. It can increase a woman's risk of infertility and other chronic conditions. We found no significant association between PCOS and preterm birth, but a 90% higher risk of very preterm birth for women with PCOS (Figure 11).

### Figure 11. Mental, behavioral, and clinical factors are associated with preterm birth

Single births in the Utah PRAMS sample, 2020–2023 (N = 176,435)



Data source: Utah Pregnancy Risk Assessment Monitoring System (PRAMS) data set (15)

**Data notes:** Relative risk estimates are adjusted for, or regardless of the mother’s age.

1 Enough pregnancy care is based on the Kotelchuck index, which accounts for the month care begins, the total number of visits, and the expected number of visits for the infant’s gestational age at birth. Enough pregnancy care does not include more than enough. Pregnancies with less than 50% of the expected number of visits at a given gestational week are categorized as not enough. Pregnancies with 110% or more of the expected number of visits are categorized more than enough.

2 Stress variables refer to the 12 months before the birth. Partner stress includes divorce or separation, or a partner not wanting the pregnancy. Traumatic stress includes going to jail or prison, a partner going to jail or prison, experiencing homelessness, or physical, emotional, or sexual abuse.

3 Depression and anxiety include symptoms that occur during pregnancy or in the 3 months before.

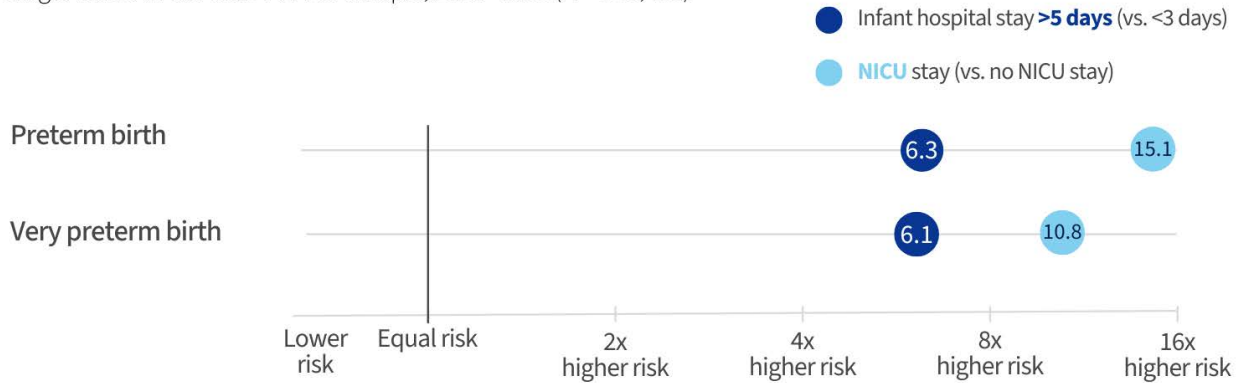
4 Pregnancy ambivalence is defined as wanting to become pregnant later than they did or being unsure of what they wanted.

\*Not statistically significant ( $p \leq 0.01$ ) after applying the Benjamini-Hochberg adjustment for multiple comparisons. All other estimates are significant.

Babies who are born preterm often need to stay in the hospital for a longer time. They also often need to go to the NICU. A baby born preterm is 15 times more likely to stay in the hospital for more than 5 days. A baby born very preterm is 11 times more likely to stay in the hospital more than 5 days. Early mortality could explain the slightly reduced risk associated with very preterm birth compared to preterm birth (19). Babies born preterm and very preterm are 6 times more likely to go to the NICU (Figure 12).

**Figure 12. Preterm birth is associated with longer hospital stays**

Single births in the Utah PRAMS sample, 2020–2023 (N = 176,435)



Data source: Utah Pregnancy Risk Assessment Monitoring System (PRAMS) data set (15)

**Data notes:** Relative risk estimates are adjusted for, or regardless of the mother’s age. We used Poisson regression to measure the risk of hospital stays longer than 5 days after binomial models failed to fit the data. This could be because of the small number of very preterm infants who did not stay in the hospital for more than 5 days. Poisson and binomial models get similar relative risk estimates (17). All estimates are statistically significant ( $p \leq 0.01$ ) after applying the Benjamini-Hochberg adjustment for multiple comparisons.

## Demographic trends in risk factors

Some of the biggest risk factors for preterm birth that can be prevented include: not getting enough pregnancy care, not gaining enough weight during pregnancy, pre-pregnancy obesity, and pre-existing diabetes. Demographic trends for these risk factors can be found on the Utah Indicator-Based Information System for Public Health (3).

Mothers in San Juan (29%) and Southwest (25%) health districts are more likely to not get enough care compared to all mothers living in Utah who delivered a single pregnancy infant from 2021 to 2024 (17%).

Mothers who are Native Hawaiian or other Pacific Islander (40%), American Indian or Alaska Native (29%), or Black or African American (28%) are more likely to not get enough care. Mothers younger than 20 years (30%) are also more likely to not get enough care (3).

Mothers in San Juan (35%) health district are more likely to not gain enough weight during pregnancy compared to the state overall (17%). Mothers who are Black or African American (27%), American Indian or Alaska Native (24%), or Asian mothers (24%) are more likely to not gain enough weight.

Mothers in San Juan (38%) and Tooele (34%) health districts are more likely to be classified as obese before pregnancy compared to the state overall (25%). Mothers in San Juan (10%) and Southeast (2%) districts are more likely to have diabetes before pregnancy compared to the state overall (1%) (3).

## Conclusions

We used data from birth records, the Utah Birth Defect Network, and the Utah Pregnancy Risk Assessment Monitoring System to find out what factors are associated with preterm birth. We found that many medical, behavioral, social, and demographic factors are associated with higher risk of preterm birth. We also found that babies born preterm are more likely to be admitted to the NICU and stay in the hospital longer.

There is still more to learn about what causes preterm birth and how to prevent it, but many of the risk factors for preterm birth can be prevented, or at least managed or treated during pregnancy. The findings from this report show that many different approaches could help lower the risk for mothers and babies in Utah.

## Acknowledgements

We used Google Gemini for editing to improve clarity and readability. All conceptual and analytic content are the authors' original work.

# References

1. Institute of Medicine (US) and National Research Council (US) Committee to Reexamine IOM Pregnancy Weight Guidelines. Weight Gain During Pregnancy: Reexamining the Guidelines. Rasmussen KM, Yaktine AL, editors. Washington (DC): National Academies Press (US); 2009. PMID: 20669500. Accessed at <https://pubmed.ncbi.nlm.nih.gov/20669500/>
2. Utah health status update: Health insurance coverage for pregnant women in Utah. (2025). Accessed at [https://ibis.utah.gov/ibisph-view/pdf/opha/publication/hsu/2025/2506\\_InsPreg.pdf#HSU](https://ibis.utah.gov/ibisph-view/pdf/opha/publication/hsu/2025/2506_InsPreg.pdf#HSU)
3. Utah Birth Certificate Database. (2021–2024). Retrieved Tue, 02 September 2025 from the Utah Department of Health and Human Services, Indicator-Based Information System for Public Health website: <https://ibis.utah.gov/ibisph-view/>
4. Thomas MK, Lammert LJ, Beverly EA. Food Insecurity and its Impact on Body Weight, Type 2 Diabetes, Cardiovascular Disease, and Mental Health. *Curr Cardiovasc Risk Rep.* 2021;15(9):15. doi: 10.1007/s12170-021-00679-3. Epub 2021 Jul 5. PMID: 34249217; PMCID: PMC8255162.
5. Branley CE, Goulding M, Tisminetzky M, Lemon SC. The association between multimorbidity and food insecurity among US parents, guardians, and caregivers. *BMC Public Health.* 2025 Apr 22;25(1):1487. doi: 10.1186/s12889-025-22714-3. PMID: 40264094; PMCID: PMC12013002.
6. Moradi S, Mirzababaei A, Dadfarma A, Rezaei S, Mohammadi H, Jannat B, Mirzaei K. Food insecurity and adult weight abnormality risk: a systematic review and meta-analysis. *Eur J Nutr.* 2019 Feb;58(1):45-61. doi: 10.1007/s00394-018-1819-6. Epub 2018 Sep 15. PMID: 30219965.
7. U.S. Department of Agriculture (USDA) Food and Nutrition Service. National and State Level Estimates of WIC Eligibility and Program Reach in 2021. <https://www.fns.usda.gov/research/wic/eer/2021>. Updated on December 1, 2025. Accessed on February 10, 2026.
8. Center on Budget and Policy Priorities. (2025). WIC’s Critical Benefits Reach Only Half of Those Eligible. Accessed at <https://www.cbpp.org/research/food-assistance/wics-critical-benefits-reach-only-half-of-those-eligible-0>
9. Centers for Disease Control and Prevention. (2023). Diagnosing Birth Defects. Accessed at <https://www.cdc.gov/birth-defects/diagnosis/index.html#:~:text=the%20neural%20tube,After%20the%20baby%20is%20born,children%20and%20families%20are%20met.>
10. March of Dimes. (2024). Prematurity Profile. Accessed at <https://www.marchofdimes.org/peristats/reports/united-states/prematurity-profile>
11. Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics System, Linked Birth / Infant Deaths on CDC WONDER Online Database. Data are from the Linked Birth / Infant Deaths Records 2020-2023, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Preterm birth determined using obstetric estimate (OE). Accessed at <http://wonder.cdc.gov/lbd-current-expanded.html> on April 14, 2026
12. Waitzman NJ, Jalali A, Grosse SD. Preterm birth lifetime costs in the United States in 2016: An update. *Semin Perinatol.* 2021;45(3):151390. doi:10.1016/j.semperi.2021.151390
13. Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics System, Natality on CDC WONDER Online Database. Data are from the Natality Records 2020-2024, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Preterm birth determined using obstetric estimate (OE). Accessed at <http://wonder.cdc.gov/natality-expanded-current.html> on April 14, 2026

# References continued

14. Utah Department of Health and Human Services, Office of Vital Records and Statistics. Birth records data set, 2021-2024.
15. Utah Department of Health and Human Services, Office of Maternal and Child Health. Utah Pregnancy Risk Assessment Monitoring System (PRAMS) data set, 2020-2023.
16. Utah Department of Health and Human Services, Office of Children with Special Health Care Needs. Utah Birth Defect Network data set, 2019-2022.
17. Petersen MR, Deddens JA. A comparison of two methods for estimating prevalence ratios. *BMC Med Res Methodol*. 2008 Feb 28;8:9. doi: 10.1186/1471-2288-8-9. PMID: 18307814; PMCID: PMC2292207.
18. Ma Y, Fu H, Li Y, Bao ZR, Dong WB, Lei XP. Interactions between long interpregnancy interval and advanced maternal age on neonatal outcomes. *World J Pediatr*. 2023 Dec;19(12):1155-1161. doi: 10.1007/s12519-023-00728-4. Epub 2023 Apr 26. PMID: 37099258; PMCID: PMC10590323.
19. Seaton SE, Barker L, Draper ES, Abrams KR, Modi N, Manktelow BN; UK Neonatal Collaborative. Estimating neonatal length of stay for babies born very preterm. *Arch Dis Child Fetal Neonatal Ed*. 2019 Mar;104(2):F182-F186. doi: 10.1136/archdischild-2017-314405. Epub 2018 Mar 27. PMID: 29588296; PMCID: PMC6580734.

# Additional data from birth records

Utah Office of Vital Records and Statistics birth records data set, 2021-2024 (14)

**Table 1. Characteristics of term, preterm, and very preterm single pregnancy births to Utah residents, 2021-2024**

Characteristic	Term births N = 164,332		Preterm births N = 13,821		Very preterm births N = 1,795	
	n	%	n	%	n	%
<b>Mother's demographic factors</b>						
Mother's age						
<20 years	4,326	2.6%	437	3.2%	62	3.5%
20-34 years	135,473	82.4%	10,566	76.4%	1,382	77.0%
35-39 years	19,947	12.1%	2,129	15.4%	250	13.9%
40+ years	4,586	2.8%	689	5.0%	101	5.6%
Mother's education						
Less than high school	10,616	6.5%	1,224	8.9%	190	10.6%
High school graduate	34,047	20.7%	3,313	24.0%	460	25.6%
Some college	53,461	32.5%	4,688	33.9%	590	32.9%
College graduate	63,340	38.5%	4,213	30.5%	488	27.2%
Mother's race and ethnicity <sup>1</sup>						
American Indian or Alaska Native	2,752	1.7%	298	2.2%	44	2.5%
Asian	6,586	4.0%	659	4.8%	73	4.1%
Black	3,758	2.3%	387	2.8%	72	4.0%
Hispanic	32,921	20.0%	3,172	23.0%	450	25.1%
Native Hawaiian or Other Pacific Islander	4,208	2.6%	459	3.3%	65	3.6%
White	141,742	86.3%	11,442	82.8%	1,456	81.1%
Mother born outside the U.S.	25,286	15.4%	2,380	17.2%	346	19.3%
Mother's residence						
Metropolitan <sup>2</sup>	142,383	86.6%	11,865	85.8%	1,542	85.9%
Not metropolitan	21,866	13.3%	1,934	14.0%	250	13.9%
<b>Father's demographic factors</b>						
Father's age						
<20 years	1,791	1.1%	183	1.3%	29	1.6%
20-34 years	115,057	70.0%	8,773	63.5%	1,123	62.6%
35-39 years	26,535	16.1%	2,432	17.6%	296	16.5%
40-44 years	9,511	5.8%	978	7.1%	115	6.4%
45+ years	3,493	2.1%	449	3.2%	56	3.1%
Father's education						
Less than high school	16,851	10.3%	1,930	14.0%	326	18.2%
High school graduate	30,996	18.9%	2,989	21.6%	419	23.3%
Some college	36,319	22.1%	3,069	22.2%	368	20.5%
College graduate	74,336	45.2%	5,094	36.9%	559	31.1%
Father's race and ethnicity						
American Indian or Alaska Native	2,301	1.4%	237	1.7%	36	2.0%
Asian	5,401	3.3%	418	3.0%	56	3.1%
Black	4,177	2.5%	411	3.0%	70	3.9%
Hispanic	29,198	17.8%	2,761	20.0%	388	21.6%
Native Hawaiian or Other Pacific Islander	4,736	2.9%	439	3.2%	70	3.9%
White	133,122	81.0%	10,501	76.0%	1,273	70.9%
Father born outside the U.S.	24,594	15.0%	2,299	16.6%	339	18.9%

**Data notes:**

1 Race and ethnicity categories are not mutually exclusive, meaning that individuals can identify as more than one race or ethnicity.

2 Metropolitan areas are determined by Rural Urban Commuting Area (RUCA) codes assigned to Zip codes by the U.S. Department of Agriculture. Definitions are available at <https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/documentation>

# Additional data from birth records

Utah Office of Vital Records and Statistics birth records data set, 2021-2024 (14)

**Table 1 continued. Characteristics of term, preterm, and very preterm single births to Utah residents, 2021-2024**

Characteristic	Term births N = 164,344		Preterm births N = 13,821		Very preterm births N = 1,795	
	n	%	n	%	n	%
<b>Mother's clinical factors</b>						
Prior births (including stillbirth)						
No prior births (first time delivery)	60,093	36.6%	5,216	37.7%	821	45.7%
1-2 prior births	77,773	47.3%	6,063	43.9%	678	37.8%
3 or more prior births	26,466	16.1%	2,542	18.4%	296	16.5%
Time between pregnancies (interpregnancy interval) <sup>1</sup>						
<6 months	2,940	1.8%	342	2.5%	50	2.8%
6-11 months	10,328	6.3%	781	5.7%	87	4.8%
12 to 17 months	17,437	10.6%	1,153	8.3%	113	6.3%
18 to 23 months	17,169	10.4%	1,027	7.4%	76	4.2%
24 to 59 months (2-4 years)	39,595	24.1%	3,229	23.4%	352	19.6%
60+ months (5+ years)	14,472	8.8%	1,798	13.0%	254	14.2%
Prior preterm birth	7,168	4.4%	2,256	16.3%	271	15.1%
Chronic conditions						
2 or more of the conditions below	5,928	3.6%	1,314	9.5%	197	11.0%
High blood pressure <sup>2</sup>	1,345	0.8%	503	3.6%	70	3.9%
Diabetes <sup>2</sup>	3,289	2.0%	993	7.2%	156	8.7%
Thyroid disease	10,139	6.2%	1,224	8.9%	161	9.0%
Underweight (body mass index (BMI) lower than 18.5)	5,187	3.2%	493	3.6%	60	3.3%
Obese (BMI 30 or higher)	39,714	24.2%	4,434	32.1%	623	34.7%
Class 1 (BMI 30-34.9)	22,336	13.6%	2,171	15.7%	300	16.7%
Class 2 (BMI 35-39.9)	10,597	6.4%	1,273	9.2%	169	9.4%
Class 3 (BMI 40 or higher)	6,781	4.1%	990	7.2%	154	8.6%
Other BMI categories						
Normal BMI (18.5-24.9)	75,788	46.1%	5,189	37.5%	620	34.5%
Overweight BMI (25-29.9)	42,103	25.6%	3,429	24.8%	443	24.7%
Infertility treatment	8,085	4.9%	1,143	8.3%	196	10.9%
Infection <sup>3</sup>	2,356	1.4%	293	2.1%	41	2.3%
Prior cesarean	21,612	13.2%	2,653	19.2%	334	18.6%
Weight gain during pregnancy <sup>4</sup>						
Not enough	27,858	17.0%	3,069	22.2%	571	31.8%
Enough	42,680	26.0%	3,057	22.1%	365	20.3%
Too much	89,641	54.5%	7,166	51.8%	748	41.7%

## Data notes:

1 Time between pregnancies (between the most recent delivery and subsequent conception) includes still and live births.

2 High blood pressure and diabetes include both pre-existing or pregnancy-related conditions.

3 Infections included chlamydia, cytomegalovirus (CMV), gonorrhea, hepatitis A, B, and C, herpes, HIV/AIDS, and syphilis.

4 We defined enough pregnancy weight gain using recommendations from the Institutes of Medicine based on pre-pregnancy body mass index, and mean weight gain per week to account for gestational age (1).

\*Estimate has been suppressed because the number of events is very small and not appropriate for publication.

## Additional data from the Utah Birth Defect Network

Utah Birth Defect Network data set, 2019-2022 (16)

**Table 2. Distribution of birth defects in term, preterm, and very preterm single births to Utah residents, 2019-2022**

Body system affected	Term births N = 164,535		Preterm births N = 13,625		Very preterm births N = 1,720	
	n	%	n	%	n	%
Any defect included in the UBDN	2,229	1.4%	583	4.3%	112	6.5%
Central nervous system defect	51	0.03%	35	0.3%	<11*	0.5%
Gastrointestinal defect	112	0.1%	83	0.6%	13	0.8%
Musculoskeletal defect	341	0.2%	120	0.9%	25	1.5%
Cardiovascular defect	914	0.6%	291	2.1%	62	3.6%
Chromosomal defect	260	0.2%	120	0.9%	16	0.9%
Orofacial defect	286	0.2%	57	0.4%	11	0.6%
Genitourinary defect	552	0.3%	97	0.7%	17	1.0%
Eye defect	60	0.04%	17	0.1%	<11*	*
Ear defect	65	0.04%	<11*	*	<11*	*

\*Estimate has been suppressed because the number of events is very small and not appropriate for publication.

# Additional data from Utah PRAMS

Utah Pregnancy Risk Assessment Monitoring System (PRAMS) data set, 2020-2023 (15)

**Table 3. Characteristics of term, preterm, and very preterm single births sampled in PRAMS, 2020-2023**

Characteristic	Term births N = 163,697		Preterm births N = 12,739		Very preterm births N = 1,786	
	n	%	n	%	n	%
<b>Socioeconomic and health care access factors</b>						
Percentage of federal poverty level (FPL)						
Less than 185%	50,641	32.0%	4,617	37.9%	585	34.5%
Less than 100%	20,580	13.0%				
100% to 138%	14,439	9.1%				
139% to 184%	15,622	9.9%				
185% or more	107,801	68.0%	7,572	62.1%	1,108	65.5%
Not enough pregnancy care <sup>1</sup>	15,176	12.0%	1,405	27.0%	195	32.3%
Enough pregnancy care						
More than enough pregnancy care						
No dental cleaning 12 months before pregnancy	42,057	29.1%	3,659	32.5%	682	42.8%
No flu shot during pregnancy or 3 months before	45,331	37.1%	3,338	35.9%	672	47.8%
No COVID shot during pregnancy <sup>2</sup>	29,959	72.9%	2,023	71.1%	342	69.3%
<b>Clinical factors</b>						
Polycystic ovarian syndrome 3 months before pregnancy	13,698	8.5%	1,273	10.3%	268	15.4%
Painful, red, or swollen gums during pregnancy	9,471	8.0%	686	7.6%	133	9.8%
Dental problems during pregnancy	22,083	18.2%	1,832	20.0%	281	20.3%
COVID-19 diagnosis during pregnancy <sup>3</sup>	6,901	11.3%	405	8.9%	64	9.1%
<b>Psychosocial and behavioral factors</b>						
Smoked throughout pregnancy	3,902	3.2%	583	6.3%	68	5.0%
Smoked 3 months before pregnancy	11,935	9.8%	1,348	14.5%	179	13.1%
Depression during pregnancy or 3 months before	42,984	33.3%	4,753	45.8%	604	40.3%
Anxiety during pregnancy or 3 months before	64,173	47.9%	6,210	58.2%	941	60.7%
Partner stress in the 12 months before pregnancy <sup>4</sup>	9,621	7.8%	1,153	12.1%	181	13.1%
Traumatic stress in the 12 months before pregnancy <sup>5</sup>	7,210	4.8%	910	7.8%	147	9.4%
Financial stress in the 12 months before pregnancy <sup>6</sup>	61,022	37.5%	4,887	38.6%	742	42.2%
Pregnancy ambivalence <sup>7</sup>	41,869	26.0%	4,038	32.5%	599	34.5%
Unplanned pregnancy	7,086	4.4%	705	5.7%	97	5.6%
<b>Outcomes</b>						
Infant hospital stay fewer than 3 days	89,540	76.1%	2,378	25.7%	130	9.6%
Infant hospital stay 3-5 days	23,911	20.3%	1,572	17.0%	28	2.0%
Infant hospital stay more than 5 days	4,281	3.6%	5,287	57.2%	1,193	88.3%
Neonatal intensive care unit stay	13,684	11.2%	6,500	70.7%	1,232	89.8%

**Data notes:**

1. Enough prenatal care is based on the Kotelchuck index, which accounts for the month care begins, the total number of visits, and the expected number of visits for the infant's gestational age at birth. Pregnancies with less than 50% of the expected number of visits at a given gestational week are categorized as not enough. Pregnancies with 110% or more of the expected number of visits are categorized more than enough.
2. Respondents surveyed in 2021 were asked about COVID-19 vaccination.
3. Respondents surveyed from July 2020 through December 2021 were asked if a provider told them they had COVID-19 during pregnancy.
4. Partner stress includes divorce or separation, or a partner not wanting the pregnancy.
5. Traumatic stress includes going to jail or prison, a partner going to jail or prison, experiencing homelessness, or physical, emotional, or sexual abuse.
6. Financial stress includes trouble paying bills, job loss, partner's job loss, or a cut in work hours or pay.
7. Pregnancy ambivalence is defined as wanting to become pregnant later than they did or being unsure of what they wanted.