

ECE 143 FINAL PROJECT

PREGNANCY-RELATED COMPLICATIONS AND MORTALITY IN THE U.S.

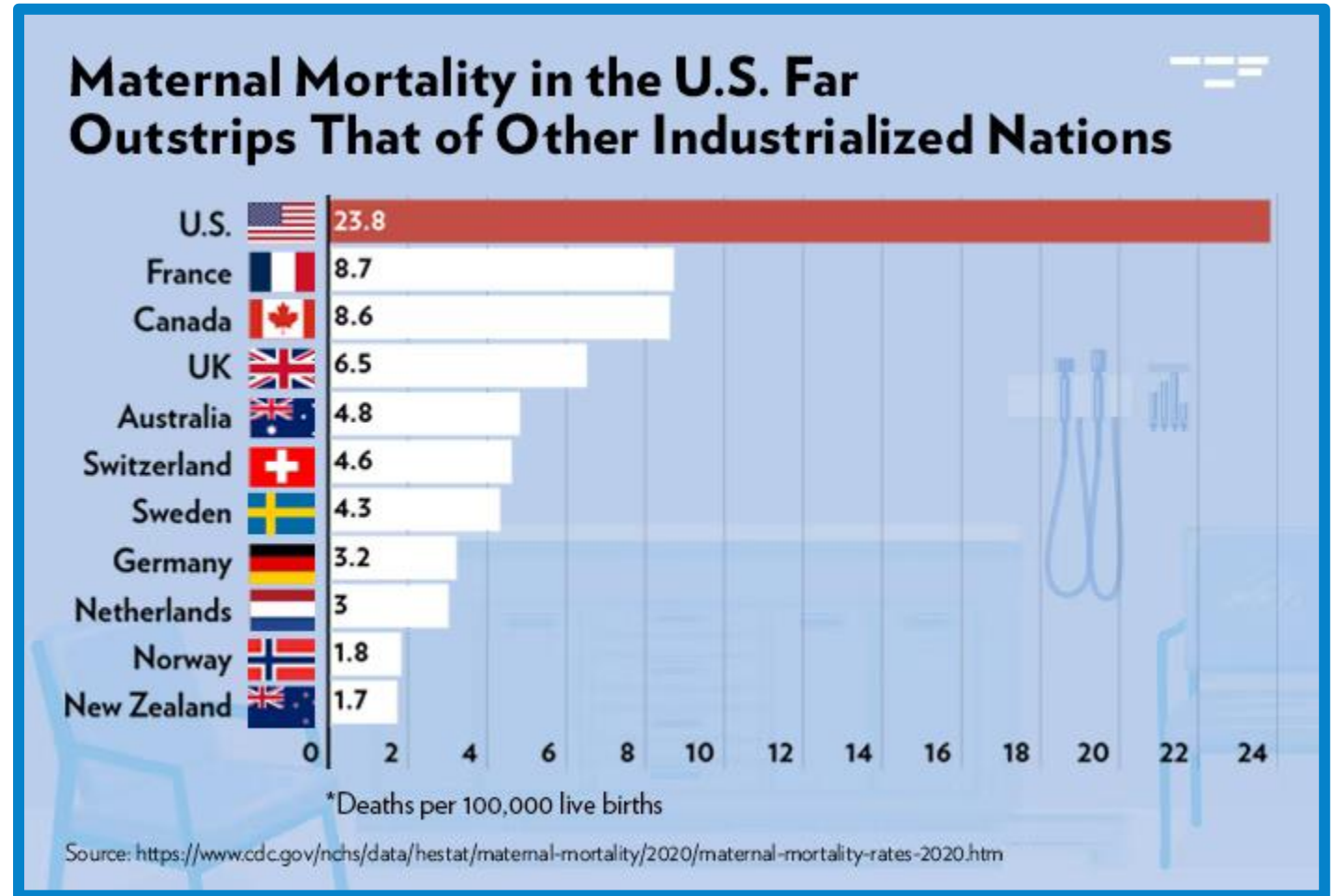
TEAM 3

Pulkit Agrawal • Mandy Cheung •
Abhijith Dasharathi • Atishna Samantaray • Naman Sehgal

UC San Diego
JACOBS SCHOOL OF ENGINEERING
Electrical and Computer Engineering

MOTIVATION

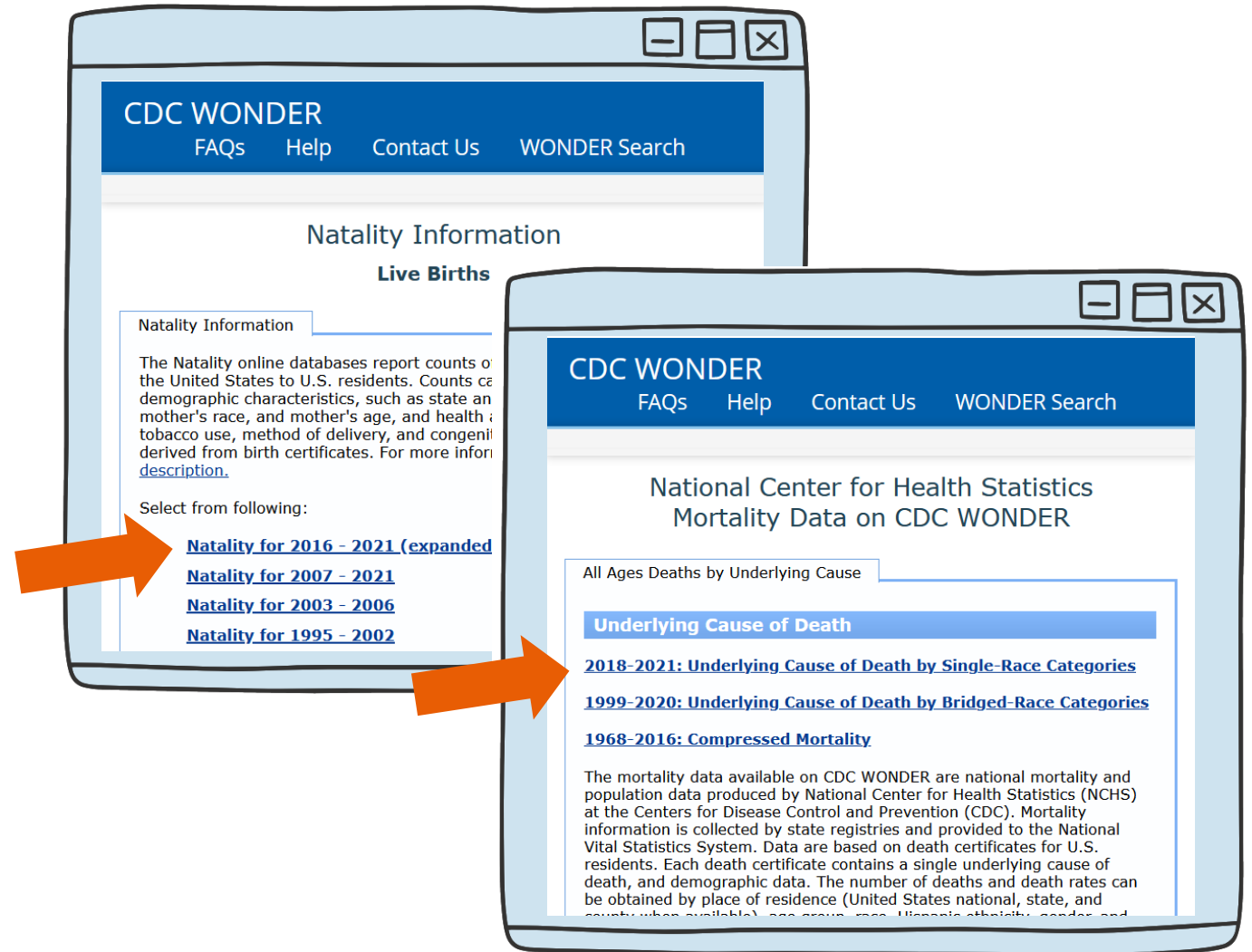
- The U.S. has experienced a **higher MMR** than other industrialized countries **for over 20 years**
- *“What factors contribute to pregnancy-related complications?”*



Plot source: <https://tcf.org/content/commentary/worsening-u-s-maternal-health-crisis-three-graphs/>

DATA OVERVIEW

- Accessible at <https://wonder.cdc.gov/>
- **Natality for 2016-2021** reports live births using over **130 parameters**
- **Underlying Cause of Death for 2018-2021** reports mortality by **cause of death**



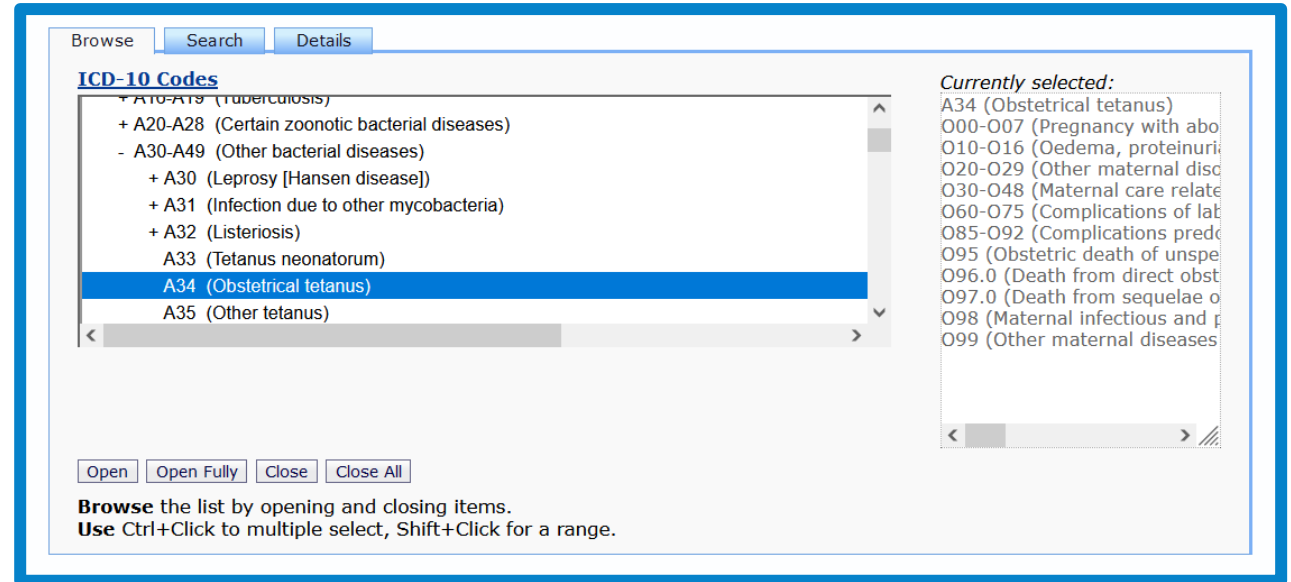
METHODOLOGY



CDC datasets are large & encoded

To navigate this, we wrote code to access the CDC Wonder API

We merged datasets and removed “Not Reported”, “Suppressed”, and “Unreliable” data



	Single Race 6	Year	Births	Deaths	MMR per 100,000 Live Births
0	American Indian or Alaska Native	2019.0	28450.0	14.0	49.0
1	American Indian or Alaska Native	2020.0	26813.0	13.0	48.0
2	American Indian or Alaska Native	2021.0	26124.0	31.0	119.0
3	Asian	2018.0	240798.0	32.0	13.0
4	Asian	2019.0	238769.0	33.0	14.0



ANALYSIS OVERVIEW

Physical Maternal
Characteristics

Social Maternal
Characteristics

Healthcare
Characteristics

Physical Maternal Characteristics

PARAMETERS ANALYZED IN THIS SECTION

1. Tobacco and Cigarette Use

2. Height

3. Weight

} Body Mass Index (**BMI**) = $\frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$

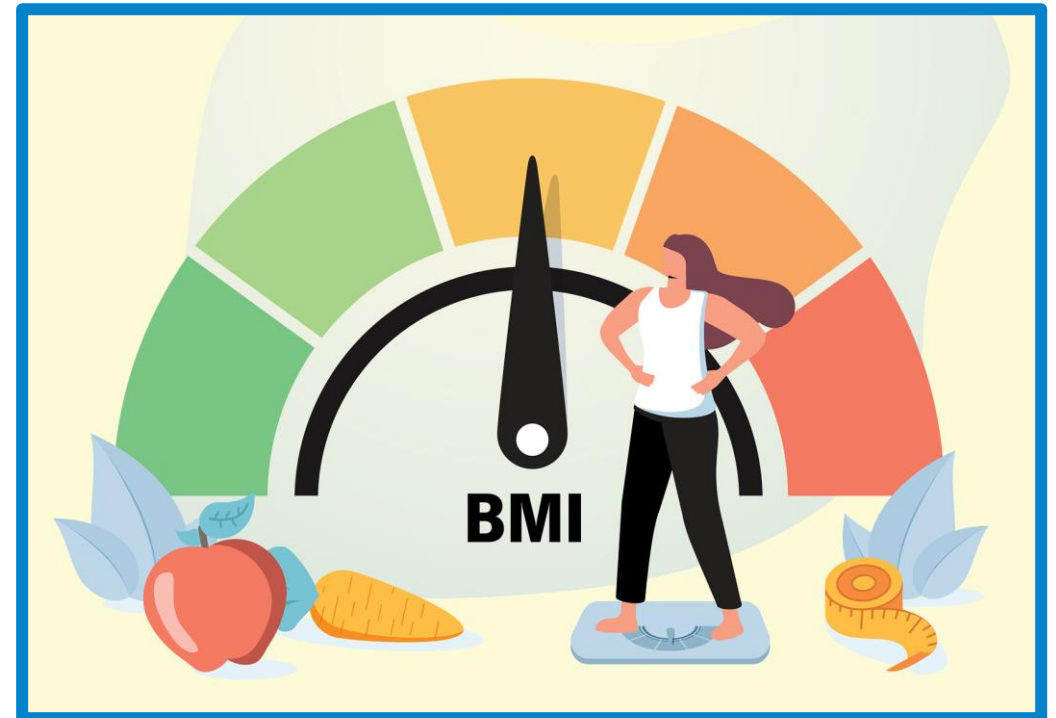
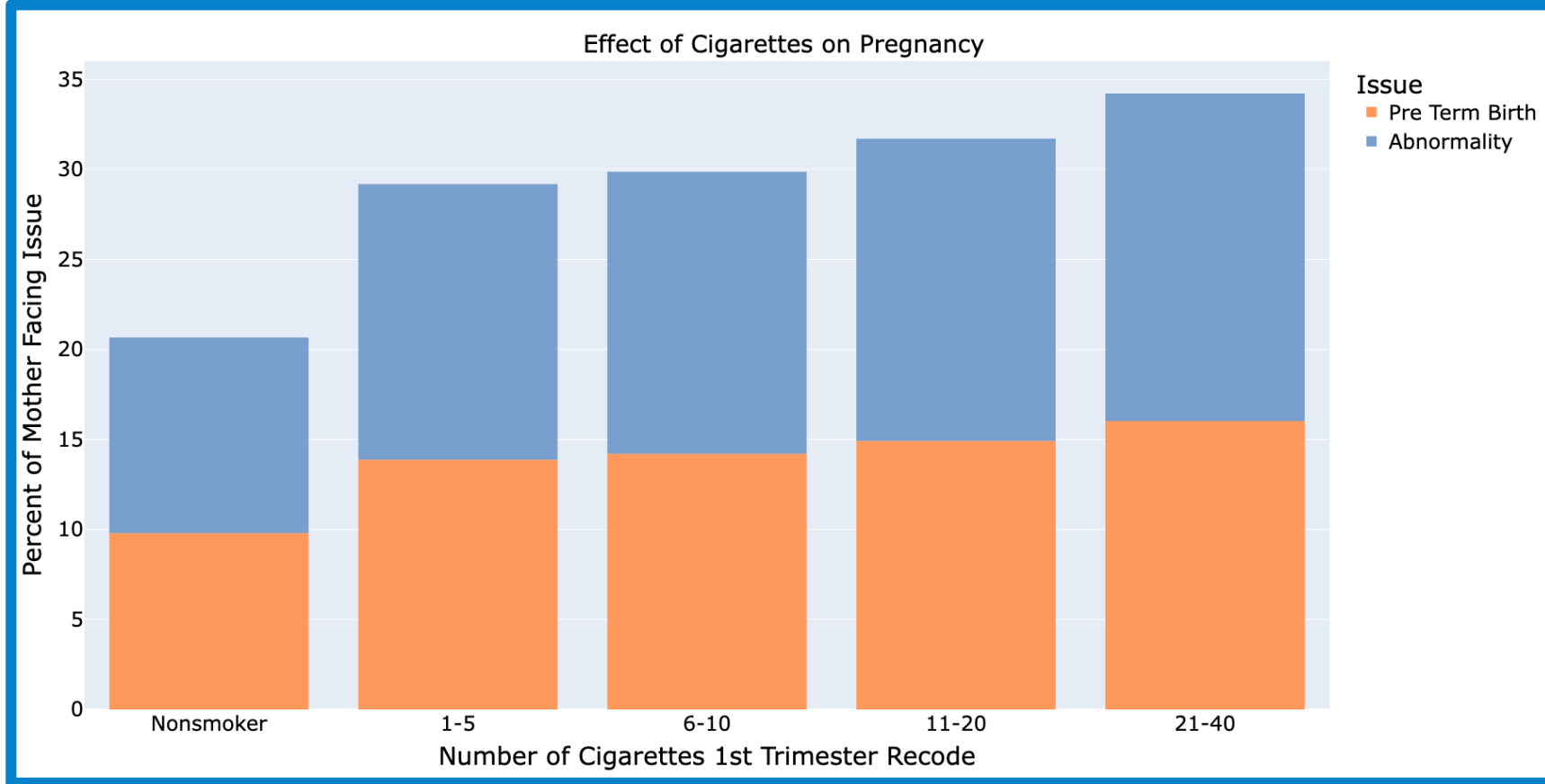


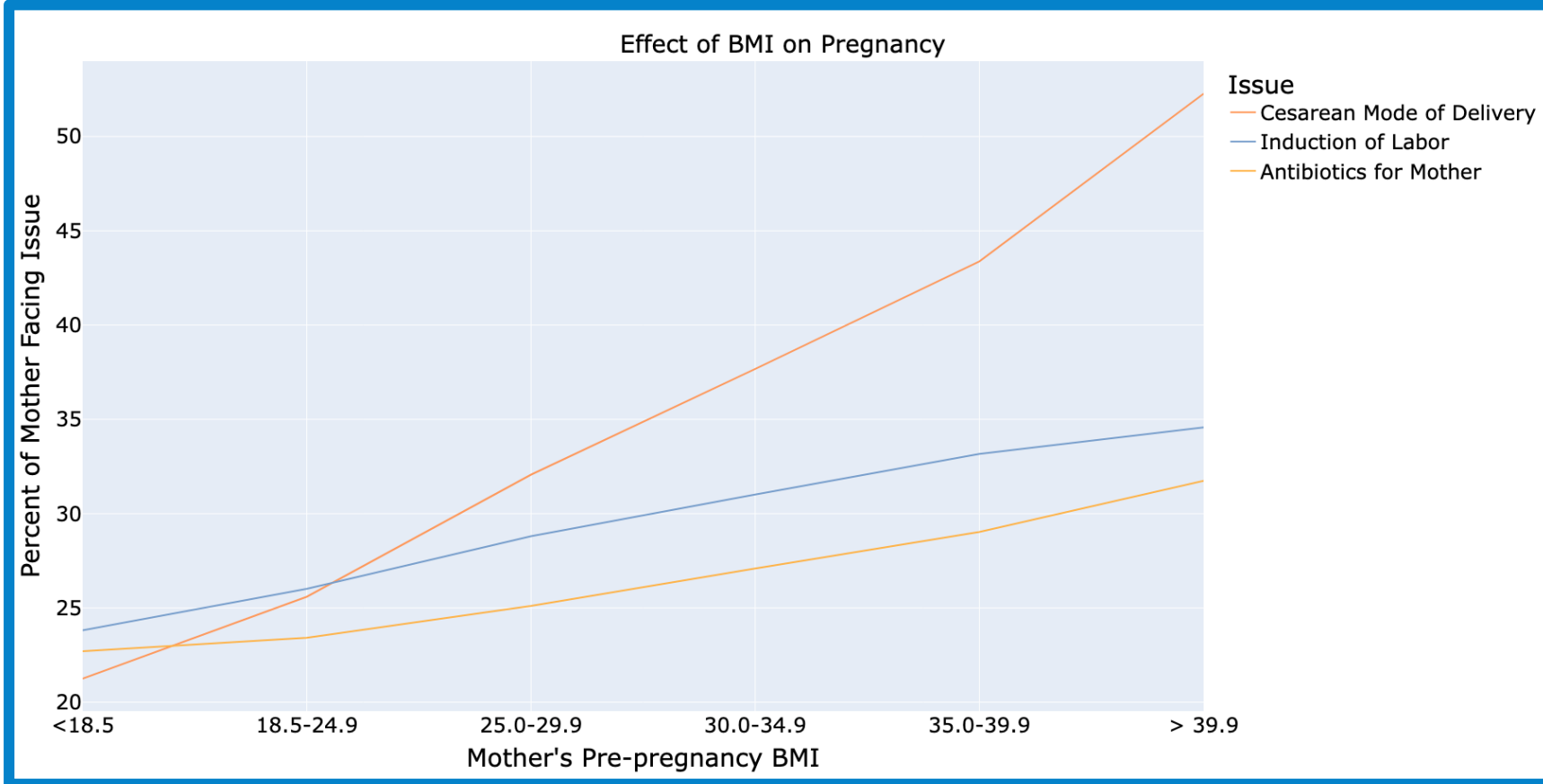
Photo source: <https://health.clevelandclinic.org/is-bmi-accurate/>



IMPACT OF CIGARETTES

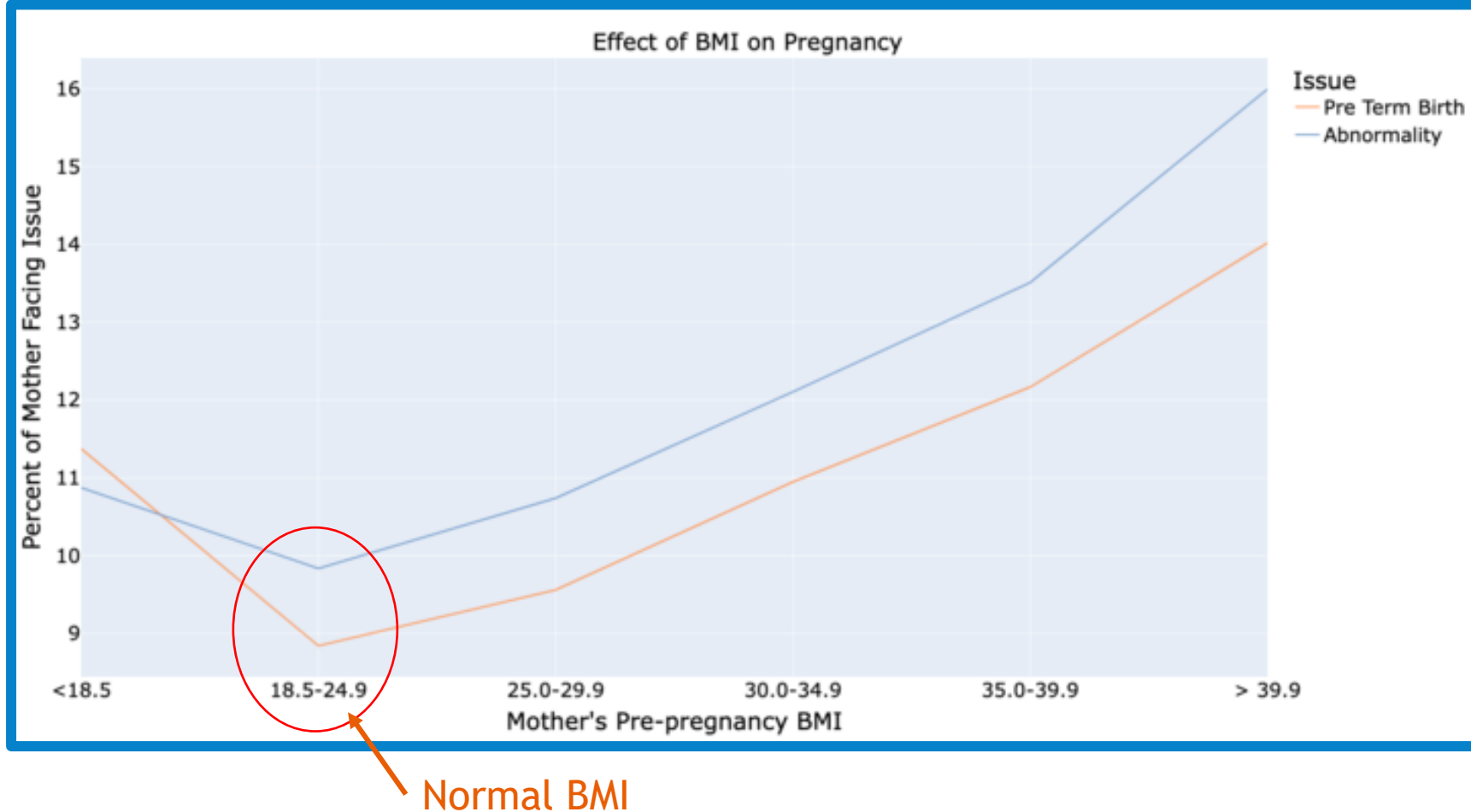
- Abnormalities refer to live births where the newborn experiences
 - Assisted Ventilation
 - NICU Admission
 - Surfactant Replacement Therapy
 - Antibiotics for Suspected Neonatal Sepsis
 - OR Seizures

IMPACT OF BMI



- Cesarean Mode refers to the surgical delivery procedure
- Induction of Labor refers to methods of stimulating the uterus for the purposes of inducing labor

IMPACT OF BMI



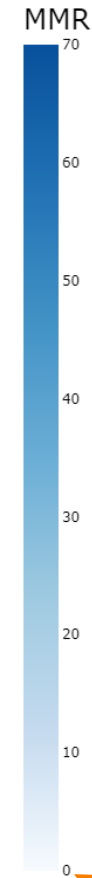
- Preterm births refer to live births that occur **before 37 weeks** of pregnancy is completed
- This is generally considered **dangerous**, as the baby may develop **long-term health issues**

Social Maternal Characteristics

2018 Maternal Mortality Ratio per 100,000 Live Births by State

MMR

70
60
50
40
30
20
10
0



- MMR is defined as deaths/100,000 live births of that population
- There is uneven MMR distribution in the U.S.

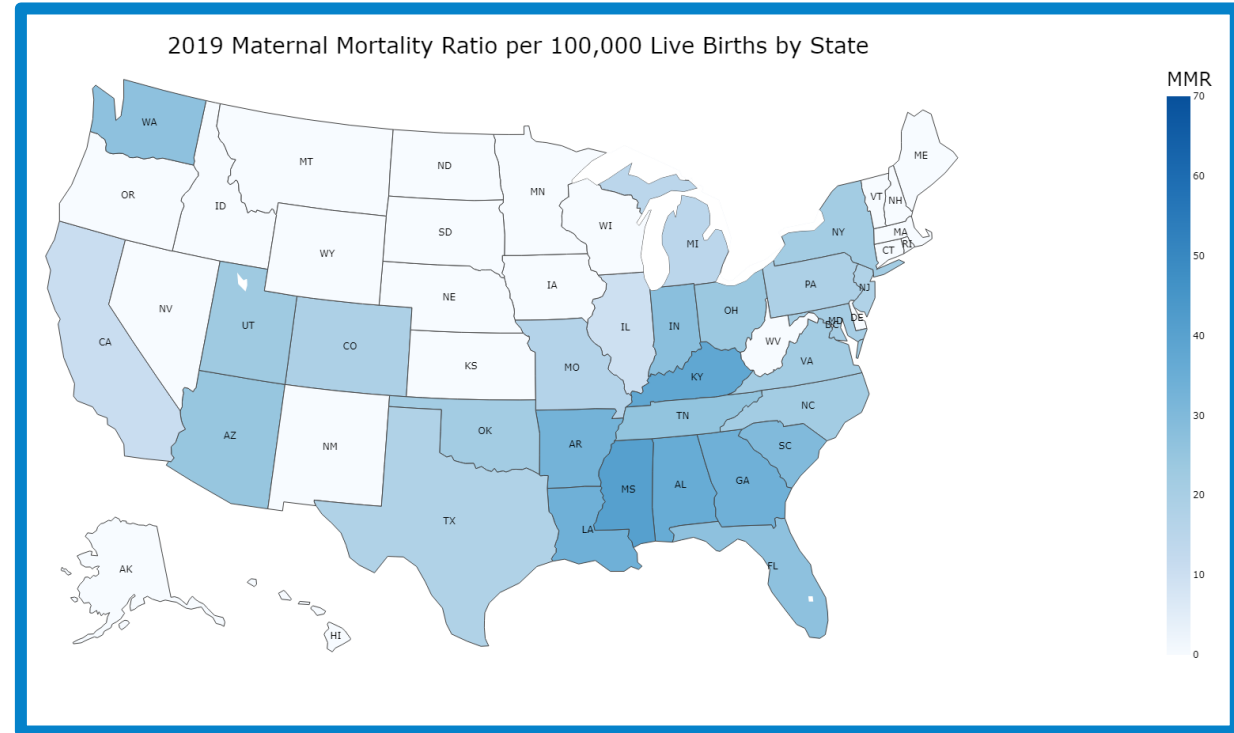
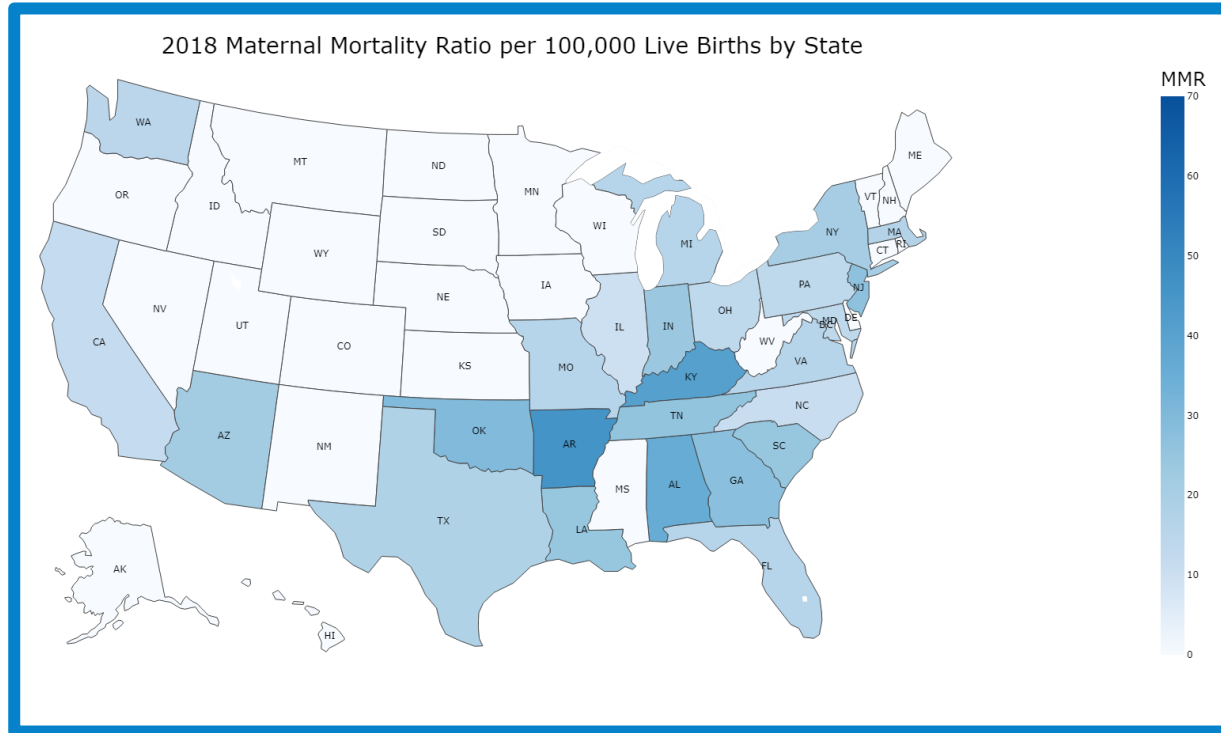
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2018

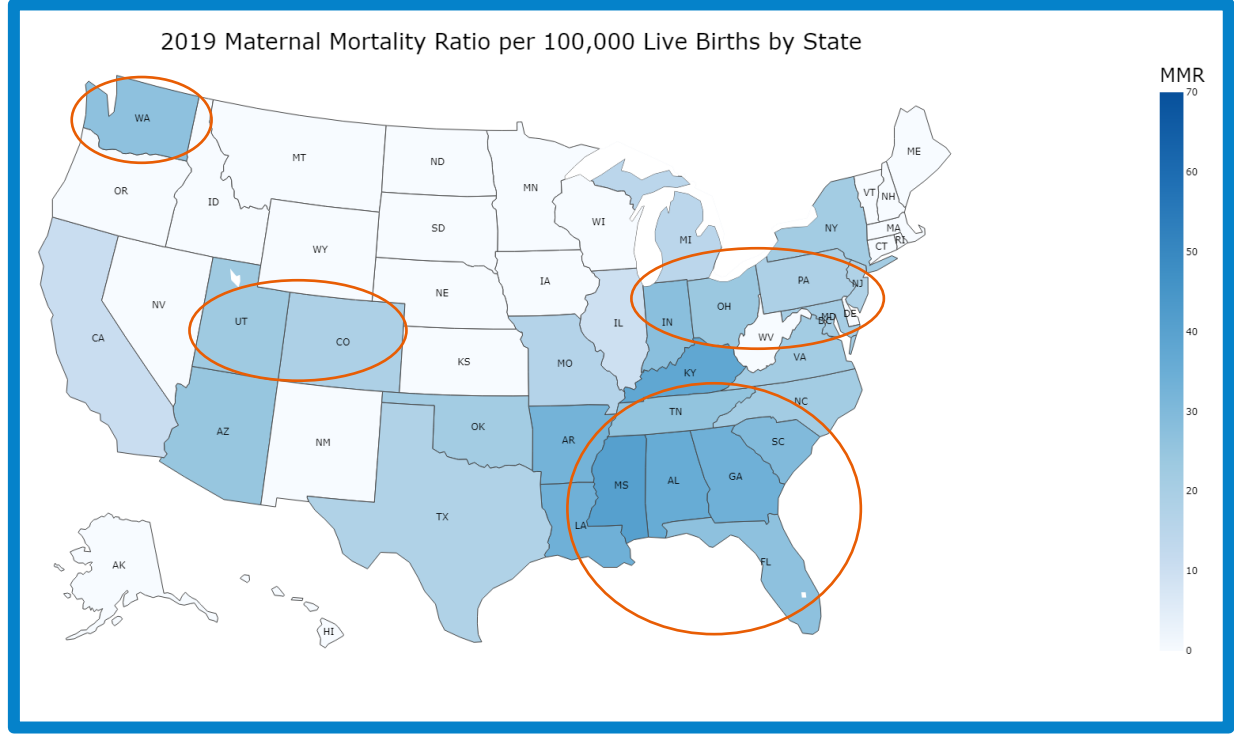
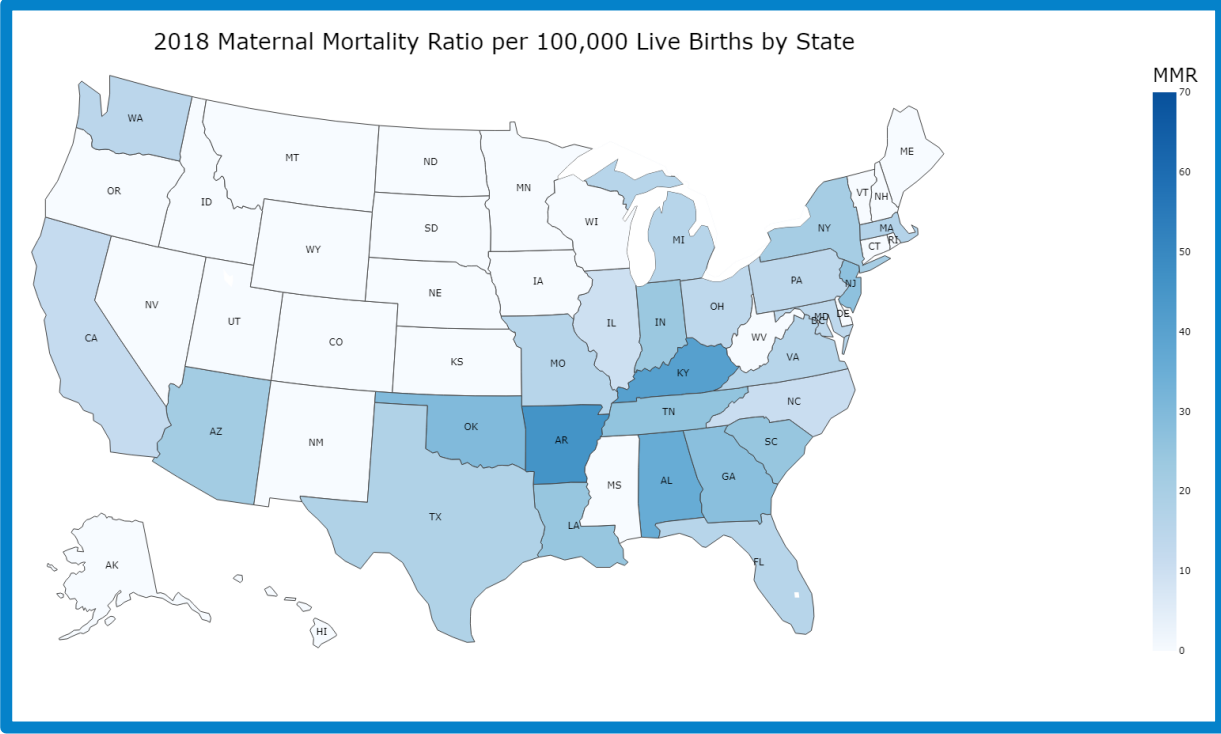


2019





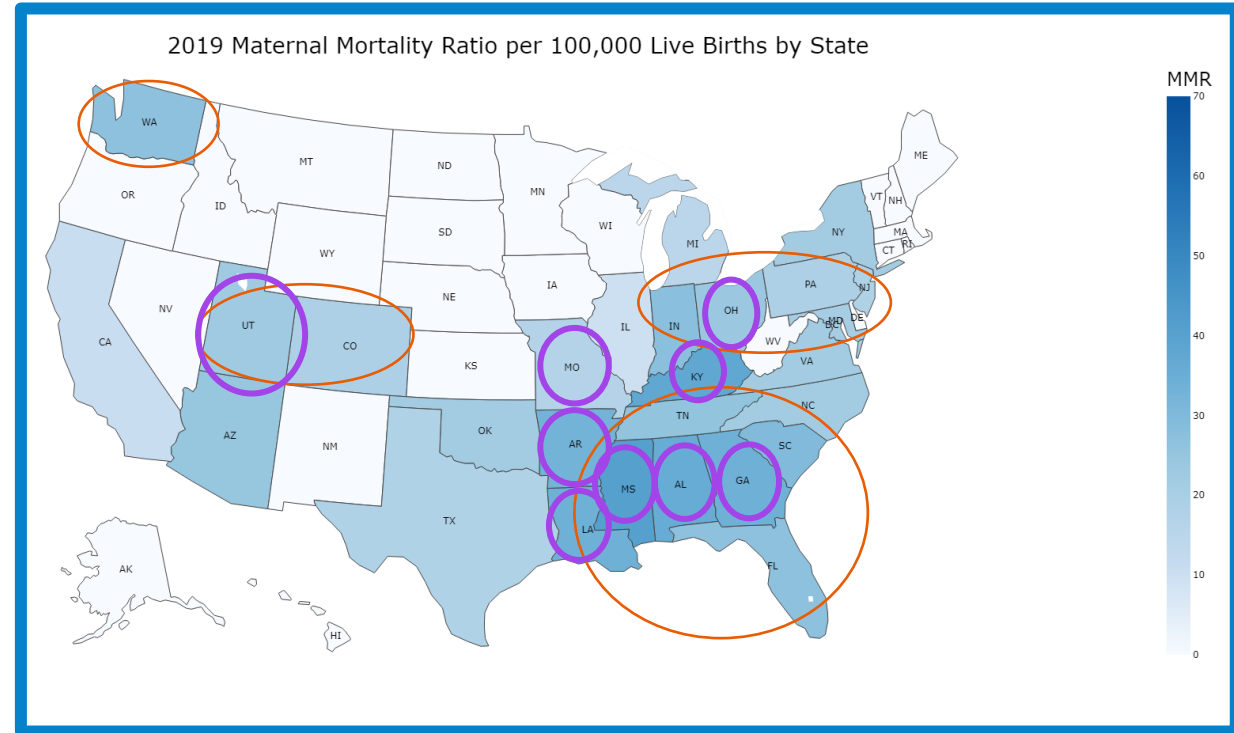
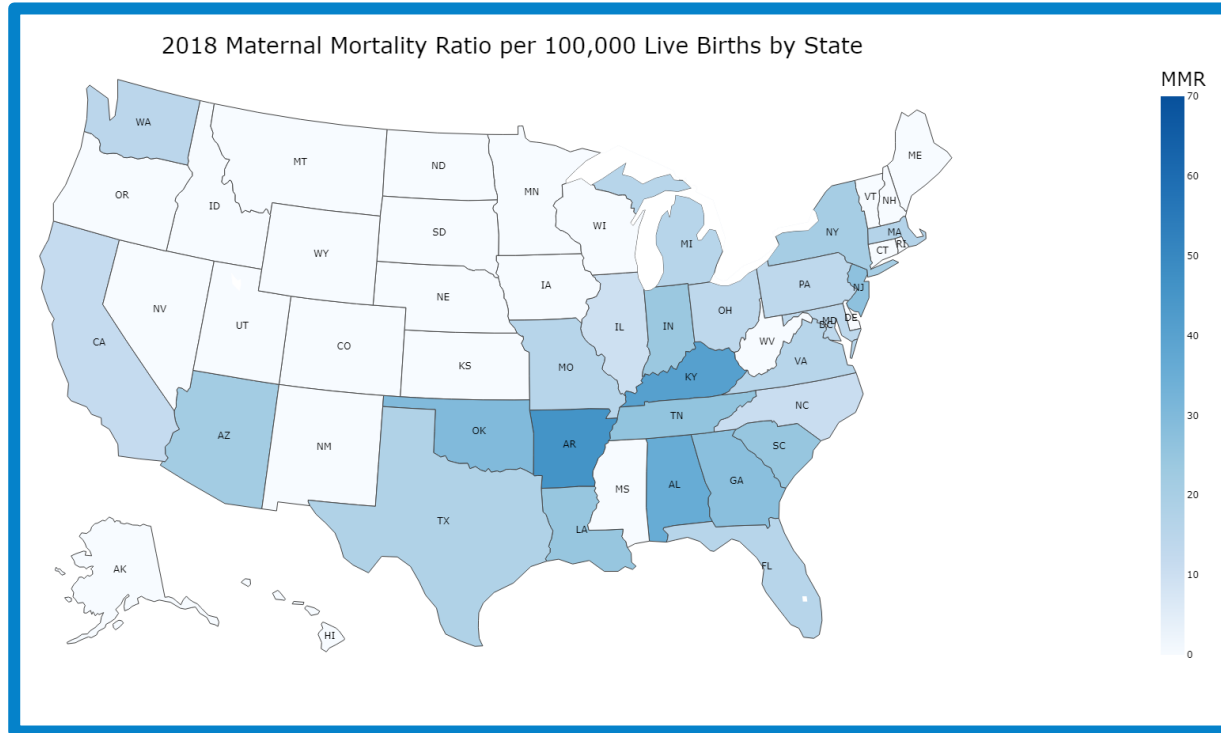
2019



2018



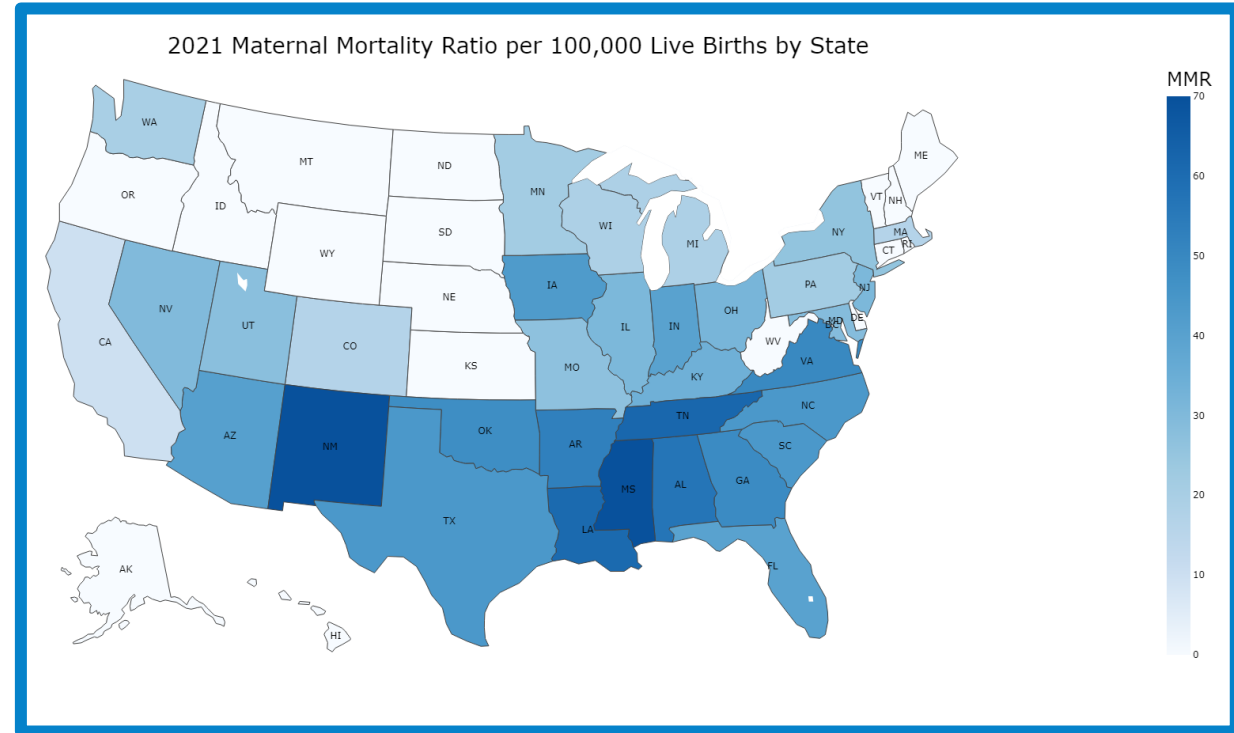
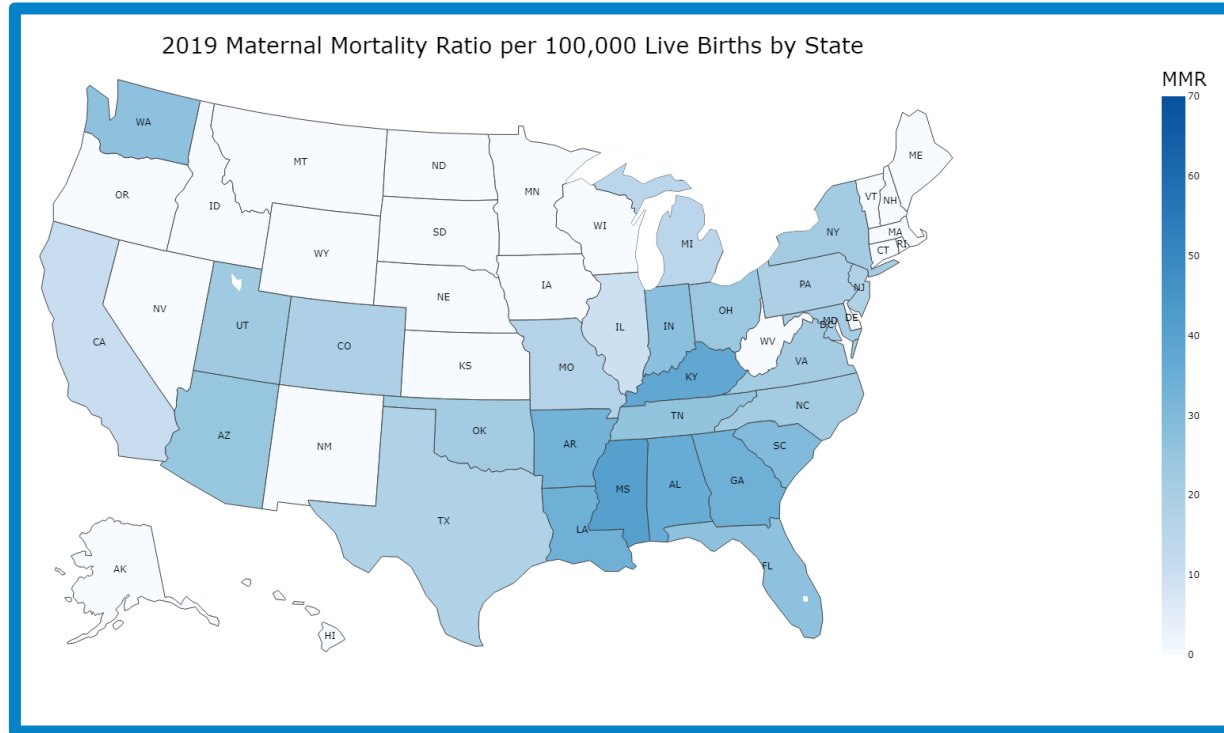
2019



2019

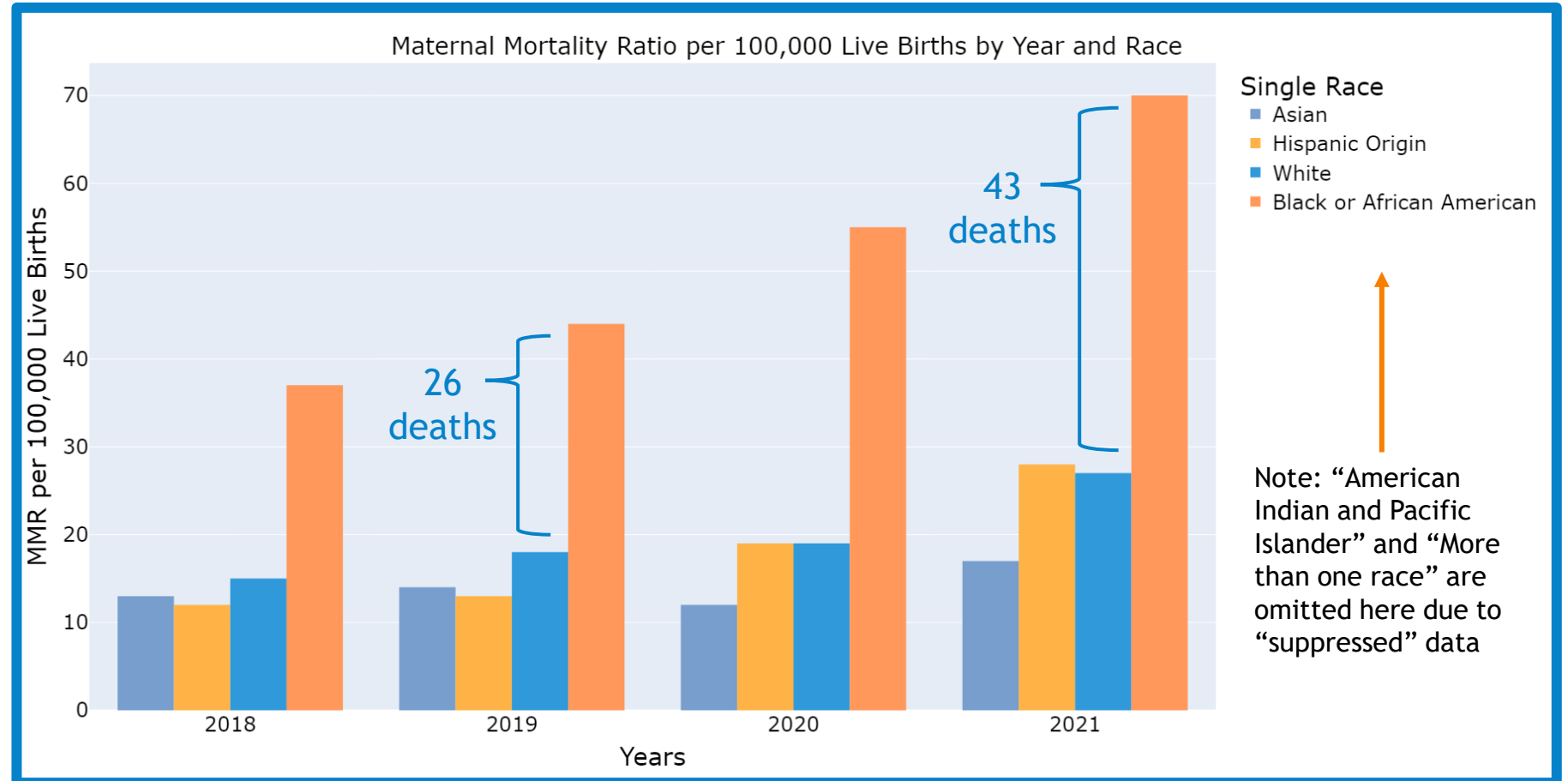


2021



IMPACT OF RACE

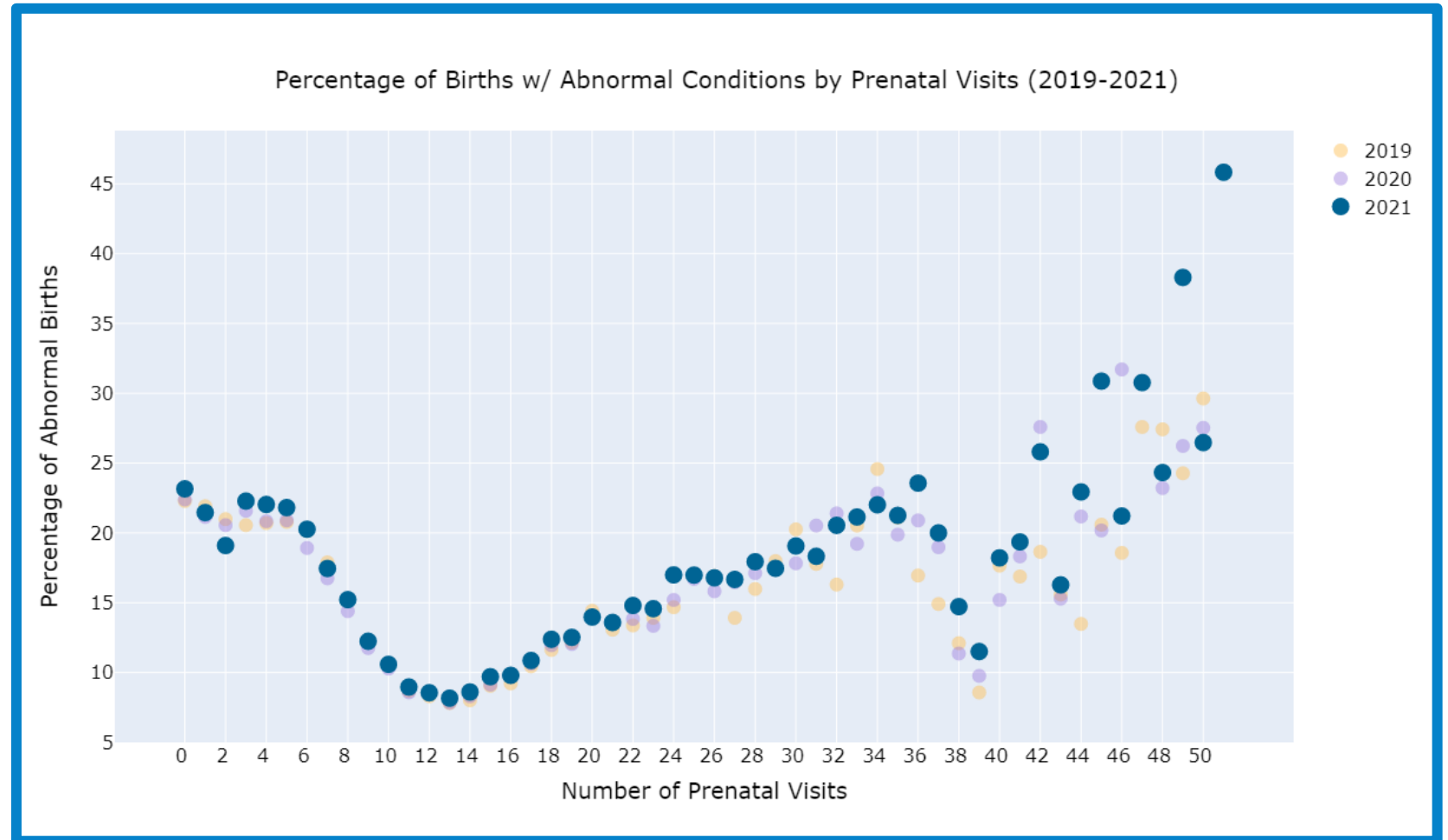
- Racial disparity in MMR exists year after year
- This concern is worsened by the COVID-19 pandemic



Healthcare Characteristics

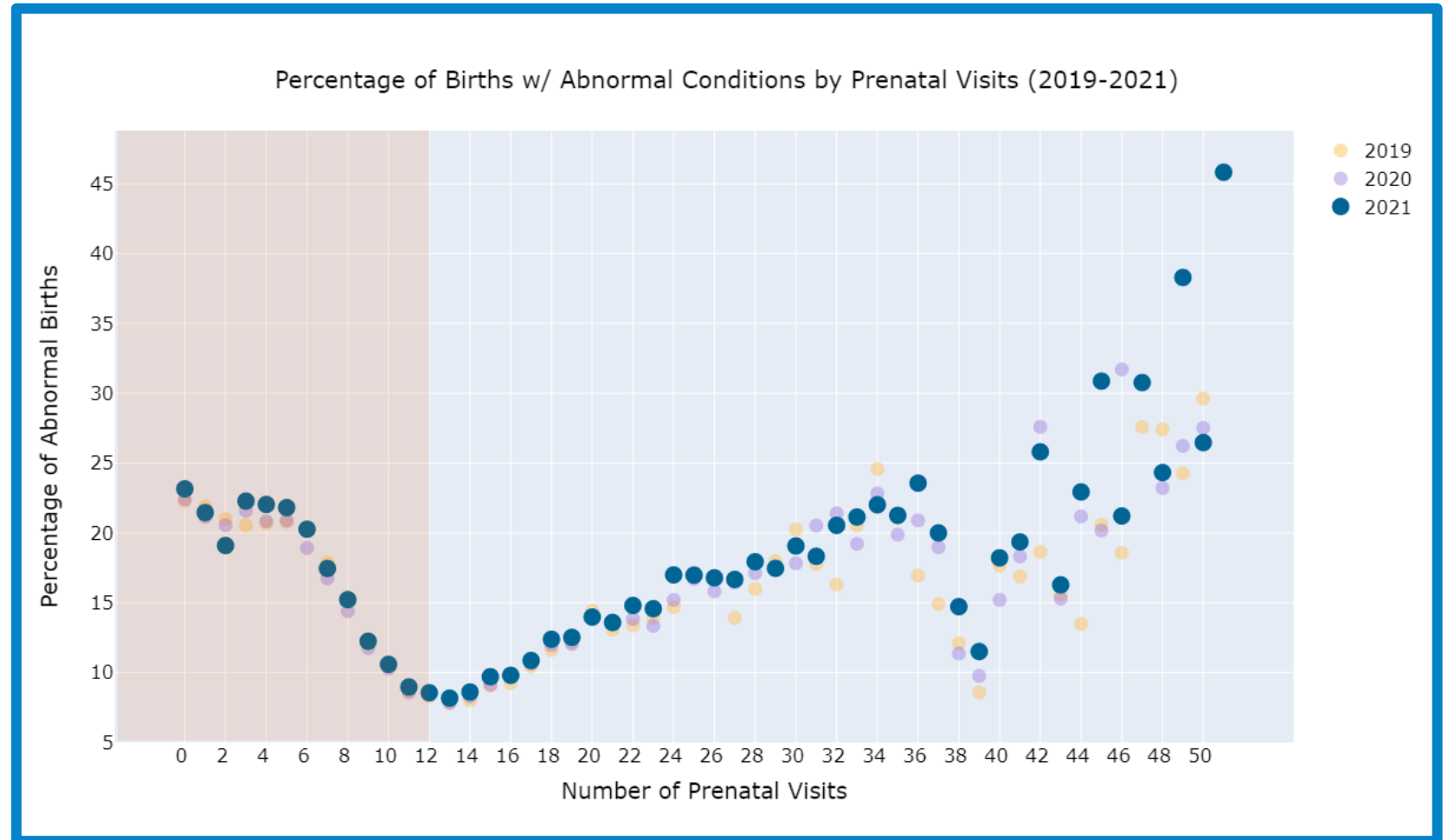
IMPACT OF PRENATAL CARE

- This trend shows up **year-after-year**
- Around 0-12 visits, the trend is intuitive
- But what is going on after 12 visits?



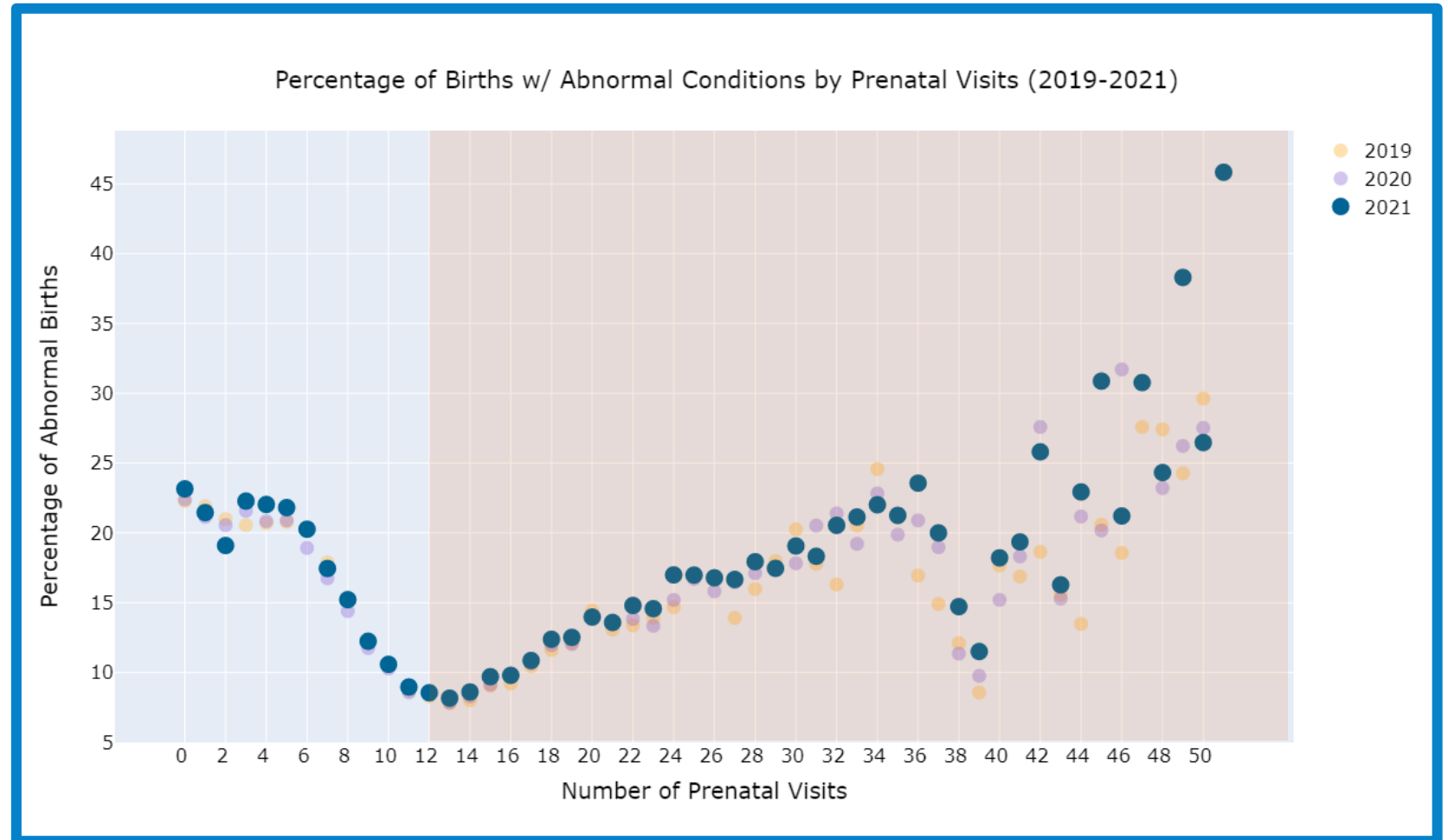
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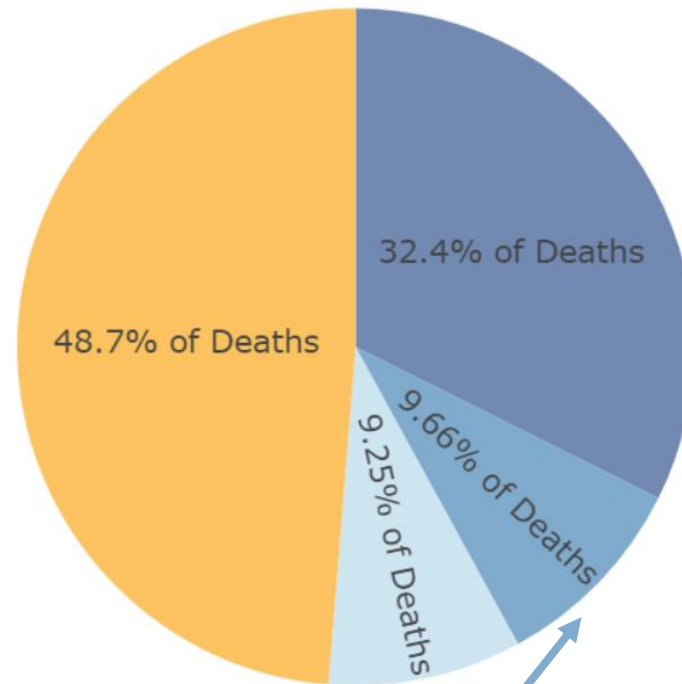
IMPACT OF PRENATAL CARE

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- But what is going on **after 12 visits?**



IMPACT OF POSTNATAL CARE

Percentage of Deaths by Pregnancy Timeline (2021)



- About **41%** of pregnancy-related deaths occur **after childbirth**



CONCLUSION

- Pregnancy-related complications can be a difficult topic that requires us to consider **multiple dimensions**. We've only scratched the surface in this presentation!

Physical Maternal
Characteristics



Social Maternal
Characteristics



Healthcare
Characteristics

Thank you for listening!

APPENDIX A: RESOURCES

About Physical Health Maternal Characteristics:

<https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pretermbirth.htm>

<https://pubmed.ncbi.nlm.nih.gov/35469531/>

<https://www.uptodate.com/contents/fetal-macrosomia>

<https://my.clevelandclinic.org/health/diseases/22311-shoulder-dystocia>

About Social Maternal Characteristics:

<https://www.nytimes.com/interactive/2019/us/abortion-laws-states.html>

<https://www.gao.gov/assets/gao-23-105871.pdf>

APPENDIX A: RESOURCES

About Maternal Mortality Reporting:

<https://www.cdc.gov/nchs/maternal-mortality/evaluation.htm>

<https://www.who.int/data/gho/indicator-metadata-registry/imr-details/4622>

https://apps.who.int/iris/bitstream/handle/10665/70929/9789241548458_eng.pdf;jsess

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7592741/>

APPENDIX B: DEFINITIONS

- **Maternal Mortality** is defined as deaths due to pregnancy-related complications during pregnancy or up to a year after childbirth. Subclassify (between 42 days - 1year after childbirth as *late maternal death*).
 - CDC uses A34, 000-095, 098-099
- **Ratio** is defined as number of events per 100,000 live births
 - <https://www.who.int/data/gho/indicator-metadata-registry/imr-details/26>
 - We're basically using WHO's standard definition for "Maternal Mortality Ratio"
 - The CDC uses the word "rate", but apparently this is just for ease of language

APPENDIX B: DEFINITIONS

- We used Single **Race** 6 Category and whether mother was of Hispanic origin or not to classify race.
 - Non-Hispanic American Indian or Alaska Native
 - Non-Hispanic Asian
 - Non-Hispanic Black or African American
 - Non-Hispanic Native Hawaiian or Other Pacific Islander
 - Non-Hispanic White
 - Non-Hispanic More than one race
 - Hispanic

APPENDIX B: DEFINITIONS

- **Maternal Morbidity** includes any one or more of the following conditions:
 - Maternal Transfusion - Yes; No; Unknown or Not Stated.
 - Third or Fourth Degree Perineal Laceration - Yes; No; Unknown or Not Stated.
 - Ruptured Uterus - Yes; No; Unknown or Not Stated.
 - Unplanned Hysterectomy - Yes; No; Unknown or Not Stated.
 - Admission to Intensive Care Unit - Yes; No; Unknown or Not Stated.