**ECE 143 Final Presentation Outline**

1. Title Slide
   1. [**Mandy** Elapsed=0:00, Duration=0:10]
   2. Hi, we’re team 3. Our topic is pregnancy-related complications in the US
   3. I want to open by acknowledging that we’ll talk about some sensitive things due to our topic, and we tried to approach this as respectfully as possible. But we look forward to any feedback you may have.
2. Motivation
   1. [**Mandy** Elapsed=0:10, Duration=0:20]
   2. VISUALS ON SLIDE: US vs Countries MMR Plot
   3. We were motivated to choose this topic because the US had a consistently high Maternal Mortality Ratio
   4. You can see, on a chart comparing MMRs for industrialized countries, even compared to the next highest country we have a ratio 2-3x higher
   5. This led us to ask what factors contribute to pregnancy complications?
3. Data Overview
   1. [**Mandy** Elapsed=0:30, Duration=0:30]
   2. VISUALS ON SLIDE: screenshots of data table
   3. For this, we used the CDC’s 2016-2021 births & 2018-2021 mortality data sets
   4. The mortality dataset was more limited, so we relied mostly on the births dataset for details about maternal characteristics, in which we used maternal morbidity and abnormal birth conditions as measures for pregnancy-related complications
4. Methodology
   1. [**Mandy** Elapsed=1:00, Duration=0:30]
   2. VISUALS ON SLIDE: screenshots of API?
   3. The births dataset was large, and everything was encoded with the CDC’s own values, so our first step was to write code to access the CDC Wonder API to query data in manageable chunks
   4. With each subset of data, we removed rows where responses were missing or (according to the CDC) had suppressed or unreliable data
5. Overview
   1. [**Mandy** Elapsed=1:30, Duration=0:30]
   2. VISUALS ON SLIDE: icons for each category
   3. We organized our analysis into three broad categories that contribute to a mother’s risk of pregnancy-related complications:
      * 1. Physical Characteristics
        2. Social Characteristics
        3. Healthcare Characteristics
           1. Which we defined as things surrounding the pregnancy, such as prenatal appointments
   4. And now Pulkit will speak about physical characteristics
6. PC: Title Slide
   1. [**Pulkit** Elapsed=2:00, Duration=1:30]
7. PC: Definitions Slide
   1. There are various Physical Maternal Characteristics out of which
   2. we select Height, Weight, and use of tobacco like cigarettes for the analysis.
   3. Instead of using height and weight individually, we use the patient’s pre-pregnancy BMI for the analysis
8. PC: Cigarettes Slide
   1. In this graph for the number of cigarettes a patient smokes during pregnency
   2. The thing that we want to emphasize is that, for any smoker, the proportion of patients facing issues is higher when compared with any non-smoker.
   3. And, as the patient smokes more cigarettes per day, the % of patients facing complications increases.
9. PC: BMI Linear Slide
   1. In this graph, we see an increasing trend with respect to the BMI of the patient.
   2. Patients having higher BMI are more likely to have prior health issues like diabetes

which could lead to fetal macro-somia that is giving birth to a large baby.

* 1. This leads to multiple complications like the baby's shoulders could get stuck during delivery or it could also lead to the rupture of the membrane leading to infections.
  2. And hence, the number of patients requiring Cesarean mode of delivery and induction of labor increases.
  3. To avoid infections, the use of antibiotics during delivery also increases with the BMI.

1. PC: BMI U-shape Slide
   1. In the next graph, we see u shaped trend. abnormal conditions detected in a newborn baby and issues like preterm birth are dependent on the normal BMI of the patient.
   2. and hence for all the abnormal BMIs, we see that the number of cases reported with complications are higher.
   3. we know that BMI plays an important role in pregnancy and, over the years, the total number of patients having normal BMI is decreasing in US.
   4. Thus we can see an increase in the number of patients facing complications
   5. Now Mandy will talk about Social Characteristics
2. SC: Title Slide
   1. [**Mandy** Elapsed=3:30, Duration=1:30]
3. SC: US Map of MMR by State 2018
4. VISUALS ON SLIDE: US Map MMR by State
5. We anticipated that regional differences would play a role in social characteristics, so we began this section by exploring MMR by state
6. Maternal Mortality ratio is the number of deaths per 100,000 live births of that population
7. On this map here, the darker blue states are ones experiencing a higher ratio of maternal mortality
8. SC: US Map of MMR by State 2018 and 2019
   1. As we checked the annual distribution of MMR, we noticed some unexpected increases

between 2018 and 2019

1. SC: US Map of MMR by State 2018 and 2019
   1. I’ve loosely circled these in orange
   2. We tried to investigate for some context on what might’ve happened in 2019
   3. One of the things that seemed relevant to the topic of pregnancies was the wave of abortion bans enacted in early 2019.
2. SC: US Map of MMR by State 2018 and 2019 with circles!
   1. The states that passed a 2019 bill to increase limitations on the abortion procedure are circled in purple
   2. Some further exploring is necessary to conclude if these events are related and the distribution of MMR in the states will certainly has a myriad of complex reasons, but we thought the overlap was interesting in this particular case.
3. SC: US Map of MMR by State 2019 and 2021
   1. Now by 2021, we can see another significant increase. We were able to corroborate with literature that the COVID-19 pandemic dramatically exacerbated pregnancy-related deaths
   2. This actually links us to the other major contributor that we found in social characteristics
4. SC: Racial Disparity MMR
   1. VISUALS ON SLIDE: Yearly MMR by race bar graph
   2. You can see on this plot showing MMR by year and race, the MMR experienced by Black mothers is far higher than any other race category
   3. And if we compare 2019 and 2021, the increase is much more dramatic for Black mothers. This is consistent with literature detailing how the COVID-19 pandemic disproportionately affected some minoritized communities
   4. Now let’s move on to healthcare
5. HC: Title Slide
   1. [**Mandy** Elapsed=5:00, Duration=1:30]
6. HC: How do prenatal appointments affect abnormal conditions?
   1. We found that one of the most prominent trends was the effect of prenatal appointments
   2. This plot is of percentage of births with abnormal conditions by number of prenatal visits
7. HC: How do prenatal appointments affect abnormal conditions?
   1. Between 0 and 12 visits, we see a sort of intuitive decrease in abnormal conditions as the pregnancy is receiving more care
8. HC: How do prenatal appointments affect abnormal conditions?
   1. But after 12 visits, we start seeing an increase, this seemed strange to us
   2. But we considered that perhaps if a pregnancy is requiring 20, 30, 40 prenatal visits, it is because a high-risk is already anticipated, such as a genetic disorder
9. HC: Timing of pregnancy deaths
   1. After seeing the effect of prenatal visits, we wanted to analyze postnatal visits as well, but could not find a lot of data
   2. So we decided to pivot and check what complications occur after childbirth
   3. We were surprised to find a significant number of deaths occur after childbirth, as late as a year
   4. Additionally, the standard definition of MMR excludes late maternal deaths, this led us to consider that perhaps postnatal care is important, but there is currently a lack of attention there
10. Conclusion
    1. [**Pulkit?** Elapsed=6:30, Duration=0:30]
    2. To conclude, although we originally felt physical health would be most important regarding pregnancy complications, we’ve learned that there are many outside factors, such as social characteristics and health care that we can improve to increase positive and safe pregnancies
    3. We’ve included an appendix to this slide deck if you’re interested in checking extra details or anything we’ve referenced here
11. Thank you!