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How the COVID-19 Pandemic Highlights the Effects of Genetic Conflict During Pregnancy

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Abstract

Pregnancy is often viewed as a cooperative endeavor between mother and fetus. However, biologists have documented that under the surface, pregnancy is better characterized as a time where genetic conflict between maternal and paternal genes over fetal development can run rampant. While genetic conflict is a *typical* aspect of pregnancy, uncontrolled genetic conflict has the potential to result in pregnancy complications for both the mother (e.g., miscarriage, stillbirth, preterm birth) and the fetus (e.g., intrauterine growth restrictions, low birth weight). But, unexpectedly, the COVID-19 pandemic has presented researcher with a case study to investigate genetic conflict during pregnancy. Specifically, medical doctors noted changes in the frequency of pregnancy complications (e.g., premature births, miscarriages, stillbirths) theorized to be influence by genetic conflict. As the biology of these complications did not change during the pandemic, we wanted to investigate potential behavioral changes that influenced the expression of genetic conflict in pregnancy complications using archival data. Understanding these relationships can elucidate how cultural and behavioral changes influence biological processes such as the occurrence of pregnancy complications.

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Background

Pregnancy is typically viewed as a cooperative venture between the mother and the fetus

However, conflict is endemic in this relationship as fitness interests are not perfectly aligned (Haig, 1993)

Some of this conflict has been thought to be mitigated by social effects (Ayers, 2022)

The COVID-19 pandemic provides a case study of how social effects influence genetic conflict

- Pregnancy complications as indexes of uncontrolled genetic conflict (Haig, 1993)
- Decreased very and extremely low birth weights in Ireland (Panahi et al., 2020)
- Decreased premature birth (Arena et al., 2023; Hederman et al., 2021)
- Increased stillbirth in the UK (Khalil et al., 2020) and in miscarriages in Turkey (Sacinti et al., 2020)
- Increased of postpartum depression and anxiety (Davenport et al., 2020; Durankuş et al., 2022)

Method

Data for this project were obtained from the publicly accessible Center for Disease Control's National Center for Health Statistics' website https://wonder.cdc.gov/natality.html

Use the Birth Data Files and Natality Information demographics

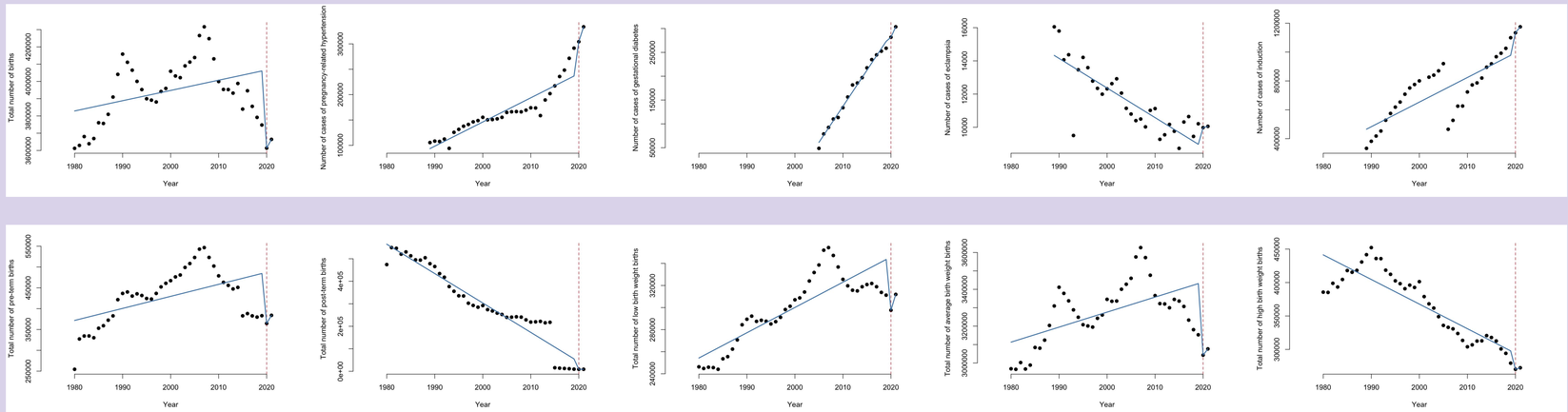
Accessed data on births from 1980 to 2021

Recorded total number of births per year, number of pregnancy complications influenced by genetic conflict (hypertension, gestational diabetes, eclampsia), and birth outcomes influenced by genetic conflict (induction, preterm birth, low birth weight, high birth weight)

More information on the data and method can be found at https://osf.io/2qjnf/

Results

We conducted interrupted time series analyses to determine if the social changes accompanying the COVID-19 pandemic influenced the frequency of pregnancy complications



	Total Number of Births	Hypertension	Gestational Diabetes	Eclampsia	Induction	Preterm Birth	Post-term Birth	Low Birth Weight	Average Birth Weight	High Birth Weight
Trend before COVID	5,940.71**	4,766.71**	15.140.92***	-178.37***	17,051.18***	2,890.87***	-13,069.56***	2,290.26***	8,152.70***	-3679.80***
Change immediately after COVID	-497493.30	38,329.66	-13,124.48	930.26	114,992.60	-139,453.50	-46,439.99	-60,318.30	-422,055.70	-29,818.28
Trend after COVID	44,704.29	24,573.29	6,679.08	253.37	24,,231.82	16,601.13	13,185.56	12,037.74	25,545.30	5,944.80

** $p < 0.05$, *** $p < 0.01$

Total number of births, hypertension, gestational diabetes, induction, preterm births, low birth weight, and average birth weight all followed positive trends before the pandemic

Eclampsia, post-term births, and high birth weights all followed negative trends after the pandemic

Compared to these trends, total number of births,gestational diabetes, preterm births, post-term births, low birth weights, average birth weights, and high birth weights were all lower immediately following the onset of the pandemic

Hypertension, eclampsia, and inductions were all higher immediately following the onset of the pandemic

Discussion and Conclusion

Our results should be interpreted with caution as we do not have enough data after the COVID-19 pandemic to make conclusive statements about the impact of these social changes on pregnancy outcomes

Our results highlight the importance of understanding genetic conflict during pregnancy and the effect of social changes to reduce the severity of pregnancy complications and improve birth outcomes

Future research should broaden this analysis by assessing differences in pregnancy complications rates by state to assess the social effects of lockdowns and restrictions

Future research should also investigate the effects of easing pandemic restrictions and long term social changes, such as increased remote work, on pregnancy complications