Delivering in the Time of COVID-19: A Population-Based Study of Childbirths in the U.S.

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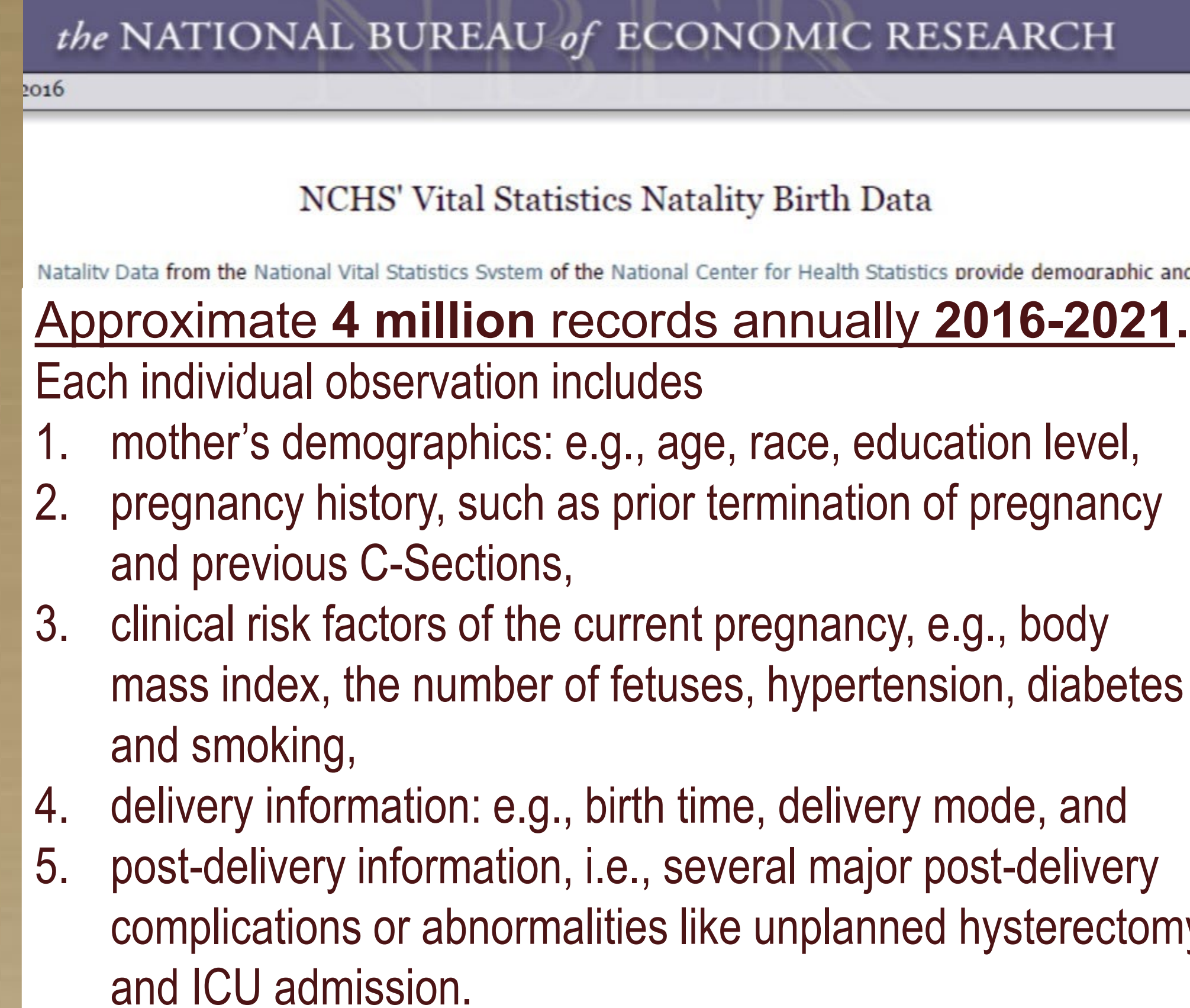Department of CIS & Analytics, McCoy College of Business, Texas State University

Background

Since December 2019, COVID-19 (new coronavirus pneumonia) has spread widely, posing a great threat to public health worldwide. On March 11, 2020, the World Health Organization announced that SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus Type 2) was spreading globally, known as the COVID-19 outbreak [1]. The epidemic has caused unprecedented damage to health care system in many countries and regions. The morbidity and mortality associated with SARS-CoV-2 infection has placed enormous strain on healthcare systems and has caused significant disruption to the delivery of non-COVID-19 healthcare services [2]. The suddenness and severity of the outbreak have adversely affected a variety of health care facilities and services, forcing all healthcare professionals and patients to reconsider how and how often healthcare is provided [3].

These disruptions to health services have led to serious collateral damage, disproportionately affecting vulnerable populations, especially pregnant women and newborns, despite of various emerging clinical guidelines for obstetric care [4, 5]. Across the world, multiple studies have shown that neonatal mortality and stillbirth rates have risen sharply, and birth rates have declined during the COVID-19 pandemic, regardless of maternal COVID-19 infection [6]. Based on data analysis of multiple regions before and after the epidemic [7, 8], studies suggest that quality of childbirth care services are influenced by human factors of healthcare professionals--- staff burnout, culture, teamwork [9], persisting high pressure at work [10-12]---as well as birth companions from family and other social connections [13].

Objectives

We aim to investigate the impacts of the COVID-19 pandemic on childbirth outcomes, maternal and newborn healthcare in the U.S. By identifying changes in childbirths and associated health services before and after the onset of COVID-19, we provide valuable managerial insights for healthcare administration and professionals to provide high-quality health care for mothers and infants. The problems exposed by this global epidemic and corresponding improvements will contribute to precautious planning in possible national or global health crises in the future.

Data

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NCHS' Vital Statistics Natality Birth Data

Natality Data from the National Vital Statistics System of the National Center for Health Statistics provide demographic and

Approximate **4 million** records annually **2016-2021**. Each individual observation includes
1. mother's demographics: e.g., age, race, education level,
2. pregnancy history, such as prior termination of pregnancy and previous C-Sections,
3. clinical risk factors of the current pregnancy, e.g., body mass index, the number of fetuses, hypertension, diabetes and smoking,
4. delivery information: e.g., birth time, delivery mode, and
5. post-delivery information, i.e., several major post-delivery complications or abnormalities like unplanned hysterectomy and ICU admission.

Major Findings

Overall conception and delivery rates in the U.S. dropped due to the onset of COVID-19, yet they bounced back quickly during the lockdowns.
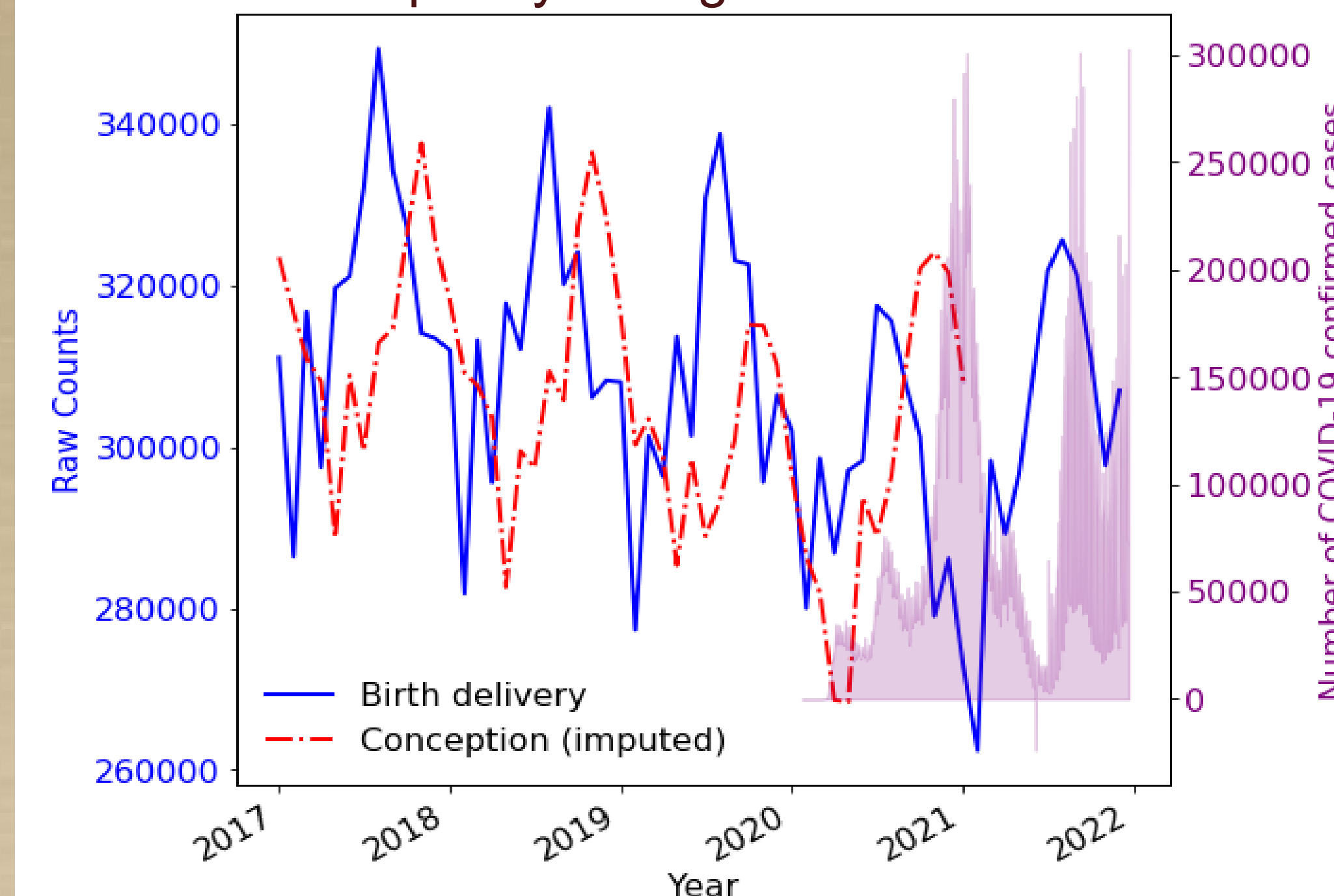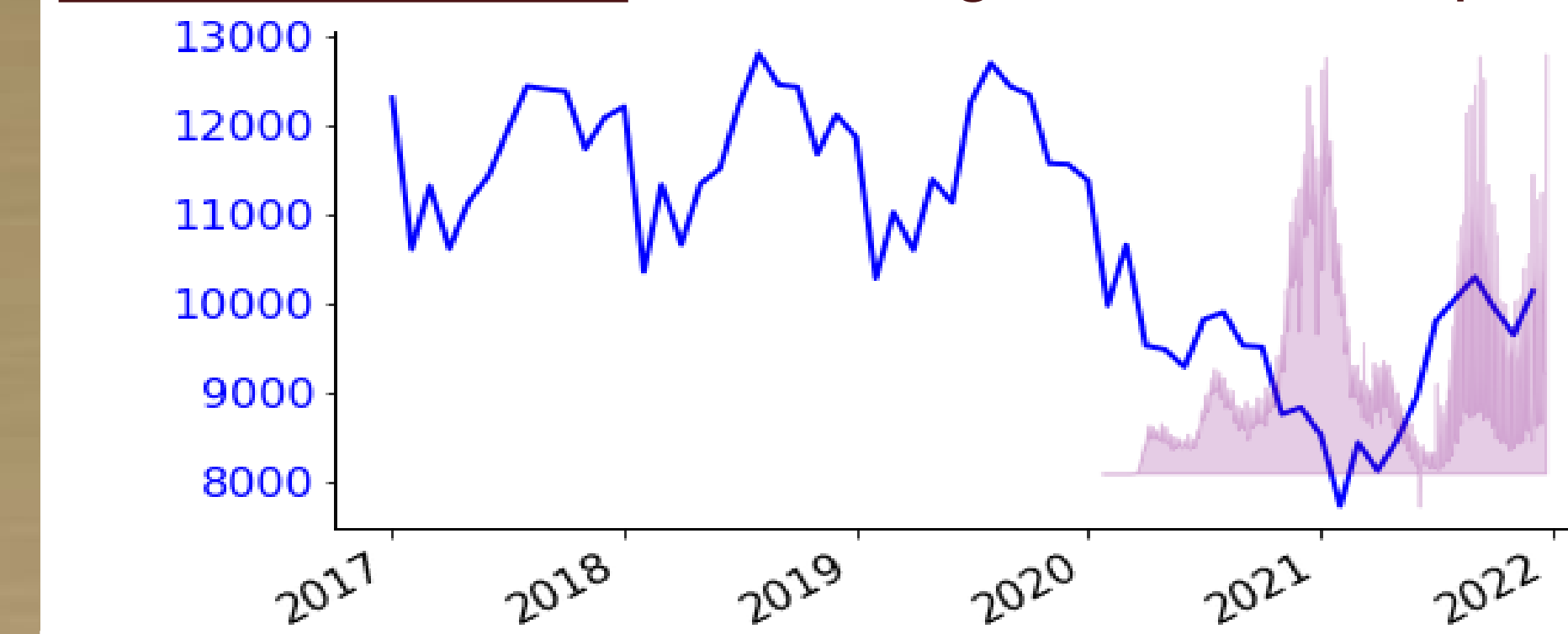

Childbirths by foreign travelers halved due to travel restrictions to the U.S. during the pandemic.
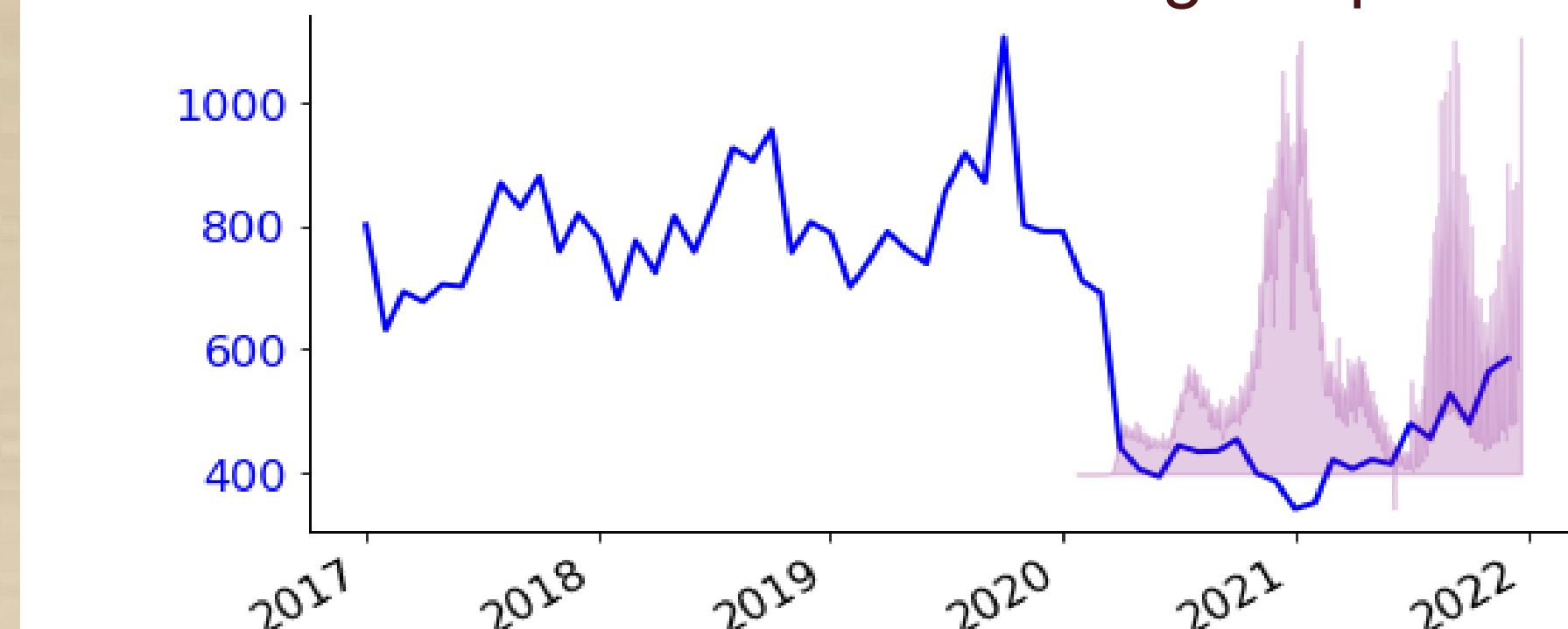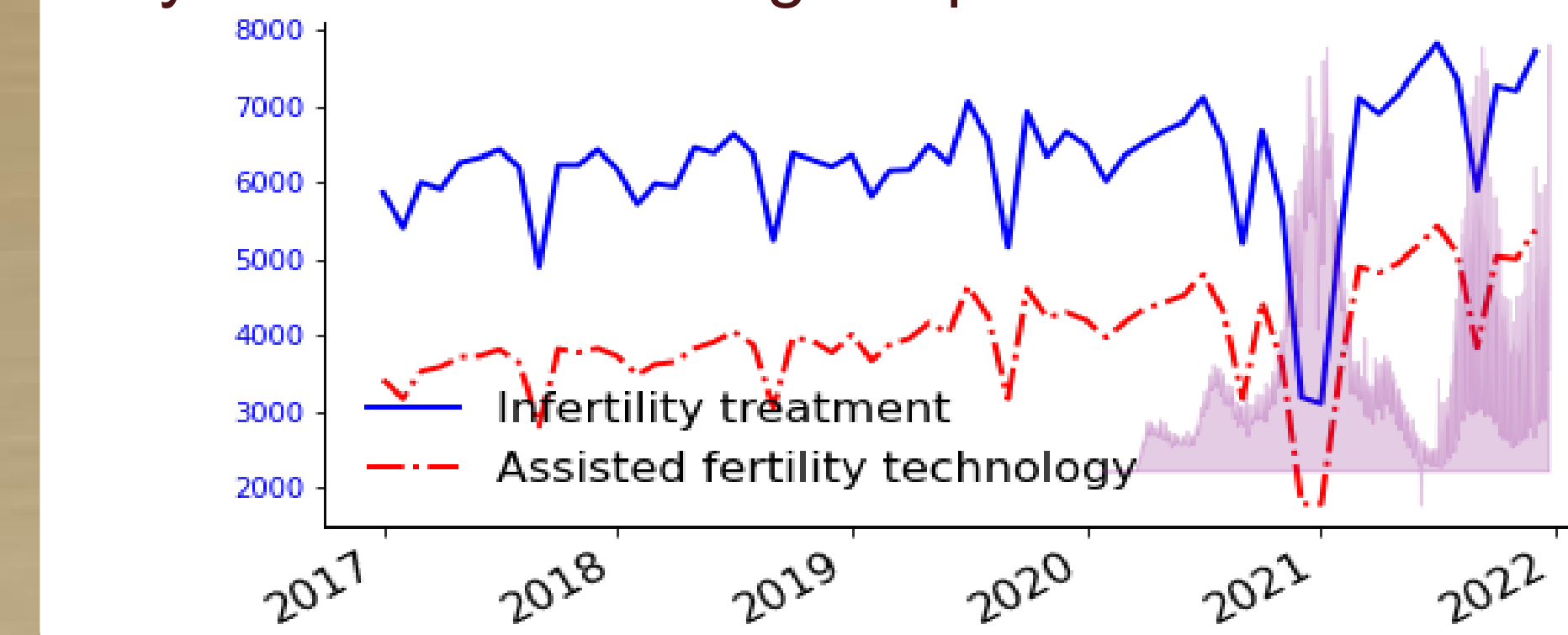

Major Findings C'td

The number of live births for women without health insurance falls during the lockdown period.


Use of infertility treatment & assistant fertility technology was hit badly by the COVID onset, yet they recover fast during the pandemic.

More highly educated women chose to have babies during the pandemic, and overall educational levels of pregnant women keep increasing.
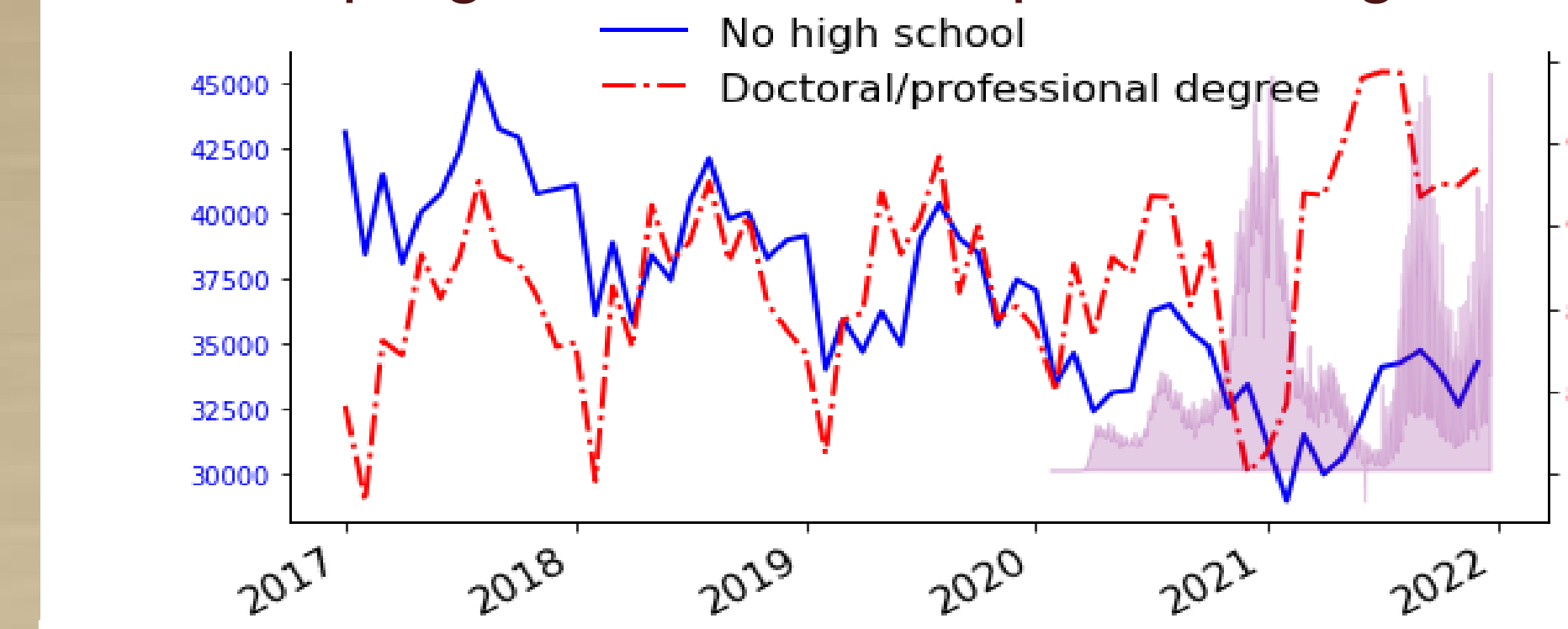
Fewer pregnant woman keep proper weight gain during the pandemic, which can have negative effects on childbirth outcomes, such as **higher proportion of low birth-weight newborns**.
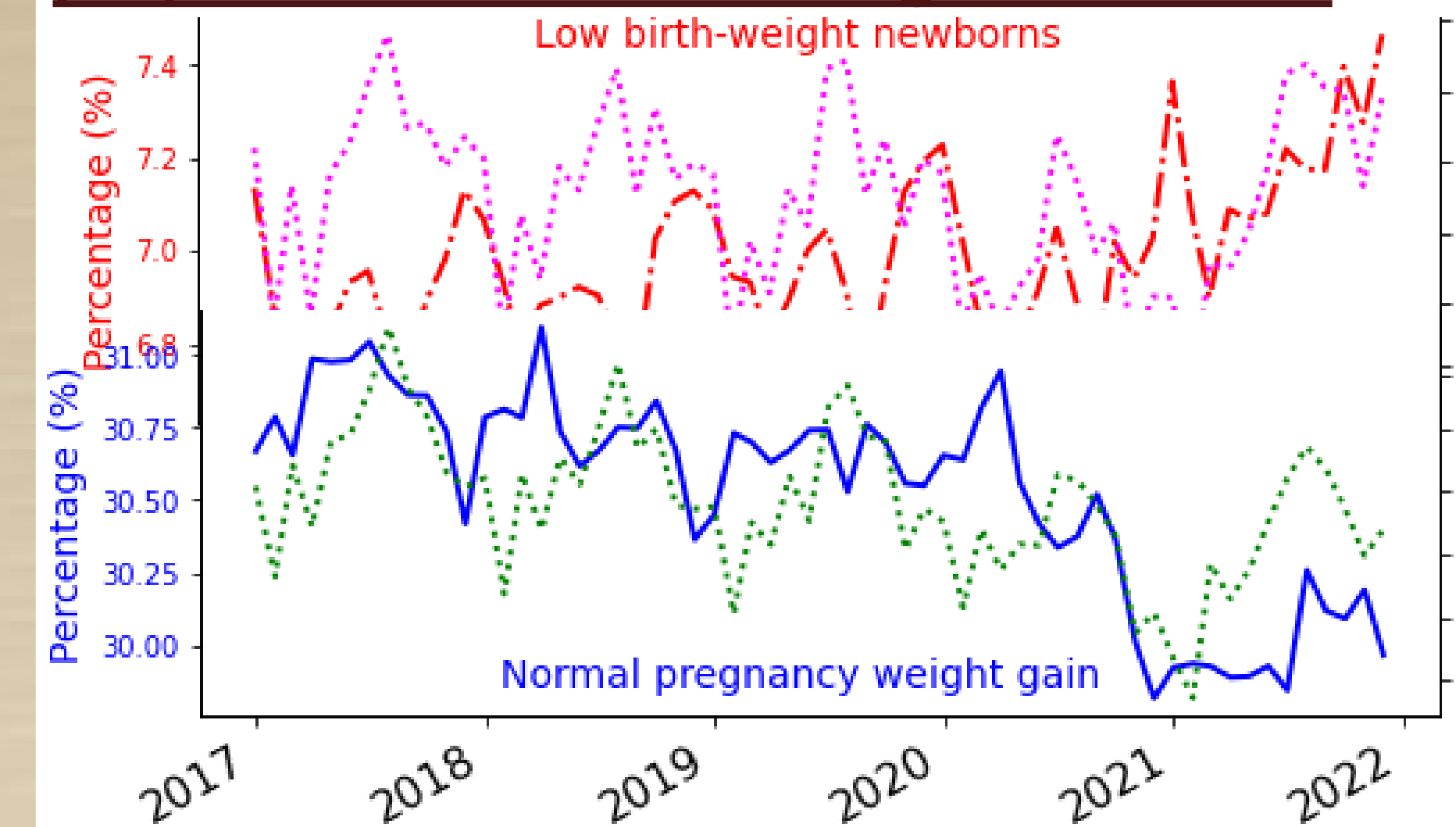
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Dr. Zhu's research focuses on improving effectiveness and efficiency in healthcare and service systems. She contributes to strategic, operational and technical policy-making by applying interdisciplinary approaches, including mathematics, analytics, statistics, operations management and economics. Closely collaborating with physicians, health administration, and researchers, she is working on several projects related to maternity care, oncology, Emergency Departments, electric vehicles and shared transport. Dr. Zhu received her Ph.D. in Operations Management from McGill University, Canada in 2018; she has a M.Sc. in Mathematical and Computational Finance from University of Oxford, UK, and a B.Sc. in Mathematics from Nanjing University, China.

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