Introduction

Several studies have documented the impact of the COVID-19 pandemic on fertility outcomes in a variety of countries (Aassve et al 2021; Bailey, Currie, and Schwandt 2022; Kearney and Levine 2023; Fallesen and Cozzani 2023). Much of the evidence suggests those considering pregnancy at the outset of the pandemic delayed conception until the later half of 2020, when there was a return to some sense of normalcy (Kearney and Levine 2023). Most of these studies consider aggregate national-level fertility responses, but geographic heterogeneity within states likely exists. This is particularly true between rural and urban areas, where differential access to prenatal care can be substantial. Attitudes towards the pandemic also differed between rural and urban areas, which could have also influenced fertility behaviors. We use restricted birth register data to investigate whether fertility responses to the COVID-19 pandemic differed between rural and urban areas in the U.S. Additionally, we assess whether pandemic policies—like stay-at-home orders that varied across U.S. states—impacted rural and urban fertility differently. Preliminary results suggest that both rural and urban areas saw significant decreases in birth rates in late 2020, which then rebounded in early 2021. Rural areas had less dramatic changes in fertility behaviors compared to pre-pandemic trends, but the birth rebound in 2021 was less pronounced. Conversely, we find stay-at-home orders impacted rural areas less, somewhat dampening what could have been more dramatic rural fertility declines during the pandemic in states that implemented such orders. These results have important implications for rural U.S. communities, which already face demographic challenges from persistent outmigration and smaller childbearing cohorts.

Theoretical Framework

There are several channels through which the COVID-19 pandemic could have plausibly influenced fertility. First, fertility has typically been procyclical, increasing with better economic circumstances. The pandemic lead to one of the sharpest employment declines in U.S. history, leaving many wondering whether their jobs would exist on the other side of the related lockdowns. In normal circumstances such uncertainty would induce many of those considering getting pregnant to postpone their attempts at conception. The novel aspect of the COVID-19 virus also introduced uncertainty with regard to how it would impact maternal health and fetal development, which would have also likely delayed plans to conceive. Stay-at-home orders would have likely also dampened fertility by reducing in person interactions. This would have especially affected non-marital fertility where mother and father do not live in the same house.

However, there are several potential mechanisms through which the pandemic could have acted to increase fertility. During lockdowns, many employers adopted work-from-home policies that would have provided some existing parents with greater flexibility. These policies would have had a heterogeneous impact, benefitting better educated parents whose jobs could be moved home. The pandemic could have also increased fertility temporarily more robust safety nets. The CARES Act provided temporary provided income support to most Americans, and disproportionately so to those with children. These payments had a substantial impact on child poverty in the U.S. and could have provided existing parents sufficient financial stability to have another child.

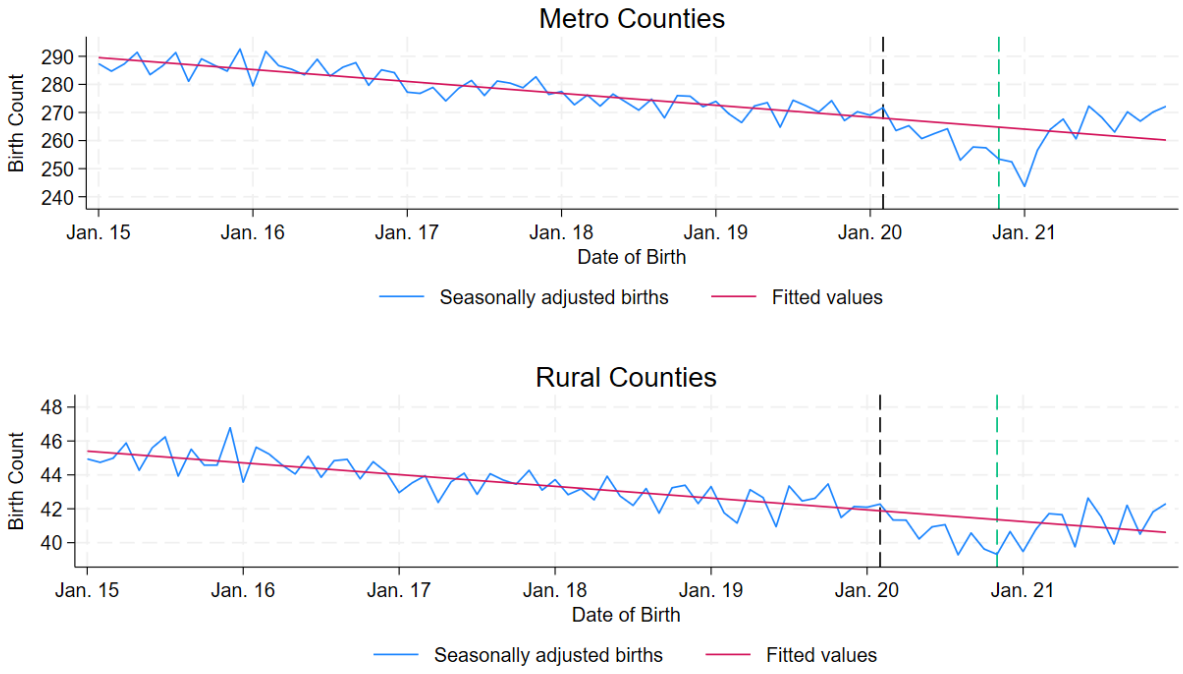
Fertility responses in rural areas may have differed from urban responses for several reasons. Rural and urban attitudes toward COVID differed greatly. In general, those in rural areas took fewer precautions (masking, distancing, staying at home) compared to rural individuals. This could be, in part, due to the lower rural population density, making viral transmission less likely. It also could have been driven by more independent attitudes in rural areas. Regardless, such attitudes would have affected the extent to which individuals felt the pandemic was a serious enough threat to postpone important life events, like

childbearing. The pandemic also had heterogeneous impacts on rural and urban labor markets. A higher percentage of urban jobs could be done in a remote capacity compared to the higher percentage of in person jobs in mining, agriculture, and tourism in rural areas. These differences could have impacted the financial realities for prospective parents in rural and urban areas. Finally, urban areas had much greater access to prenatal care in pre-pandemic times and the COVID-19 pandemic likely only deepened this divide. Poor rural internet access limited the expansion of telehealth opportunities for rural residents, potentially limiting prenatal care in more remote places.

Data and Methods

We use restricted national birth register data from the U.S. National Center for Health Statistics Natality files that contain all births records in the U.S. for 2011-2021. These files contain information on the child, mother, circumstances surrounding the birth, and geocodes for place of birth and residence that are censored in the publicly available data. We combine these data with county-level COVID-19 prevalence from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University and information on state stay-at-home orders from the U.S. Centers for Disease Control and Prevention. County population comes from the U.S. National Cancer Institute's Surveillance, Epidemiology, and End Results Program (SEER).

We first use Ordinary Least Squares regressions to determine the predicted values for births given pracademic trends between 2011-2019 and calculate the number of missing births in both rural and urban counties. The following two figures show the deviation from the pre-pandemic trend in metro and rural counties.

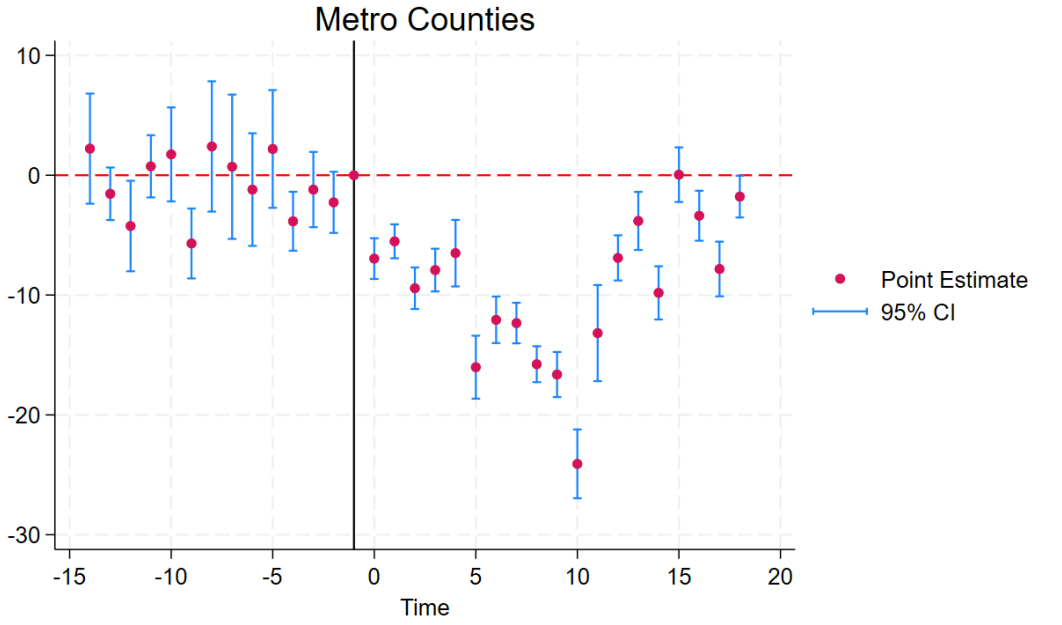


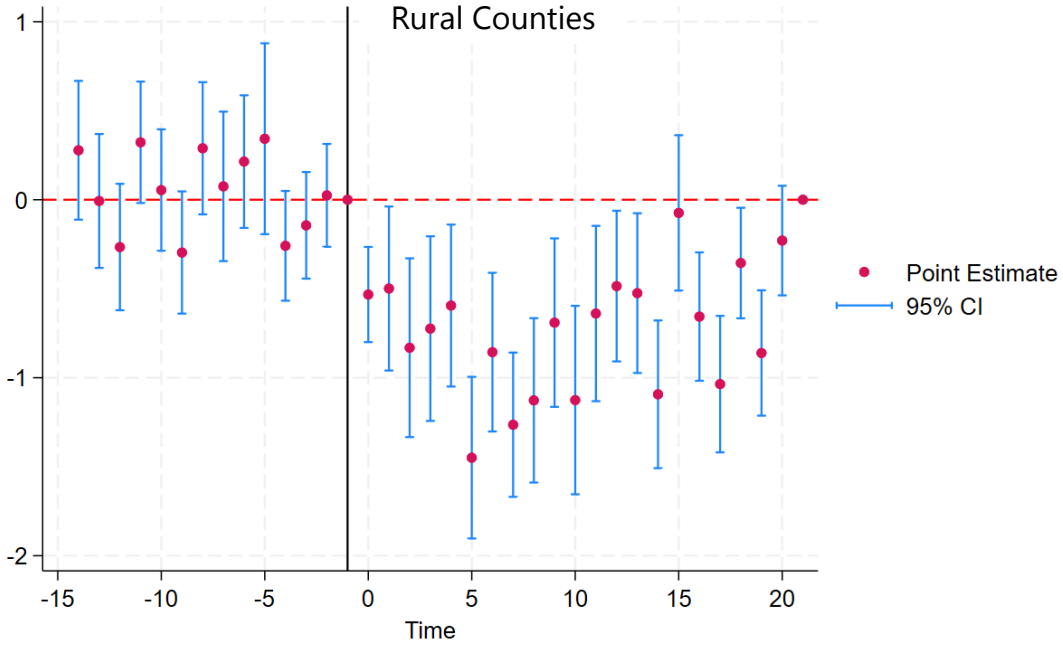
We then estimate event study models taking the form:

$$y_{it} = \beta_k lead_{it}^k + \cdots \beta_2 lead_{it}^2 + \delta_0 lag_{it}^0 + \cdots \delta_L lag_{it}^L + \sigma_i + \delta_t + time_t + \epsilon_{it}$$

where y_{it} is the number of seasonally-adjusted births in county i in month t, $lead_{it}^k$ is a binary indicator of k periods prior to the pandemic, lag_{it}^k is a binary indicator of k period since the beginning of the

pandemic, σ_i are county fixed effects, δ_t are month fixed effects, and $time_t$ is linear time trend. We estimate these models separately for rural and urban counties and compare the respective coefficients from each geography.





Next we estimate a series of difference-in-difference models that exploit the policy variation between states that implemented a stay-at-home order before April 1, 2020 and those that did not. To account for the possibility of time-varying treatment effects in a common timing framework, we estimate the following model:

$$y_{it} = \beta_k lead_{it}^k + \ldots \beta_2 lead_{it}^2 + \delta_0 lag_{it}^0 + \cdots \delta_L lag_{it}^L + \delta_0 W * lag_{it}^0 + \cdots \delta_L W * lag_{it}^L + \sigma_i + \delta_t + \epsilon_{it}$$

where the variables are the same as above, but now we include the W term—which indicates states that implemented a stay-at-home order prior to April 1, 2020—interacted with each individual time period after April 2020.

Expected findings

Preliminary results suggest that rural areas did not experience as dramatic impacts on fertility during the COVID-19 pandemic, though fertility rates in rural areas were not as quick to bounce back in the first half 2021. We also find evidence that states that implemented stay at home orders had had steeper declines in their fertility rates and fertility rates in those states did not recover as quickly as states that did not implement stay at home orders. These effects were driven by the stay-at-home policy impact on urban areas.