Tracing Hidden Struggles of Rural Indian Women during Pandemic*

Ruoxian Wu

April 16, 2024

This paper replicates a pivotal study on the socio-economic impacts of pandemic containment policies on women in India, specifically examining mental health and food security. Utilizing a dataset spanning several indicators of economic and psychological health, this study employs a combination of linear and Lasso regression models to assess the implications of these measures. Key findings suggest significant correlations between containment intensity and various aspects of women's well-being, including mental health and economic stability. The results underscore the importance of considering gender-specific outcomes in policy-making processes, particularly in times of global crises. This study contributes to the broader discourse on public health interventions and their gendered impacts, advocating for more nuanced approaches in future public health strategies.

Table of contents

*Code and data are available at: https://github.com/ScarletWu/Tracing_Hidden_Struggles_of_Rural_Indian_Women_during_I Replication on Social Science Reproduction platform is available at: https://www.socialsciencereproduction.org/reproductions/1783/

1 Introduction

Public health funding significantly impacts public health outcomes, especially during global health emergencies like the COVID-19 pandemic. The study "Women's Well-being during a Pandemic and its Containment," published in the Journal of Development Economics (2022), examines the effects of disease and containment policies on women in lower-income countries. This paper critically analyzes the methodologies and findings of the original study.

I obtained the data from the original author to replicate the study. Using methodologies, including fixed-effect analysis and regression models, this paper evaluates the sensitivity of the findings to different analytical approaches. It aims to validate the original results and stimulate further discussion on interpreting data to assess the impacts of public health policies.

This critical analysis aims to clarify the complex relationships between public health funding, policy effectiveness, and their socio-economic effects. By reexamining the original study's data and methodology, this paper contributes to understanding how public health initiatives can be optimized to serve vulnerable populations during crises.

2 Data

2.1 Tools

My reproduction used the programming language R (R Core Team 2022), the analysis used the following packages: Haven(Wickham, Miller, and Smith 2023), Dplyr (Wickham et al. 2023), Ggplot2 (Wickham 2016), Readr (Wickham, Hester, and Bryan 2024), Here (Müller 2020), Janitor (Firke 2023), KableExtra (Zhu 2024), Knitr (Xie 2014), Tidyverse (**rTidyverse?**).

2.2 Source

This critical analysis utilizes replication data associated with the article "Women's well-being during a pandemic and its containment" from the Journal of Development Economics. This

data, along with associated code, was made accessible by the authors to facilitate the replication of key findings such as statistical models and graphical representations. By enabling the reproduction of the authors' analyses, this data contributes to the transparency and credibility of the study's conclusions. The replication package can be find and downloaded after requesting access.

2.3 Variables

The data for this study includes both individual-level and regional-level variables from six states in rural India. Individual-level variables encompass demographic details (age, gender, household head status), economic factors (employment status, income levels), and health-related outcomes (mental health indicators, nutrition data). Regional-level variables cover containment measures, healthcare access, and socio-economic indicators such as the prevalence of COVID-19, public health infrastructure, and local economic conditions.

Regarding data collection, the authors conducted a large phone survey in August 2020, targeting households that were first interviewed in the fall of 2019, thereby providing a pre-pandemic baseline. This longitudinal approach allowed the researchers to examine changes over time attributed to the pandemic and containment policies. The survey data were supplemented with regional health statistics and COVID-19 case data obtained from official public health sources. The data from the phone survey included detailed questions on mental health using validated psychological scales (PHQ9 and GAD7) and food security questions adapted from national health surveys. This allowed the researchers to construct indices of mental health and nutritional status, crucial for evaluating the impact of containment policies on women's well-being.

Subsequent to data collection, the data were organized and analyzed using statistical software, with the authors employing advanced econometric techniques such as difference-in-differences and regression discontinuity designs to assess the impact of varying levels of containment. This rigorous analytical approach helps to isolate the effects of public health interventions from other confounding factors.

3 Model

Different models were used to evaluate diffrent factors to Indian women's well-being during the pandemic.

We employ a regression model to assess the impact of district-level containment measures on individual outcomes, considering age, state, and district variables. Our outcome of interest reflects various personal experiences, with containment representing the intensity of policy measures in one's district.

The model accounts for age and state as non-varying influences, along with controls for local COVID-19 severity and pre-pandemic socioeconomic factors to mitigate potential confounding effects. We ensure a consistent sample across studies by including only individuals with complete control data.

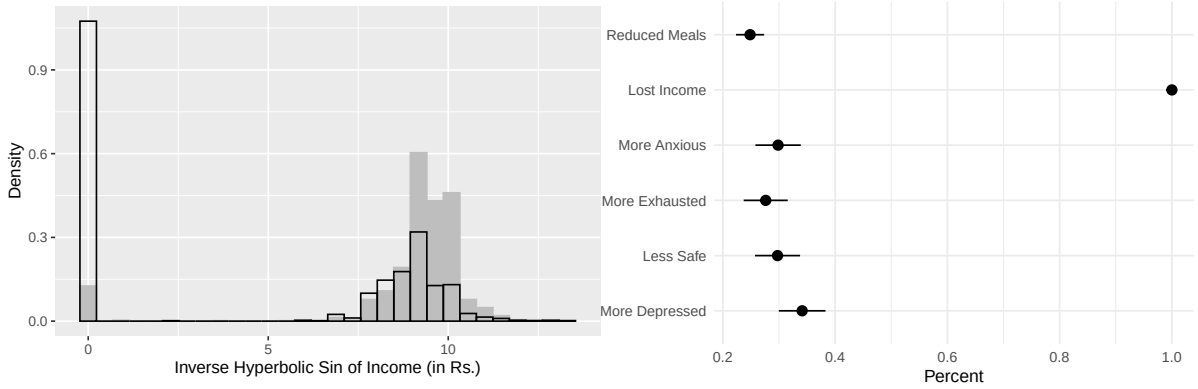
$$y_{iasd} = \beta \text{containment}_d + \alpha_a + \delta_s + \Gamma X_i + \varepsilon_{iasd},$$

Additionally, we probe the robustness of our findings against possible biases in self-reported mental health changes by comparing them with general mental health inquiries that do not reference the pandemic timeframe.

$$y_{iasd} = \beta_1 \text{has\_son}_i + \beta_2 \text{has\_daughter}_i + \beta_3 \text{female\_headed}_i + \alpha_a + \delta_s + \Gamma X_i + \varepsilon_{iasd},$$

In a related analysis, we explore how the presence of sons or daughters and female-headed households correlate with individual well-being, applying the same control variables and fixed effects as in the initial model.

4 Results



(a) Distributions of Transformed Income

(b) Effect of COVID-19 on Various Outcomes

Figure 1: Impact of general economic disruptions on income and women's welfare.

Figure 1a presents a histogram comparing the distribution of normal monthly income to income during the COVID-19 period, transformed using the inverse hyperbolic sine (IHS), which helps to linearize the data and deal with non-negative income values. The two distributions allow for a visual assessment of the shift in income levels due to the pandemic.

Figure 1b is a dot plot with error bars that showcase the proportion of households experiencing various outcomes due to the pandemic. These outcomes include lost income, reduced meals, and changes in mental health status such as increased depression, anxiety, exhaustion, and feelings of safety. Each point represents the mean value for the outcome, with the bars indicating the confidence intervals, providing a clear indication of the pandemic's impact on these factors.

Figure 2 illustrates scatter plots that relate the containment measures to different outcomes, including anxiety, depression, exhaustion, lost income, reduced meals, and safety. The plots typically have the containment intensity on the x-axis and the outcome variable on the y-axis. The line represents the best-fit linear relationship between containment and the specific outcome. In these analyses, a regression coefficient ( ) is used to measure the strength and direction of the relationship, accompanied by standard errors (SE) to indicate the precision of these estimates. As containment measures become more stringent , individuals report increasing levels of depression (= 0.295, Figure 2a), exhaustion (= 0.504, Figure 2b), and anxiety (= 0.332, Figure 2c), alongside a decreased sense of safety (= 0.282, Figure 2d). Additionally, there is a notable reduction in meal frequency (= 1.15, Figure 2e) and an increase in the loss of individual income (= 0.065, Figure 2f) associated with stricter containment policies. These values are all positive, indicating a direct correlation with containment levels, and the SE values (in parentheses) reflect the variability of the estimates within the clusters of districts.

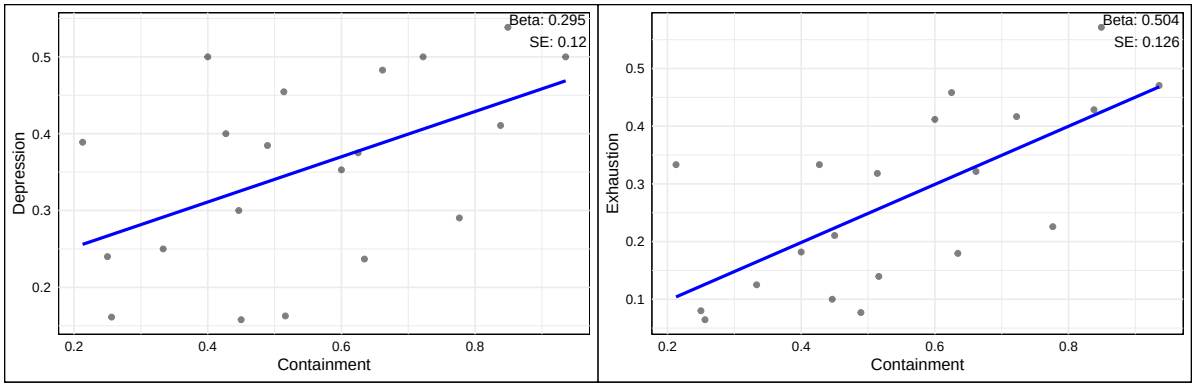
The analysis reveals significant impacts of the COVID-19 pandemic on women's well-being in rural India. Specifically, moving from zero to average containment levels is associated with a 38% increase in the likelihood of women reporting more depression, a 73% increase in reporting more exhaustion, and a 44% increase in reporting more anxiety. These effects are further magnified among women with daughters and those living in female-headed households, underscoring the compounded vulnerabilities these groups face.

4.1 Mental Health Deterioration

The study documents a significant deterioration in mental health among the surveyed women, with increases in reported depression, exhaustion, and anxiety. These findings align with broader literature indicating that women, particularly in lower-income settings, bear a disproportionate burden of mental health challenges during crises.

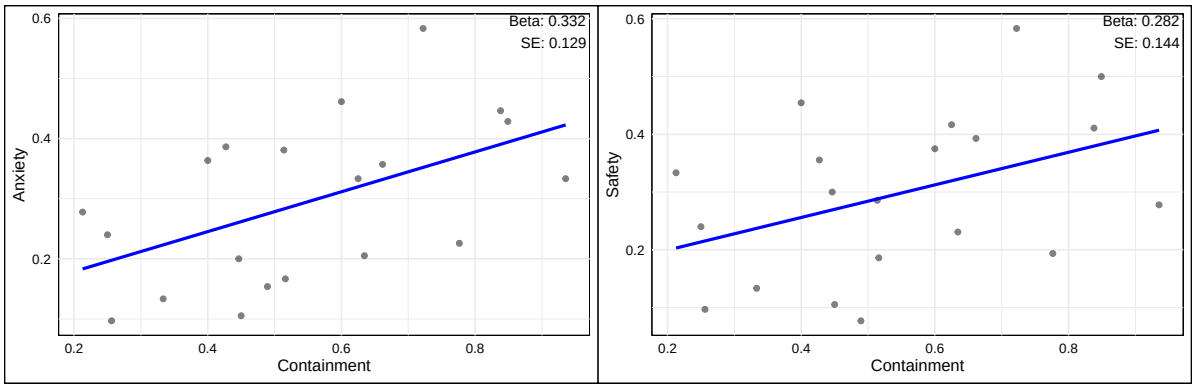
4.2 Economic and Nutritional Impact

Economically, the pandemic led to dramatic income losses and heightened food insecurity, with the latter particularly pronounced among women. The findings suggest that containment measures, while necessary for public health, inadvertently exacerbated these issues, underscoring the need for targeted support measures.



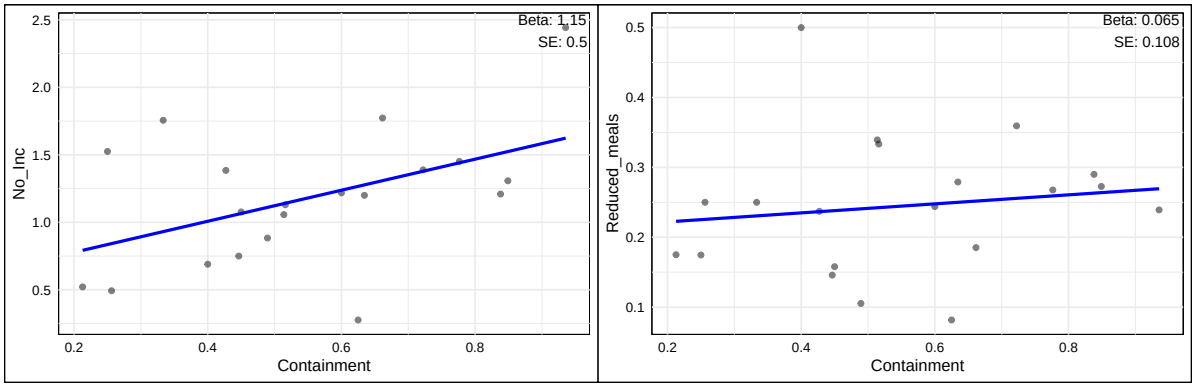
(a) Scatter Plot of More Depressed

(b) Scatter Plot of More Exhausted



(c) Scatter Plot of More Anxious

(d) Scatter Plot of Less Safe



(e) Scatter Plot of Reduced Meals

(f) Scatter Plot of Individual Lost Income

5 Discussion

5.1 Socioeconomic Strain and Mental Health

The data suggest that the socioeconomic strains induced by the pandemic—compounded by containment measures—have had a profound impact on women's mental health. These findings are critical, given the limited social safety nets available in many parts of rural India, which amplify the adverse effects of such crises.

5.2 Policy Implications

These results highlight the necessity for policymakers to consider the indirect effects of pandemic containment measures on vulnerable populations, particularly women. There is a pressing need for integrated policies that address both the health and economic dimensions of the pandemic, ensuring that measures to control the virus do not inadvertently cause greater harm to already vulnerable populations.

5.3 Future Research Directions

Further research is needed to explore the long-term impacts of the pandemic and containment measures on women's well-being. Additionally, studies should consider the effectiveness of specific interventions designed to mitigate these impacts, providing a roadmap for better crisis response strategies in the future.

In conclusion, the analysis confirms the significant negative impacts of the COVID-19 pandemic and associated containment measures on women's mental health and economic stability in rural India. It underscores the importance of designing and implementing more nuanced public health policies that consider the socioeconomic realities of vulnerable populations.

In progress

Reference

Firke, Sam. 2023. *Janitor: Simple Tools for Examining and Cleaning Dirty Data*. https://github.com/sfirke/janitor.

Müller, Kirill. 2020. *Here: A Simpler Way to Find Your Files*. https://here.r-lib.org/.

R Core Team. 2022. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. https://ggplot2.tidyverse.org.

Wickham, Hadley, Romain François, Lionel Henry, Kirill Müller, and Davis Vaughan. 2023. *Dplyr: A Grammar of Data Manipulation*. https://dplyr.tidyverse.org.

Wickham, Hadley, Jim Hester, and Jennifer Bryan. 2024. *Readr: Read Rectangular Text Data*. https://readr.tidyverse.org.

Wickham, Hadley, Evan Miller, and Danny Smith. 2023. *Haven: Import and Export 'SPSS', 'Stata' and 'SAS' Files*. https://haven.tidyverse.org.

Xie, Yihui. 2014. "Knitr: A Comprehensive Tool for Reproducible Research in R." In *Implementing Reproducible Computational Research*, edited by Victoria Stodden, Friedrich Leisch, and Roger D. Peng. Chapman; Hall/CRC. http://www.crcpress.com/product/isbn/9781466561595.

Zhu, Hao. 2024. *kableExtra: Construct Complex Table with 'Kable' and Pipe Syntax*. http://haozhu233.github.io/kableExtra/.