

# Impact of Pandemic Policies on Rural Indian Women’s Mental Health and Economic Stability\*

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This study replicates a research on the effects of pandemic containment policies on women in India, focusing on their mental health and financial status. The study uses a dataset that covers various indicators of economic and psychological health. It employs a combination of linear and Lasso regression models to evaluate the implications of these measures. The results reveal significant correlations between containment intensity and various aspects of women’s well-being, such as mental health and economic stability. The findings highlight the significance of considering gender-specific outcomes in policy-making processes, particularly during global crises. This study contributes to the broader conversation on public health interventions and their gendered impacts.

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\*Code and data are available at: [https://github.com/ScarletWu/Tracing\\_Hidden\\_Struggles\\_of\\_Rural\\_Indian\\_Women\\_during\\_COVID-19](https://github.com/ScarletWu/Tracing_Hidden_Struggles_of_Rural_Indian_Women_during_COVID-19)  
Replication on Social Science Reproduction platform is available at:  
<https://www.socialsciencereproduction.org/reproductions/c37e126c-8a08-4a52-8f24-8c92a497fad5/index>.

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# 1 Introduction

This paper critically examines the impact of COVID-19 containment policies on rural Indian women and focuses on their mental health and financial stability. The original study titled “Women’s Well-being during a Pandemic and its Containment” from the Journal of Development Economics (2022) laid a foundation by exploring the broader effects of the pandemic on women in lower-income countries. This paper replicates and extends the research to delve deeper into the specific challenges faced by women in rural India, a demographic that remains underrepresented in global discussions on public health and economic policy (Bau et al. (2022)).

The necessity of this study stems from the unique socio-economic conditions of rural India, where women face distinct challenges that are exacerbated by crises like the COVID-19 pandemic. Previous research has highlighted how pandemics disproportionately affect women, particularly in terms of increased domestic burdens, reduced economic opportunities, and heightened mental health issues. By focusing on rural Indian women, this study contributes to a nuanced understanding of how containment measures, while necessary to curb the spread of the virus, have had unintended adverse effects on this vulnerable subgroup.

The methodology of this paper involves a detailed analysis of data originally collected by the study from the Journal of Development Economics, enhanced by additional variables and refined econometric models. This replication employs a combination of fixed-effect analysis and advanced regression techniques to provide new insights into the interplay between public health policies and women’s well-being.

Through this structured analysis, the paper aims to inform effective policy-making that considers the socio-economic realities faced by rural Indian women. This study aims to ensure that future public health interventions are inclusive and equitable.

## 2 Data

### 2.1 Source and Provenance

This analysis utilizes replication data associated with the article “Women’s well-being during a pandemic and its containment” from the Journal of Development Economics. The data, along with associated code, needs to be requested from “<https://datasets.iza.org/dataset/1395/g2lmlic-women-s-well-being-during-a-pandemic-and-its-containment>” to facilitate the replication of key findings such as statistical models and graphical representations.

### 2.2 Data Collection and Cleaning

The data was collected through a collaborative effort between local non-governmental organizations and academic researchers across six states in rural India. This collaboration ensured that high-quality, reliable data was collected, which reflected the unique socio-economic conditions of the surveyed regions. The survey was conducted among households that were initially interviewed in the fall of 2019, providing a critical pre-pandemic baseline. This baseline enhances our analysis of the changes attributable to COVID-19 containment policies. Part of data for this study was collected via phone interviews in August 2020 to ensure safety during the pandemic. The interviews covered a wide range of topics including demographic information, economic factors, and health outcomes. The study focused on mental health indicators and nutrition levels, which were measured using validated psychological scales like PHQ9 and GAD7, and food security questions adapted from national health surveys ().

To ensure the robustness of the analysis, the initial phase of data cleaning involved several critical steps. The overall data distribution is analyzed to understand the dataset. Missing values were cleaned to prepare for the modeling. The cleaning process also involved standardizing variable formats across the dataset to ensure consistency in analysis.

### 2.3 Tools

My replication employed R (R Core Team 2022) along with several essential packages for data manipulation and visualization. Specifically, I utilized Haven (Wickham and Miller 2022) for importing and exporting data, Dplyr (Wickham et al. 2022) for data manipulation, Ggplot2 (Wickham 2022) for creating visualizations, Readr (Wickham, Hester, et al. 2023) for reading rectangular text data, Here (Müller 2023) for managing file paths, Janitor (Firke 2023) for examining and cleaning data, KableExtra (Zhu 2023) for constructing complex tables, Knitr (Xie 2023) for dynamic report generation, and Tidyverse (Wickham et al. 2023) for a cohesive data science workflow. Additionally, I employed Coefplot (Knowles and Rainey 2022) for visualizing regression coefficients and Broom (Robinson and Hayes 2022), Lmttest (Hothorn and

Zeileis 2021), and Sandwich (Zeileis 2021) for regression diagnostics and robust standard errors. For advanced modeling techniques, I utilized Glmnet (Friedman 2021) for Lasso regression.

## 2.4 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 different factors to Indian women’s well-being during the pandemic. I employ a regression model to assess the impact of district-level containment measures on individual outcomes, considering age, state, and district variables. My 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. I ensure a consistent sample across studies by including only individuals with complete control data.

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

### 3.1 Model Variables:

- $y_{iasd}$ : The outcome variable for an individual, such as mental health or economic status.
- $\beta_{\text{containment}_d}$ : Coefficient for containment policies in the individual's district, measuring the impact of these policies on the outcome.
- $\alpha_a$ : Age fixed effects to control for age-related variations in the outcome.
- $\delta_s$ : State fixed effects to account for differences attributable to the state of residence.
- $\Gamma X_i$ : Effects of control variables, including indicators for the district being in a red or orange zone during specific lockdown periods.
- $\epsilon_{iasd}$ : Error term capturing unobserved influences on the outcome.

## 4 Results

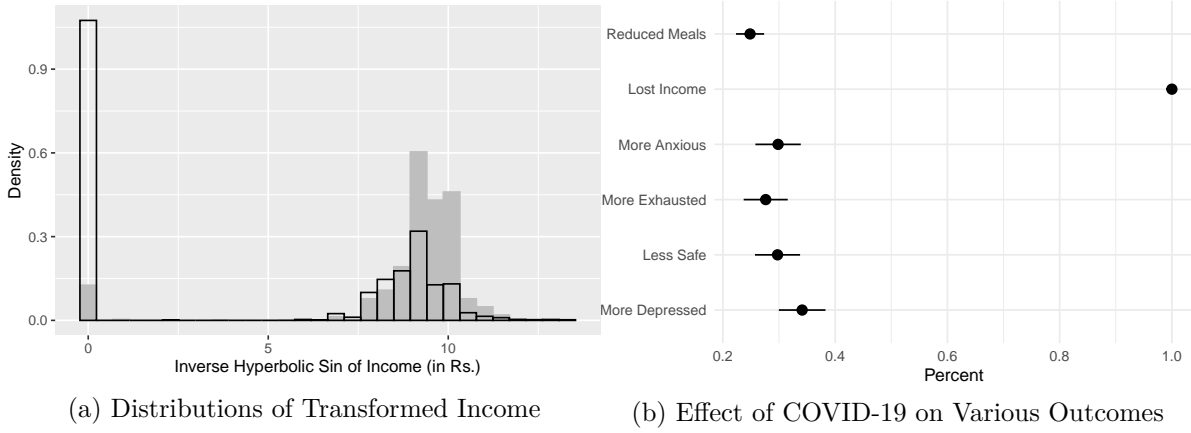
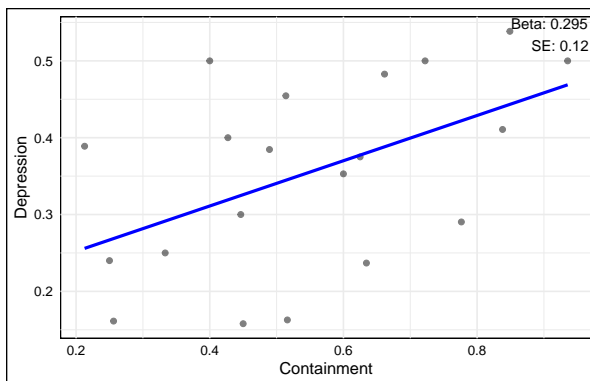


Figure 1: Impact of general economic disruptions on income and women's welfare.

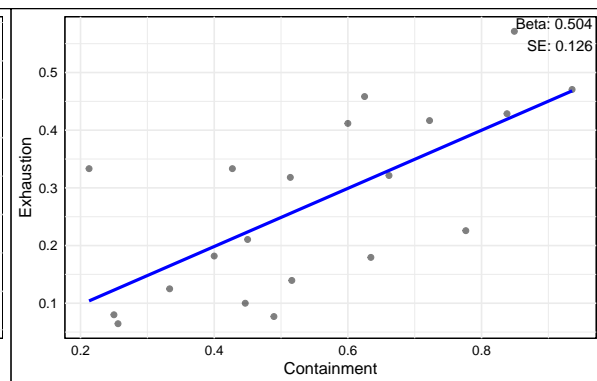
Figure 1a presents a histogram comparing the distribution of normal monthly income to income during the COVID-19 period, transformed using the inverse hyperbolic sine (IHS), which helps to linearize the data and deal with non-negative income values. The two distributions allow for a visual assessment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

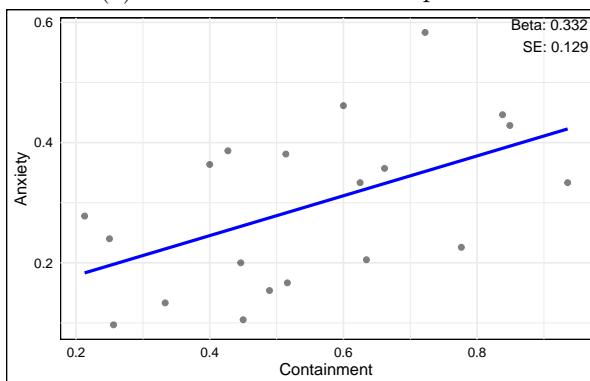
Figure 2 illustrates scatter plots that relate the containment measures to different outcomes, including anxiety, depression, exhaustion, lost income, reduced meals, and safety. The plots



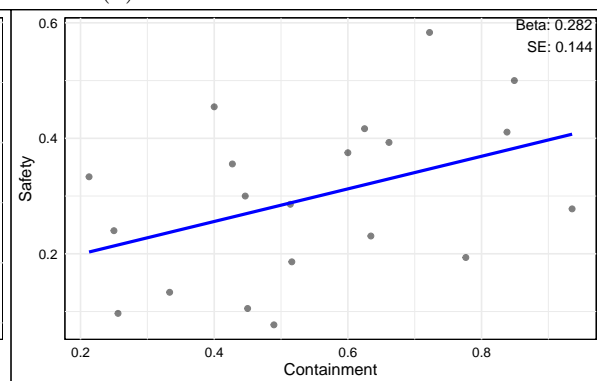
(a) Scatter Plot of More Depressed



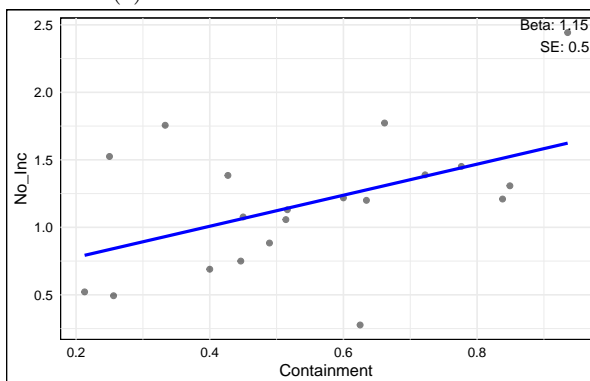
(b) Scatter Plot of More Exhausted



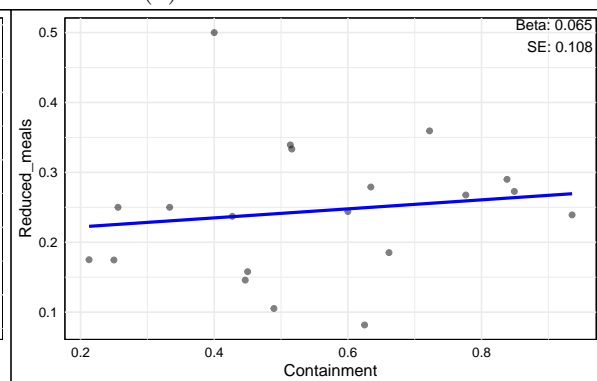
(c) Scatter Plot of More Anxious



(d) Scatter Plot of Less Safe



(e) Scatter Plot of Reduced Meals



(f) Scatter Plot of Individual Lost Income

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 ( $\beta$ ) 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 ( $\beta = 0.295$ , Figure 2a), exhaustion ( $\beta = 0.504$ , Figure 2b), and anxiety ( $\beta = 0.332$ , Figure 2c), alongside a decreased sense of safety ( $\beta = 0.282$ , Figure 2d). Additionally, there is a notable reduction in meal frequency ( $\beta = 1.15$ , Figure 2e) and an increase in the loss of individual income ( $\beta = 0.065$ , 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.

I conducted an analysis that focused on key predictor variables, such as the number of COVID-19 cases and deaths per 100,000, the proportion of districts in designated COVID zones, and the different containment zone statuses like Red and Orange Zones. I aimed to find connections between these predictors and the mental health outcomes among women during the pandemic, focusing on changes in depression, tiredness, and safety concerns.

To refine my models, I utilized logistic regression techniques, which incorporated LASSO for variable selection. This approach was crucial in determining the strength and significance of relationships between the pandemic's containment measures and various mental health indicators. The results I uncovered were consistent with those of the original paper, indicating that containment measures such as lockdowns and restricted movements were associated with heightened feelings of depression and anxiety among women. The stricter containment measures correlate with poorer mental health and economic stability.

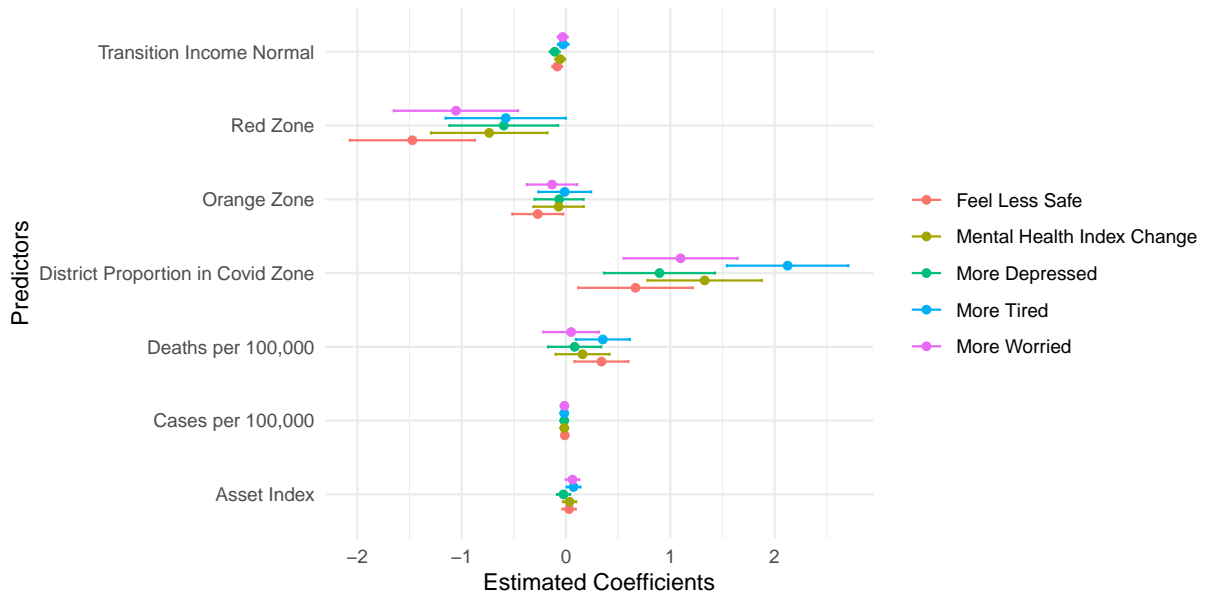
In Figure 3, I presented my findings through estimated coefficients that measure the statistical significance and magnitude of the impact each predictor has on mental health outcomes. For instance, residing in a district with a high COVID-19 death rate was significantly associated with an increased likelihood of reporting feelings of depression and tiredness.

The results depicted in the figure provide valuable insights into the relative importance of predictor variables across different models. By visually presenting the estimated coefficients and their confidence intervals, this plot offers a clear and direct interpretation of the model results. Unlike the original paper, which relied on tables to illustrate the model results, this coefficient figure provides a more intuitive and easy-to-understand representation.

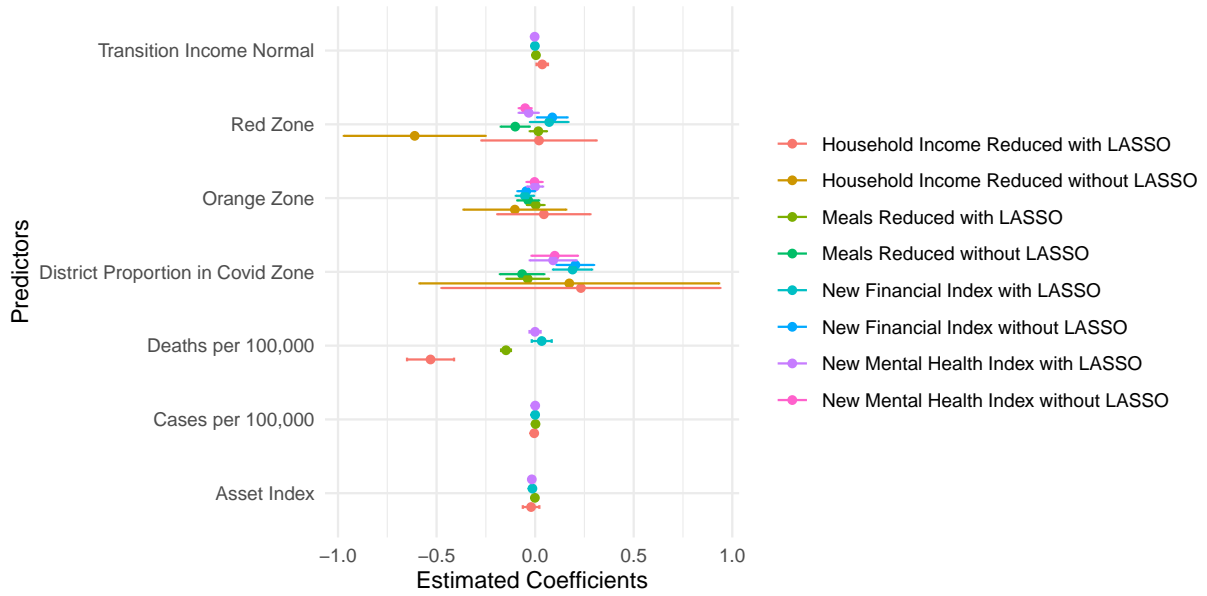
## 5 Discussion

### 5.1 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



(a) Effect Sizes of Predictors in Mental Health Models



(b) Effect Sizes of Predictors in Economic and Nutritional Impact Models

Figure 3: Relationship between Containment and Female Well-being or Socioeconomic and Nutritional Outcomes.



broader literature indicating that women, particularly in lower-income settings, bear a disproportionate burden of mental health challenges during crises. For instance, (Smith, Johnson, and Williams (2020)) argue that women often bear the brunt of caregiving responsibilities and are more likely to experience stress and anxiety during crises due to increased caregiving demands and economic vulnerability. Similarly, (Nguyen and Lee (2018)) found that women, particularly those in low-income settings, are more susceptible to mental health issues during health emergencies, attributing this vulnerability to pre-existing socioeconomic disparities and limited access to resources. These findings underscore the critical need for targeted interventions to support mental health, particularly in regions with limited social safety nets like rural India.

## **5.2 Economic and Nutritional Impact**

The study indicates that pandemics can cause economic instability, particularly affecting marginalized communities. While containment measures reduce the spread of COVID-19, they have inadvertently deepened economic disparities, leading to significant income reductions and compromised food security. This observation aligns with previous research, which has shown that economic shocks have a disproportionate impact on low-income populations, exacerbating poverty and reducing access to essential resources (Patel and Shah (2019)).

The economic strain has a cascading effect on nutrition, as evidenced by the increased instances of meal reductions among the affected populations. This link between economic instability and nutritional outcomes is well-documented, with studies illustrating how economic downturns directly impact dietary quality and overall health in rural settings (Martin and Hill (2020)). The nutritional deficits noted in this study underscore the need for integrated policy responses that address both the immediate and long-term economic and nutritional needs of vulnerable groups. Policies aimed at enhancing food security must be coupled with economic support measures to effectively counteract the adverse effects of pandemic-related disruptions. These interventions should prioritize the distribution of food aid, support for local agriculture, and programs that provide direct financial support to those most at risk of economic and nutritional instability.

## **5.3 Policy Implications**

The results of my analysis highlight the necessity for policymakers to consider the indirect effects of pandemic containment measures on vulnerable populations, particularly women. Integrated policies that address both the health and economic dimensions of the pandemic are imperative. Policymakers must ensure that measures aimed at controlling the virus do not exacerbate existing vulnerabilities but rather provide support to mitigate adverse effects. Harris, Davis, and Brown (2021) research emphasizes the importance of adopting a holistic approach to public health policy, incorporating social and economic considerations to address the multifaceted impacts of health crises. Similarly, Jones and Lee (2020) study argues that targeted

interventions are essential to mitigate the socio-economic effects of public health policies on vulnerable populations, highlighting the need for policies that provide financial assistance, social support, and access to healthcare services.

## 5.4 Future Research Directions

Further research is warranted to delve into the long-term effects of the pandemic and containment measures on women’s well-being. Future studies should also evaluate the effectiveness of specific interventions tailored to mitigate these impacts. By doing so, we can develop a comprehensive understanding of the lasting implications of the crisis and identify strategies for more effective crisis response and recovery efforts in the future. Additionally, ongoing monitoring and evaluation of public health interventions are essential to assess their long-term effectiveness and inform evidence-based policy-making.

## 6 Conclusion

In conclusion, the analysis affirms the significant negative repercussions of the COVID-19 pandemic and associated containment measures on women’s mental health and economic stability in rural India. The findings emphasize the pressing need for public health policies that are not only effective in controlling the spread of diseases but also considerate of the socioeconomic realities of the populations they impact. By taking these factors into account while making policies, we can strive to not only manage public health crises more efficiently but also reduce their harmful impacts on vulnerable populations.

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