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Women's Well-Being during a Pandemic and Its Containment

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ABSTRACT

Women's Well-Being during a Pandemic and Its Containment*

The COVID-19 pandemic brought the dual crises of disease and the containment policies designed to mitigate it. Yet, there is little evidence on the impacts of these policies on women, who are likely to be especially vulnerable, in lower-income countries. We conduct a large phone survey and leverage India's geographically-varying containment policies to estimate the association between both the pandemic and its containment policies, and measures of women's well-being, including mental health and food security. On aggregate, the pandemic resulted in dramatic income losses, increases in food insecurity, and declines in female mental health. While potentially crucial to stem the spread of COVID-19 cases, we find that greater prevalence of containment policies is associated with increased food insecurity, particularly for women, and with reduced female mental health. Average containment levels are associated with a 39-40% increase in the likelihood of sadness, depression, and hopelessness among women and with an increase in the likelihood that women feel more worried by 45% of the variable mean. Particularly vulnerable groups of women, those with daughters and those living in female-headed households, experience larger declines in mental health.

JEL Classification:
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Keywords:
mental health, pandemic, gender, India, COVID-19, vulnerable populations

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1 Introduction

Pandemics represent a twin health and economic shock with devastating effects, particularly in low-income countries, where substitutes for in-person transactions are scarce and formal safety nets are limited. Women may be especially vulnerable in these settings given gender norms, low availability of mental health services, and weaker state capacity. To examine how women fare in these contexts during the COVID-19 pandemic, we conduct a large phone survey in six states in rural areas in northern India. Combined with India's highly spatially-variant containment policies, we are able to estimate the relationship between both the pandemic and the containment policies and key measures of women's well-being, including female mental health, in a country of 1.4 billion people.

While lockdowns may be crucial to stem the spread of COVID-19 cases, when not combined with adequate social safety nets, they can also generate economic and health distress. Low-income settings may be particularly affected, as they have limited state capacity for aid and insurance, a lack of alternatives for in-person transactions, and less resilient supply chains (Mobarak and Barnett-Howell, 2020; Egger et al., 2021). Anecdotal evidence suggests that rural India suffered from significant disruptions to food supply chains and losses of economic livelihood, perhaps affecting the physical and mental well-being of vulnerable populations (Purohit, 2020; Singh and Kumar, 2021). Yet, without the systematic measurement of these outcomes for at-risk populations, the extent of this crisis, and its relationship with containment policies are difficult to quantify.

Building off a sample of households that were interviewed in Fall 2019, we conduct a timely phone re-survey in August 2020, near the height of the first COVID-19 wave in India, when India had between 50,000 and 70,000 new COVID-19 cases per day.[1] This setup not only gives us measures of pre-pandemic baseline characteristics, but also allowed trusted surveyors who had already developed relationships with these households to inquire about women's mental well-being.

We find that the pandemic is associated with drastic income losses and increases in food insecurity, as well as declines in female mental health and well-being. These mental health effects suggest that many important costs of the pandemic may be difficult to observe in standard data sources. We note that these declines in well-being may be due to the aggregate stress and economic effects of the pandemic and/or the effect of containment policies.

Identifying the impact of containment policies is challenging in most settings. We leverage the fact that containment exposure is uniquely heterogeneous in our setting. While India initially pursued a nation-wide lockdown in response to the pandemic, from June 2020 onward, it had a patchwork of containment zones in which lockdown measures were imposed. These zones were determined by district or town authorities, and their size could be as small as one apartment building or a 1 km radius (Express News Service, 2020). This mosaic of policies within relatively small geographic areas provides us with a unique opportunity to derive meaningful

[1] These numbers are from the COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University.

variation in lockdown policies and assess the relationship of containment with mental health and other measures of well-being.

We show that the negative effects of the pandemic are exacerbated in areas with more containment, and respondents in these areas report both worse female mental health and more food insecurity. Average containment levels are associated with increases in the likelihood of sadness, depression, and hopelessness among women by 39-40% and an increase in the likelihood they feel more worried by 45% of the variable mean. Two pieces of evidence suggest that the associations we report may be capturing the causal effects of containment, despite the fact that containment policies are not randomly assigned to geographic units. First, living in an area with a higher prevalence of lockdowns is not systematically associated with pre-treatment socioeconomic measures, either for outcomes collected from our own sample prior to the pandemic or for district-level measures of food intake in the 2015-16 National Family Health Survey. Second, the inclusion of district-level cumulative measures of case and death rates in the regression allows us to compare two areas with the same COVID-19 incidence but different containment policies, and does not change the estimates.

Last, we examine how the relationship between the aggregate COVID-19 shock and our outcome measures vary with the pre-existing vulnerability of women. Recent evidence from high-income settings suggests that working mothers with young children are particularly affected by lockdowns (Zamarro and Prados, 2021). While relative female labor force participation in India is lower, traditional gender norms may make women particularly vulnerable at times of socio-economic stress. We find that the negative relationship between the pandemic and mental health is significantly exacerbated for women who have daughters, and for women in female-headed households. This is consistent with the existence of strong son preference in India, where daughters may lower a woman's status within the household (Jayachandran, 2015).

We contribute to the literature in two ways. First, we provide new evidence on the repercussions of lockdowns in countries with limited social safety nets by leveraging fine-grained geographic variation in containment, even conditional on pandemic severity. Second, we expand the evidence on the effects of the pandemic, particularly on mental health, to a lower-income setting. While contemporaneous work examines the consequences of the pandemic on mental health and well-being, much of this work is concentrated in high-income countries (Brodeur et al., 2021; Armbruster and Klotzbücher, 2020; Davis et al., 2020; Witteveen and Velthorst, 2020; Adams-Prassl et al., 2020; Huebener et al., 2020; Etheridge and Spantig, 2020), or the middle-income settings of Turkey (Altindag, Erten and Keskin, Forthcoming; Özdin and Bayrak Özdin, 2020), Brazil (Ferreira et al., 2021), and Egypt (El-Zoghby, Soltan and Salama, 2020).[2] In contrast, we focus on a lower-middle income country, where limited social safety nets, lack of mental health services (Angelucci and Bennett, 2021), and traditional gender norms make women especially vulnerable.[3]

[2]See Xiong et al. (2020) for a systematic review of the effects of the pandemic on the mental health of the general population across countries.

[3]Additional evidence on the effect of the pandemic on mental health of men and women in India can be found

In addition, we collect data specifically from rural areas. Concurrent work using data from food markets and healthcare claims shows that rural India suffered from severe disruptions to food supply chains (Lowe, Nadhanael and Roth, 2020) and access to health services (Jain and Dupas, 2021). The economic effects of the pandemic appear to have been even more severe in rural areas (Bertrand, Krishnan and Schofield, 2020). Thus, our survey across rural North India allows us to measure the consequences of these disruptions on the households who were likely the most affected. Though India is officially classified as middle-income, the findings from low-income, rural areas in India are likely to be informative for other low-income settings around the world. Finally, by collecting survey data in which the phone was passed to women, we are able to measure female mental health, a typically challenging outcome to observe in such contexts, using standard measures validated in the psychology literature.[4]

We emphasize that our findings on the adverse repercussions of the containment measures are positive, rather than normative results, since we do not study or quantify the long-run health or economic impacts of improved mitigation. Nonetheless, the large negative associations suggest that, without expanded social insurance, lockdown policies could severely affect the well-being of women in low-income countries. Indeed, eight months after our survey, COVID-19 cases in India skyrocketed six to eight times higher than when we conducted the survey, resulting in more containment policies. Our results suggest that any time such policies are instituted, they should be complemented with targeted aid, with particular attention to the well-being of women.

Finally, we note that these results are not merely relevant for the current pandemic. Global pandemics are expected to increase in frequency due to urbanization, globalization, loss of biodiversity, and climate change (Dodds, 2019). Understanding the consequences of different containment policies is crucial for crafting future approaches to disease control and concurrent aid-targeting in lower-income settings.[5]

2 Data

This project mainly uses data from a phone survey of 1,545 rural Indian households. These data were collected in partnership with IDInsights (IDI), a global advisory, data analytics, and research organization, from September–October 2019, and the sample was resurveyed from a sample that IDI had surveyed in-person prior to the pandemic. In addition, we supplement these data with information on case and death rates.

Data Collection & Key Variables. Working with IDI, we conducted the phone survey in 20 districts across 6 states (Rajasthan, Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh, and

in Afridi, Dhillon and Roy (2021), who focus on a sample of poor households in Delhi. In this different population, they find that mental health declines more for women than men during the pandemic. Acharya Samadarshi, Sharma and Bhatta (2020) also document increases in stress during the pandemic in an online survey from Nepal.

[4]Recent work shows that providing information about the Covid-19 pandemic via phone calls reduced anxiety among Indian migrant workers (Sadish, Adhvaryu and Nyshadham, 2021).

[5]Lower-middle income countries like India, alone, account for roughly 3 billion people or roughly 40 percent of the global population.

Maharashtra) in Northern India. Households participated in a 20-30 minute survey with two parts, a household-head module and a female respondent module. The number of questions in both modules was limited since households resist taking part in surveys with a duration greater than 20 minutes over the phone.[6]

In the household-head module, we surveyed the household head (who was male in 78% of cases) about the household's socioeconomic conditions, household head's income, the male and female heads' nutrition, and the number of days the respondent wished for more food for themselves or their children. The nutrition questions were taken from the National Family and Health Survey (NFHS) round 4, allowing us to use the pre-pandemic responses to the survey from the same district to benchmark nutritional outcomes. We include the full set of food categories in the NFHS (milk, pulses, vegetables, fruits, eggs, fish, and meat) in our survey. However, since a large fraction of the population we study is vegetarian, when we construct aggregate indices for nutrition, we focus on milk, pulses, vegetables, and fruits.

After the head module, if the head was male, we asked him to pass the phone to a female household member (typically the female household head). The female responded to an additional survey asking about her mental health and status within the household, as well as if this had changed since the pandemic. In cases where the respondent to the head module was female, the same respondent answered the female survey. Altogether, this allowed the female module to be conducted with 573 women.

To ascertain information on women's mental health, we asked a selection of questions from the PHQ9 depression diagnostic scale (Kroenke, Spitzer and Williams, 2001) and the GAD7 anxiety scale (Spitzer et al., 2006).[7] From the PHQ9, we ask *Over the last two weeks, how often have you been bothered by:* (1) *Feeling sad, down, depressed, or hopeless?* and (2) *Feeling tired or like you are carrying a heavy burden or like you have little strength in your body?*. From the GAD7, we ask, *Over the last 2 weeks, on how many days have you been bothered by not being able to stop or control worrying?* We supplement these mental health questions by asking women about their perceptions of their safety during the pandemic: *Over the last two weeks, how often have you been bothered by: Feeling worried about your physical safety?*[8]

For a subset of questions, we also directly elicit how respondents' outcomes have changed due to the pandemic. For example, for each of the mental health questions above (as well as the safety question), we ask respondents a follow-up question about whether their experiences have improved, worsened, or stayed the same since the pandemic. By measuring changes in these outcomes, we are able to both assess the aggregate effects of the pandemic and measure the relationship between lockdowns and outcome variables, accounting for pre-pandemic differences across individuals.

[6] Providing incentives for survey participation in India is challenging because mobile money is not widespread and most households have monthly, unlimited cell phone bundles, reducing the value of offering households extra data or cell phone minutes.

[7] The phone survey's short time frame prevented us from asking the two complete scales.

[8] Patel et al. (2008) validate the PHQ and other related assessment tools in the Indian context. Sadish, Adhvaryu and Nyshadham (2021) also elicit mental health information on the phone during India's Covid-19 pandemic, and highlight the feasibility of such data collection.

We supplement these key variables with data on pre-pandemic household assets collected by IDI in their prior survey. Table A1 reports summary statistics for the primary outcomes.

Representativeness. Our sample was randomly drawn from a sample of lactating mothers that IDInsights had previously surveyed. The lactating mothers sample was drawn from a combination of voter rolls and community health worker registers. The voter rolls are representative of the population, and compare well with averages from census and survey data (Joshi et al., 2020).

For the re-survey, we called a random sub-sample of 4,799 households and were able to successfully survey 32%, a relatively high response rate for a phone survey. In the vast majority of cases where we did not re-survey a household, we were unable to reach that household with the listed phone number (61% of households could not be reached, and 6.6% refused to take part in the survey). To evaluate whether our non-responsiveness leads to a less representative sample, in Appendix Table A3, we estimate the relationship between household wealth, whether a survey was completed, whether a household could be reached, and whether the household refused.[9] Households that completed the survey are slightly wealthier, but the magnitude of the effect is very small, with a 1 standard deviation (sd) increase in the asset index increasing the likelihood of being reached by less than 1 percentage point. Thus, a household at the 95th percentile of the wealth distribution is less than 4 percentage points more likely to be surveyed than one at the 5th percentile. Since this differential response slightly overweights wealthier households, to the extent that it biases our aggregate estimates of the effect of the Covid-19 pandemic, it is likely to lead to underestimate the severity of the pandemic's effects. The remaining columns of Table A3 show that wealthier households are more likely to be reached but also more likely to refuse (though both effects are small in magnitude), leading to positive association between wealth and survey completion in column 1.

Additional Data on Case Rates/Deaths. We supplement our phone survey data with additional district-level data on COVID-19 hospitalizations and deaths between the start of the pandemic and the time of the survey. This data is assembled by the Development Data Lab.[10]

3 The Aggregate Shock

We use questions that directly elicit how respondents' outcomes change from the pre- to post-pandemic period to measure the aggregate effects of the pandemic. The left sub-figure in Figure 1 reports the distribution of the head's self-reported income before and after the pandemic, which shows a dramatic drop. On average, the head's monthly income falls from 8,625 Rupees (120 USD) in a normal month to 3,584 Rupees (50 USD) in the current (during COVID) month,

[9] We follow Filmer and Pritchett (2001) and create an index by conducting a principle components analysis over indicators for the assets owned prior to the pandemic – car, jeep, bicycle, motorcycle, scooter, refrigerator, radio, television, electric fan, dressing table, stove, pressure cooker, mobile phone – and predicting the first principal component. The discrepancy between the original sample size of 4,799 and the sample size in the table is due to a small number of households with missing wealth information.

[10] This data can be accessed at http://www.devdatalab.org/covid.

a decline of about 50%. The right sub-figure shows that 76% of the respondents report reduced income for themselves, and 24% report reduced meals for someone in the household.

Next, we use the female well-being questions to show the percentage of households where the female respondent reports that her feelings of depression, exhaustion, anxiety, and safety have worsened over the course of the pandemic. For each measure, roughly 30% of respondents indicate that their feelings have worsened. For all four measures, female respondents report that their feelings have worsened roughly twice as much as they report that they have improved, suggesting that worsening does not simply reflect idiosyncratic changes or mean reversion.

4 Association With Containment Policies

Having established that the pandemic had large negative consequences for both households' economic outcomes and female well-being in India, we turn to understanding the relationship between containment intensity and these outcomes. We first document variation in our containment measure and show that it is not correlated with pre-pandemic characteristics that could impact the outcomes we measure. We also find no association with our overall phone survey response rate and containment policies. We then report estimates of the relationship between containment and contemporaneous economic, nutritional, and female well-being measures. Finally, we show that the point estimates are not sensitive to the inclusion of district-level controls for case rates and deaths.

Containment Measure. Since the end of the federal lockdown in May 2020, there are no centralized databases (even at the state level) containing complete information on India's patchwork of lockdown policies. To assemble this information, we asked households in the survey if they were currently experiencing containment restrictions and calculate the share of respondents in a district experiencing containment policies. Figure A1 reports the distribution of this measure and shows that the prevalence of containment policies varies widely across districts. Consistent with the fact that containment areas can be extremely localized (i.e. as small as an apartment building or street (Express News Service, 2020)), the district-level distribution shows substantial variation within districts in the proportion of respondents that report being affected by containment restrictions.

Figure 2 shows scatter plots that indicate that higher containment is associated with a worsening of all four female well-being outcomes and an increase in the fraction of households with reduced meals. Households in a higher containment area also report larger numbers of individuals who have lost income in their households.

Before continuing to the formal estimates of the relationship between containment and our outcomes of interest, we evaluate the scope for two potential sources of bias. We first evaluate whether district-level containment measures are correlated with prior district characteristics. Each row of Table A2 regresses a different pre-pandemic covariate on the district-level containment measure and reports the coefficient and standard error (columns 3 and 4). The top part of Table A2 reports the relationship between the containment measure and self-reported

normal income (row 1), an asset index constructed from the pre-pandemic baseline survey (row 2), and indicator variables for whether the household male and female heads have completed secondary school. The bottom part uses measures of the frequency with which individuals in a given district report eating different food types in the NFHS. These answers have been recoded so that a higher value indicates a higher likelihood of consumption and normalized so that the coefficients can be interpreted in terms of standard deviations.[11] Across 20 measures, the containment measure is only marginally significantly related to one female consumption measure (vegetable consumption), and the positive coefficient suggests that, if anything, areas with higher containment had better nutritional outcomes prior to the pandemic. Altogether, we conclude that a higher prevalence of containment policies in the future is not strongly related to baseline district characteristics, and there is certainly no evidence that districts with more containment are substantially poorer or more disadvantaged.

Second, in Figure A2, we examine whether response rates are differential by containment status. There is no overall relationship between containment and not being reached or being surveyed, suggesting limited scope for selection. However, areas with higher levels of containment do have statistically significantly lower refusal rates. While this is potentially concerning, because refusal rates are low, moving from a district with below-median to above-median containment only decreases refusal rates by 1.72 percentage points. Thus, we do not expect differential refusal to strongly bias our results, and we confirm that this is the case for our main estimates with Lee-style bounds (Lee, 2009).

Research Design. To examine the relationship between containment and different outcomes, we estimate the following regression:

$$y_{iasd} = \beta\, containment_d + \alpha_a + \delta_s + \mathbf{\Gamma X_i} + \epsilon_{iasd}, \tag{1}$$

where i denotes the respondent, a their age, s their state of residency, and d their district. y_{iasd} is the outcome variable, and $containment_d$ is the district-level measure of containment (the share of respondents in a district experiencing containment policies). All specifications include age fixed effects α_a and state fixed effects δ_s. The vector of controls $\mathbf{X_i}$ includes indicator variables for whether the district was in a red or orange zone in India's previous centralized lockdown during April and May 2020.[12] We include two additional sets of controls to assist in ruling out either simultaneous causality between containment and the negative outcomes we observe or omitted variable bias from pre-pandemic socioeconomic measures. First, we control for the cumulative per capita COVID-19 death and case rate between the start of the pandemic and the time of the survey to control for the direct effects of the health crisis. Second, we use double-lasso (Urminsky, Hansen and Chernozhukov, 2016) to select additional controls, which may improve power or balance, from the pre-pandemic socioeconomic measures from the survey

[11] The values were normalized with the full NFHS, so the means and SD are not exactly 0 and 1.

[12] India's central government classified all districts into green, orange and red zones, where red zones had the strictest mobility restrictions and green the most lenient. In June 2020, the centralized district-level restrictions were dismantled, and each state could demarcate their own containment regions.

(variables in the top part of Table A2). To maintain a consistent sample across regressions, we restrict the sample in all these regressions to individuals for whom these control variables are available.

Female Well-being. Table 1 reports the results from estimating Equation 1 in our sample. Containment is associated with a substantial and statistically significant increase in both the depression indicators: moving from 0 to 100% containment is related to a 24-25 percentage point (pp) increase in the likelihood that feelings of depression have worsened and a 36-37pp increase in the likelihood that feelings of tiredness have increased. Since the mean of the containment variable is equal to 0.554, moving from no containment to average levels of containment is associated with a 13-14pp increase in the likelihood that feelings of depression have worsened (39-40% of the variable mean) and a 20pp increase in the likelihood that feelings of tiredness have increased (73% of the variable mean). Containment is also associated with a significant increase in the anxiety measure. Moving from 0 to average containment is related to a 13pp increase in the likelihood that respondents feel more worried (45% of the variable mean). Finally, containment is also related to decreased feelings of safety, but these results are not statistically significant. For all the results in this table, the point estimates in the odd columns (without lasso or case and death rate controls) and even columns (with additional controls) are almost identical. Controlling for the direct health effects of the pandemic has no effect on the estimated relationship between containment and female well-being.

We report two robustness checks for these results. First, to ensure the relationships we observe in Table 1 are not driven by differential refusal, in Table A4, we construct Lee-style bounds of the relationship between containment and the outcomes (Lee, 2009). To facilitate the bounding exercise, for this table, our explanatory variable of interest is an indicator variable equal to 1 if a district has above median containment. The first column for each outcome reports the unadjusted coefficient with this regressor. In the second column, we re-run the regression after dropping the 1.72% of observations with the best outcomes in the below-median districts; this provides us with an estimate of the upper bound relationship between containment and the outcome. The third column reports the lower bound, as we drop the 1.72% of observations with the worst possible outcome. The resulting bounds are tight and indicate that differential non-response has little scope to bias the estimates. Second, to more richly control for the direct effects of the pandemic, and allow those effects to be non-linear, in Table A5, we control for up to third-degree polynomials in case and death rates. The relationship between containment and the mental health outcomes remains large and significant.

Socioeconomic and Nutritional Outcomes. Table 2 reports the relationship between containment and socioeconomic and nutritional measures from the phone survey, from Equation 1. Columns 1 and 2 examine the number of household members who experienced reductions in income. The point estimate indicates that moving from a district with 0% to 100% containment is related to an increase in the number of household members who have lost income by more than one member. Moving from no containment to average levels of containment is associated

with 0.6 additional household members who have lost income (a 51% increase relative to the mean of the dependent variable). In columns 3 and 4, the outcome is an indicator variable for whether the household had to reduce meals; the point estimates indicate that moving from no containment to full containment is associated with a 15pp increase in the likelihood of reducing meals. Hence, moving from no containment to average levels of containment is associated with a 8pp increase in the likelihood of reducing meals (a 33% increase relative to the mean of the dependent variable).

The final four columns examine the relationship between containment and food intake for men and women. Our outcome indices are formed by creating an indicator variable equal to 1 if an individual is below the gender-specific, district-level median food consumption for a food category in the pre-pandemic NFHS and then averaging over these indicator variables for all of the food categories for each individual. Thus, the regressions "control" for cross-district variation, since a positive coefficient for these estimates indicates that an individual is doing worse than her pre-pandemic *district-specific* average. Moving from a district with 0% to 100% containment is related to an increase in the share of food categories for which a woman's consumption is below her district's pre-pandemic median of 24pp. These estimates imply that moving from no containment to average levels of containment is associated with a 13pp increase in the share of food categories for which a woman's consumption is below her district's pre-pandemic median (a 33% increase relative to the dependent variable mean). For males, the coefficient is positive but not statistically significant and five times smaller. As before, across all outcomes, controlling for the direct health effects of the pandemic leaves the associations with containment unchanged.

The results in these last four columns underline the relationship between food insecurity and containment and suggest that food insecurity disproportionately impacts women. Further, they provide one potential mechanism for the negative mental health effects in Table 1. When there are negative economic shocks to households, women are particularly vulnerable to declines in consumption. Hathi et al. (2021) provide evidence in favor of such a connection: women who eat after men in their households also have worse mental health in the India Human Development Survey.

Turning to our two robustness tests, Table A6 reports the Lee-style bounds for the socioeconomic and nutritional outcomes, which are again tight. Table A7 reports the estimates including the richer controls for case and death rates. The point estimates are virtually identical.

5 Family Structure and Vulnerable Women

The results from Tables 1 and 2 speak to the vulnerability of women—a particularly hard to reach population in phone surveys in countries like India, especially during the pandemic. We now examine the relationship between the pandemic and the outcomes of women who are in a more vulnerable position in the household. We focus on women with daughters, because son preference is common in India (Jayachandran, 2015) and having a daughter (rather than a son)

may lower a woman's status. Indeed, Milazzo (2018) finds that having a daughter rather than a son increases a woman's likelihood of experiencing anemia and intimate partner violence. We also examine whether female-headed households fare worse, although we caution these results are suggestive since these households are also likely to be of lower socioeconomic status.

Empirical Strategy. To examine the relationship between family structure and female well-being, we estimate the following regression:

$$y_{iasd} = \beta_1 \, has\_son_i + \beta_2 \, has\_daughter_i + \beta_3 \, female\_headed_i + \alpha_a + \delta_s + \mathbf{\Gamma X_i} + \epsilon_{iasd}, \quad (2)$$

where i denotes an individual, a the respondent's age, s the respondent's state of residency, and d the district, y_{iasd} is the outcome variable, and has_son_i and $has\_daughter_i$ are indicator variables denoting whether the respondent has a son or daughter. $female\_headed_i$ denotes whether the respondent lives in a household where the head is female. The fixed effects and other controls are the same as in the previous equation.

Results. Table 3 reports the results from estimating Equation 2 in our sample. Having a daughter is associated with a substantial and statistically significant decrease in mental health. If the woman has a daughter, she is 9pp more likely to have worsening feelings of depression and 10pp more likely to have worsening feelings of tiredness. Having a daughter is also associated with a statistically significant effect on the anxiety and safety measures, leading to a 7pp increase in the likelihood that respondents are more anxious and a 10pp increase in the likelihood that they feel less safe when moving from zero to 100% containment. The latter finding may capture an increased threat of intimate partner violence. These negative effects appear to be specific to women with daughters rather than women with children. The effects associated with having a son are small, statistically insignificant and not systematically positive. While we lack the precision to reject that the coefficients on having a son and daughter are the same in all cases, we can reject that they are the same for safety at the 5 percent level.

The effects on well-being are also exacerbated when the head of the household is female, although we caution that female-headed household's socioeconomic status could also be systematically different from male-headed households.[13] When the respondent lives in a female headed household, she is 12-14pp more likely to have worsening feelings of depression and 9-11pp more likely to have worsening feelings of exhaustion when moving from zero to 100% containment. Living in a female-headed household is also significantly associated with the safety measure, leading to a 12-13pp increase in the likelihood that respondents feel less safe.

[13] Around 20 percent of the households in the data have a female-headed household. Among these households, 84 percent of the female heads are currently married, and 13 percent are widowed. Anderson and Ray (2019) document that widows are particularly vulnerable in India.

6 Discussion and Policy Implications

We find that the onset of the COVID pandemic is associated with adverse outcomes for women's mental health, household food security, and incomes in India. In addition to the aggregate shock, there is evidence that increased containment measures are associated with worse outcomes, demonstrating that movement restrictions are materially important. In areas with greater exposure to containment policies, women experienced greater declines in mental health and well-being, as well as decreased food security.

Moreover, we show that women who are in a more vulnerable position in the household are more likely to experience declines in mental health and show increased concern for their safety. While potentially crucial for public health purposes, containment is associated with large negative consequences for both standard socioeconomic outcomes and outcomes that are harder to observe and measure, like mental health. This may be especially the case in low-income contexts with limited social insurance, where more vulnerable populations — such as Indian women — may be particularly harmed by both the direct effects of the pandemic and these policies. Furthermore, some of the important negative consequences of lockdowns may be hidden in more standard socioeconomic datasets that do not collect information on mental health.

These results have strong implications for economic policy, as policymakers should target aid, particularly access to food, to vulnerable households and women. As vaccine disparities in lower-income countries persist, and other pandemics are likely, understanding the consequences of the pandemic and containment policies is crucial for policymakers.

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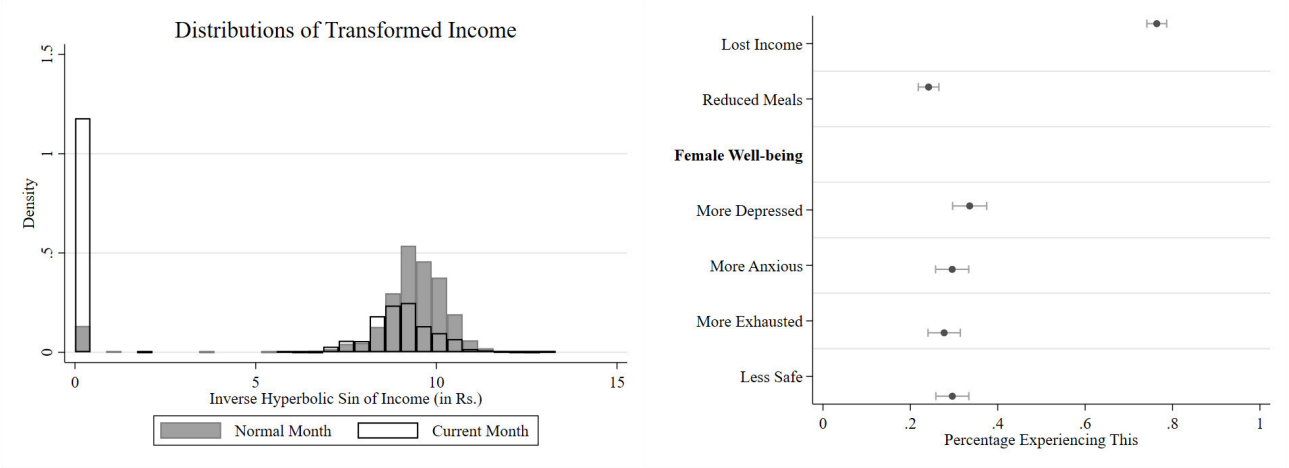
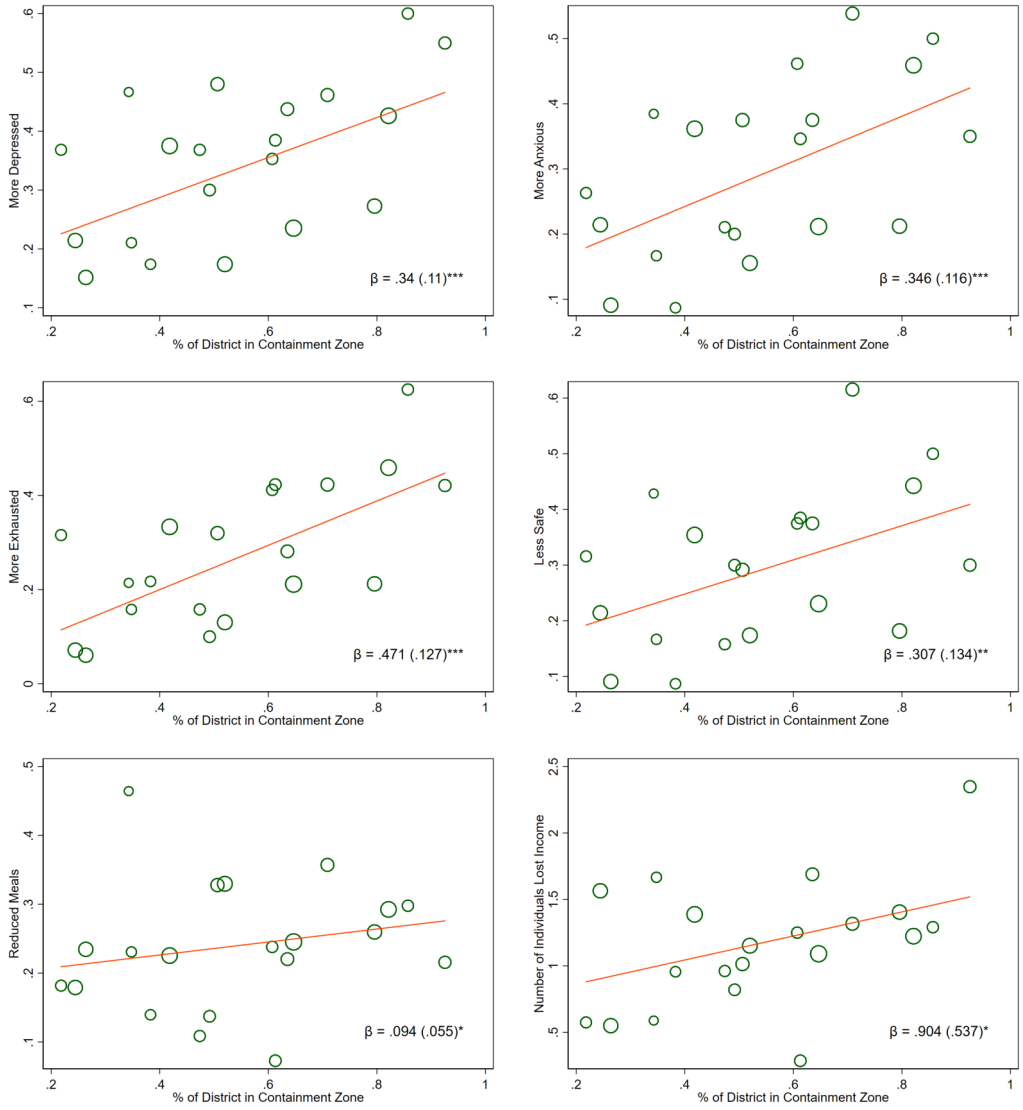
Figures and Tables

Figure 1: Impact of Aggregate Shock on Income and Female Well-Being



Notes: The left sub-figure reports the distribution of the inverse hyperbolic sine of the household head's self-reported income in the current month and a normal month in rupees. The right sub-figure reports the percentage of households reporting reduced income, reduced meals, and worsening measures of female well-being. 'Lost Income' is the fraction of households where the head reported less income in the current month than a normal month. For each member in the household roster, we ask if they reduced the number/size of daily meals, and report the fraction of households where at least one member reduced meals. The outcomes for female well-being (e.g., more depressed) were elicited by asking "Have these feelings become worse now compared to before the Covid crisis?" The figure reports the fraction of households with women reporting worse well-being.

Figure 2: Female Well-being and Socioeconomic Outcomes by Containment Intensity



Notes: This figure reports district-level relationships between women's well-being (or household's socioeconomic outcomes) and the fraction of a district in a containment zone. Each point represents a district-level average, with bubble size weighted by sample size. β reports the regression coefficient, with standard errors clustered at the district level in parentheses. *,**, and *** denote 10, 5, and 1% significance respectively. The outcomes for female well-being (e.g., more depressed) were elicited by asking "Have these feelings become worse now compared to before the Covid crisis?" The 'Reduced Meals' measure is an indicator variable for whether the head reported reducing the number/size of meals for at least one person in the household. The 'Number of Individuals Lost Income' measure is the number of adults who contribute to the income of the household who have lost their job or had their income reduced due to COVID.

Table 1: Relationship between Containment and Female Well-being

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	More Depressed		More Exhausted		More Anxious		Less Safe	
Containment	0.248**	0.240***	0.363*	0.366***	0.263	0.242***	0.148	0.127
	(0.113)	(0.0717)	(0.176)	(0.120)	(0.155)	(0.0733)	(0.151)	(0.131)
Past Containment Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Controls	No	Yes	No	Yes	No	Yes	No	Yes
Case and Death Controls	No	Yes	No	Yes	No	Yes	No	Yes
Dep Var. Mean	0.344	0.344	0.276	0.276	0.301	0.301	0.299	0.299
Adjusted R-squared	0.010	0.027	0.022	0.056	0.023	0.053	0.006	0.026
Observations	489	489	489	489	489	489	489	489

Notes: This table reports the relationship between district-level containment and female well-being relative to their well-being before the Covid crisis using Equation 1. In columns (1) & (2), the outcome is an indicator variable that the respondent feels more depressed. In (3) & (4), it is an indicator variable for feeling more exhausted. In (5) & (6), it is an indicator variable for feeling more anxious. Finally in (7) & (8), it is an indicator variable for feeling less safe. Standard errors are clustered at the district level. *,**, and *** denote 10, 5, and 1% significance respectively.

Table 2: Relationship between Containment and Socioeconomic and Nutritional Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					Below Median Consumption for:			
	Num. Lost Income		Reduced Meals		Male		Female	
Containment	1.087**	1.097***	0.153**	0.150**	0.0554	0.0544	0.235**	0.236**
	(0.386)	(0.339)	(0.0668)	(0.0635)	(0.104)	(0.101)	(0.102)	(0.0892)
Past Containment Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Controls	No	Yes	No	Yes	No	Yes	No	Yes
Case and Death Controls	No	Yes	No	Yes	No	Yes	No	Yes
Dep Var. Mean	1.183	1.183	0.250	0.250	0.333	0.333	0.390	0.390
Adjusted R-squared	0.102	0.107	0.029	0.028	0.055	0.085	0.033	0.081
Observations	1057	1057	1057	1057	1057	1057	1057	1057

Notes: This table reports the relationship between district-level containment and socioeconomic and nutritional outcomes from Equation 1. In columns (1) & (2), the outcome is the number of household members who lost their job or income. In columns (3) & (4), it is an indicator variable for whether the household reduced meals for at least one member. In columns (5)-(8), it is an indicator for the share of food categories for which the respondent's intake is below the gender-specific district-level median in the pre-pandemic NFHS. Standard errors are clustered at the district level. *,**, and *** denote 10, 5, and 1% significance respectively.

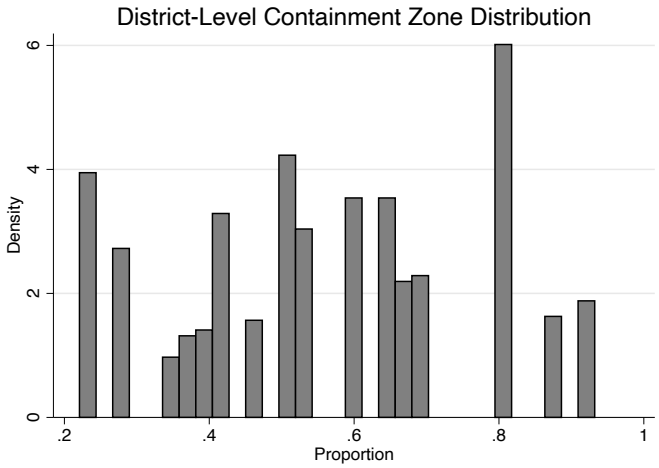
Table 3: Relationship between Household Structure and Female Well-being

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	More Depressed		More Exhausted		More Anxious		Less Safe	
Has Daughter	0.0925**	0.0920**	0.104***	0.104***	0.0743**	0.0765**	0.103**	0.0977**
	(0.0421)	(0.0424)	(0.0357)	(0.0356)	(0.0348)	(0.0363)	(0.0379)	(0.0416)
Has Son	0.0362	0.0360	0.00777	0.00796	0.0101	0.0107	-0.0158	-0.0110
	(0.0548)	(0.0571)	(0.0409)	(0.0444)	(0.0562)	(0.0601)	(0.0512)	(0.0524)
Female Headed Houshold	0.124***	0.137***	0.0901**	0.107***	0.0395	0.0533	0.119**	0.130**
	(0.0349)	(0.0328)	(0.0397)	(0.0371)	(0.0449)	(0.0413)	(0.0513)	(0.0462)
Past Containment Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Controls	No	Yes	No	Yes	No	Yes	No	Yes
Case and Death Controls	No	Yes	No	Yes	No	Yes	No	Yes
Dep Var. Mean	0.344	0.344	0.277	0.277	0.302	0.302	0.302	0.302
Adjusted R-squared	0.023	0.037	0.024	0.051	0.020	0.045	0.028	0.048
Observations	483	483	483	483	483	483	483	483
P Value of Difference	0.322	0.332	0.061	0.066	0.246	0.238	0.011	0.023

Notes: This table reports the relationship between household structure and female well-being from Equation 2. The p-value from testing the equality of the coefficients is reported in the last row. All outcomes report well-being relative to before the Covid pandemic. In columns (1) & (2), the outcome is an indicator variable for the respondent feeling more depressed. In (3) & (4), it is an indicator variable for feeling more exhausted. In (5) & (6), it is an indicator variable for feeling more anxious. Finally in (7) & (8), it is an indicator variable for feeling less safe. Standard errors are clustered at the district level. *,**, and *** denote 10, 5, and 1% significance respectively.

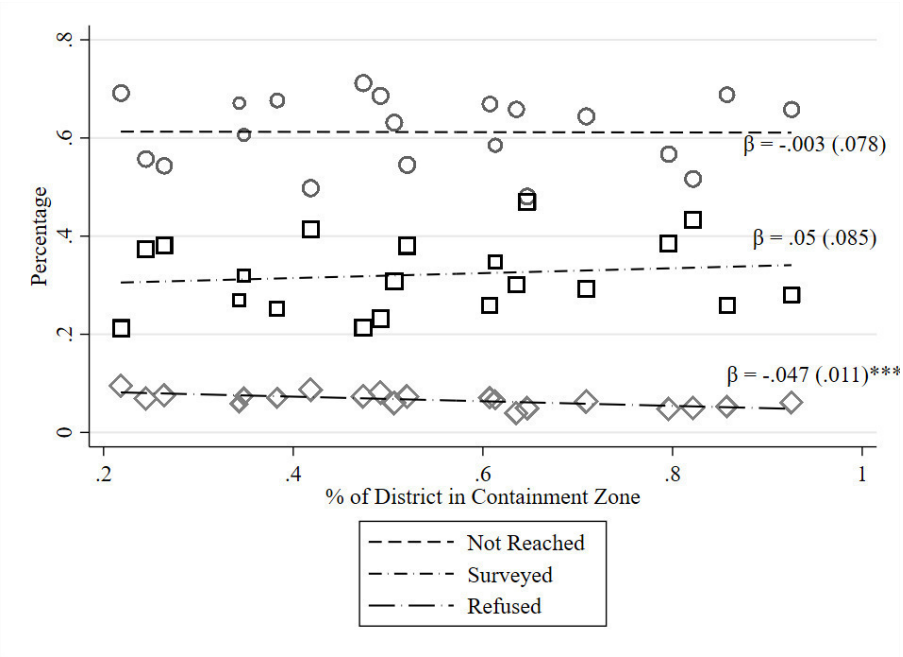
Online Appendix

Figure A1: Distribution of Containment Measure



This figure reports the distribution of the district-level average of households' responses to a question regarding whether they were currently subject to containment policies.

Figure A2: Response Rate Variation by Containment



This figure reports how different kinds of response rates (refusal, not-reached, and surveyed) vary with district-level containment.

Table A1: Summary Statistics

	Mean	SD	25 Pct	50 Pct	75 Pct	Obs
Socioeconomic Status						
Num Lost Income	1.183	1.313	0	1	2	1057
Reduced Meals in Household	0.250	0.433	0	0	0	1057
Days wished for more food...						
For self	0.894	1.804	0	0	1	1008
For children	1.193	2.165	0	0	2	954
Share below-median food categories (Male)	0.333	0.281	0	0.25	0.5	1057
Share below-median food categories (Female)	0.390	0.297	0.25	0.25	0.5	1057
Mental Health						
Female Depression Worse	0.344	0.475	0	0	1	489
Female Anxiety Worse	0.301	0.459	0	0	1	489
Female Exhaustion Worse	0.276	0.448	0	0	1	489
Female Safety Worse	0.299	0.458	0	0	1	489

Notes: This table reports summary statistics for our main outcomes. The measures in the top half are socioeconomic and nutritional outcomes: row 1 is the number of people who lost income in a household, row 2 is an indicator for whether they reduced meals for anyone in the household, row 3 and 4 are the number of days they wished for more food for themselves and their children respectively, rows 5 and 6 are an average over food categories of indicator variables for whether an individual's intake is below the median for his/her district-gender specific intake in the pre-pandemic NFHS. The bottom half are measures for female well-being: rows 7-10 are indicator variables for whether the female respondent's feelings of depression, anxiety, exhaustion and safety worsened compared to before the pandemic.

Table A2: District-Level Balance on Containment Table

	Mean	SD	Containment Coef.	Se	N
Pre-Treatment Outcomes in Survey Sample					
IHS(Pre-pandemic Income)	8.910	2.346	0.190	0.535	1389
Asset Index	0.000	1.779	-1.214	0.841	1538
Male Head Completed Secondary	0.589	0.492	-0.069	0.118	1468
Female Head Completed Secondary	0.450	0.498	-0.022	0.139	1461
NFHS 4 Female Consumption (Normalized)					
Milk	-0.166	0.970	-0.029	0.320	22012
Pulses	0.159	1.009	0.478	0.477	22012
Veg	0.016	1.010	0.855*	0.461	22012
Fruits	-0.348	0.845	-0.137	0.189	22012
Eggs	-0.212	0.949	-0.158	0.425	22012
Fish	-0.148	0.897	-0.010	0.483	22012
Meat	-0.156	0.953	-0.190	0.406	22012
NFHS 4 Male Consumption (Normalized)					
Milk	-0.214	0.995	0.129	0.295	2992
Pulses	0.086	0.988	0.379	0.513	2992
Veg	-0.194	1.028	0.435	0.414	2992
Fruits	-0.322	0.882	-0.060	0.238	2992
Eggs	-0.222	0.996	0.037	0.431	2992
Fish	-0.126	0.935	0.078	0.511	2992
Meat	-0.213	0.981	-0.101	0.463	2992

Notes: This table reports the relationship between containment and different pre-pandemic measures. The measures in the top third of the table are drawn from our survey sample: row 1 is self-reported normal income, row 2 is an asset index constructed from the pre-pandemic baseline survey, and rows 3 and 4 are indicator variables for whether the household male and female heads have completed secondary school. The measures in the bottom part are drawn from the NFHS Round 4. These are measures of the frequency with which individuals in a given district report eating different food types (on a scale of 1-4). These answers have been recoded so that a higher value indicates a higher likelihood of consumption and normalized so that the coefficients can be interpreted in terms of standard deviations. Standard errors are clustered at the district level. *,**, and *** denote 10, 5, and 1%significance respectively.

Table A3: Relationship between Response and Wealth

	(1) Completed	(2) Not Reached	(3) Refused
Asset Index	0.00998**	-0.0178***	0.00778***
	(0.00455)	(0.00507)	(0.00198)
Constant	0.322***	0.612***	0.0662***
	(0.0181)	(0.0174)	(0.00347)
Dep Var. Mean	0.322	0.612	0.0662
Adjusted R-squared	0.00100	0.00332	0.00239
Observations	4774	4774	4774

Notes: This table reports the relationship between a household's asset index and an indicator for whether they completed the survey (column (1)), whether they could not be reached (column (2)) and whether they refused to participate in the survey (column (3)). Standard errors are clustered at the district level. *,**, and *** denote 10, 5, and 1% significance respectively.

Table A4: Bounds for Relationship between Containment and Female Well-being

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	More Depressed			More Exhausted			More Anxious			Less Safe		
High Containment	0.0894**	0.0880*	0.0802*	0.197***	0.202***	0.192***	0.135***	0.140***	0.133***	0.128**	0.135***	0.120**
	(0.0404)	(0.0424)	(0.0436)	(0.0359)	(0.0356)	(0.0368)	(0.0330)	(0.0327)	(0.0349)	(0.0467)	(0.0472)	(0.0474)
Past Containment Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Case and Death Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dep Var. Mean	0.334	0.335	0.327	0.277	0.279	0.270	0.299	0.302	0.293	0.297	0.300	0.291
Adjusted R-squared	0.029	0.027	0.031	0.067	0.068	0.069	0.056	0.056	0.058	0.029	0.032	0.033
Observations	560	526	526	560	555	555	552	547	547	558	553	553

Notes: This table reports the relationship between an indicator for above-median containment and female well-being relative to their well-being before the Covid crisis, bounding the effects of differential refusal rates. The first column for each outcome is created with the full sample, while the second column provided an upper bound, and the third column provided a lower bound. In columns (1), (2) & (3), the outcome is an indicator variable that the respondent feels more depressed. In (4), (5) & (6), it is an indicator variable for feeling more exhausted. In (7), (8) & (9), it is an indicator variable for feeling more anxious. Finally in (10), (11) & (12), it is an indicator variable for feeling less safe. Standard errors are clustered at the district level. *,**, and *** denote 10, 5, and 1% significance respectively.

Table A5: Relationship between Containment and Female Well-being with Semi-Parametric Case and Death Rate Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	More Depressed		More Exhausted		More Anxious		Less Safe	
Containment	0.248**	0.208**	0.363*	0.410***	0.263	0.269***	0.148	0.192
	(0.113)	(0.0951)	(0.176)	(0.0902)	(0.155)	(0.0757)	(0.151)	(0.114)
Past Containment Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Controls	No	Yes	No	Yes	No	Yes	No	Yes
Cases & Deaths (3rd deg polynomial)	No	Yes	No	Yes	No	Yes	No	Yes
Dep Var. Mean	0.344	0.344	0.276	0.276	0.301	0.301	0.299	0.299
Adjusted R-squared	0.010	0.014	0.022	0.046	0.023	0.043	0.006	0.014
Observations	489	489	489	489	489	489	489	489

Notes: This table reports the relationship between district-level containment and female well-being relative to their well-being before the Covid crisis using Equation 1 controlling for up to third-degree polynomials in case and death rates. In columns (1) & (2), the outcome is an indicator variable that the respondent feels more depressed. In (3) & (4), it is an indicator variable for feeling more exhausted. In (5) & (6), it is an indicator variable for feeling more anxious. Finally in (7) & (8), it is an indicator variable for feeling less safe. Standard errors are clustered at the district level. *,**, and *** denote 10, 5, and 1% significance respectively.

Table A6: Bounds for Relationship between Containment and Socioeconomic and Nutritional Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
								Below Median Consumption for:				
	Num. Lost Income			Reduced Meals			Male			Female		
High Containment	0.339**	0.353**	0.250*	0.0638**	0.0682**	0.0480*	0.0735	0.0799*	0.0621	0.132***	0.142***	0.120**
	(0.142)	(0.140)	(0.137)	(0.0248)	(0.0246)	(0.0255)	(0.0428)	(0.0436)	(0.0440)	(0.0436)	(0.0445)	(0.0441)
Past Containment Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Case and Death Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dep Var. Mean	1.163	1.178	1.121	0.239	0.242	0.232	0.335	0.338	0.329	0.390	0.393	0.382
Adjusted R-squared	0.081	0.084	0.095	0.021	0.020	0.023	0.066	0.068	0.065	0.059	0.067	0.065
Observations	1276	1267	1267	1212	1200	1200	1210	1196	1196	1175	1155	1155

Notes: This table reports the relationship between an indicator for above-median containment and socioeconomic and nutritional outcomes, bounding the effects of differential refusal rates. The first column for each outcome is created with the full sample, while the second column provides an upper bound, and the third column provides a lower bound. In columns (1), (2) & (3), the outcome is the number of household members who lost their job or income. In columns (4), (5) & (6), it is an indicator variable for whether the household reduced meals for at least one member. In columns (7)- (12), it is an indicator for the share of food categories for which the respondent's intake is below the gender-specific district-level median in the pre-pandemic NFHS. Standard errors are clustered at the district level. *,**, and *** denote 10, 5, and 1% significance respectively.

Table A7: Relationship between Containment and Socioeconomic and Nutritional Outcomes with Semi-Parametric Case and Death Rate Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					Below Median Consumption for:			
	Num. Lost Income		Reduced Meals		Male		Female	
Containment	1.087**	1.183***	0.153**	0.219***	0.0554	0.0123	0.235**	0.251***
	(0.386)	(0.185)	(0.0668)	(0.0576)	(0.104)	(0.0774)	(0.102)	(0.0818)
Past Containment Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Controls	No	Yes	No	Yes	No	Yes	No	Yes
Cases & Deaths (3rd deg polynomial)	No	Yes	No	Yes	No	Yes	No	Yes
Dep Var. Mean	1.183	1.183	0.250	0.250	0.333	0.333	0.390	0.390
Adjusted R-squared	0.102	0.113	0.029	0.029	0.055	0.087	0.033	0.075
Observations	1057	1057	1057	1057	1057	1057	1057	1057

Notes: This table reports the relationship between district-level containment and socioeconomic and nutritional outcomes from Equation 1 controlling for up to third-degree polynomials in case and death rates. In columns (1) & (2), the outcome is the number of household members who lost their job or income. In columns (3) & (4), it is an indicator variable for whether the household reduced meals for at least one member. In columns (5)-(8), it is an indicator for the share of food categories for which the respondent's intake is below the gender-specific district-level median in the pre-pandemic NFHS. Standard errors are clustered at the district level. *,**, and *** denote 10, 5, and 1% significance respectively.