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An examination of multiple illness and social related stressors during the COVID-19 pandemic on maternal and child mental health; findings from a birth cohort in rural Pakistan

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Abstract

Purpose In an effort to improve preparation for future pandemics, researchers continue to examine the myriad psychosocial pathways through which the COVID-19 pandemic impacted mental health. Moving beyond extant research on factors such as financial difficulties or social isolation, we present findings on two less documented pathways: (a) COVID illness and death within one's social network and (b) experiencing pandemic-related basic needs stressors, beyond financial difficulties, on the mental health of mothers and children in South Asia.

Methods Data come from the 2021–2022 wave of the Bachpan birth cohort (6-year-old children, $n = 814$ mother-child dyads) in rural Pakistan. Multivariable regressions were used to estimate the association between COVID illness/death among family/friend/community members and basic needs stressors (e.g. difficulties with food, housing, medical care) with 4 outcomes: maternal anxiety (GAD-7) and depression symptoms (PHQ-9), and child emotional/behavioral problems (SDQ-TD) and anxiety (SCAS).

Results Maternal mental health was independently predicted by illness within the mother's network and basic needs stressors, even after accounting for pre-pandemic socioeconomic status, depression, and pandemic-related financial stressors. Specifically, having a family member/friend who became ill was associated with 1.29 higher PHQ-9 scores (95% CI: 0.34, 2.24), compared to those who did not know anyone affected. Increased basic needs stressors were also associated with higher PHQ-9 and GAD-7 levels and children's behavioral/emotional problems and anxiety. Social network proximity to COVID illness/death was not associated with child mental health outcomes.

Conclusion These findings provide evidence of additional pathways through which prolonged global events, like the pandemic, can have multigenerational mental health impacts.

Keywords COVID-19, Depression, Anxiety, Child mental health, Social stressors, Mechanisms

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Introduction

The COVID pandemic was a major crisis that disrupted societal well-being globally. Elucidating the pathways with which such events impact population health is of increasing importance to researchers and policy makers. The documented and wide-ranging impact of the COVID pandemic on adult and child mental health suggests the presence of multiple, distinct, pathways influencing key outcomes [1, 2]. A better understanding of diverse potential pathways is not only key to understanding the heterogeneous impacts of the pandemic, but also to design strategies to lessen the deleterious impacts of future crises. Furthermore, evidence from diverse populations globally is necessary to ensure that any knowledge gained is not limited to a small proportion of the world's population.

In addition to direct impacts of the COVID illness itself, the most commonly documented psychosocial stressors involve financial difficulties stemming from a reduction in working hours and income [3]. Other stressors that have been linked with mental health include social isolation, lack of social support, and disruptions to physical activity, all salient for parents and children [4]. While numerous other pathways likely exist, the vast majority of the extant COVID pandemic literature has focused on the aforementioned avenues. In this analysis, we expand the scope of potential pathways through which the pandemic may impact mental health by focusing on the experiences of (a) COVID illness and death within one's social network and (b) pandemic-related basic needs stressors. We examine the association between these factors and mental health, above and beyond impacts of financial stressors. Furthermore, to more fully document the impact of these exposures on family mental health, we present findings with both maternal and child outcomes.

Illness and death in a person's social network

Pre-pandemic literature on the mental health impact of serious illness within one's close network [5] suggests similar findings may exist for knowing people who had severe illness or died from COVID. Indeed, emerging evidence from Brazil and the US suggests that severe illness or death among friends and family is correlated with worse mental health and wellbeing outcomes among adults [6–8]. Illness in one's network can be a stressor through social and psychological avenues. More numerous/severe cases of illness among an individual's family, friends, or neighbors makes the disease more salient and worries about contracting the virus might lead to heightened anxiety and self-induced withdrawal from social interactions, exacerbated by caregiving activities for the ill. Furthermore, households with ill members may experience stigma from their communities, intensifying social isolation and reducing access to social support [9].

Experiences of stigma might further exacerbate existing social divisions such as those resulting from socioeconomic status, ethnicity, or religion. Within families with COVID-related deaths, cultural practices that offer support such as large funerals were restricted during the lockdowns. This would further deprive individuals of community support, potentially prolonging their grieving. More evidence is needed to document the extent to which illness and death among one's network independently impacts people's mental health.

Pandemic-related basic needs stressors above and beyond financial impacts

Although a substantial body of evidence has documented the impact of pandemic financial stressors like reduced work or income on mental health, other basic needs stressors have received less attention [10]. Importantly, as infection levels rose, lockdowns impacted access to key services, including medical care, food, and housing, as well as overall feelings of safety and security, especially in Low-and-Middle Income (LMIC) settings [11]. For example, supply chain issues led to food shortages of uncertain duration, a significant stressor especially for families with children [12]. Many clinics and hospitals stopped accepting most patients, and those that remained open were often difficult to reach due to road closures [13]. Even those who managed a consultation on the phone struggled to get medications due to pharmacies closing and restrictions on movement [14]. As the pandemic wore on, concerns related to one's homestead such as access to livestock feed became more prominent, especially in rural areas [15]. Many of the closures and restrictions on mobility were often enforced by an increased police presence, further contributing to a feeling of overall community tension [16]. These basic needs stressors are distinct, and may function independently, from those directly posed by reductions of working hours and income, which are more documented [3, 10]. These basic needs stressors also have the potential to impact mental health independently from exposure to COVID-19 illness or death in one's social network. Even without interpersonal exposure to COVID-19, the global disruption to services, food supply, healthcare, and social institutions may have adversely affected mental health.

Family level and intergenerational impacts

Although multiple studies have demonstrated that pandemic stressors were associated with worse mental health among mothers and their children [17], it is not well understood how much of the impact on children was independent of the household's prior level of vulnerability or their parents' concurrent mental health. Several researchers have reported that financial difficulties predict worse child mental health in the presence of

increased maternal distress, with little or no impacts on children when maternal distress did not increase [18–21]. Other studies have documented distinct trajectories and predictors of maternal vs. child mental health during the pandemic [17, 22]. While these studies likely reflect complex underlying family dynamics and processes, they do suggest that how a child experienced the pandemic is, at least partially, influenced by the state of the household before and during the pandemic. Examining pandemic impacts on both maternal and child mental health in the same household sheds light on these dynamics.

To better understand the impact of the pandemic on these intergenerational processes, it is also crucial to incorporate information on the pre-pandemic state of the household in terms of SES and pre-existing mental illness. The lack of such pre-pandemic data in many studies makes it difficult to isolate the impact of the pandemic itself. In the current study, we focus on two pathways between the COVID pandemic and maternal and child mental health that have received relatively less attention: (a) the presence of COVID illness and death in one's social network and (b) the experience of pandemic-related basic needs stressors beyond financial difficulties, such as difficulties in accessing food or medical care.

We locate this analysis in Pakistan, where experience of the pandemic was similar to that of other LMICs, especially in Asia, although illness and death rates varied widely across the region [23]. The first COVID-19 wave occurred during March–October 2020. It began with a 2-week country wide lockdown, which was then followed by a series of 'smart lockdowns' which were meant to reflect local outbreak trends [24]. We leverage data from the January 2021–August 2022 data collection wave of the Bachpan birth cohort (when the children were 6 years old). This 20-month period of data collection spanned both a resurgence of COVID illnesses (including the sixth wave during summer 2022) as well as an overall tapering of infection rates. Furthermore, by this time the vast majority of the population were vaccinated [25]. This data was combined with pre-pandemic data on prior socioeconomic status and maternal and child mental health. This will allow us to describe the extent to which different pandemic stressors directly impact maternal and child mental health, and whether any impacts on child mental health remain after controlling for concurrent maternal mental health. Specifically, we hypothesize that (a) COVID-19 illness in one's social network and (b) basic needs stressors will independently predict maternal and child mental health symptoms, above and beyond financial stressors.

Methods

Study sample

This analysis uses data from the Bachpan Study, a birth cohort with an embedded cluster-randomized controlled trial of an adaptive cognitive behavioral therapy-based intervention for perinatal depression [26, 27]. Participants were recruited from 40 village clusters outside Rawalpindi, Pakistan from October 14, 2014 to February 25, 2016. Pregnant women aged 18 or older were screened for depression using the Patient Health Questionnaire (PHQ-9), and those scoring 10 or higher were included in the trial. Village clusters were randomly assigned to the intervention, Thinking Healthy Programme – Peer-Delivered Plus (THPP+), or control, enhanced usual care (EUC). For every woman who screened positive for depression, the next non-depressed woman in the same village cluster was invited to the cohort only portion of the study, resulting in a 1:1 ratio of depressed to non-depressed women at baseline. Mother-child dyads in both the trial and cohort sections of the study ($N=1,154$) were followed up through baseline (pregnancy), 3 months, 6 months, 1 year, 2 years, 3 years, 4 years, and 6 years postpartum, with data collection for 7 and 8 years ongoing. Data are collected through face-to-face interviews, either in the woman's home or the local community health worker house, per the woman's preference.

Data in this analysis are drawn primarily from the 6-year wave, which was conducted between December 2021–August 2022. Covariate data is drawn from previous waves as appropriate.

Ethics statement

Before joining the study, all participants provided written consent, if a participant was not able to sign the form herself, a witness signed on her behalf. The research was approved by the Institutional Review Boards of the Human Development Research Foundation, Duke University, and University of North Carolina Chapel Hill in accordance with the "common Rule" in the Belmont Report of the Declaration of Helsinki.

Variables

Known COVID illness or death within one's social network

Participants were asked the following questions: 'Did anyone in your community get coronavirus/COVID-19?', 'Did any of your friends or relatives get coronavirus/COVID-19?', 'Did anyone in your household get coronavirus/COVID-19?', 'Did you get coronavirus/COVID-19?', and 'Do you know someone who died from COVID-19?'. If participants said 'yes' to knowing someone who died from COVID-19, they were asked whether family, friends, people in their community/anyone else died. A COVID-19 illness & death variable was created with five

mutually exclusive categories ordered from least to most severe:

- (1) those who did not know anyone who became infected with (including themselves), or died from, COVID-19 (completely unexposed);
- (2) those who only knew of people in the community who were infected with COVID-19. Among this group, the participant reported that neither herself, her family, nor friends were infected with COVID-19; nor did she know anyone who died from COVID-19;
- (3) those who only knew people in the community who died of COVID-19. Among this group, none of the participant's friends or family had COVID or died from COVID;
- (4) those who reported that they, a friend, or a family member had COVID-19 infection but did not die from COVID-19; and.
- (5) those who reported that a friend or family member died from COVID-19.

Pandemic-related basic needs and financial stressors

Participants were asked about difficulties experienced by their household during the pandemic. To elucidate patterns between pandemic-related stressors and mental health outcomes, stressors were broadly divided into basic needs and financial. While the two are related, the basic needs stressors were meant to capture problems experienced even in the absence of any financial stressors.

- (a) To assess basic needs stressors, participants were asked whether they experienced an improvement, no change, or worsening in several community and service access domains 'since COVID-19'. These included: difficulties in terms of food; medical care; housing situation; feeling safety/protection; and fair access to services. Using these items, we created an index score where one point was added for each of these questions answered 'worse than before', resulting in a score ranging from 0 to 5, with higher scores representing greater exposure to stressors.
- (b) To assess financial stressors, participants were asked five questions, with response options of 'not true', 'somewhat true', and 'very true': whether their family's income decreased, whether their family had to reduce working hours, if someone in the family had to find a new income-generating activity, whether someone in the family lost their job temporarily, and whether someone lost their job permanently. For each answer of 'somewhat true' or 'very true', one point was added to the financial stressors score, ranging from 0 to 5, with higher

scores representing more exposure to financial stressors.

Maternal depression symptoms

Maternal depression was assessed using the Patient Health Questionnaire (PHQ-9) [28]. The PHQ-9 is a 9-item screening tool inquiring about frequency of depression symptoms in the last two weeks. The PHQ-9 has been widely used across a range of cultural contexts, and is validated for use in the Bachpan cohort [29]. PHQ-9 score was modeled as a continuous variable ranging from 0 to 27 with higher scores representing higher depression symptoms.

Maternal anxiety symptoms

Maternal anxiety was assessed using the Generalized Anxiety Disorder 7-item (GAD-7) [30]. The GAD-7 is a screening tool inquiring about anxiety symptoms in the last two weeks and has been validated for use in Urdu speakers [31]. GAD-7 score was modeled as a continuous variable ranging from 0 to 21 with higher scores representing higher anxiety symptoms.

Child emotional and behavioral problems

The maternal-reported Strengths and Difficulties Questionnaire (SDQ) was used to assess child emotional and behavioral problems. The SDQ consists of 25 items covering emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior. The SDQ has been validated for use in Pakistan [32]. A sum of items excluding the prosocial domain generates the Total Difficulties (TD) score, with a range of 0–40, with higher scores representing higher levels of problems [33].

Child anxiety symptoms

Child anxiety was measured using the generalized anxiety subscale of the parent-reported Spence Children's Anxiety Scale (SCAS). The SCAS has been validated for use in Pakistan [34]. This 6-item subscale has a range of 0–18, with higher scores representing greater levels of generalized anxiety [35].

Additional covariates

Several other variables were identified as potential confounders and included in the analyses. These include: maternal age, nuclear vs. non-nuclear family structure (assessed at baseline); child sex; SES represented by household asset score (from the 2-year wave as the most proximal assessment preceding the 6-year wave) [36]; interviewer ID, and an ordinal variable ranging from 0 to 3 indicating degree of national-level stay at home measures during date of interview [37] (all from 6 year wave).

Statistical analysis

The impact of COVID illness/death in one's network and pandemic-related stressors on maternal and child mental health at the 6-year wave was estimated using separate linear regression models for each mental health outcome. All models contained both covid illness/death and pandemic-related stressor predictors.

The modelling strategy for maternal PHQ-9 and GAD-7 outcomes included covariates for maternal age, household structure, SES, interviewer ID, and indicator of stay-at-home measures during date of interview [37]. All models also adjusted for previous maternal mental health using the PHQ-9 and GAD-7 scores, respectively, from the 4-year wave, the most proximal wave to the outcome wave.

The modelling strategy for child behavioral/emotional problems (SDQ-TD) and child generalized anxiety (SCAS) included adjusting for child's sex, household structure, SES, interviewer ID, stay at home measures during interview date, and mother's PHQ-9 score at the 4-year wave. For the SDQ-TD models only, we also adjusted for previous SDQ-TD score, measured at the 3-year wave, the most proximal wave to the outcome wave. The child anxiety SCAS scale was included in the survey for the first time at the 6-year wave, so previous anxiety was not adjusted for. For both child mental health outcomes, a supplementary set of models further adjusted for concurrent maternal PHQ-9 score. Finally, for both maternal and child models, exploratory analyses modelled each of the basic needs stressors as individual variables to assess whether the model was driven by a specific subset of stressors. Child models were also stratified by maternal depression and child gender.

Of 1,154 women interviewed at baseline (during pregnancy), 898 were interviewed at the 6-year wave. Multiple imputation by chained equations was used to account for loss to follow up and covariate missingness at 2-, 3-, 4- and 6-years follow-up [38].

Results

The mean age of mothers at baseline was 26.6 years (SD: 4.3) with 7.7 years of education (SD: 4.4) and most families lived in extended household (88%) with 3.0 (SD: 1.8) prior pregnancies (Table 1). Among the children, 50% were girls and 98% were attending school during the 6-year-old wave. The mean maternal PHQ-9 score was 5.8 (SD: 5.5), with 23% scoring 10 or greater, representing elevated symptoms indicative of depression [28]. The mean maternal GAD-7 score was 3.8 (SD: 4.8), with 13% scoring in the elevated anxiety symptom range (>9) [30]. Among children, mean SDQ-TD score was 13.0 (SD: 4.9) and mean anxiety SCAS score was 3.4 (SD: 2.5).

While 50% of women reported not knowing anyone who got sick or died from COVID, 17% knew a

family member or friend who got sick and an additional 8% knew a family member or friend who died (Table 1). A very small number of women (1%) reported personally contracting COVID. Of the five types of basic needs stressors, women endorsed worsening in an average of 1.9 items (SD:1.9), ranging from 38% reporting zero stressors to 16% reporting all five. Almost half the women reported difficulties obtaining food (48%) and a third reported their situation being 'worse than before' for each of the other stressors (Table 1). Approximately 19% of women scored zero on both the COVID illness in one's network and basic needs stressor scores. Finally, financial stressors were distributed similarly to the basic needs ones, with a mean of 1.9 (SD: 1.3) with 72% reporting that household income had decreased.

COVID illness or death in one's social network was not distributed randomly. For example, among women with no schooling, most (66%) did not know anyone who had been ill or died from COVID, compared with 24% of those with at least some college (p -value: <0.0001), a pattern that was also observed with the asset-based SES variable. Conversely, for the basic needs stressors, it was lower SES women who experienced more stressors: those in the top asset-based SES tertile having a score of 1.4 (SD: 1.7) vs. those in the bottom tertile score of 2.4 (SD: 1.9) (p -value: <0.01). Similarly, women who were previously depressed had higher basic needs stressors (2.8 (SD: 2.0) compared with those who were not previously depressed (1.8 (SD: 1.9)) (p -value: <0.0001). The same pattern was observed with education.

Regression results in Table 2 show that COVID illness in one's social network and basic needs stressors are independently associated with worse maternal mental health, after adjusting for financial stressors (Table 2, columns 1 and 2). For example, compared to women who did not know anyone who became ill or died from COVID, women who had a friend or family member die from COVID scored 1.47 points higher on the PHQ-9 (95% CI: 0.21, 2.73). Similarly, GAD-7 scores were 1.66 points higher (95% CI: 0.52, 2.80) among women with a COVID death among family or friends compared to women with no illness in their network. Overall, the association with maternal mental health weakened with decreasing closeness of relations (from family/friends to others in the community). Similarly, as severity decreased (from knowing people who have died to only knowing people who had been ill), the strength of association also decreased. For example, women who only knew of others in the community who had gotten ill (but did not know of anyone close to them or anyone who had died) had PHQ-9 scores 0.42 points higher (95% CI: -0.89,1.75) when compared to those who did not know anyone at all. Finally, each additional basic needs stressor (e.g. difficulties with food, housing, etc.) was associated with about

Table 1 Bachpan study sample characteristics at 6 year interview (n = 814)

	Mean (SD)	Percent (n)
Household and maternal characteristics at baseline		
Age (years)	26.6 (4.3)	
Education (years)	7.7 (4.4)	
Parity	3.0 (1.7)	
Nuclear household		12.0 (98)
Husband working		90.2 (734)
Maternal and child outcomes		
Maternal depression, PHQ-9 score at 6 years	5.8 (5.5)	
Maternal anxiety, GAD-7 score at 6 years	3.8 (4.8)	
Child mental health, SDQ TD score at 6 years	13.0 (4.9)	
Child anxiety, SCAS GAD score at 6 years	3.4 (2.5)	
Child characteristics at 6 years		
Age (months)	72.2 (0.7)	
Gender	Female	50.1 (408)
School type	Public	45.6 (363)
	Private	52.8 (421)
	Madrassa	1.4 (11)
	Other	0.3 (2)
COVID illness/death exposure and stressors		
Knows anyone sick/died from COVID*		49.7 (405)
	Family/friends died [5]	7.9 (64)
	Family/friends sick [4]	16.6 (135)
	Community members/others died [3]	17.7 (144)
	Community members/others sick [2]	7.6 (62)
Did not know anyone sick/died [1]		50.3 (409)
Basic needs stressors, % responding 'worse than before'		
Total number of social stressors		1.9 (1.9)
	Housing situation	36.4 (296)
	Safety/protection	32.2 (262)
	Fair access to services	33.4 (272)
	Difficulties with food	47.2 (384)
	Medical care	38.5 (313)
Financial impact, % responding 'somewhat true' or 'very true'		
Total number of economic stressors		1.9 (1.3)
	Income decreased	72.3 (649)
	Reduced work	62.7 (563)
	New job	8.8 (79)
	Temporary job loss	42.4 (381)
	Permanent job loss	8.8 (79)

*COVID illness/death categories are mutually exclusive and in order of severity. For example, people in the 'community members/other sick' category did not report knowing anyone closer to them who had been ill and did not know anyone dying

half a point increase on both the PHQ-9 and the GAD-7 scales (PHQ-9 0.51, 95% CI: 0.30, 0.71 and GAD-7 0.54, 95% CI: 0.36, 0.72). Models with each basic needs stressor entered individually are presented in Appendix Table 1. After adjusting for COVID within one's network and basic needs stressors, financial stressors were not meaningful predictors of maternal mental health.

Turning to child outcomes (Table 2, Columns 3 and 4), we find that COVID in the mother's network had a weaker association with SDQ-TD and SCAS scores, with wide confidence intervals. For example, death among

family/friends was associated with a 0.52 higher SDQ-TD score (95% CI: -0.67, 1.71) and a 0.63 point higher SCAS score (95% CI: 0.01, 1.25). Basic needs stressors were associated with both higher SDQ-TD scores (0.24, 95% CI: 0.05, 0.44) and higher SCAS anxiety symptom scores (0.25, 95% CI: 0.15, 0.35), which is roughly half the magnitude of the maternal association with depression and anxiety symptoms. Like the maternal models, there was no evidence of an association between financial stressors and child outcomes after accounting for COVID within mother's network and basic needs stressors.

Table 2 Association of COVID-19 exposure and stressors with maternal and child mental health

		Mother		Child	
		PHQ-9	GAD-7	SDQ	SCAS GAD
		Estimate (95% CI)	Estimate (95% CI)	Estimate (95% CI)	Estimate (95% CI)
		Column 1*	Column 2*	Column 3*	Column 4*
Predictor					
COVID-19 exposure	No one sick/died	ref	ref	ref	ref
	Others sick	0.42 (-0.89, 1.75)	0.37 (-0.78, 1.52)	-0.17 (-1.39, 1.04)	0.13 (-0.49, 0.76)
	Others died	0.70 (-0.21, 1.62)	0.57 (-0.24, 1.37)	0.57 (-0.29, 1.42)	0.21 (-0.23, 0.66)
	Family/friends sick	1.29 (0.34, 2.24)	0.87 (0.03, 1.71)	0.77 (-0.12, 1.66)	0.24 (-0.22, 0.70)
	Family/friends died	1.47 (0.21, 2.73)	1.66 (0.52, 2.80)	0.52 (-0.67, 1.71)	0.63 (0.01, 1.25)
	Number of COVID-19-related basic needs stressors	0.51 (0.30, 0.71)	0.54 (0.36, 0.72)	0.24 (0.05, 0.44)	0.25 (0.15, 0.35)
Number of COVID-19-related financial stressors		0.24 (-0.05, 0.52)	0.05 (-0.20, 0.31)	0.10 (-0.17, 0.36)	0.03 (-0.11, 0.17)

*Estimates generated using linear regression modeling, missingness at 4 years accounted for using multiple imputation; Column 1 adjusts for maternal age at baseline, family structure at baseline, SES at 2 years, stay at home measures on date of 6-year interview, interviewer at 6 years, and PHQ-9 at 4 years; Column 2 adjusts for maternal age at baseline, family structure at baseline, SES at 2 years, stay at home measures on date of 6-year interview, interviewer at 6 years, and GAD-7 at 4 years; Column 3 adjusts for child gender at 6 years, family structure at baseline, SES at 2 years, stay at home measures on date of 6-year interview, interviewer at 6 years, PHQ-9 at 4 years, GAD-7 at 4 years, and SDQ at 3 years; Column 4 adjusts for child gender at 6 years, family structure at baseline, SES at 2 years, stay at home measures on date of 6-year interview, interviewer at 6 years, PHQ-9 at 4 years, and GAD-7 at 4 years

Adjusting for concurrent maternal PHQ-9 score attenuated the observed associations (Appendix Table 2): Basic needs stressors were associated with 0.13 higher points on the SDQ-TD score (95% CI: -0.06, 0.32) and 0.17 (95% CI: 0.07, 0.27) higher anxiety SCAS scores. Furthermore, stratified models did not support the hypothesis that pandemic stressors were more deleterious for children of depressed mothers (Appendix Table 3). There was no evidence of child gender differences in the strength of association between stressors and child outcomes (Appendix Table 4).

Discussion

The goal of the current study was to examine two distinct pathways between the COVID pandemic and maternal and child mental health: (a) COVID illness or death within one's social network and (b) pandemic-related basic needs stressors, beyond financial difficulties. Leveraging the longitudinal data from a birth cohort in rural Pakistan, we controlled for a suite of pre-pandemic potential confounds and explored whether impacts on 6-year-old children were independent of past and concurrent maternal mental health. We found that worse maternal depression and anxiety symptoms were independently impacted both by knowing people (friends or family) who were ill or died from COVID, as well as basic needs stressors like disruptions to acquiring food, accessing medical care, or problems with housing. Child anxiety and behavioral/emotional difficulties were impacted by both pandemic-related basic needs stressors and to a lesser extent, illness/death in the family network. These

findings provide further evidence of multiple pathways through which global and long-lasting events, such as the COVID pandemic, can have multigenerational mental health impacts. This study also build on ongoing research in the region, including India, that documents the mental health impacts of the pandemic [39].

We found that although only 1% of respondents reported having COVID, about half knew someone (friend, family member, or someone from the community) who had been ill, and 8% knew a close person (family/friend) who died. Higher SES women, such as those with higher education, were more likely to report illness or death in close social networks compared to women with less education. This might be explained by several factors: (a) in this rural area with limited access to testing, it is the higher SES households who had more access and were more likely to know people with confirmed infections; (b) in LMICs there is evidence that there was higher illness burden in urban areas and among those with higher SES due to this group's greater mobility. This was especially the case at the beginning of the pandemic and correlated with increased stigma of foreigners [40].

While exposure to COVID illness directly impacted half of the households, pandemic-related basic needs stressors impacted almost two-thirds. In contrast to the COVID illness exposures, exposure to these stressors was higher among women who were already more vulnerable, including those with pre-pandemic lower education and fewer household assets. This is consistent with prior literature documenting that those with financial struggles

pre-pandemic, struggled the most during the pandemic [41].

Findings with maternal mental health

We found that maternal mental health was independently predicted by illness in the woman's network and basic needs stressors, above and beyond any impact of financial stressors or her previous mental health. This is consistent with at least one other study looking at illness in a person's network [42]. These findings point to potential pathways and intervention targets. First, serious illness or death among family and friends had the strongest association with both depression and anxiety symptoms, relative to illness among other community members. These women might be experiencing increased social isolation and decreased support. Support services for families impacted by illness might be especially beneficial, especially if combined with efforts to reduce misinformation. There have been reports of stigma experienced by households who experienced COVID, adding to the social isolation in a time of need [43]. Framing public health messaging around infection control in a way to prevent stigma among households impacted directly by the illness could potentially reduce some of the mental health burden. As the most acute phase of pandemic wanes, we might expect this deleterious mental health impact to also reduce. Ongoing and future longitudinal studies will be able to answer questions about the duration of this impact after infection waves pass.

While many studies have documented the deleterious impact of financial stressors on changes in mental health, our analysis expanded the scope to include pandemic-related stressors beyond job or income loss. We found that increases in basic needs stressors were independently associated with worse depression and anxiety symptoms, even after accounting for financial stressors. We also found that financial stressors were not independently associated with worsening mental health symptoms. Results imply that employment and income loss are not the only drivers of depression and anxiety symptoms during a pandemic and support for accessing food and medical services, particularly in rural settings, is vital.

Findings with child mental health

Our findings also contribute to the growing literature documenting evidence of the pandemic's multigenerational impacts. We found support for the hypothesis that pandemic-related basic needs stressors were associated with worse behavioral/emotional problems and higher anxiety among 6-year-old children. The weaker effects, compared to the maternal models, were further ameliorated by adjusting for concurrent maternal mental health, with basic needs stressors continuing to be significant predictors of child anxiety independent of maternal

mental health. This points to the need for longitudinal analyses are needed to formally test potential mediation pathways between pandemic stressors, parental mental health, and child outcomes.

Our findings are consistent with other studies reporting direct impacts of the pandemic on child mental health, which are at least partially mediated by parental mental health [18–21]. There seems to be significant variation in the strength of associations and salience of the mediation pathways depending on the type of stressor, as well as the timing of the study relative to the phases of the pandemic. For example, Westrupp et al., conducted a study during a strict lockdown period in Australia, and found that environmental stressors (including financial or food accessibility) were linked with adult mental health but less so with child mental health, while psychological stressors (such as worry) among adults were more strongly linked with child mental health [44]. In our cohort, and other studies, adult mental health is consistently correlated with child mental health outside and within the pandemic period [45].

Independent of maternal mental health, children's experiences of the pandemic are filtered through their family and household environment. Caregivers who are stressed or pre-occupied with the pandemic may be less likely to engage in responsive, warm parenting, and might express more negative emotions towards the child. Consistent with this idea, mothers have reported concerns about their ability to parent well during the pandemic [46]. These pandemic reports are supported by longitudinal studies showing decreases in parenting quality compared with pre-pandemic data, a change that seems especially strong among families that are already vulnerable due to factors like lower SES [47]. Increased arguments in the household have also been reported during the pandemic and can impact relationship quality with children [17, 48]. Finally, while open communication is usually considered a positive parenting behavior, there is some evidence that sharing *too much* information about COVID increased child mental health problems, especially if parents themselves were fearful of COVID [49]. Factors outside the home and family environment might also be salient, such as lockdowns leading to less socializing with friends or outdoor exercise [50, 51]. Taking all of this evidence into consideration, it is likely that maternal mental health is only one of many mechanisms through which global events like the pandemic might impact child mental health.

Strengths and limitations

A key strength of this analysis is the ability to leverage the longitudinal design to adjust for pre-pandemic potential confounds, including previous mental health and SES. Our study also contributes much needed insights

from a LMIC, South Asian, context. While some underlying mechanisms linking stressors to mental health are likely to be generalizable across contexts, our study context is unique. For example, most mothers in the Bachpan cohort do not work outside the home meaning that a common parental stressor in other settings, providing childcare during school closures, was less salient for mothers in our study. Most study households are also extended households with grandmothers co-residing in 69% of households and almost all (89%) children have siblings. Larger households may have made the experience of lockdowns less isolating.

Our analysis also has several limitations. We do not have information on several domains which might help explain the findings, such as indicators of time use or isolation. We also cannot disentangle any differential impacts in COVID illness and/or death among family members vs. friends. It is also important to note that in the current analysis we have assumed a directionality from changes in maternal mental health to changes in child mental health. However, as Bai et al. noted, it is very stressful for parents to see their children struggle with mental health problems, which can, in turn, contribute to their own psychological distress [48]. The possibility of both directions being causal further reinforces the need for strategies that independently target both parental and child mental health.

Conclusions

In summary, our findings point to the importance of examining multiple pathways that may impact maternal and child mental health during major societal disruptions such as the COVID-19 pandemic. A better understanding of these pathways, including but also beyond financial difficulties, opens opportunities for additional ways that families may be supported during such crises.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12889-025-22280-8>.

Supplementary Material 1

Author contributions

JM contributed to the conception and design of the work, analysis and interpretation of the data, and writing and revision of the manuscript. AC contributed to the analysis and interpretation of the data and writing and revision of the manuscript. VB contributed to the conception and design of the work, the interpretation of the data and writing and revision of the manuscript. SB contributed to the revision of the manuscript. MSEC contributed to the revision of the manuscript. AF contributed to the revision of the manuscript. SCH contributed to the revision of the manuscript. AB contributed to the acquisition of the data and revision of the manuscript. SS contributed to the conception and design of the work, the acquisition of the data and revision of the manuscript.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The Bachpan Cohort study received ethical approval from the institutional review boards at the Human Development Research Foundation (IRB/1017/2021), Duke University, and the University of North Carolina at Chapel Hill. All participants provided informed consent.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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