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COVID-19 pandemic, losses of livelihoods and uneven recovery in Pune, India

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This study examines the patterns of losses in livelihoods, income and consumption expenditure among slum dwellers in Pune, a city in western India, two years after the outbreak of the COVID-19 pandemic. A four-round panel dataset is used for this study with two rounds collected before (in-person in 2018 and 2019) and two rounds collected after (via phone interviews in 2020 and 2022) the start of the pandemic. Although at the macro-level gross domestic product and unemployment rates had started to recover by mid-2020, the results of this study show that recovery of livelihoods among individuals living just above subsistence level has been very limited and uneven even two years after the start of the pandemic. Additionally, younger and less educated individuals are more vulnerable to welfare losses. Examining food consumption patterns, consumption of cereals recovered to pre-pandemic levels by 2022 but the consumption of fruits and vegetables remained below the 2019 level, thus having important implications for nutritional health.

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Introduction

Many studies have examined the immediate socio-economic effect of the COVID-19 pandemic and the associated government responses on the economy, both in developed and developing countries. Evidence from these studies points to a substantial increase in unemployment rates, decreased incomes, increased food insecurity and a higher prevalence of poverty (Major et al., 2020; Sáenz and Sparks, 2020; Abraham et al., 2021; Balana et al., 2021; Cho et al., 2021; Decerf et al., 2021; Egger et al., 2021; Gil et al., 2021; Mahmud and Riley, 2021). Studies have also documented that after an initial shock, most countries started to recover. However, both the adverse effect of the pandemic and the recovery from it have been unequal, and have mostly followed the patterns of existing inequalities and have exacerbated them (Sáenz and Sparks, 2020; Dang and Nguyen, 2021; Gil et al., 2021; Reichelt et al., 2021; Montenovo et al., 2022).

India's experience has been broadly similar to the rest of the world. On the 24th of March 2020, the Indian government imposed a strict national lockdown. Consequently, most economic activities came to a standstill between April–May 2020. This had a devastating effect on the country's economy: The gross domestic product (GDP) shrunk by 23 percent in April–June 2020[1] and unemployment rates increased to 23 percent in April 2020 from a pre-pandemic level of 8 percent in February 2020[2]. Several studies (Afridi et al., 2023; Desai et al., 2021; Kesar et al., 2021; Sumalatha et al., 2021; Afridi et al., 2020a; 2020b; Centre for Equity Studies [CES] 2020; Totapally et al., 2020) examine the immediate effects of the lockdown on economic well-being of people, using samples targeting primarily informal sector workers and low-income households. A similar magnitude of losses has been reported among farmers, wage workers in rural areas, and migrant workers (Jaacks et al., 2021; Adhikari et al., 2020; Ceballos et al., 2020; Harris et al., 2020). These studies estimate a job loss for 50–90 percent of the sample and an average decrease in earnings by 40–80 percent. These estimates are higher than the employment and income losses reported in Bhalotia et al. (2020) who look at a sample that is more representative of the general population in urban areas. Thus, the evidence is suggestive of a higher economic burden faced by vulnerable groups in the initial period of the pandemic. Apart from income losses, households also reported food shortages and reduced food intake during the lockdown period (Jaacks et al., 2021; Acharya, 2020; Harris et al., 2020).

India made a quick recovery once the lockdown restrictions were lifted. By January-March 2021, the GDP growth rate had reached pre-pandemic levels (Economic Survey of India, 2021–22). However, these macro-level aggregates do not include people who are part of the informal economy, which is the case for most people at the lower end of the income distribution in India (Abraham et al., 2021). Even though unemployment rates had already recovered to pre-pandemic levels by August 2020, work participation rates remained below the pre-pandemic level, implying that many people remained disintegrated from the labour market (Bertrand et al., 2020). Even by the end of the year 2020, many people had not been able to return to work (Abraham et al., 2022; Hughes et al., 2022 for rural areas; and Downs-Tepper et al., 2022 for urban slums) and household incomes were still depressed (Lahoti et al., 2021; Bertrand et al., 2020). The negative impact was more pronounced in urban areas relative to rural areas (Kang et al., 2021; Kesar et al., 2021; Tripathi et al., 2021). Additionally, studies point to important disparities whereby it was more difficult for women, young workers and daily wage workers to recover from job losses (Abraham et al., 2022; Deshpande, 2020). Compared to pre-pandemic patterns, employment had become more precarious with an increase in the share of informal employment (Abraham et al., 2022; World Bank, 2020). The continued economic distress is also reflected in the consumption of essential goods: The per capita expenditure on animal-sourced food had decreased by 45 percent in April 2020, and only half of the drop could be recovered by August 2020.

Most studies, globally and from India, have focused on the economic impact of the COVID-19 pandemic until the end of the year 2020. However, economic shocks often persist over time and it may take a long time for people to recover to pre-shock levels (Jordà et al., 2022; Rodríguez-Caballero and Vera-Valdés, 2020; Verho, 2020; Newhouse, 2005). Furthermore, the second wave of COVID-19 infections in India in 2021 was more devastating than the first wave in 2020 (Bogam et al., 2022). Economic activities were again severely restricted for several months in 2021 due to a reimposition of preventive measures. Qualitative evidence from India revealed considerable income losses in rural areas (Krishna and Agrawal, 2021) and higher levels of food insecurity among slum dwellers (Rains, 2022) during the second pandemic wave. Veluguri et al. (2022) found that 75 percent of the households reported earning less income after the second pandemic wave in July-August 2021 as compared to January 2021. The share of households that reported food insecurity also increased in the second year of the pandemic as compared to 2020, and the situation was more severe for landless and small-scale farmers. Using a nationally representative sample, Jha and Lahoti (2022) reported increases in poverty and inequality in the country, and persistent losses in income in urban areas 22 months after the start of the pandemic.

Prior evidence suggests that the COVID-19 pandemic and linked lockdowns have affected vulnerable groups more adversely, thus reinforcing previous inequalities. It can be assumed that lockdown measures and business closures affected daily wage earners such as street vendors more severely than formally employed workers with more secure incomes. Yet, there is limited evidence to date on whether vulnerable groups such as those living just above the subsistence level of income (defined as households with some monthly income, see Data section for details) have been able to completely recover from the economic shock two years after the pandemic.

In this study, we examine the long-term effect of the COVID-19 pandemic among slum dwellers in Pune, India. We build on a previous study (Steinert et al., 2022), which collected data in 2018 and 2019, and conducted two additional rounds of data collection in October–December 2020 and February–March 2022 to create a four-year panel. We study changes in consumption patterns and the loss of livelihoods and economic resources over time. Our study is among the few (such as Jha and Lahoti, 2022) that examine the long-term economic effects of COVID-19 among individuals living just above the subsistence level in a developing country context. The findings of this study can contribute to a more nuanced understanding of how a vulnerable sub-population in India is coping with the persistent adverse effects of the pandemic.

Background

This study focuses on slum dwellers in Pune, a city in western India. Pune is the eighth-largest city in India and is located in the Western state of Maharashtra. With a population of about 3 million, Pune was among the most affected areas in terms of COVID-19 infections (Mave et al., 2022). Evaluating the vulnerability of different regions to the spread of COVID-19 in India, Sarkar and Chouhan (2021) and Acharya and Porwal (2020) found Pune to have high vulnerability based on its

demography, socio-economic factors and access to health care. By 31st March 2022, about 660,000 COVID-19 cases had been detected in the area and over 9,300 deaths had been reported[3]. The actual rates are expected to be much higher due to limited testing capacity. Accordingly, a study conducted by the Department of Science and Technology found that for every detected COVID-19 case, 90 cases went undetected in India[4]. In addition to the national lockdown in April–June 2020, a spike in COVID-19 cases in July 2020 led to the imposition of another 10-day local lockdown in Pune. Though reported positive cases increased after July 2020, no further lockdown was imposed until the end of our study period. Most restrictions were lifted by the end of the year 2020. However, India saw a second and even more devastating wave of infections in 2021 with a death toll that was two to five times higher than that in 2020 (Jha et al., 2022; Malani and Ramachandran, 2022). During this wave, Pune did not announce a full lockdown but the city relied on less restrictive measures such as weekend and night curfews. Restaurants, malls, and offices were allowed to remain open but with limited capacity. Opening hours for non-essential businesses were restricted. These restrictions, in varying degrees, lasted from February until September 2021.

Data

This study builds upon a randomised controlled trial that was implemented in slum areas in Pune, Maharashtra, between December 2018 and October 2019 (Steinert et al., 2022). The purpose of the previous study was to investigate the impact of a commitment intervention on participants' temptation spending and saving behaviour and it further collected information on employment, income, expenditures, female empowerment and gender attitudes (Steinert et al., 2022).

The sample was drawn from over 250 different slum settlements. On average, a slum settlement covers an area of 11,500 sq. metres, with the smallest slum settlement covering an area of over 300 sq. metres and the largest spanning over 150,000 sq. metres. With an average of 341 structures and 1706 people per slum, the population density was over 170,000 people per sq. kilometre. This is about 400 times higher than the national average[5]. Most of these settlements were in or near residential areas and were on private land. The majority of dwellings were informal and around one quarter lacked access to water and modern toilet facilities inside the house. The majority of slums were also located in flood-prone areas of Pune, some of which had to be evacuated or were partly destroyed during the extreme monsoon from June to September 2019 (Steinert et al., 2022).

The study sample was selected among those who earned more than their subsistence needs and therefore had the potential to save some money (see Steinert et al. (2022) for more details on sampling design). We did not apply a specific poverty line but recruited participants who indicated that they had at least some form of monthly income, which could come from formal or informal work, remittances, or social welfare payments. Our sample thus represents poor households but not necessarily the 'poorest of the poor'. However, since this recruitment approach was applied only in the first round of data collection in 2018, it is possible that some participants fell below subsistence level in the course of the COVID-19 pandemic. The baseline sample (round 1) consisted of 1,525 male (18%) and female (82%) slum dwellers who were (i) 18 years and older, and (ii) had some income (either in the form of salary, remittances or social welfare transfers) at least once per week or on a monthly basis. The endline survey (round 2) was conducted in August-October 2019. The phone numbers collected during the round 1 and 2 provide the database for conducting phone interviews in round 3 and 4. We had phone numbers for 1467 households (96 percent). We conducted two waves of phone interviews—first in October–December 2020 (round 3) and second in February–March 2022 (round 4). Thus, using the four rounds of data, we create a panel of four waves.

In round 3 and 4, we collected information on knowledge about COVID-19, precautionary measures adopted and socio-economic difficulties faced during the pandemic. In particular, we asked whether the respondent had lost their source of livelihood since the beginning of the pandemic. We then further asked respondents to indicate whether the loss of livelihood was full or partial. During the four survey rounds, we also collected information on expenditures incurred by the respondents on various food groups in the previous month. Information on any non-food expenditures (with the same reference period of 30 days) was not collected in round 3 but in the other three rounds. Using food and non-food expenditure data, we calculate the total consumption expenditure incurred during each of the three rounds. We use the average of the urban inflation index for the months of the survey for the state of Maharashtra to calculate expenditure in real terms (2018 price level)[6].

The attrition rate between the first two rounds was 6.8 percent. In round 3, we were able to collect complete data for 851 (56 percent) out of 1525 participants (Fig. 1). The main reasons for attrition were that (i) the listed phone number was wrong or invalid for 96 respondents, (ii) 127 participants refused, and (iii) we could not establish contact with the others.

In round 4, we were able to collect complete data for 513 participants (34 percent). The main reasons for attrition were that
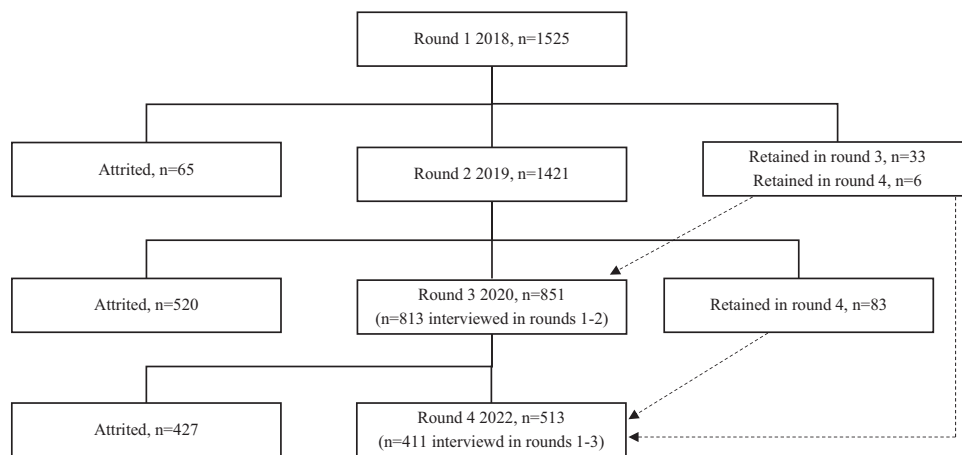

Fig. 1 Sample size by rounds. The figure presents the sample size, attrition and retention by each survey round.

Table 1 Comparison of socio-economic characteristics of the full sample with panel sample.

Variable	Round 1	Round 2	Round 3	Round 4	Panel (Round 1)[a]
Age (years)	35.98 (0.35)	36.69 (0.34)	35.56 (0.41)	37.90 (0.51)	35.29 (0.61)
Female (%)	81.51 (0.99)	83.46 (0.99)	81.43 (1.33)	84.60 (1.59)	85.89 (1.72)
Married (%)	82.82 (0.97)	82.05 (1.02)	83.90 (1.26)	84.99 (1.58)	88.32 (1.59)
Education (%)					
No education	22.29 (1.07)	22.77 (1.13)	15.28 (1.23)	14.62 (1.56)	17.03 (1.86)
Primary education	20.26 (1.03)	20.57 (1.09)	18.57 (1.33)	17.35 (1.67)	20.44 (1.99)
Secondary education	50.56 (1.28)	50.15 (1.35)	56.40 (1.71)	57.70 (2.18)	54.99 (2.46)
Higher education	6.88 (0.65)	6.51 (0.67)	9.75 (1.02)	10.33 (1.34)	7.54 (1.30)
Lower Caste (%)	45.64 (1.26)	46.23 (1.32)	44.77 (1.70)	44.83 (2.20)	44.77 (2.46)
Hindu (%)	75.25 (1.07)	76.92 (1.12)	75.91 (1.47)	78.17 (1.83)	77.13 (2.07)
Household size	3.95 (0.06)	3.76 (0.05)	3.80 (0.07)	3.62 (0.11)	3.94 (0.10)
Access to clean water (%)	79.74 (1.03)	77.83 (1.10)	84.49 (1.24)	88.89 (1.39)	80.29 (1.96)
Use flush toilet (%)	15.67 (0.93)	7.53 (0.70)	7.29 (0.89)	8.97 (1.26)	12.17 (1.61)
Number of assets owned					
Employment type (%)					
Salaried	14.75 (0.91)	12.44 (0.89)	14.32 (1.21)	18.13 (1.70)	11.46 (1.58)
Self-employed	48.32 (1.28)	45.61 (1.35)	31.00 (1.59)	41.72 (2.18)	59.02 (2.43)
Unemployed	36.93 (1.24)	41.95 (1.33)	54.67 (1.71)	40.15 (2.17)	29.51 (2.26)
Monthly per capita expenditure (INR)[b]					
Food expenditure	1286 (57)	1011 (74)	629 (27)	865 (37)	1295 (45)
Non-food expenditure	959 (129)	1218 (246)		440 (54)	1051 (165)
Total Expenditure	2245 (145)	2229 (258)		1305 (73)	2346 (174)
Observations (#)	1525	1421	851	513	411

Notes: Standard errors in parentheses. INR Indian Rupees.
[a]Based on the balanced panel sample from round 1.
[b]The expenditure data is only for expenses incurred by the respondent and not for whole household.

(i) interviews could not be completed for 23 respondents due to time or other constraints, (ii) the listed number was wrong for 102 respondents, (iii)160 respondents refused, and (iv) we could not establish contact with the rest.

We have a balanced panel for 411 observations, and have data for at least one post-Covid round for 940 observations. To compare how attrition affects our sample, we present the socio-economic characteristics of the sample for all four rounds in Table 1. In the last column of Table 1, we present the characteristics of the balanced panel using round 1 data. Attrition in round 2 comprised mostly of females, those who were employed or those who had higher incomes (Steinert et al., 2022). In rounds 3 and 4, the respondents who participated in our phone survey were more educated, owned more assets and were more likely to be working as compared to round 1. The panel sample in comparison to the full sample of round 1 consists of more females, married, educated and working individuals. Besides these shortcomings, we believe that the comparison of the pre-pandemic data with data from the phone interviews conducted during the pandemic is of interest, keeping in mind that the sample is not representative of the general population in Pune but for a specific sub-population as described in the sampling strategy.

Our attrition rates are high but not unusual, especially for a panel spanning four years. For example, Nguyen et al. (2021) had an attrition rate of 70 percent from mothers in Uttar Pradesh, India over a period of 7 months. Similarly, Egger et al. (2021) had an attrition rate of 60 percent for a sample from Kenya over a period of 5 years.

Descriptive statistics

In 2018, the average age in the sample was 36 years, with higher representation of women (82 percent) (see Table 1). Most respondents were married (83 percent) and 75 percent of the sample were Hindu. About 45 percent of the sample belonged to lower castes (Scheduled Castes and Scheduled Tribes). About 22 percent of the respondents were illiterate, which is higher than the average illiteracy rate for the state of Maharashtra[7]. Less than 20 percent had completed primary and about half of the sample had completed secondary school. Most participants were employed in unskilled or low-skilled jobs. In our sample, it was impossible to distinguish the casual workers from others. We therefore created three categories using data on employment type to establish whether the person was (1) not working[8], (2) salaried or (3) self-employed (including those who might be casual workers). In 2018, 37 percent were unemployed of which most were females (Reddy et al., 2021). About half of the respondents (48 percent) were self-employed, for instance as house helpers, tailors, sweepers, shopkeepers and taxi drivers. The total monthly per capita expenditure incurred by the respondent was Rs 2250, out of which about 60 percent was spent on food.[9]

In Table 2, we present summary statistics for selected variables, which could have been affected due to the pandemic or changed over time for the balanced panel. The percentage of respondents who were not working or were unemployed increased drastically in 2020 and returned almost to the pre-pandemic level in 2022. Total expenditure per capita after the pandemic was less than that before the pandemic had started and the fall in non-food expenditure was more severe than that in food expenditure.

Results

Loss of employment and income. We first compare the percentages of respondents who were not working. The percentage of people not working increased even before the pandemic hit, from 30 percent in 2018 to 37 percent in 2019. Since the respondents who could not be re-interviewed in 2019 were more likely to be employed, this increase in the unemployment rate is reflective of a change in the composition of the sample. Subsequently, the unemployment rate increased drastically to about 53 percent in 2020 but then returned almost to pre-pandemic levels by 2022 (see Table 2). The increase in unemployment in 2020 could be due to the pandemic or could reflect the secular fall in employment rates. We therefore specifically asked our respondents if

Table 2 Summary statistics for balanced panel sample.

Variable	Round 1	Round 2	Round 3	Round 4
Married (%)	88.32 (1.59)	87.10 (1.66)	85.40 (1.74)	85.89 (1.72)
Household size	3.94 (0.10)	3.77 (0.11)	3.89 (0.11)	3.54 (0.08)
Education (%)				
No education	17.03 (1.86)	17.03 (1.86)	14.84 (1.76)	14.36 (1.73)
Primary education	20.44 (1.99)	20.44 (1.99)	20.19 (1.98)	17.03 (1.86)
Secondary education	54.99 (2.46)	54.99 (2.46)	55.96 (2.45)	58.15 (2.44)
Higher education	7.54 (1.30)	7.54 (1.30)	9.00 (1.41)	10.46 (1.51)
Employment type (%)				
Salaried	11.46 (1.58)	14.60 (1.74)	15.09 (1.77)	17.27 (1.87)
Self-employed	59.02 (2.43)	47.93 (2.47)	31.39 (2.29)	42.58 (2.44)
Unemployed	29.51 (2.26)	37.47 (2.39)	53.53 (2.46)	40.15 (2.42)
Monthly per capita expenditure (INR)[a]				
Food expenditure	1295 (45)	979 (41)	713 (45)	886 (43)
Non-food expenditure	1051 (165)	1754 (475)		481 (66)
Total Expenditure	2346 (174)	2733 (478)		1367 (87)
Ownership of assets (%)				
Chair	59.61 (2.42)	60.10 (2.42)	63.02 (2.38)	72.26 (2.21)
Bed	71.53 (2.23)	70.80 (2.25)	68.13 (2.30)	80.29 (1.96)
Table	33.58 (2.33)	37.23 (2.39)	34.55 (2.35)	43.55 (2.45)
Mobile	94.89 (1.09)	95.38 (1.04)	91.00 (1.41)	96.35 (0.93)
Generator	0.49 (0.34)	0.73 (0.42)	1.70 (0.64)	0.97 (0.48)
Gas stove	97.32 (0.80)	95.38 (1.04)	93.92 (1.18)	97.57 (0.76)
Radio	9.00 (1.41)	9.73 (1.46)	11.68 (1.59)	4.87 (1.06)
Landline	6.33 (1.20)	0.97 (0.48)	1.22 (0.54)	2.19 (0.72)
Television	83.45 (1.84)	87.35 (1.64)	85.89 (1.72)	87.10 (1.66)
Mixer	92.70 (1.28)	93.43 (1.22)	91.97 (1.34)	94.89 (1.09)
Refrigerator	54.74 (2.46)	60.34 (2.42)	59.12 (2.43)	67.64 (2.31)
Bike	17.52 (1.88)	17.52 (1.88)	27.74 (2.21)	18.25 (1.91)
Rickshaw	5.84 (1.16)	6.81 (1.24)	6.08 (1.18)	8.52 (1.38)
Motorbike/scooter	60.83 (2.41)	64.96 (2.36)	63.26 (2.38)	71.29 (2.23)
Car	3.89 (0.96)	5.60 (1.14)	1.70 (0.64)	4.38 (1.01)
Any Jewellery	30.17 (2.27)	56.20 (2.45)	41.85 (2.44)	49.39 (2.47)
Gold	32.60 (2.32)	29.93 (2.26)	29.68 (2.26)	31.14 (2.29)

Notes: Standard errors in parentheses. *INR* Indian Rupees.
[a]The expenditure data is only for expenses incurred by the respondent and not for the whole household.

Table 3 Situation of households after the pandemic started.

	Round 3 (full sample)	Round 3 (panel data)	Round 4 (full sample)	Round 4 (panel data)
Economic losses				
Not working (%)	54.3 (1.71)	53.5 (2.46)	40.2 (2.17)	40.1 (2.42)
Those employed in 2019 (%)				
Loss of livelihood				
Complete	53.3 (2.23)	49.0 (3.12)	21.3 (2.35)	21.8 (2.58)
Partial	21.6 (1.86)	26.4 (2.76)	33.4 (2.71)	35.0 (2.98)
Decrease in earned income	84.1 (1.65)	86.8 (2.11)	58.7 (2.83)	60.9 (3.05)
Decrease in financial resources for the household	87.9 (1.12)	87.5 (1.63)	72.3 (1.98)	75.0 (2.15)
Coping mechanism (%)				
Used savings	68.6 (1.59)	70.8 (2.25)	51.3 (2.21)	53.8 (2.46)
Borrowed	17.2 (1.29)	16.5 (1.84)	21.1 (1.80)	21.2 (2.02)
Cut expenses	27.0 (1.52)	26.5 (2.18)	14.0 (1.54)	15.3 (1.78)
Cut food expenses	20.4 (1.38)	19.7 (1.96)	10.9 (1.38)	12.2 (1.61)
Sold assets	4.8 (0.73)	5.6 (1.14)	3.1 (0.77)	3.4 (0.90)
Observation	851	411	513	411

Notes: Standard errors in parentheses.

they had lost their source of livelihood as a consequence of the pandemic. Among those who were working in 2019, 49 percent of our sample reported that they had fully lost their source of livelihood as a consequence of the pandemic, even four to five months after the lifting of restrictions (see Table 3). Further, 26 percent indicated that they experienced a partial loss of their livelihood. Even in 2022, two years after the pandemic's outbreak,

22 percent of respondents reported that they had lost their source of livelihood completely and 35 percent partially due to the pandemic. Additionally, among those who were employed in 2019, about 87 percent and 61 percent of the respondents reported a loss of income in 2020 and 2022, respectively.

Additionally, to gauge the situation at the household level, we also asked if the respondent's household had faced any financial

Table 4 Socio-demographic characteristics of households experiencing economic loss (odds ratio).

Variables	Loss of livelihood	Shortage of financial resources
Age (years)	0.98 (0.01)*	0.99 (0.01)
Female (%)	0.81 (0.25)	0.78 (0.21)
Married (%)	0.54 (0.20)*	0.71 (0.23)
Primary educated (%)	0.29 (0.13)***	0.40 (0.14)***
Secondary educated (%)	0.46 (0.19)*	0.47 (0.16)**
Higher (%)	0.34 (0.20)*	0.19 (0.09)***
Salaried job (%)	0.27 (0.08)***	0.95 (0.28)
Number of assets owned (#)	0.94 (0.05)	0.98 (0.04)
Hindu (%)	0.63 (0.21)	0.89 (0.21)
Scheduled caste/Tribe (%)	0.90 (0.12)	0.82 (0.09)*
Household size (#)	0.96 (0.06)	1.00 (0.05)
Treatment group (%)	1.07 (0.26)	1.12 (0.22)
Observation (#)	407	669

Notes: Standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Fig. 2 Per capita per month consumer expenditure. The figure presents the estimated mean and the confidence intervals (bar lines). All numbers are in Indian rupees and have been adjusted to 2018 price levels.

shortages since the beginning of the pandemic. With potentially several income earners in a household, the potential income losses of the respondent may be compensated by the income of other household members.[10] About 88 percent of the households in our sample reported facing financial difficulties in 2020 and 75 percent in 2022.

Next, we examine the socio-economic characteristics of the households that reported a loss in livelihoods and financial resources. For each of these variables, we create a dummy variable that takes the value of 1 if the respondent experienced any economic loss since the start of the pandemic, and 0 otherwise. We then use a logit model and estimate the probability of experiencing a loss in livelihood and financial resources. We use the socio-economic characteristics in 2019 and a dummy variable for the treatment group from the experiment as control variables. Results are presented in Table 4[11].

Younger, less educated individuals, and those who were not in salaried jobs had a higher likelihood of losing their source of livelihood. Less educated respondents were also more likely to report shortages of financial resources.

Households employed several coping strategies to deal with the economic shock (see Table 3). The most commonly reported coping mechanism was the use of existing savings, followed by cutting expenses and borrowing money. Among households cutting expenses, households most commonly reported reducing food expenditures among all expenditures. When we compare food and non-food consumption expenditure over time (section "Change in consumption expenditure"), our data shows that the fall in non-food expenditure was more severe than the fall in food expenditure. Since the expenditure data we collected only captures expenses incurred by the respondent and not by the entire household, this is not necessarily contradictory. Less than five percent of households reported selling assets.

Change in consumption expenditure. Other studies found that households had responded to the economic shock by primarily cutting food expenditure, selling assets and borrowing money (Downs-Tepper et al., 2022; Azim Premji University [APU], 2021). These studies show that 43–86 percent of households reported reducing their food intake in the first few months after the start of the pandemic. Kumar et al. (2023) and Veluguri et al. (2022) are among the few studies that examined a longer time
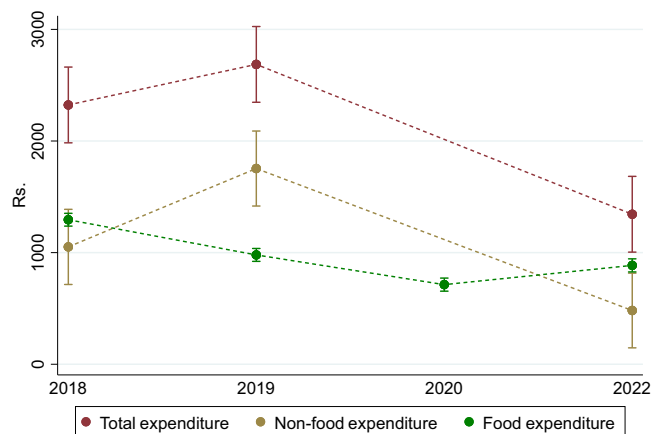
period and found that the consumption patterns had not fully recovered by mid-2021. Building on this, we examine the patterns of monthly per capita total, non-food, and food expenditure. For this analysis, we use only those observations for which we have data for all four rounds (i.e., the balanced panel) and control for individual and time-fixed effects.

There was no statistically significant difference between total and non-food expenditure in the two years before the pandemic but both saw a steep fall by 2022 (Fig. 2) for the balanced panel. Food expenditure, on the other hand, had already declined prior to the pandemic, but the fall was steeper after the pandemic had hit. Compared to 2018, per capita food expenditure was 10 percent lower in 2019, 40 percent lower in 2020 and 25 percent lower in 2022. Thus, the per capita food expenditure had started to recover by 2022 but had not yet reached the pre-pandemic level.

We also examine changes in expenditure by major food groups (see Table 5) for the balanced panel. Per capita cereal consumption fell in 2020 and did not recover to the pre-pandemic level. Expenditure on lentils, vegetables and meat decreased in 2020 but recovered to pre-pandemic levels in 2022. Expenditure on sugar increased in post-pandemic years compared to 2019 and was similar to the 2018 level. We also consider expenditure on unhealthy foods such as fried snacks, cakes, non-alcoholic and alcoholic beverages. The expenditure on these items was declining before the pandemic, and remained below pre-pandemic level in 2022.

Discussion

The Indian economy was experiencing an economic slowdown even prior to the COVID-19 pandemic. The pandemic and the associated preventive measures led to a further deterioration of the economic situation. However, with the easing of restrictions, the unemployment rate and the GDP have recovered to pre-pandemic levels (Economic Survey of India, 2021–22). Using data from the nationally representative Consumer Pyramids Household Survey conducted by the Centre for Monitoring Indian Economy, APU (2021) reports that by December 2020, the employment rate had recovered to 95–98 percent of the pre-pandemic value. 85 percent of those employed in September-December, 2019 were also employed in the same months in 2020. However, this aggregate picture does not imply recovery for all groups of society. Specifically, the situation for those working in the informal sector is not well captured by these official labour statistics.

Table 5 Per capita expenditure by food groups (Rs.).

Variable	Round 1	Round 2	Round 3	Round 4
Cereals[1]	291.42	279.61	219.20	216.22
	(15.60)	(15.04)	(28.91)	(16.15)
Lentils[2]	88.11	79.17	71.03	95.99
	(6.10)	(4.08)	(6.10)	(5.90)
Fats[3]	40.84	52.44	35.39	36.35
	(11.26)	(4.37)	(5.23)	(6.45)
Milk products[4]	279.19	253.15	243.38	299.47
	(13.96)	(13.96)	(14.43)	(12.30)
Meat and eggs[5]	187.90	165.89	148.61	196.83
	(12.86)	(16.40)	(13.19)	(12.98)
Fruits[6]	89.28	89.80	91.62	103.01
	(5.43)	(7.88)	(11.35)	(8.46)
Vegetables[7]	349.86	319.53	275.07	367.90
	(14.41)	(13.42)	(16.55)	(18.17)
Sugar[8]	184.25	173.61	212.43	200.19
	(6.81)	(6.26)	(17.23)	(8.30)
Fried snacks, cakes, alcoholic and non-alcoholic beverages[9]	461.52	270.41	216.48	195.96
	(55.83)	(21.02)	(27.43)	(17.62)

Notes: Standard error in parentheses. 1—pre-pandemic per capita cereal expenditure is statistically higher than the per capita expenditure in post-covid years. There is no statistical difference between round 3 and 4. 2—Significant differences are between round 1 and round 3, round 2 and round 4, round 3 and round 4. 3—Significant differences are between round 2 and 3, round 2 and 4. 4—Significant differences are between round 2 and 4, round 3 and 4. 5—Significant differences are between round 1 and 3, round 3 and 4. 6—No statistically significant differences. 7—Significant differences are between round 1 and round 3, round 2 and 3, round 2 and round 4, round 3 and 4. 8—Significant differences are between round 2 and 3, round 2 and round 4. 9—Significant differences are between round 1 and 2, round 1 and round 3, round 1 and 4, round 2 and 4.

In our sample of individuals living just above the subsistence level, about 75 percent reported complete or partial loss of livelihood in 2020 among those who were working in 2019. Our estimates are higher than the numbers reported by APU (2021) for informal workers for the same period. In fact, our estimates are closer to the reported loss of employment immediately after the lockdown in other studies for India (Kesar et al., 2021; ActionAid, 2020; Afridi et al., 2020a; 2020b; CES, 2020; Totapally et al., 2020) and other countries (Egger et al., 2021; Josephson et al., 2021). By early 2022, 55 percent were still experiencing losses in livelihoods, implying a slow and only partial recovery. Thus, contrary to the expectation at the beginning of the pandemic that the job losses would remain temporary (Afridi 2020a; 2020b), a large proportion of people in our sample has not yet been able to go back to work, even two years after the pandemic's start.

The pre-pandemic average income of our sample is much lower than the pre-pandemic average income in the APU (2021) study; and is similar only to the income reported by APU (2021) for daily wage workers in the Indian Working Survey. Lower-income households have suffered a worse shock (APU, 2021; Kang et al., 2021; Lahoti et al., 2021) and our results corroborate the results of these studies.

Even after two years, the same socio-demographic groups—younger and less educated—were found to bear a higher burden of the economic loss. Notably in our sample, there were no gender inequities for those who lost their source of livelihood (conditional on being employed in 2019) since the pandemic started. In contrast, national-level surveys have shown that women were less likely to recover from employment losses (APU, 2021). However, the difference was less sharp when only informal workers were considered (APU, 2021), as women are primarily employed in the informal sector. It is also possible that we were unable to detect gender disparities because of the smaller share of men in our original sample and thus limited statistical power.

Our estimates on the proportion of households that experienced loss of income in 2020 are close to earlier estimates of losses in income in India and other countries (Egger et al., 2021; Afridi, 2020a; 2020b; Tran et al., 2020). We find that by 2022, nearly 60 percent of households still reported a loss of income. While we do not have fine-grained data on the amount of income earned, our measure of total monthly expenditures can be considered as a proxy for income. We show that while total expenditure was stable before the start of the pandemic, it decreased by 50 percent in 2022. However, it is important to caution that we only have information on expenditure incurred by the respondent and it therefore does not reflect the total expenditure of the entire household. Jha and Lahoti (2022) who also cover a similar time period as our study, found that except for households in the top income decile, all other income deciles had recovered to the pre-pandemic level by December 2021. Since they also reported a leftward shift in the income distribution for urban areas, their result is not necessarily contradictory to our results. A reason for the differences in our findings could be that Jha and Lahoti (2022) track income deciles over time and not individuals.

In our sample, compared to 2019, about two-thirds of the household reported reduced food expenditures in 2020 and 55 percent in 2022. In this case, again, the situation that we observe compares to the patterns observed immediately after the lockdown in other studies (APU, 2021; Jaacks et al., 2021; Kesar et al., 2021). Analysing changes in expenditure by food groups, we find that intake of both micro and macro nutrients had reduced in 2020 while by 2022, except for expenditure on cereals, other groups had recovered to pre-pandemic level. Harris et al. (2020) also found that Indian farming households protected their staple food consumption two months after the start of the pandemic, while reducing intake of fruits and animal-sourced food. The intake of fruits and animal-sourced food did not recover more than a year later for half of their sample (Kumar et al., 2023). Findings on the intake of unhealthy food are mixed in the literature. Ruíz-Roso et al. (2020) report an increase in intake of ultra-processed food among adolescents immediately after the pandemic began in Brazil, whereas Caso et al. (2022) report reduction in intake of unhealthy food in Italy. The strict lockdown at the beginning of the pandemic could have reduced access and therefore consumption of unhealthy food in our sample, which may not have recovered due to losses in income and employment (Picchioni et al., 2022).

In our sample, less than five percent of households report selling assets to cope with the shock caused by the pandemic. Our results are in line with the findings of Krishna and Agrawal (2021) suggesting that structural (long-term and chronic) poverty was not affected during the pandemic in our sampled households. However, with previous studies (Jha and Lahoti, 2022) suggesting that the effect of shocks may persist over years, it is possible that without substantial government support, other means of coping with the pandemic may dry up eventually and may push households into structural poverty. Also, the current strategy of reducing food intake could result in worse health outcomes and consequently a lower level of productivity and reduced earnings in the future.

There are several limitations of the study. First, there is a high attrition rate in our sample. The respondents whom we were not able to track are poorer and less educated than the original sample. Kugler et al. (2021) argue that despite the sample selection in phone surveys, such studies can provide relevant insights. We would argue the same for our study since the goal was not to survey a sample representative of the general population to begin with but rather to track a sample of individuals living just above subsistence level over time. Second, our results are not causal. Although we have two rounds of data to establish pre-pandemic trends, it is still not sufficient to disentangle the effect of a pandemic from other factors. Also, the pandemic effects may not be additive but multiplicative with other economic factors. Third, since we only

have data for 2020 and 2022, we cannot comment on how the second wave of infections and restrictions has affected the recovery path. Fourth, it is possible that there are important differences in the reliability of measures between the face-to-face (rounds 1–2) and phone-based surveys (rounds 3–4). While phone-based surveys may be less prone to social desirability bias, it is possible that respondents are more distracted during phone interviews. This could, for example, increase the measurement error for retrospective information on consumption patterns and impair respondents' ability for accurate recall. Fifth, in our study we only examine one aspect of distress, that is loss in employment and income. However, distress is multidimensional, and households also face, for instance, social and psychological distress (Reddy et al., 2021). As the data was collected through phone surveys, we could not collect all the information required to create vulnerability indices such as the livelihood vulnerability indicator or social vulnerability indicator used in other studies (Reddy et al., 2021).

Conclusion

The economically and socially vulnerable classes in India are facing an unprecedented crisis. The resumption of economic activity has done little to alleviate the economic distress among these classes. Improved macro-economic indicators do not correlate with improvements at all levels of society. Households in our sample were earning just above the subsistence level when they were selected for the study in 2018. We show that these households face a grave risk of being pushed or have already been pushed below the poverty line.

It is now clear that the recovery process has been limited for individuals at the lower end of the income distribution and from previous research it is known that the effect of economic shocks can last for decades (Verho, 2020; Newhouse, 2005). Thus, there is a need for continued support, especially for vulnerable groups in precarious employment conditions and low-income groups. Leveraging the database of bank account holders under the Jan Dhan Yojana (a financial inclusion programme), a cash relief programme was implemented by the Indian government at the beginning of the pandemic, providing a transfer of Rs. 500 for three months to female beneficiaries[12]. However, not only was the amount of transfer inadequate to cope with economic losses but it reached only half of its intended beneficiaries (Ghosh, 2020; Khera, 2020; Somanchi, 2020). In addition to longer periods of sustained financial support and more substantial transfer amounts, it has been recommended to use the beneficiary list from other programmes such as NREGA (National Rural Employment Guarantee Act), PDS (Public Distribution System) to address potential exclusion errors (Somanchi, 2020). Strengthening and expanding NREGA could provide support to those families and households who are still struggling to find employment (APU, 2021). While continued and substantial support is recommended, simple income support measures alone may not suffice. The Indian government provides food supplements through various programmes such as the Integrated Child Development Scheme (ICDS), school meals, Gareeb Kalyan Anna Yojana, and the PDS, but these programmes primarily focus on the provision of cereals/calories. Even though there are massive exclusion biases in the abovementioned programmes (Somanchi, 2020; Drèze and Khera, 2017; Reddy et al., 2016), they could provide a readily available infrastructure to be leveraged for offering more diverse food options to poor households, thus ensuring more balanced and healthier diets. The provision of free grains as a support measure to protect households from the COVID-19-related shock continues even in 2023, but cannot sufficiently alleviate the poor health outcomes. A decentralised approach has been recommended to improve the functioning of these existing programmes (Drèze et al.,

2018; Gragnolati et al., 2006), which would also be key in implementing the suggested extensions. Exclusion or inclusion in any targeted programme is based on objective criteria, which cannot adequately capture the multitude of complex factors that cause poverty. In an unexpected event like COVID-19, it may be more beneficial to extend the benefits to a larger population. The Government of India is gradually moving to a more universal approach, for instance through its Rights to Food Act, or universalisation of the ICDS programme, but there is still scope for improvement.

In addition to these short-term and crisis-specific policies, there is a need for more long-term policy changes. The precarious nature of informal jobs and the lack of social security have all contributed to more severe effects on those working in the informal sector. Labour law reforms and a basic state social security programme for all workers engaged in any type of job are the first steps needed to protect vulnerable groups from a shock like COVID-19. While the unemployment rate has recovered, the labour force participation rate was below the pre-pandemic level in June 2022 (Dev and Sengupta, 2022). This is particularly true for women and those employed in the informal sector.

The aim of this study was to highlight the persistent nature of the shock due to COVID-19. Continuous research efforts will be needed to understand how vulnerable population groups can be better protected from similar shocks in the future.

Data availability

The datasets generated and analysed during the current study are available online. The first two rounds of data are available at https://osf.io/p8dj5/files/osfstorage while the last two rounds are available at https://doi.org/10.25625/XUV5YE.

Notes

1 https://statisticstimes.com/economy/country/india-quarterly-gdp-growth.php, accessed on 16th July 2022.

2 https://unemploymentinindia.cmie.com/, accessed on 16th July 2022.

3 http://www.cessi.in/coronavirus/pune accessed on 15 August 2022

4 https://www.businesstoday.in/latest/trends/india-may-have-missed-90-infections-for-every-detected-covid-19-case/story/425175.html

5 https://www.worldometers.info/world-population/india-population/ visited on 5th July 2023.

6 We use the food price index to deflate food expenditure and the general index to deflate non-food expenditure. https://mahasdb.maharashtra.gov.in/cpiReports.do accessed on 18th July 2022.

7 https://www.census2011.co.in/census/state/maharashtra.html

8 It is not possible to distinguish between those who are looking for employment and those who are not.

9 Appendix Tables A.1 and A.2 present summary statistics by age and education.

10 This also allows us to look at those households where the respondent was not working in 2019.

11 Results based on balanced panel are available in Appendix Table A.3.

12 Jan Dhan Yojana is a financial inclusion scheme launched in 2014 with the aim of improving access to financial services. Please see https://pmjdy.gov.in/ for details.

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Author contributions

NM—conceptualisation, data collection, methodology, formal analysis, writing—original draft, writing—review & editing. JIS—conceptualisation, methodology, writing—review & editing. SV—conceptualisation, methodology, writing—review & editing, supervision.

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Competing interests

The authors declare no competing interests.

Ethical approval

The questionnaire and methodology for this study were approved by the Institutional Ethics Committee at the University of Goettingen and the Indian Institute of Technology, Gandhinagar.

Informed consent

Participation in the survey was voluntary and the participants had the right to withdraw from the study at any point or not answer any question. Informed consent was taken before the start of each interview.

Additional information

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