

# Determinants and Dynamics of Food Insecurity During COVID-19\*

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## Abstract

COVID-19 has threatened food security of the poor due to the lockdown of markets amidst poor institutions and lack of social safety nets in the developing world. To provide rapid evidence on the determinants and dynamics of food insecurity and to understand the coping strategies adopted by rural households during the pandemic, we carried out a telephone survey of roughly 10,000 rural households in Bangladesh, three weeks after the country went into lockdown. We found that roughly 90% of households reported experiencing a negative income shock after the countrywide lockdown was implemented. Households that primarily depend on daily casual labor for their income were affected the most, while households with regular jobs were affected the least in terms of food insecurity. Households adversely hit by income shock due to the pandemic were also found to rely more on past savings, food stocks, and loans from various sources to cope with the food crisis. When we followed-up 2,402 households, about 3 to 4 weeks after the first wave, to understand the dynamics of food insecurity, we found that food insecurity increased significantly across households and began affecting groups that were in advantageous position during the first wave of data collection. This poses a threat to the poor as food security has already worsened since the crisis hit and would presumably worsen further in the future unless rapid measures are taken to attenuate it at the earliest.

**Keywords:** Food insecurity, COVID-19, poverty, coping, Bangladesh.

**JEL Classification:** I3, I15, O12, Q18

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# 1 Introduction

The 2019 coronavirus disease (COVID-19) has brought about unprecedented challenges to the food security situation, particularly in the developing world. The United Nations (UN) estimates that more than a quarter of a billion people could face starvation during the pandemic (UN, 2020). The World Health Organization (WHO) also expressed concern over the potential impact of COVID-19 on food shortages, hunger, and malnutrition which would only increase the vulnerability to diseases further (WHO, 2020). Thus, economic lockdown measures imposed by many developing countries carry a serious trade-off in terms of economic welfare, hunger, and poor nutrition (Ravallion, 2020). On global food crisis during COVID-19, the UN World Food Programme Executive Director, David Beasley, stated, “In a worst-case scenario, we could be looking at famine in about three dozen countries” (CSIS, 2020). About 80% of the world’s poorest and most food-insecure people live in remote rural areas. As a result of COVID-19 lockdown and movement restrictions imposed by many countries, these poor people are unable to work due to loss of jobs, businesses, and livelihoods, and with limited access to markets, both their lives and livelihoods have been threatened (Barrett, 2020). The food insecurity among these people will not only further deteriorate health and physical wellbeing but may also affect their mental health and psychosocial wellbeing (Perez-Escamilla & de Toledo Vianna, 2012), particularly among women and children.

In this paper, we investigate the determinants and dynamics of food insecurity during the COVID-19 crisis using data collected in two waves from rural households in Bangladesh. In particular, we explore the factors that determine food insecurity across rural households during the crisis, coping strategies adopted by them, and how food insecurity transitions over time.<sup>1</sup> We attempt to identify those most at risk of severe hunger and food insecurity in a vulnerable population so that households can be quickly identified, effective policies can be designed, and resources can be allocated at the earliest before hunger and malnutrition in its worst forms manifest in the time of such a crisis. We study Bangladesh for a number of reasons. First, Bangladesh started implementing countrywide lockdown measures from 26 March 2020 due to the pandemic, 18 days after detecting its first COVID-19 positive patient (WHO Bangladesh, 2020). Second, households in Bangladesh had low food security before the pandemic. It ranked 83 out of 113 countries globally, and the situation was worse than many other neighboring countries, such as India, Nepal, Pakistan, and Myanmar (Global Food

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<sup>1</sup>Although macro-level factors, such as trade restrictions, have a strong impact on food supply and prices, and, thus, affects food security of the poor (Glauber et al., 2020; Sulser & Dunston, 2020), we focus primarily on household-level factors of food insecurity in this study.

[Security Index, 2019](#)). Third, 13 million people are already out of work with no fallbacks and an additional 5 million people are expected to be in extreme poverty due to COVID-19 in Bangladesh ([Shah, 2020](#); [Abi-Habib, 2020](#)). Therefore, the adverse effects of such a countrywide lockdown may extend beyond income shocks and may also affect people’s food insecurity that will only deteriorate further if new policies to protect the vulnerable are not implemented at the earliest.

## 2 Data

This study focuses on respondents from three already existing surveys (from three large scale RCTs conducted in 2019) located in the southwestern region of Bangladesh. To collect rapid information on food insecurity, we collaborated with a local NGO, Global Development Research Initiative (GDRI), to conduct a brief telephone survey (or tele-survey) on these respondents. See section 4 for a short discussion on our fieldwork costs and experiences during COVID-19.

We collected our data in two waves. Data collection during the first wave started on 14 April 2020, 19 days after the lockdown, and ended on 3 May 2020. In the first wave, we surveyed 9,847 rural households that are distributed across 423 villages. We collected data on household-level food insecurity, income loss, coping strategies, and household head’s primary occupation. We then construct a range of indicators based on the Food Insecurity Experience Scale (FIES), following [Ballard et al. \(2013\)](#). FIES is a powerful tool in this situation as it lays emphasis on direct responses of individuals and can capture different situations ranging from anxieties related to lack of food to short term discomforts related to lack of quality and quantity to life-threatening characteristics such as hunger, related to the access dimension of food security. In addition to indicators, we also use the continuous FIES score in our analysis.<sup>2</sup> Then, about 3-4 weeks after the first wave, a follow-up survey was conducted on 2,402 households (out of the 9,847 households) that are distributed across 410 villages. During this follow-up, we only collected information on household-level food insecurity (i.e., FIES questions). To collect data, enumerators tele-surveyed one adult member from each household.<sup>3</sup>

Since conducting comprehensive tele-survey on a large sample was not feasible during the crisis, we matched a subsample of the tele-surveyed households to data collected

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<sup>2</sup>See Appendix B for a detailed discussion of the FIES score and how we construct our indicators, and see Table B1 and Figure B1 in the same Appendix for its summary.

<sup>3</sup>The overall response rate in wave 1 was about 78% and in wave 2 was about 96%. The main reasons for non-response during wave 1 include phone numbers being invalid, phone numbers belong to non-household members, phones were switched off, or numbers were not active any longer.

previously (for a different research project) to explore whether household characteristics, such as financial decision-making power of women within households, the proportion of female household members, education, income, equivalized savings, and agricultural land possession, can also help explain food insecurity. This data was collected in June 2019 and comprises 2,691 households (out of 9,847 rural households surveyed in wave 1).

To understand the representativeness of our rural sample, we also compare characteristics of our sample (using the data collected in 2019) to the rural sample of the Bangladesh Household Income and Expenditure Survey 2016 (HIES) data ([Bangladesh Bureau of Statistics, 2016](#)). These comparisons are reported in Table B2 in Appendix B. Our comparisons indicate that our survey households have very similar characteristics to average rural households in Bangladesh.

### 3 Results

Figure 1 (see Wave 1, all sample) provides a sense of the overall food insecurity experienced by rural households in this short period following the lockdown in Bangladesh. It is evident that more than 80% of households experienced mild to severe food insecurities and more than 50% of households experienced moderate to severe food insecurities. This summary is complemented with Table A1 in Appendix A. In the summary presented in Table A1, three other characteristics stand out: (i) 90% of the households have experienced income loss due to COVID-19, (ii) more than 50% of the head of households are either in farming or are day laborers, and (iii) savings, borrowings, and food stocks appear to be the main coping strategies to address food shortages during the pandemic. Additionally, Figure 2 highlights some interesting variations in food insecurity. For instance, it appears income loss and food insecurity are strongly correlated across households. While households with no change in income are mostly food secured, food insecurity appears to increase with income loss (Graph A, Figure 2). In terms of occupation, food insecurity falls relatively more in the moderate to severe category for households that are primarily farmers and wage laborers than among households with more stable occupations, such as having public sector jobs or owning businesses (Graph B, Figure 2).

**Determinants of food insecurity.** To examine in detail whether factors such as loss of income, primary occupations of households, remittances received from family members (from cities and/or abroad), and involvement in microcredit programs determine incidence of food insecurity, we regress self-reported food security measures (indi-

cator variables) on a range of explanatory variables using the following OLS regression model:

$$Y_{ij} = \alpha + I'\beta + O'\gamma + R'\delta + \theta M_{ij} + \nu_j + \epsilon_{ij} \quad (1)$$

where the dependent variable  $Y_{ij}$  for household  $i$  in village  $j$  is, alternatively, (i) indicator for food insecurity, (ii) indicator for mild food insecurity, (iii) indicator for moderate food insecurity, (iv) indicator for severe food insecurity, or (v) FIES Score. See Table A1 (Panel A) in Appendix A and Section 1 in Appendix B for a brief discussion and construction of the outcome variables used in the analysis. Subsequent panels in Table A1 in Appendix A also defines the following explanatory variables:  $I$  is a vector of indicators for partial and complete income loss (Panel B);  $O$  is a vector of indicators for primary household occupations (Panel C);  $R$  is a vector of indicators for change in household remittances (Panel D); and,  $M$  is an indicator for households that are enrolled in microcredit programs (Panel D). In all specifications, we include villages fixed effects,  $\nu_j$ , and cluster standard errors at the village level (423 clusters). We report these estimated coefficients in odd-numbered columns in Table 1. Columns 1 and 9 present estimates on the full sample while columns 3, 5, and 7 report estimates on subsamples.

Firstly, on income loss, we find that households that experienced a complete or partial loss of income are more likely to be food insecure than households that did not experience income loss. When we break down income loss into complete and partial, we find that both partial and complete income loss leads to being more food insecure. However, food insecurity among the partial income loss households is statistically less severe than households that experienced complete income loss (F-test:  $p < 0.01$  while comparing these two estimated coefficients within all odd-numbered columns). Overall, income loss is positively correlated with food insecurity across households.

Secondly, in terms of occupation, we find that heads of households (HH hereinafter) that are farm and day laborers are more likely to be food insecure than HH that are farmers (Columns 1 and 9). Moreover, positive, significant, and larger coefficients under ‘moderate’ and ‘severe’ panels relative to coefficients under ‘mild’ panel imply that farm and day laborers experience more severe food insecurity (Column 3, 5, and 7). Besides, day laborers experience statistically more severe food insecurity relative to farm laborers (Column 7; F-test:  $p = 0.022$ ), while mild and moderate food insecurity across farm and day laborers are statistically similar (F-test:  $p = 0.090$  (in mild, Column 3) and  $p = 0.350$  (in moderate, Column 5)). On the other hand, HH who have their own business or those who work in the public sector are less food insecure than HH that are farmers (Columns 1 and 9). Also, government jobs appear to make households more food secure than having own businesses; however, the difference between the estimated coefficients is only

marginally significant in column 1 (F-test:  $p = 0.064$  in column 1 but  $p > 0.10$  in subsequent columns). Interestingly, HH with private jobs are only marginally better off in terms of food security than HH that are farmers. However, HH with public jobs and own businesses are significantly more food secure than that with private jobs (F-test:  $p < 0.01$  in all comparisons within odd-numbered columns). A reasonable interpretation of this fact is that public sector jobs tend to be more stable than any other jobs in Bangladesh.

Finally, on the involvement in microcredit programs, we find that households with membership to microcredit programs are more likely to be food insecure than households with no membership (Columns 1 and 9). The estimated coefficients on this indicator are also similar across specifications and suggest that membership to microcredit programs is correlated with household food insecurity, presumably due to repayment obligations that further weakens the purchasing power of the household. Surprisingly, remittance received from family members seems to explain food insecurity very little. For instance, only households that stopped receiving remittances during COVID-19 are less food insecure than households that receive no remittances (Column 1); although, this insecurity is rather mild (Column 3). One possible explanation for this negative and statistically significant coefficient is that households with family members working abroad or in the cities are usually better-off financially than households with no family members working abroad or in the cities. Thus, discontinuation of remittances still keeps these households relatively less food insecure. Besides, remittances that partially stopped or remain unchanged do not explain food insecurity across households.

To check the robustness of these results, we augment all specifications with household-level characteristics (collected in 2019) and find similar results (only equalized savings significantly explain food insecurity). Moreover, our results remain robust and qualitatively similar across all specifications using probit (for dummy outcomes in columns 1 through 7) and ordered probit (for FIES score outcome in column 9) models. These regressions are provided in Tables A2 and A3 respectively in Appendix A. Since other household characteristics of our sample (collected in 2019) explain food insecurity very little (Table A2 in Appendix A), we focus the remainder of the analysis without these characteristics.

**Coping mechanisms.** Next, we discuss how households are coping with the negative income shock. Panel E in Figure A1 in Appendix A highlights some major coping strategies. It appears households primarily rely on previous savings and stored food to cope with income loss. Also, households with complete income loss are more

likely to take out loans than households with partial income loss. Similarly, Figure A2 in Appendix A provides a sense of the association between food insecurity and coping strategies. This figure highlights two noteworthy relationships. First, households with higher savings and access to stored food from the past are less food insecure. Second, the more food-insecure households are, the more likely they are to borrow/loan money. Other crucial mechanisms, particularly NGOs and government aid, supported these households to some extent during the crisis.

To explore these relationships more in detail, we augment the OLS regression model 1 by adding coping strategies (listed and defined in Panel E, Table A1 in Appendix A) as additional explanatory variables. We report these augmented specifications in even-numbered columns in Table 1.<sup>4</sup> Focusing on coping strategy estimates, we see that households that rely on previous savings and stored food to cope with the crisis are less likely to be food insecure, as indicated by negative and statistically significant coefficients (even-numbered columns). Likewise, household borrowing/loans is also positively associated with food insecurity, where severely food insecure households take out more loans than households with mild to moderate food insecurities (also highlighted in Figure A2). Moreover, severely food insecure households go to friends and relatives for help (Column 8); the government and NGOs have also been successful to an extent in effective targeting, identifying, and helping the food insecure households.<sup>5</sup>

**Dynamics of food insecurity.** Is food insecurity deteriorating rapidly? To explore this possibility, we followed-up a subset of households from the first wave ( $N = 2,402$ ) to investigate whether food insecurity among rural households is deteriorating further during the pandemic-lockdown.<sup>6</sup> We look back at Figure 1 (Waves 1 and 2,  $N = 2,402$ ), which also provides an ocular depiction of household-level food insecurity

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<sup>4</sup>Since coping strategies only apply to households that experienced income loss due to COVID-19, specifications in even-numbered columns only focus on households that experienced an income loss and, thus, have smaller samples than specifications in odd-numbered columns in the same Table.

<sup>5</sup>The Bangladeshi Government announced a program to allocate subsidized rice to the 5 million most vulnerable people, but the measures were inadequate compared to its poor population. Please note that according to the Bangladesh Bureau of Statistics, there are now about 20% people, or 35 million of the country's 164 million population, who live below the poverty line in 2019. This rate is substantially higher if one considers the World Bank's definition of USD 1.9 a day for the poverty line (Islam, 2020). In addition, the government promised to provide BDT 2,500 (USD 30) to 5 million poor households by May 18, but it could not be disbursed in due time and none of the households in our survey area received any such transfers by the time the second wave was completed (TBS Report, 2020).

<sup>6</sup>We present some basic statistics to show a balance of characteristics between households that participated in both waves and households that only participated in the first wave. We present these statistics in Table A4 in Appendix A. While there are a few significant differences, these differences do not follow a particular pattern (i.e., differences in both directions), suggesting characteristics are similar between these two groups of households.

dynamics. It is evident from this figure that the proportion of food secure and mildly insecure households dropped relative to their first wave insecurities (roughly by 10 percentage points), while the number of severely insecure households drastically increased during the second wave (roughly by 30 percentage points), implying a probable shift. Table 2 matrix complements these summary data. For instance, among the households that were food secure in wave 1 ('Food Secure' row), roughly 88% of such households experienced a deterioration in food security status, i.e., became food insecure from secured (333 of 380 households). In contrast, among the households that were food insecure in wave 1 ('Food Insecure' row), only 1.5% households experienced an improvement in its food security status, i.e., became food secured from insecure (31 of 2,022 households). 85% of households (of 2,402 households) nevertheless did not experience any change in their food security status.

When the change in food insecurity is regressed on the same set of variables as in the OLS regression model 1, it becomes apparent which groups are experiencing deterioration in terms of food insecurity in the second wave. Table 3 presents the OLS estimates. Columns 1 and 2 in Table 3 look at the change in food insecurity status (improved or deteriorated) vis-à-vis no change, while columns 3 and 4 focus on improvement (against no change), and the final two columns look at the deterioration of food insecurity status (against no change) across households. We find that households that already faced complete income loss (in wave 1) experienced less deterioration in terms of food insecurity than households that had no or partial income loss (negative and statistically significant coefficient in column 5). This implies that food insecurity must be rapidly dispersing among the previously 'better-off' groups. A similar scenario can also be observed across occupations. For instance, farm and day laborers, who were significantly more food insecure than farmers during the first wave, experienced less deterioration in food insecurity status than farmers in the second wave. Moreover, self-employed or business-dependent households experienced more deterioration than farmers in the second wave, which might be due to limitations imposed on shops and businesses during the pandemic. Public servants, on the other hand, experienced both improvement and deterioration in food security status in the second wave (Columns 3 and 5 respectively). Their improvement in food security is in line with the fact that their salary from government jobs might not have changed and perhaps, initially (in wave 1), they were concerned about job and income losses due to the lockdown. However, it is puzzling why their food security also deteriorated in the second wave. Furthermore, households under microcredit programs have also experienced relatively less deterioration than households that are not part of any microcredit programs.



When we also explore the role of coping strategies (OLS estimates in even-numbered columns), we observe an interesting pattern. The most common coping strategies such as savings, food stocks, and loans did not help households in improving food insecurity (Column 4). Instead, households that were using up their savings and stored food in the first wave have experienced a significant deterioration in food insecurity in the second wave (Column 6). One reasonable interpretation of this pattern is that resources, such as savings and food stocks, are getting depleted during the pandemic. Hence, once used up, food insecurities were meant to deteriorate. Also, households that borrowed money in the first wave experienced less deterioration in food insecurity in the second wave. This implies that borrowing is taking over as an important coping mechanism, which could affect livelihoods and wellbeing and food security in the long term, even after the lockdown restrictions are relaxed (assuming households would have to repay the lenders post lockdown).

Finally, when we explore whether the preparedness to tackle emergencies (in terms of managing a substantial amount of money within a week) can explain changes in food insecurity, we find that households that are self-reliant or are well-equipped to handle emergencies have experienced a significant improvement in food security than households that are poorly equipped (Column 4). Self-reliant households also experienced relatively less deterioration in food security than poorly equipped households (negative coefficient in Column 6), but this coefficient is only marginally significant at 10% level. Therefore, the ability of households in handling emergencies appears to be an important factor in dealing with food insecurity.

## **4 Lessons learned from fieldwork during COVID-19**

Carrying out remote surveys in rural communities in developing countries during COVID-19 can be a big challenge for development researchers. This study benefited notably by our already-installed research infrastructure in the southwestern region of Bangladesh. First, the local research-focused NGO, GDRI, has a wide local network with up-to-date contact information of numerous households in this area. This allowed us to reach out to as many as 10,000 households during the first wave and also conduct a follow-up on a subset of households. Second, many of the surveyed households (for this study) were previously surveyed by GDRI, which gave us access to various additional household-level information. Besides, households responded positively as they were familiar with GDRI's social activities in this region. Third, enumerators at GDRI are highly trained with substantial experience (working for at least five years) in interviewing and collecting

quantitative data from similar respondents. This, along with access to previous data, resulted in our interviews being relatively short (20 minutes per household on average). During a brief pilot, we also learned that setting up an appointment prior to conducting interviews lead to higher participation by households and reduced attrition during the follow-up. We believe both appointments and interview durations have improved our data quality. Finally, one of the investigators of this study (Firoz Ahmed) is affiliated with a public university located in the study region, which improved our communication with GDRI and reduced various other costs. In terms of monetary costs, the total cost of data collection (by 25 enumerators) across the two waves was about USD 11,000. This includes the costs of phone calls, enumerator training, enumerator salary, NGO overhead, etc. These costs are very low relative to the costs of collecting data in person. Therefore, researchers looking to collect data from rural communities in developing countries during COVID-19 should take note.

## 5 Conclusion

Overall, our results from this study suggest that the countrywide lockdown due to COVID-19 led to a drastic increase in income loss and food insecurity across rural households in Bangladesh. We also find that households that are primarily in occupations without job security, such as farm and day laborers, were initially affected the most in terms of food insecurity. Besides, households with higher savings and access to stored food from the past are relatively less food insecure, and households are more likely to take out loans when they are more food insecure. Our survey evidence also indicates that food insecurities appear to be dispersing rapidly into groups that were formerly food secured. With no indication of improvement in food security among the affected households, the pattern on such transmission suggests that food insecurity would inevitably catch-up on the remaining food-secure households if drastic measures are not taken by policymakers to arrest the spread at the earliest.

Our survey evidence is useful to gain important insights into the major determinants of food insecurity among households during the COVID-19 pandemic. Besides, we also learn about the major coping strategies undertaken and the rapid dispersion of food insecurities across households. This informs policymakers about the factors to be targeted while designing new policies to support the poor and vulnerable during this pandemic.

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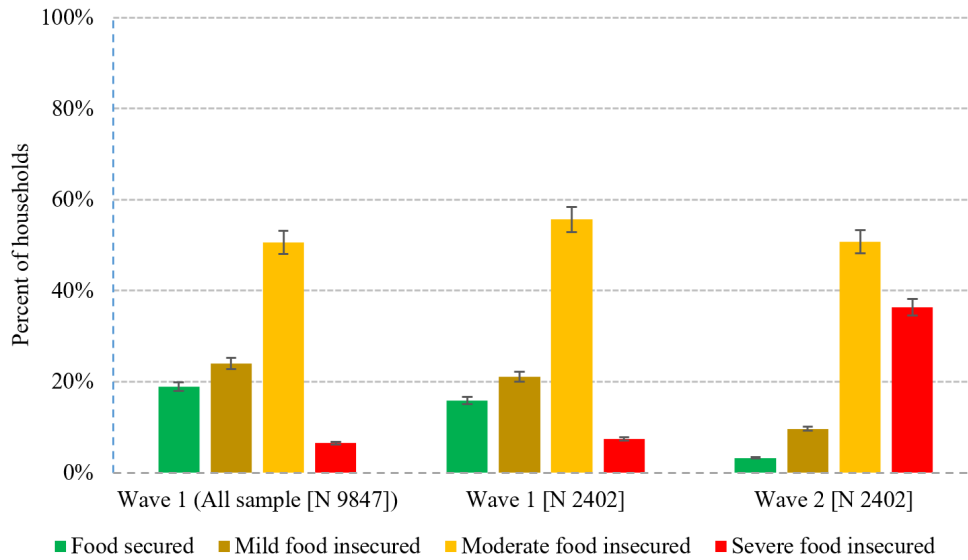
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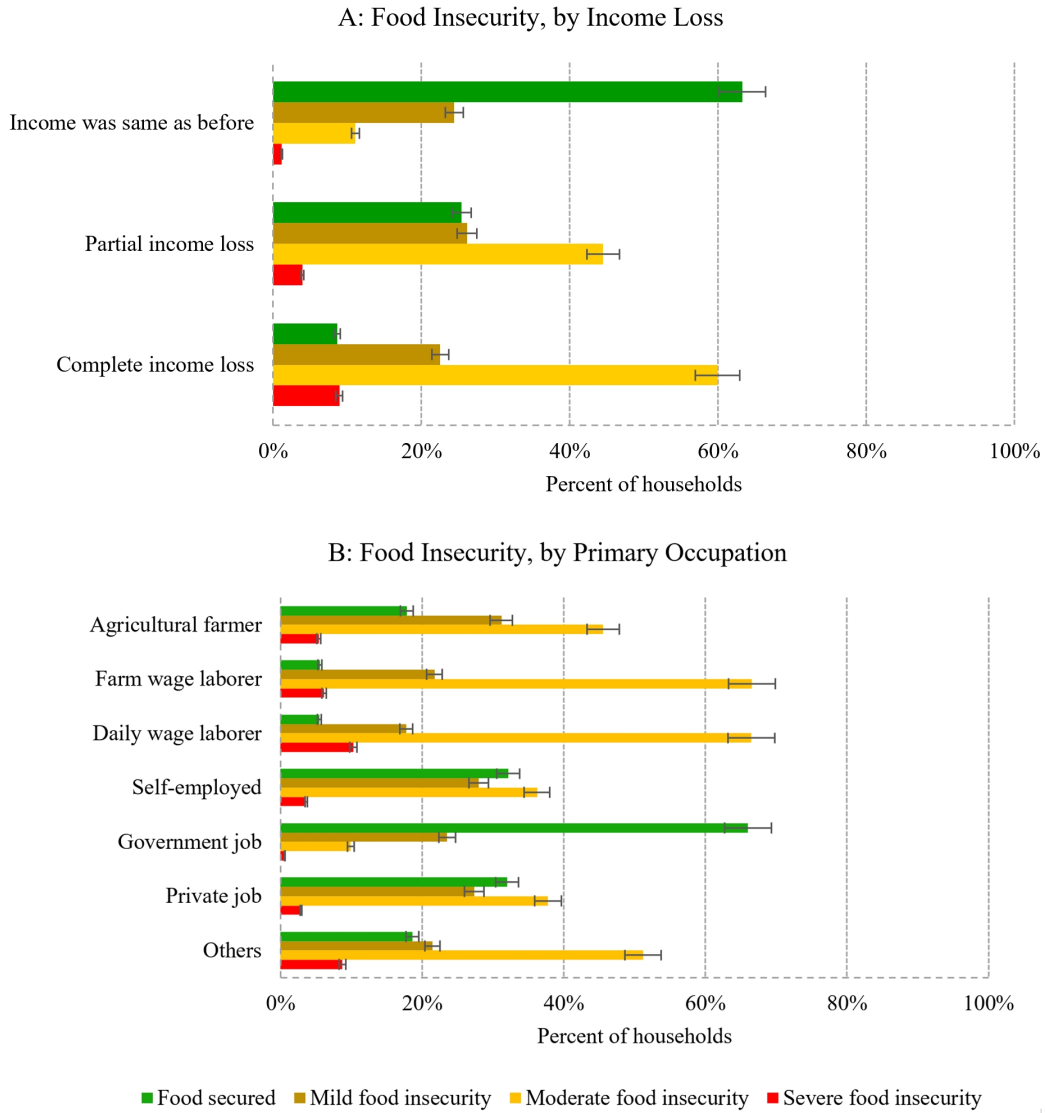
## 6 Main Tables & Figures

Figure 1: Food Insecurity Across the Two Waves



**Note:** This figure summarizes food insecurity across the two waves of data collection. ‘Food secured’ is an indicator for households that did not face any food insecurities in the past 2-3 weeks. ‘Mild food insecurity’ is a dummy variable that equals 1 if households worry about food intake, were unable to eat healthy food, or ate few varieties of food in the past 2-3 weeks and 0 otherwise; ‘Moderate food insecurity’ is a dummy variable that equals 1 if households had to skip a meal, ate less than usual, or ran out of food during the past 2-3 weeks and 0 otherwise; ‘Severe food insecurity’ is a dummy variable that equals 1 if household members were hungry yet did not eat or did not eat for a whole day during the past 2-3 weeks and 0 otherwise. Bars with 95% confidence intervals have been reported.

Figure 2: Summary of Food Insecurity



**Note:** Bars with 95% confidence intervals have been reported. See Table A1 in Appendix A for variable descriptions.

Table 1: Determinants of Food Insecurity

VARIABLES	Food Insecure		Mild		Moderate		Severe		FIES Score	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Household income loss (omitted category: No income loss (odd columns) / Partial income loss (even columns))</i>										
Complete Income Loss	0.412*** (0.023)	0.089*** (0.009)	0.305*** (0.029)	0.103*** (0.017)	0.511*** (0.023)	0.124*** (0.012)	0.302*** (0.026)	0.118*** (0.022)	1.906*** (0.081)	0.586*** (0.040)
Partial Income Loss	0.303*** (0.023)	-	0.180*** (0.029)	-	0.354*** (0.024)	-	0.081*** (0.022)	-	1.143*** (0.076)	-
<i>Occupation of the household head (omitted category: Farmer)</i>										
Farm Laborer	0.096*** (0.015)	0.067*** (0.014)	0.065* (0.035)	0.035 (0.034)	0.148*** (0.020)	0.106*** (0.018)	0.179*** (0.054)	0.105* (0.054)	0.586*** (0.077)	0.373*** (0.074)
Day Laborer	0.111*** (0.013)	0.069*** (0.012)	0.122*** (0.025)	0.095*** (0.027)	0.161*** (0.017)	0.104*** (0.015)	0.302*** (0.035)	0.198*** (0.035)	0.852*** (0.064)	0.572*** (0.059)
Self-employed/Business	-0.115*** (0.014)	-0.109*** (0.014)	-0.109*** (0.020)	-0.096*** (0.022)	-0.145*** (0.019)	-0.137*** (0.019)	-0.089*** (0.027)	-0.060** (0.026)	-0.563*** (0.066)	-0.507*** (0.064)
Government Job	-0.176*** (0.034)	-0.198*** (0.061)	-0.145*** (0.041)	-0.162* (0.089)	-0.195*** (0.033)	-0.187*** (0.067)	-0.065* (0.036)	-0.106 (0.064)	-0.667*** (0.121)	-1.175*** (0.203)
Private Job	-0.035* (0.021)	-0.042* (0.022)	-0.036 (0.032)	-0.038 (0.039)	-0.054** (0.026)	-0.061** (0.029)	-0.054 (0.037)	-0.087* (0.044)	-0.298*** (0.091)	-0.313*** (0.100)
Others	-0.002 (0.016)	-0.022 (0.016)	-0.045 (0.031)	-0.039 (0.033)	0.014 (0.021)	-0.011 (0.020)	0.041 (0.037)	0.036 (0.039)	0.228** (0.088)	0.094 (0.083)
<i>Change in Remittances (omitted category: No remittance)</i>										
Completely stopped	-0.076** (0.035)	-0.074** (0.034)	-0.140** (0.055)	-0.143** (0.060)	-0.066 (0.046)	-0.050 (0.047)	-0.080 (0.052)	-0.062 (0.050)	-0.151 (0.172)	-0.148 (0.161)
Partially stopped	-0.028 (0.043)	-0.027 (0.043)	-0.001 (0.063)	0.004 (0.068)	-0.027 (0.049)	-0.014 (0.051)	-0.044 (0.043)	-0.008 (0.053)	-0.271 (0.178)	-0.230 (0.196)
Unchanged	-0.081 (0.084)	-0.249* (0.130)	0.002 (0.104)	-0.503** (0.215)	-0.131 (0.082)	-0.259 (0.169)	-0.014 (0.086)	-0.447*** (0.128)	-0.276 (0.443)	-1.304* (0.774)
<i>Involved in microcredit program (omitted category: No loan taken)</i>										
Microcredit loan taken	0.045*** (0.007)	0.027*** (0.007)	0.070*** (0.015)	0.061*** (0.016)	0.044*** (0.009)	0.023** (0.009)	0.059*** (0.017)	0.035** (0.017)	0.226*** (0.037)	0.136*** (0.037)
<i>Coping strategies</i>										
Past savings	-	-0.107*** (0.013)	-	-0.135*** (0.027)	-	-0.145*** (0.017)	-	-0.189*** (0.035)	-	-0.761*** (0.067)
Previously stored food	-	-0.072*** (0.011)	-	-0.085*** (0.023)	-	-0.098*** (0.014)	-	-0.102*** (0.028)	-	-0.424*** (0.055)
Help from friends/relatives	-	0.005 (0.014)	-	0.066 (0.048)	-	0.002 (0.019)	-	0.162*** (0.045)	-	0.268*** (0.098)
Help from the Government	-	0.023** (0.011)	-	0.041 (0.037)	-	0.031** (0.014)	-	0.134*** (0.041)	-	0.282*** (0.071)
Help from NGOs	-	0.024 (0.025)	-	0.122* (0.073)	-	0.030 (0.032)	-	0.219** (0.101)	-	0.052 (0.215)
Other loans taken	-	0.070*** (0.010)	-	0.090*** (0.023)	-	0.097*** (0.014)	-	0.238*** (0.037)	-	0.536*** (0.055)
Others	-	-0.013 (0.019)	-	-0.034 (0.039)	-	-0.012 (0.025)	-	0.014 (0.040)	-	0.047 (0.099)
Village FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,847	9,082	4,225	3,554	6,844	6,275	2,506	2,013	9,847	9,082
R-squared	0.356	0.317	0.451	0.467	0.492	0.457	0.600	0.697	0.409	0.423

Robust standard errors clustered by village are in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Note:** OLS estimates reported. Dependent variables in columns 1-2 are a dummy that equals 1 if households have food insecurity and 0 if no food insecurity (full sample); columns 3-8 breaks down the sample into mild, moderate, and severe food insecurities (split-samples); i.e., dependent variables in columns 3-4 are a dummy that equals 1 if households have mild food insecurity and 0 if no food insecurity; dependent variables in columns 5-6 are a dummy that equals 1 if households have moderate food insecurity and 0 if no food insecurity; dependent variables in columns 7-8 are a dummy that equals 1 if households have severe food insecurity and 0 if no food insecurity; dependent variables in columns 9-10 are FIES score (between 0 and 8), where high number corresponds to high food insecurity. Even columns focus only on households that have experienced a negative income shock due to COVID-19 (i.e., experienced either complete or partial income loss). Since coping strategies only apply to households that reported income loss, odd columns do not report estimates for coping strategies. See Table A1 in Appendix A for other variable descriptions.

Table 2: Improvement and Deterioration in Food Insecurity Over Time

Incidence of food insecurity in wave 1	Incidence of food insecurity in wave 2		Total
	Food Secure	Food Insecure	
<b>Food Secure</b>	47 (1.96%) <i>(Always food secured)</i>	333 (13.86%) <i>(Deterioration)</i> (Mild=67, Moderate=236, Severe=30)	380 (15.82%)
<b>Food Insecure</b>	31 (1.29%) <i>(Improvement)</i> (Mild=31, Moderate=0, Severe=0)	1,991 (82.89%) <i>(Always food insecure)</i> (Mild=165, Moderate=984, Severe=842)	2,022 (84.18%)
N (%)	78 (3.25%)	2,324 (96.75%)	2,402 (100%)

**Note:** The break-ups for the extent of food insecurity are presented in the brackets below.



Table 3: Dynamics of Food Insecurity

VARIABLES	Change		Improved		Deteriorated	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Household income loss (omitted category: No or partial income loss)</i>						
Complete Income Loss	-0.113*** (0.017)	-0.071*** (0.018)	-0.007 (0.007)	-0.005 (0.007)	-0.109*** (0.017)	-0.066*** (0.017)
<i>Occupation of the household head (omitted category: Farmer)</i>						
Farm Laborer	-0.084*** (0.029)	-0.073*** (0.027)	-0.008 (0.011)	-0.002 (0.011)	-0.078*** (0.028)	-0.072*** (0.026)
Day Laborer	-0.097*** (0.023)	-0.063*** (0.022)	-0.011 (0.008)	-0.006 (0.008)	-0.089*** (0.022)	-0.060*** (0.021)
Self-employed/Business	0.095*** (0.029)	0.089*** (0.029)	0.016 (0.012)	0.017 (0.011)	0.088*** (0.028)	0.081*** (0.028)
Government Job	0.222*** (0.065)	0.191* (0.103)	0.109** (0.054)	-0.009 (0.009)	0.184*** (0.066)	0.196* (0.103)
Private Job	0.010 (0.049)	-0.010 (0.049)	0.006 (0.026)	-0.005 (0.029)	0.011 (0.045)	-0.007 (0.045)
Others	-0.007 (0.035)	-0.007 (0.030)	-0.016 (0.011)	-0.007 (0.011)	0.006 (0.034)	-0.000 (0.029)
<i>Change in Remittances (omitted category: No remittance)</i>						
Completely stopped	0.023 (0.055)	0.035 (0.048)	-0.002 (0.008)	0.006 (0.006)	0.023 (0.055)	0.031 (0.048)
Partially stopped	0.041 (0.097)	-0.052 (0.085)	-0.006 (0.014)	-0.022 (0.016)	0.049 (0.098)	-0.034 (0.085)
Unchanged	0.294* (0.177)	0.128 (0.213)	0.138 (0.140)	-0.013 (0.019)	0.294 (0.212)	0.132 (0.206)
<i>Involved in microcredit program (omitted category: No loan taken)</i>						
Microcredit loan taken	-0.054*** (0.016)	-0.031** (0.016)	-0.009 (0.005)	-0.002 (0.005)	-0.050*** (0.015)	-0.031** (0.015)
<i>Coping strategies</i>						
Past savings	-	0.110*** (0.021)	-	0.005 (0.008)	-	0.112*** (0.021)
Previously stored food	-	0.057*** (0.021)	-	0.003 (0.007)	-	0.056*** (0.020)
Help from friends/relatives	-	-0.030 (0.024)	-	-0.004 (0.013)	-	-0.023 (0.025)
Help from the Government	-	-0.045** (0.020)	-	-0.012* (0.007)	-	-0.035* (0.020)
Help from NGOs	-	-0.067 (0.076)	-	-0.003 (0.023)	-	-0.062 (0.080)
Other loans taken	-	-0.054*** (0.018)	-	0.001 (0.007)	-	-0.049*** (0.018)
Others	-	-0.044 (0.039)	-	0.006 (0.010)	-	-0.048 (0.038)
<i>Can manage money during emergency (omitted category: Not manageable)</i>						
Fairly manageable	-	-0.010 (0.018)	-	0.007 (0.005)	-	-0.015 (0.017)
Very easily manageable	-	-0.010 (0.033)	-	0.047** (0.022)	-	-0.046 (0.029)
Self-sufficient/no help required	-	-0.028 (0.036)	-	0.046** (0.019)	-	-0.064* (0.035)
Village FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,402	2,247	2,069	1,981	2,371	2,225
R-squared	0.390	0.414	0.291	0.293	0.393	0.424

Robust standard errors clustered by village are in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Note:** OLS estimates reported. Dependent variables in columns 1-2 (Changed) are a dummy variable that equals 1 if households experienced a change in their food security status (either became insecure in wave 2 from secured in wave 1 or vice versa) and 0 if food security status did not change. Dependent variables in columns 3-4 (Improved) are a dummy variable that equals 1 if households experienced an improvement in food security status in wave 2 (i.e., became food secured) and 0 if food security status did not change. Dependent variables in columns 5-6 (Deteriorated) are a dummy variable that equals 1 if households experienced a deterioration in food security status in wave 2 (i.e., became food insecure) and 0 if food security status did not change. In addition, 'Can manage money during emergency' specifically asks, "In case of an emergency, if you/family needed BDT 2,000 (or USD 25) in the next 7 days, do you think you can manage?" with responses ranging from not possible, fairly possible, very easily possible and self-sufficient (do not need help). The latter three responses are then converted into indicators for selecting these responses and 0 being "not possible/manageable". See Table A1 in Appendix A for other variable descriptions.

# Determinants and Dynamics of Food Insecurity During COVID-19

## Appendix A

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### Additional Tables and Figures

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Table A1: Summary statistics and variable descriptions

Variables of Interest	Mean	Std. Dev.	N	Type	Description
<i>Panel A: Food security variables (All sample)</i>					
FIES Score	2.778	1.971	9,847	C	FIES score is between 0 and 8, where a higher score corresponds to high food insecurity
Food secure	0.189	0.392	9,847	D	1 =Household never faced food insecurity in the last 2-3 weeks; 0 =Otherwise
Food insecure	0.811	0.392	9,847	D	1 =Household faced at least some food insecurity in the last 2-3 weeks; 0 =Never faced insecurity
Mild food insecurity	0.240	0.427	9,847	D	1 =Household worry about food intake, were unable to eat healthy food, or ate few varieties of food in the past 2-3 weeks; 0 =Otherwise
Moderate food insecurity	0.506	0.500	9,847	D	1 =Household had to skip a meal, ate less than usual, or ran out of food during the past 2-3 weeks; 0 =Otherwise
Severe food insecurity	0.065	0.247	9,847	D	1 =Household members were hungry yet did not eat or did not eat for a whole day during the past 2-3 weeks; 0 =Otherwise
<i>Panel B: Household income loss (All sample)</i>					
Complete income loss	0.561	0.496	9,847	D	1 =Stopped earning income completely; 0 =Otherwise
Partial income loss	0.361	0.480	9,847	D	1 =Earn income partially; 0 =Otherwise
Income unchanged	0.078	0.268	9,847	D	1 =Income remained unchanged; 0 =Lost income partially or completely
<i>Panel C: Primary occupation of the household (All sample)</i>					
Agricultural farmer	0.169	0.374	9,847	D	1 =Agricultural farmer by occupation; 0 =Otherwise
Farm laborer	0.090	0.286	9,847	D	1 =Farm wage laborer by occupation; 0 =Otherwise
Day laborer	0.325	0.468	9,847	D	1 =Daily wage laborer by occupation; 0 =Otherwise
Self-employed/Business	0.256	0.437	9,847	D	1 =Self-employed/Business owner by occupation; 0 =Otherwise
Government job	0.036	0.186	9,847	D	1 =Public servant by occupation; 0 =Otherwise
Private job	0.053	0.223	9,847	D	1 =Private servant by occupation; 0 =otherwise
Others	0.072	0.259	9,847	D	1 =Other occupations; 0 =Listed occupations
<i>Panel D: Change in Remittances and Microcredit (All sample)</i>					
Complete remittance loss	0.014	0.119	9,847	D	1 =Stopped receiving remittance completely; 0 =Never receive remittance
Partial remittance loss	0.008	0.090	9,847	D	1 =Receive remittance less than before; 0 =Never receive remittance
Remittance unchanged	0.003	0.055	9,847	D	1 =Remittance amount remain unchanged; 0 =Never receive remittance
Microcredit loan taken	0.506	0.500	9,847	D	1 =Enrolled in a microcredit program; 0 =Not enrolled
<i>Panel E: Coping strategies (Subsample: excludes income unchanged)</i>					
Past savings	0.760	0.427	9,082	D	1 =Using savings to purchase food; 0 =Otherwise
Previously stored food	0.566	0.496	9,082	D	1 =Consuming previously stored food; 0 =Otherwise
Help from friends/relatives	0.048	0.214	9,082	D	1 =Received help from friends/relatives; 0 =Otherwise
Help from the Government	0.093	0.290	9,082	D	1 =Received government relief; 0 =Otherwise
Help from NGOs	0.005	0.073	9,082	D	1 =Received relief from NGO; 0 =Otherwise
Other loans taken	0.335	0.472	9,082	D	1 =Borrowed money; 0 =Otherwise
Other sources	0.061	0.240	9,082	D	1 =Availed food via any other means not listed; 0 =All listed means
<i>Panel F: Other Household Characteristics (Subsample: collected in 2019)</i>					
Agricultural land possession (in '00 decimals)	0.358	2.130	2,691	C	Area of land possessed (approx. 1/100 acre)
Never went to school	0.099	0.298	2,691	D	1 =If never went to school; 0 =Otherwise
Completed Primary	0.617	0.486	2,691	D	1 =If completed primary education; 0 =Otherwise
Completed Secondary	0.150	0.357	2,691	D	1 =If completed secondary education; 0 =Otherwise
Completed Higher Secondary	0.082	0.274	2,691	D	1 =If completed higher secondary education; 0 =Otherwise
Beyond Higher Secondary	0.052	0.223	2,691	D	1 =If completed any degree after higher secondary; 0 =Otherwise
Bottom 25% of income	1.667	0.377	673	C	Average monthly income (in '000 BDT) of households that falls within the bottom 25% income
Middle 50% of income	2.745	0.540	1,362	C	Average monthly income (in '000 BDT) of households that falls within the middle 50% income
Top 25% of income	4.795	1.825	656	C	Average monthly income (in '000 BDT) of households that falls within the top 25% income
Equalized savings	0.522	2.782	2,691	C	Household savings divided by square root of household size
Proportion of female household members	0.518	0.169	2,691	C	Female household members divided by total household members
Women's decision-making power	0.151	0.358	2,691	D	1 =If women are involved in family expenditure decisions 0 =Otherwise

**Note:** Wave 1 summary statistics reported. Data presented in Panels A-E were collected during the first wave, while data in Panel F were collected previously in 2019 (as part of a different research project). Coping mechanisms do not add up to 1 as a household may use more than one strategy; also, coping mechanism questions were only asked to households that lost their incomes (either complete or partial). 'Type' column specifies whether a variable is dummy (D) or continuous (C).

Table A2: Determinants of Food Insecurity with Other Household Characteristics

VARIABLES	Food Insecure		Mild		Moderate		Severe		FIES Score	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Agricultural land possession	0.001 (0.002)	0.002 (0.001)	0.002 (0.001)	0.002* (0.001)	-0.004 (0.010)	0.004 (0.009)	-0.012 (0.012)	-0.005 (0.011)	-0.025** (0.010)	-0.018*** (0.006)
Completed Primary	-0.022 (0.017)	-0.016 (0.018)	-0.045 (0.048)	-0.018 (0.053)	-0.013 (0.023)	-0.019 (0.023)	-0.030 (0.059)	0.026 (0.062)	-0.193* (0.101)	-0.199** (0.098)
Completed Secondary	-0.028 (0.022)	-0.007 (0.022)	-0.035 (0.061)	-0.007 (0.066)	-0.035 (0.027)	-0.019 (0.027)	-0.029 (0.059)	0.018 (0.064)	-0.347*** (0.119)	-0.316*** (0.117)
Completed Higher Secondary	-0.052* (0.028)	-0.024 (0.027)	-0.114 (0.076)	-0.072 (0.072)	-0.024 (0.034)	-0.023 (0.034)	-0.033 (0.069)	0.042 (0.076)	-0.123 (0.153)	-0.055 (0.156)
Beyond Higher Secondary	-0.081* (0.043)	-0.061 (0.040)	-0.120 (0.088)	-0.115 (0.088)	-0.085* (0.045)	-0.072 (0.049)	-0.030 (0.067)	0.015 (0.072)	-0.315* (0.175)	-0.212 (0.181)
Middle 50% Income	0.005 (0.013)	-0.001 (0.012)	-0.010 (0.039)	-0.025 (0.041)	0.002 (0.015)	-0.003 (0.015)	-0.005 (0.039)	-0.046 (0.038)	0.061 (0.067)	0.034 (0.066)
Top 25% Income	-0.008 (0.019)	-0.020 (0.018)	0.018 (0.048)	0.030 (0.048)	-0.028 (0.021)	-0.044** (0.021)	0.007 (0.052)	-0.059 (0.054)	0.023 (0.094)	-0.063 (0.092)
Equalized savings	-0.007*** (0.002)	-0.005** (0.002)	-0.008*** (0.002)	-0.007** (0.003)	-0.006*** (0.002)	-0.006*** (0.002)	-0.005*** (0.002)	-0.003** (0.002)	-0.032*** (0.008)	-0.030*** (0.007)
Proportion of female household members	0.035 (0.039)	0.028 (0.037)	0.131 (0.099)	0.063 (0.112)	0.013 (0.045)	0.007 (0.042)	0.017 (0.092)	0.013 (0.091)	-0.193 (0.180)	-0.175 (0.171)
Women's decision-making power	0.011 (0.020)	-0.005 (0.020)	0.004 (0.052)	-0.023 (0.062)	0.004 (0.024)	-0.000 (0.023)	0.051 (0.041)	0.060 (0.047)	0.179* (0.094)	0.138 (0.094)
Income Loss	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Remittances	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Microcredit	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coping Strategies	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Village FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,691	2,512	911	756	2,044	1,910	632	520	2,691	2,512
R-squared	0.376	0.366	0.484	0.540	0.494	0.485	0.677	0.778	0.418	0.451

Robust standard errors clustered by village are in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Note:** We merge our previously collected household survey data (from 2019) with the current survey data to carry out this analysis. The reference group of education dummy variables is 'Never went to school'. Middle 50% is a dummy that equals 1 if income of a household falls within the middle 50% and 0 if falls within the bottom 25%; Top 25% is a dummy that equals 1 if income of a household falls within the top 25% and 0 if falls within the bottom 25%; See Table A1 for all other variable descriptions.

Table A3: Determinants of Food Insecurity (using Probit and Ordered Probit)

VARIABLES	Food Insecure		Mild		Moderate		Severe		FIES Score	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Household income loss (omitted category: No income loss (odd columns) / Partial income loss (even columns))</i>										
Complete Income Loss	1.747*** (0.090)	0.584*** (0.051)	1.252*** (0.116)	0.470*** (0.070)	2.250*** (0.118)	0.692*** (0.065)	2.697*** (0.463)	0.922*** (0.184)	1.462*** (0.069)	0.420*** (0.028)
Partial Income Loss	1.069*** (0.087)	-	0.731*** (0.116)	-	1.441*** (0.116)	-	1.436*** (0.427)	-	0.956*** (0.065)	-
<i>Occupation of the household head (omitted category: Farmer)</i>										
Farm Laborer	0.742*** (0.110)	0.554*** (0.118)	0.360** (0.162)	0.214 (0.181)	0.907*** (0.127)	0.697*** (0.135)	0.731*** (0.283)	0.460 (0.333)	0.385*** (0.050)	0.261*** (0.051)
Day Laborer	0.818*** (0.080)	0.620*** (0.087)	0.572*** (0.113)	0.472*** (0.129)	0.979*** (0.094)	0.767*** (0.103)	1.490*** (0.200)	1.390*** (0.258)	0.560*** (0.042)	0.397*** (0.040)
Self-employed/Business	-0.465*** (0.065)	-0.423*** (0.073)	-0.411*** (0.082)	-0.387*** (0.095)	-0.526*** (0.084)	-0.469*** (0.096)	-0.767*** (0.185)	-0.648*** (0.215)	-0.394*** (0.044)	-0.371*** (0.044)
Government Job	-0.705*** (0.139)	-0.671*** (0.227)	-0.618*** (0.176)	-0.653* (0.351)	-1.128*** (0.222)	-0.610** (0.273)	-1.721** (0.761)	-0.884 (0.819)	-0.626*** (0.103)	-0.919*** (0.157)
Private Job	-0.162 (0.099)	-0.209* (0.119)	-0.187 (0.132)	-0.183 (0.165)	-0.206* (0.123)	-0.268* (0.147)	-0.231 (0.359)	-0.804 (0.491)	-0.179*** (0.063)	-0.197*** (0.070)
Others	-0.031 (0.087)	-0.074 (0.099)	-0.191 (0.123)	-0.185 (0.143)	0.066 (0.109)	0.032 (0.121)	0.128 (0.212)	0.179 (0.276)	0.162*** (0.058)	0.070 (0.056)
<i>Change in Remittances (omitted category: No remittance)</i>										
Completely stopped	-0.511*** (0.168)	-0.549*** (0.191)	-0.674*** (0.253)	-0.688** (0.287)	-0.325 (0.217)	-0.392 (0.257)	-0.539 (0.344)	-0.685 (0.603)	-0.094 (0.117)	-0.102 (0.114)
Partially stopped	-0.097 (0.203)	-0.115 (0.213)	0.055 (0.275)	0.012 (0.305)	-0.165 (0.249)	-0.119 (0.261)	-5.329*** (0.256)	-5.848*** (0.410)	-0.194 (0.134)	-0.173 (0.145)
Unchanged	-0.389 (0.395)	-1.558*** (0.580)	-0.214 (0.466)	-1.800** (0.817)	-1.143** (0.559)	-1.810** (0.826)	0.264 (1.141)	-10.173*** (0.439)	-0.249 (0.398)	-0.927 (0.579)
<i>Involved in microcredit program (omitted category: No loan taken)</i>										
Microcredit loan taken	0.226*** (0.043)	0.130*** (0.048)	0.293*** (0.062)	0.277*** (0.070)	0.197*** (0.052)	0.066 (0.057)	0.532*** (0.131)	0.330** (0.163)	0.168*** (0.025)	0.104*** (0.026)
<i>Coping strategies</i>										
Past savings	-	-0.753*** (0.095)	-	-0.571*** (0.128)	-	-0.903*** (0.117)	-	-0.921*** (0.207)	-	-0.544*** (0.046)
Previously stored food	-	-0.516*** (0.077)	-	-0.407*** (0.109)	-	-0.627*** (0.095)	-	-0.694*** (0.234)	-	-0.304*** (0.038)
Help from friends/relatives	-	0.538** (0.212)	-	0.521** (0.260)	-	0.766*** (0.277)	-	1.391*** (0.466)	-	0.185*** (0.067)
Help from the Government	-	0.380*** (0.123)	-	0.252 (0.191)	-	0.503*** (0.140)	-	0.870*** (0.314)	-	0.191*** (0.049)
Help from NGOs	-	5.226*** (0.205)	-	5.473*** (0.152)	-	5.045*** (0.186)	-	8.409*** (0.465)	-	0.048 (0.146)
Other loans taken	-	0.598*** (0.082)	-	0.472*** (0.114)	-	0.731*** (0.096)	-	1.256*** (0.220)	-	0.368*** (0.038)
Others	-	-0.179 (0.117)	-	-0.168 (0.164)	-	-0.173 (0.146)	-	-0.022 (0.284)	-	0.024 (0.069)
Village FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,847	9,082	4,225	3,554	6,844	6,275	2,506	2,013	9,847	9,082
Pseudo R-squared	0.408	0.423	0.424	0.454	0.510	0.524	0.678	0.759	0.137	0.140

Robust standard errors clustered by village are in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

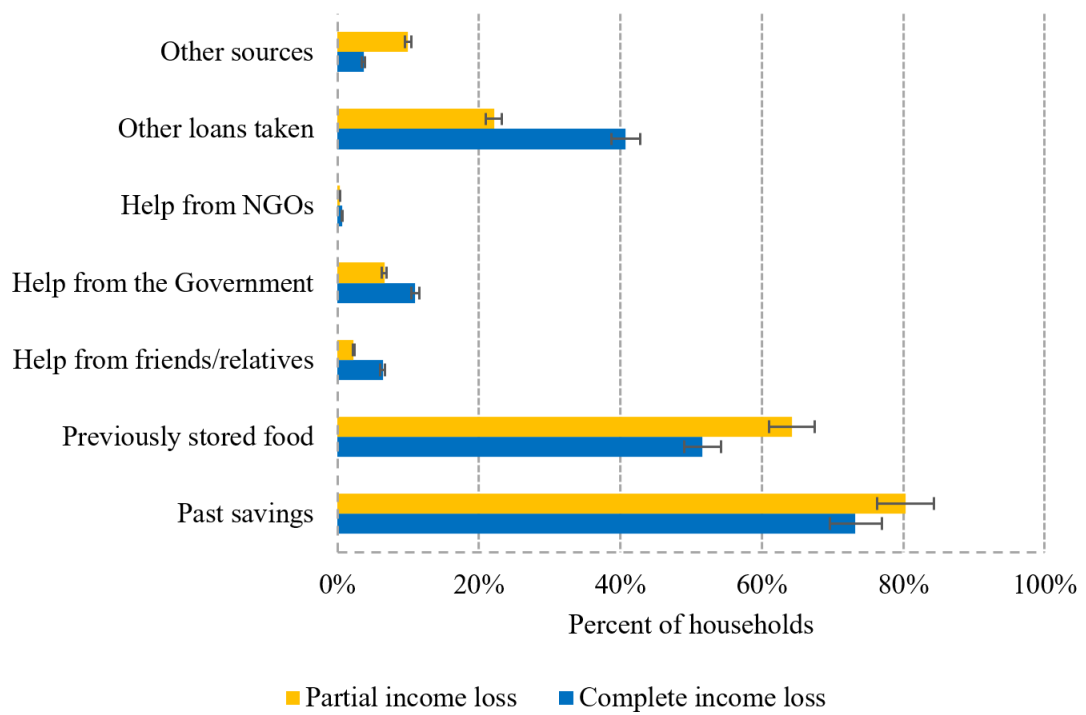
**Note:** Probit (columns 1-8) and Ordered Probit (columns 9-10) regression estimates reported. See Table A1 and the note under Table 1 for variable descriptions.

Table A4: Comparison between Households from Wave 1 and Waves 1 &amp; 2

Variables of Interest	Wave 1 Only		Waves 1 & 2		Difference
	Mean	Std. Dev.	Mean	Std. Dev.	
<i>Household income loss (N = 9,847)</i>					
Complete income loss	0.55	0.50	0.59	0.49	-0.04***
Partial income loss	0.37	0.48	0.35	0.48	0.02
Income unchanged	0.08	0.27	0.06	0.25	0.02**
<i>Primary occupation of the household (N = 9,847)</i>					
Agricultural farmer	0.17	0.37	0.17	0.38	0.00
Farm laborer	0.09	0.28	0.10	0.30	-0.01**
Day laborer	0.32	0.47	0.33	0.47	0.00
Self-employed/Business	0.26	0.44	0.23	0.42	0.03**
Government job	0.04	0.19	0.03	0.18	0.01
Private job	0.06	0.23	0.04	0.21	0.02**
Others	0.07	0.25	0.09	0.28	-0.02***
<i>Change in Remittances and Microcredit (N = 9,847)</i>					
No remittance	0.98	0.16	0.97	0.16	0.01
Complete remittance loss	0.01	0.11	0.02	0.13	-0.01*
Partial remittance loss	0.01	0.09	0.01	0.08	0.00
Remittance unchanged	0.00	0.05	0.00	0.05	0.00
Microcredit loan taken	0.50	0.50	0.52	0.50	-0.02
<i>Coping strategies (N = 9,082)</i>					
Past savings	0.77	0.42	0.75	0.44	0.02*
Previously stored food	0.57	0.49	0.55	0.50	0.02*
Help from friends/relatives	0.05	0.21	0.05	0.21	0.00
Help from the Government	0.09	0.29	0.09	0.29	0.00
Help from NGOs	0.01	0.07	0.01	0.08	0.00
Other loans taken	0.33	0.47	0.35	0.48	0.00
Other sources	0.06	0.24	0.06	0.24	0.00

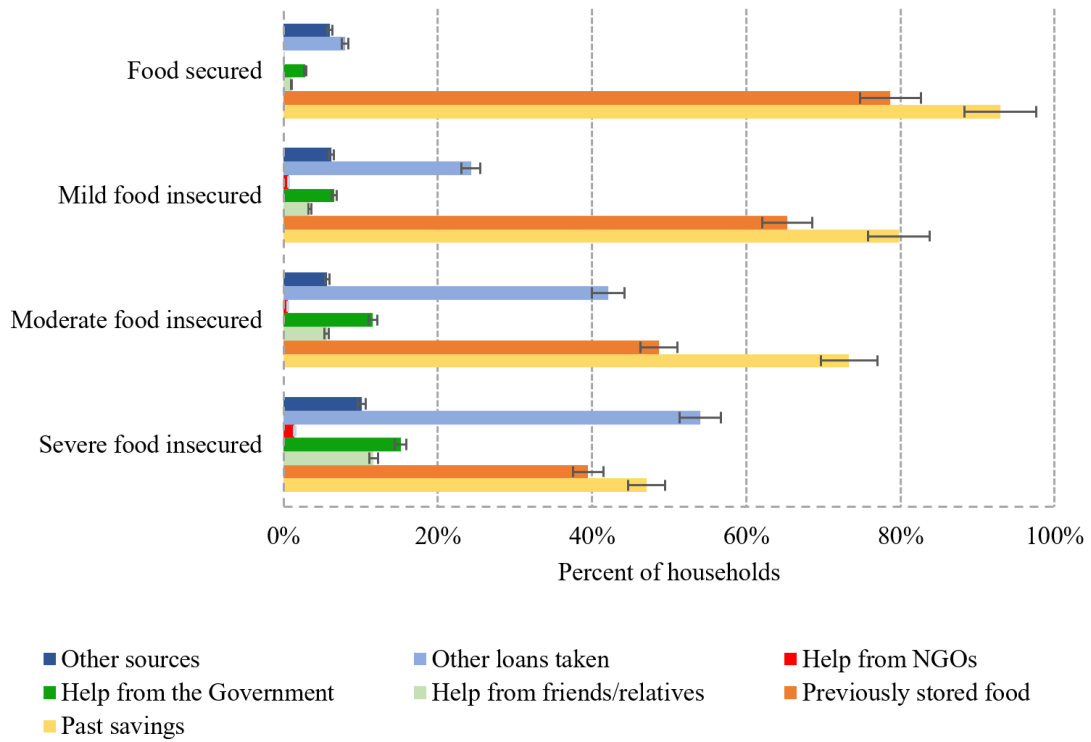
**Note:** Comparisons in characteristics (collected during the first wave) between households that only participated in wave 1 (Wave 1 Only) and households that participated in both waves (Waves 1 & 2). *p*-values are from two sample T-test with unequal variances. See Table A1 for all variable descriptions. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Figure A1: Income Loss by Coping Strategies



**Note:** Summary of income loss by coping strategies in the first wave are presented. Bars are with 95% confidence intervals. See Table A1 for descriptions of coping strategies.

Figure A2: Coping Strategies by Food Insecurities



**Note:** Summary of coping strategies by food insecurities in the first wave are presented. Bars are with 95% confidence intervals. See Table A1 for descriptions of coping strategies.



## Appendix B

### 1. The Food Insecurity Experience Scale

We conducted the telephone survey in April-May 2020 in two southwestern districts, Khulna and Satkhira, of Bangladesh. The study covers five Upazilas (sub-districts) of these two districts including Asasuni and Tala from Satkhira district, and Dumuria, Paikgacha, and Koyra from Khulna District.

In defining food security, we follow FAO (2009), “Food security exists when all people, at all times, have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.” This definition recognizes availability, access, utilization, and stability as the four principal pillars in the concept of food security.

We constructed the food security indicators (Food Insecurity Experience Scale) based on the eight questions to identify those at risk of severe hunger and food insecurity in the population (see Ballard, et al. (2013) for details). During wave 1, we asked the following questions to the households using a reference period of the last 2-3 weeks (after the COVID-19 outbreak): was there a time when, because of lack of money or other resources: [1] WORRIED: You were worried you would not have enough food to eat?; [2] HEALTHY: You were unable to eat healthy and nutritious food?; [3] FEWFOOD: You ate only a few kinds of foods?; [4] SKIPPED: You had to skip a meal?; [5] ATELESS: You ate less than you thought you should?; [6] RANOUT: Your household ran out of food?; [7] HUNGRY: You were hungry but did not eat? and [8] WHOLEDAY: You went without eating for a whole day? We summarize these responses in Table B1 below. We also provide a summary of these responses by income loss experienced by households using a bar chart in Figure B1.

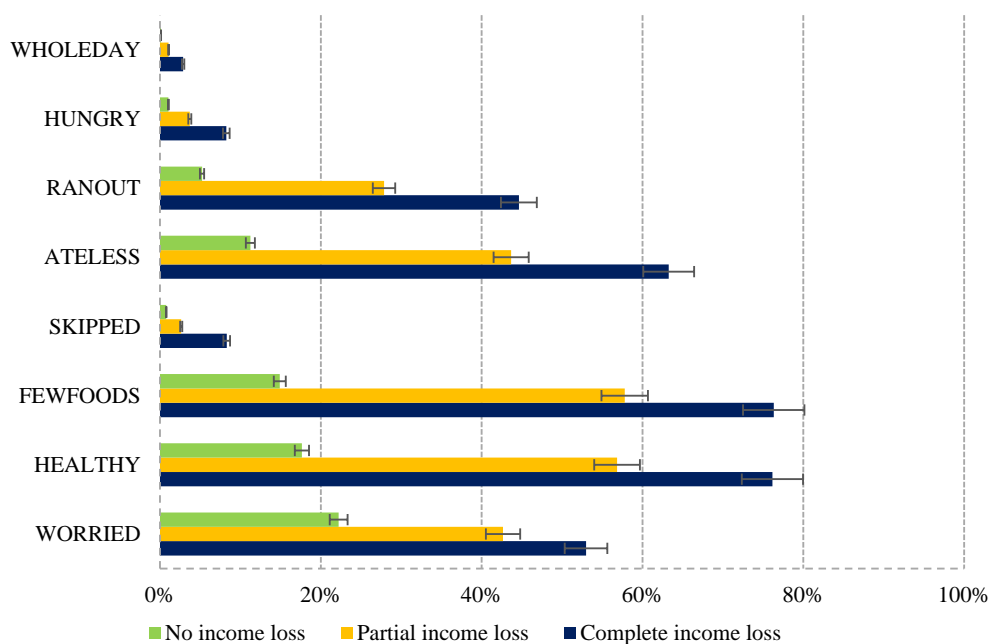
We follow Ballard et al. (2013) to identify households as mildly food insecure [MILD] if they responded affirmatively to any of the first three questions: [1]-[3]; moderately food insecure [MODERATE] if they responded affirmatively to any of the questions in [4]-[6] and finally, severely food insecure [SEVERE] if they responded positively to either [7] or [8]. Households that belonged to none of these categories were categorized as food secure. Later, we use these indicator variables in our regression analysis.

**Table B1: Summary statistics**

Variables of Interest	Obs.	Mean	Std. Dev.	Min	Max
WORRIED	9,847	0.47	0.50	0.00	1.00
HEALTHY	9,847	0.65	0.48	0.00	1.00
FEWFOOD	9,847	0.65	0.48	0.00	1.00
SKIPPED	9,847	0.06	0.23	0.00	1.00
ATELESS	9,847	0.52	0.50	0.00	1.00
RANOUT	9,847	0.36	0.48	0.00	1.00
HUNGRY	9,847	0.06	0.24	0.00	1.00
WHOLEDAY	9,847	0.02	0.14	0.00	1.00
FIES	9,847	2.78	1.97	0.00	8.00

**Note:** The FIES variable is created by adding up responses from the eight food security questions. Thus, FIES is between 0 and 8.

**Figure B1: Household food security status (using the FIES questions) by income loss**



Note: Bars are with 95% confidence interval.

## 2. Representativeness of our survey households

We compare household characteristics of the rural sample of nationally representative Household Income and Expenditure Survey (HIES) of Bangladesh collected in 2016 with the household characteristics of the 2019 survey sample (2,691 households out of 9,847 households surveyed in wave 1). Comparisons are presented in Table B2. It is apparent in this Table that the observable characteristics of our 2,691 households are similar to that of the overall rural households in Bangladesh. If we restrict the overall rural sample of HIES in terms of the 90<sup>th</sup> percentile of average monthly household expenditure (in BDT), then our 2019 sample represents the average monthly expenditure of rural Bangladesh. Moreover, if we restrict the overall rural sample of HIES in terms of the 99<sup>th</sup> percentile of agricultural land owned (acres), then our 2019 sample represents the households of rural Bangladesh.

**Table B2: Comparison of HIES 2016 and the 2019 sample characteristics**

Variables	(A) HIES 2016 Rural Sample			(B) The 2019 Sample		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Average monthly household expenditure (in BDT)	31,827	10,670	12,028	2,691	9,467	4,187
Agricultural land owned (acres)	32,002	0.55	5.22	2,691	0.36	2.13
Male headed household	32,089	0.87	0.34	2,691	0.91	0.29
Household size	32,089	4.06	1.57	2,691	4.33	1.15
Proportion of female household members	32,089	0.49	0.19	2,691	0.52	0.17
Average education (years of schooling)	32,089	3.58	2.60	2,691	2.82	2.01

Note: Panel A shows the characteristics of rural household samples collected under the Household Income and Expenditure Survey (HIES) of Bangladesh collected in 2016 and Panel B shows the characteristics of a subset of households from our previously collected data from June 2019.

**References:**

Ballard, T.J., Kepple, A.W. & Cafiero, C. 2013. The food insecurity experience scale: development of a global standard for monitoring hunger worldwide. *Technical Report. Rome, FAO*. (available at <http://www.fao.org/economic/ess/ess-fs/voices/en/>).

FAO. 2009. Declaration of the World Summit on Food Security, World Summit on Food Security, Rome, 16-18 November. (available at <ftp://ftp.fao.org/docrep/fao/Meeting/018/k6050e.pdf>).