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Food Consumption and Food Security during the COVID-19 Pandemic in Addis Ababa

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ABSTRACT

International humanitarian organizations have expressed substantial concern about the potential for increases in food insecurity resulting from the COVID-19 pandemic. In this paper, we use a unique panel survey of a representative distribution of households in Addis Ababa to study both food security and food consumption. In contrast to some other countries in the region, Ethiopia never went into a full lockdown severely restricting movement. Despite subjective income measures suggesting a large proportion of households have been exposed to job loss or reduced incomes, we find that relative to a survey conducted in August and September of 2019, food consumption and household dietary diversity are largely unchanged or slightly increased by August 2020. We find some changes in the composition of food consumption, but they are not related to shocks found in previous phone surveys conducted with the same households. The results therefore suggest the types of subjective questions about income typically being asked in COVID-19 phone surveys may not appropriately reflect the magnitude of such shocks. They also imply, at least indirectly, that in the aggregate food value chains have been resilient to the shock associated with the pandemic.

Keywords: COVID-19; Food security; Nutrition security; Food consumption

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ACRONYMS

BMI	Body Mass Index
CDF	Cumulative Distribution Function
CSA	Central Statistical Agency (Ethiopia)
EEA	European Economic Association
EPHI	Ethiopia Public Health Institute
HDDS	Household Dietary Diversity Score
IPA	Innovations for Poverty Action
LSMS-ISA	Living Standards Measurement Surveys-Integrated Surveys for Agriculture
MOH	Ministry of Health
NGO	Non-Governmental Organization
PSNP	Productive Safety Net Programme
RECOVR	Research for Effective COVID-19 Responses
RCT	Randomized Control Trial

I. INTRODUCTION

The COVID-19 pandemic has led to substantial concern about threats to food security (Laborde, et al., 2020a). Food prices rose almost immediately (Torero, 2020), and as a result there has been substantial concern that poverty and food insecurity will rise, and the nutritional status of vulnerable groups will fall, as the pandemic continues (Headey and Ruel, 2020, Laborde, et al., 2020b). In April 2020, the World Food Programme projected the number of acutely food insecure people in the world could double by the end of 2020 without concerted action (WFP, 2020).

There are several ways the COVID-19 pandemic may increase food insecurity in low and middle-income countries. Restrictions on movement may have had the largest early negative impact on food security (Béné, 2020, Resnick, 2020). Devereux, et al. (2020) suggest disruptions to food systems from the pandemic both related to the food production side (production and processing) and demand side (economic and physical access to food) could negatively affect food security. Informal markets may be more disrupted than formal markets, and of particular concern on the demand side is the way that value chains function within countries (Barrett, 2020, Reardon, et al., 2020). If value chains are disrupted, then prices for disrupted chains are likely to rise; however, if value chains quickly find ways to be resilient to the pandemic, then the shock of movement restrictions that bound most heavily early in the pandemic may not have longer term effects on prices (Reardon and Swinnen, 2020).

From a consumer perspective, reduced income may lead to less purchasing power for food, particularly among the vulnerable. Phone surveys from multiple countries suggest widespread income reductions in both urban and rural areas (e.g., Amare, et al., 2020, Mobarak and Vernot, 2020, Nestour, et al., 2020, Wieser, et al., 2020). Although lockdowns may have led to income losses, the severity of the incomes losses remains largely unknown, and lockdowns or restrictions on movement have varied substantially by country.

Related to household incomes, evidence from Addis Ababa is no different from evidence in other parts of the world. In a phone survey conducted in early May, 58 percent of respondents stated that their incomes had fallen relative to their standard income at that time of the year (Hirvonen, et al., 2020a); in July, that percentage remained high at 64 percent (de Brauw, et al., 2020). Phone survey respondents also suggest the most common shock to their household has been either unemployment or a loss of income (Abate, et al., 2020b, de Brauw, et al., 2020, Hirvonen, et al., 2020a).

In this paper, we use data collected from a representative distribution of households in Addis Ababa to study how the COVID-19 shock has affected their food consumption. We collected baseline data for a randomized control trial (RCT) in August and September 2019, and collected endline data for the RCT in January and February 2020. When the COVID-19 pandemic and associated movement restrictions occurred soon thereafter, we began collecting monthly phone surveys between May and August. In the August survey, we collected a third round of food consumption data. Relative to the September 2019 survey, we find no evidence of a decline in food security by August 2020 among the 577 households for which we have observations. Moreover, the distribution of food consumption is nearly unchanged; if anything, household members are able to eat more post-pandemic than they were before. This finding is at odds with the subjective evidence described above about income declines, and appears in contrast with much of the international narrative related to COVID-19 and food insecurity.

To begin to reconcile these differences, we first explore heterogeneity in the composition of food consumption. We find consumption of staples has risen, while consumption of legumes and vegetables have fallen. Meanwhile, fruit and animal source food consumption remained the same on average, suggesting indirectly that several value chains, even of perishable foods, continued to function well. However, we find almost no evidence that those reporting reduced incomes are more likely to reduce consumption of more expensive foods, suggesting that the changes in demand relate to changing prices rather than declining demand among some households.

The evidence in the paper therefore suggests that relying on subjective questions about income changes found in most phone surveys to model changes in food security will overstate food security concerns. Further, the evidence in the paper is consistent with phone survey evidence that value chains have largely been resilient to the pandemic (Hirvonen, et al., 2020b, Tesfaye, et al., 2020). In other words, in facing the pandemic shock households have found ways to smooth food consumption, and food availability appears to be relatively high.

The results are therefore more suggestive that the movement restrictions that occurred early on in the pandemic acted more like a temporary shock than a permanent one. After an adjustment period, people began to find ways to continue to (or find) work, they found ways to ensure that value chains continued to provide food to markets, and to the extent that they have faced income shocks, they have found ways to smooth those shocks. After adjusting to the new equilibrium with less movement and less personal contact, markets began to work smoothly again.

To make this argument, the paper proceeds as follows. The next section provides more background about the Ethiopian response to COVID-19, followed by a more detailed description of the data. Next, we discuss the results on self-reported income changes. In the same section, we contrast these measures with more objective reports of food security and food consumption. We then provide suggestive evidence on explanations for the disconnect between the food consumption data and reports of reduced income. The final section describes implications of our results, including those related to subjective questions about income, and suggests further research on food value chains.

II. CONTEXT

Addis Ababa

In 2016, the estimated population of Addis Ababa was 3.8 million (CSA, 2018b) out of which 16.8 percent had consumption levels below the national poverty line (CSA, 2018a). Virtually all households have access to electricity, more than 90 percent are connected to piped water, and more than half have access to improved sanitation (World Bank, 2020). About 44 percent of households in Addis Ababa are headed by women. The average household size is four members (CSA, 2018b).

Data from the 2016 Demographic and Health Survey show a co-existence of under- and over-nutrition in Addis Ababa (CSA and ICF, 2016). Nearly 15 percent of children under five years of age in the city are chronically undernourished (stunted; short for their age). Meanwhile, 13 percent of women and 18 percent of men between the ages of 15 and 49 years are thin with a body-mass index (BMI) of less than 18.5 kg/m^2, even as 29 percent of women and 20 percent of men are overweight or obese with a BMI above 25 kg/m^2.

According to the 2018 Urban Employment Unemployment Survey of the Central Statistical Agency (CSA), 20 percent of the working age population in Addis Ababa are unemployed (CSA, 2018b). 30 percent of the employed population are self-employed (CSA, 2018b). In terms of sector of employment, 20 percent work in wholesale and retail trade, 13 percent in manufacturing, 8 percent in construction and 5 percent in accommodation and food service activities (CSA, 2018b). About 10 percent work for other households as, for example, servants or guards (CSA, 2018b). Finally, 9 percent of the working age population in Addis Ababa work in the informal sector (CSA, 2018b).[1]

[1] CSA (2018b) defines informality as "persons who work in an enterprise or business that did not keep book of account, who did not have license and mainly produced for the market were considered to be working in the informal sector".

COVID-19 policy measures in Ethiopia

The first COVID-19 case was confirmed in Ethiopia on 13 March 2020. By 23 August, more than 757,057 laboratory tests had been conducted out of which 40,671 were positive (5 percent of all tests) (MoH and EPHI, 2020). More than 60 percent of the these positive tests have been in the capital, Addis Ababa (MoH and EPHI, 2020). By 30 August, there had been 678 deaths in Ethiopia attributed to the virus (MoH and EPHI, 2020).

The first policy measures to limit the spread of COVID-19 in Ethiopia were declared on 16 March, just three days after the first confirmed case. The government of Ethiopia closed schools, banned all public gatherings and sporting activities, and encouraged physical distancing. Travelers from abroad were put into a mandatory quarantine, bars were closed until further notice, and travel through land borders was prohibited. Several regional governments imposed restrictions on public transportation and other vehicle movement between cities and rural areas.

A federal level State of Emergency was declared on 8 April. Land borders were closed, except for cargo. Facemasks became compulsory in public spaces. Restrictions on cross-country public transportation and city transportation were also declared; for example, the carrying capacity of public transportation providers was limited to half of their normal capacity. The government also prohibited employers from laying off their workers and property owners from evicting their tenants or increasing rents during the State of Emergency. Some administrative regions took even stricter measures by closing restaurants and limiting movement between rural and urban areas. Adherence to these measures and other recommended virus prevention practices were reportedly high (Abate, et al., 2020b, de Brauw, et al., 2020, Hirvonen, et al., 2020a). However, in contrast to some other countries in the region, Ethiopia never went into a full lockdown that severely restricted movement, imposed curfews, or fully closed all borders. A full lockdown was not imposed to protect the economically most vulnerable segments of the population (France-24, 2020). As of July, movement across regional states was allowed and humanitarian

organizations were permitted to operate without restrictions (UNOCHA, 2020). Official inflation estimates suggest that food prices have risen during the pandemic but not at an unusually fast rate relative to overall inflation (see Hirvonen, 2020).

The main social protection response to COVID-19 in Ethiopia has come through the Productive Safety Net Programme that operates in urban and rural areas. Launched in 2005 in food insecure rural areas and in 2017 in selected urban areas, PSNP is managed by the Government of Ethiopia and is mostly funded by a consortium of international organizations and development partners. The PSNP provides monthly cash or food transfers against labor-intensive public works that build community assets. Eligible households with limited labor capacity receive unconditional cash transfers. Due to the pandemic, the public works requirement was waived and thus all beneficiaries now are receiving unconditional transfers. At the beginning of the pandemic, beneficiaries also received three months of payments in advance (Gentilini, et al., 2020). In addition to the PSNP, a number of smaller scale initiatives have been launched to support poor and vulnerable households, including food banks set up by city administrations, community support, and NGO programs.

III. DATA

Our COVID-19 telephone survey in Addis Ababa builds on an earlier IFPRI-led randomized controlled trial testing the effectiveness of video-based behavioral change communication to increase fruit and vegetable consumption in the city (Abate, et al., 2019).[2] The baseline (or pre-intervention) survey for this project was administered in August and September 2019 with an endline (or post-intervention) survey in January and February 2020 – approximately one month before the first confirmed COVID-19 cases in Ethiopia. The phone surveys were administered in early May, June, July, and August. Table 1 shows the dates and the sample sizes for each survey round as well as the type of food consumption module administered in the survey. Below we provide more details about the in-person and phone surveys.

Table 1. Survey times, sample sizes and the type of food consumption module, by survey round

Survey round	Dates	Sample size	Food consumption module
In-person survey #1	August 21 - September 20, 2019	930	Food item level
In-person survey #2	January 24 - February 11, 2020	895	Food item level
Phone survey #1	May 01 - 05, 2020	600	Food group level
Phone survey #2	May 30 - June 06, 2020	589	Food group level
Phone survey #3	June 27 - July 04, 2020	584	Food group level
Phone survey #4	August 01 - 08, 2020	577	Food item level

Note: The phone surveys were based on a random sub-sample of the sample used in the in-person surveys.

In-person surveys

In designing these surveys, we adopted a stratified random sampling approach based on household welfare levels to ensure a balanced sample between wealthy and less wealthy neighborhoods and between poor and rich households (for more details; see Appendix A). The baseline survey was administered between August and September in 2019 and covered 930 households. The endline survey took place between January and February 2020, and 895 households were interviewed; or 96 percent of the baseline

[2] Ethical approval for the in-person and phone surveys was obtained from the Institutional Review Board of IFPRI.

sample. The January and February 2020 survey instrument collected detailed information about household demographics, income sources, asset levels, food consumption, and food security. We use the information collected about asset levels to construct a pre-pandemic asset index by applying a principal components method (see Sahn and Stifel, 2003) and use this index to contrast the food security outcomes between wealthy and less-wealthy households.

For the purposes of this paper, we do not use the consumption data from the January-February survey as a comparison for two reasons.[3] First, as mentioned, it acted as an endline for an RCT, and so a treatment effect could have affected some types of food consumption. But perhaps more importantly, we cross-randomized a survey experiment to better understand the impacts of telescoping on food consumption measures; given that we find what appears to be substantial telescoping bias (Abate, et al., 2020a), the distribution of consumption in the February survey is affected by the two experiments.

Phone surveys

To understand how the COVID-19 crisis is affecting households in Addis Ababa, we administered a series of phone survey with a sub-sample of households that participated in the in-person surveys.[4] The phone surveys use phone numbers for members of the sample for the survey conducted in January and February 2020. Phone numbers were collected from 99 percent (887 households) of the 895 sample households that took part in the February survey, which is indicative of the proportion of households in Addis with cell phones. Out of these households, we drew a sub-sample of 600 households. The first phone survey was administered in early May, and follow-up surveys in early June, July, and August.[5]

[3] Nevertheless, we illustrate the use of the February 2020 food consumption measure in the two CDFs that make up our main result in Appendix D, and they are quite similar to the results shown in the main body of the paper.

[4] This phone study was pre-registered in the European Economic Association (EEA) and Innovations for Poverty Action (IPA) COVID-19 registries.

[5] For participating in the phone surveys, households were given a 100-birr phone credit (about $3). The phone credit was mentioned in the introduction to the call in which we also obtained verbal informed consent to participate in the survey. We hypothesize that the relatively high response rate is due to the rapport built up through in person meetings and regular phone calls; the decision to attempt a food consumption survey was based on our low attrition

Attrition rates remained relatively small. In our final phone survey in August, we managed to reach 577 households out of the 600, implying an attrition rate of 3.8 percent.

To minimize the risk of response bias (Dabalen, et al., 2016, Lau, et al., 2019), we used sample stratification and replacement techniques in the first phone survey. We first split the sample into deciles according to household asset holdings, and then randomly selected 60 households from each decile (600 households in total). If the enumerators were unable to reach a selected household after five attempts, it was replaced with another randomly selected household in the same asset decile. Because some households could not be reached in the initial sample, they were replaced with another randomly selected household in the same decile.

Forty-six (or 7.7 percent) of the initially sampled 600 households could not be reached in the first phone survey administered in early May. These households were replaced with another randomly selected household from the original sample in the same decile. Apart from one household, all households that were reached agreed to take part in the survey. Based on key household characteristics (sex, age, and education level of household head; household size and asset levels; household dietary diversity indicators) measured in January and February 2020, the final sub-sample that took part in the first phone survey is very similar to those households that took part in the pre-pandemic face-to-face survey but were not interviewed in the phone survey in May 2020 (Appendix B). Table C1 in Appendix C shows that the composition of the sample households remained similar before and during the pandemic in 2020. While changes in dependency ratios are not statistically different from zero, we do see a small decrease in household size between September 2019 and February 2020 rounds.[6]

rates in the first three rounds, and the hypothesized rapport with households. We extensively pre-tested the food consumption module used in the August phone survey and only implemented it after we were sure the types of issues that arose were quite similar to issues that arise when fielding in-person consumption surveys.

[6] The most commonly cited reasons for a member leaving the household were "to live with other relatives" (26 %), marriage (17 %), death (14 %), leaving for work (10 %), schooling (7 %) and divorce (5 %).

The first three phone survey instruments focused on questions about food and nutrition security and self-reported changes in income sources and levels.[7] In August survey, we replaced this questionnaire with a comprehensive household food consumption module, identical to the one administered in the in-person surveys in September and February.

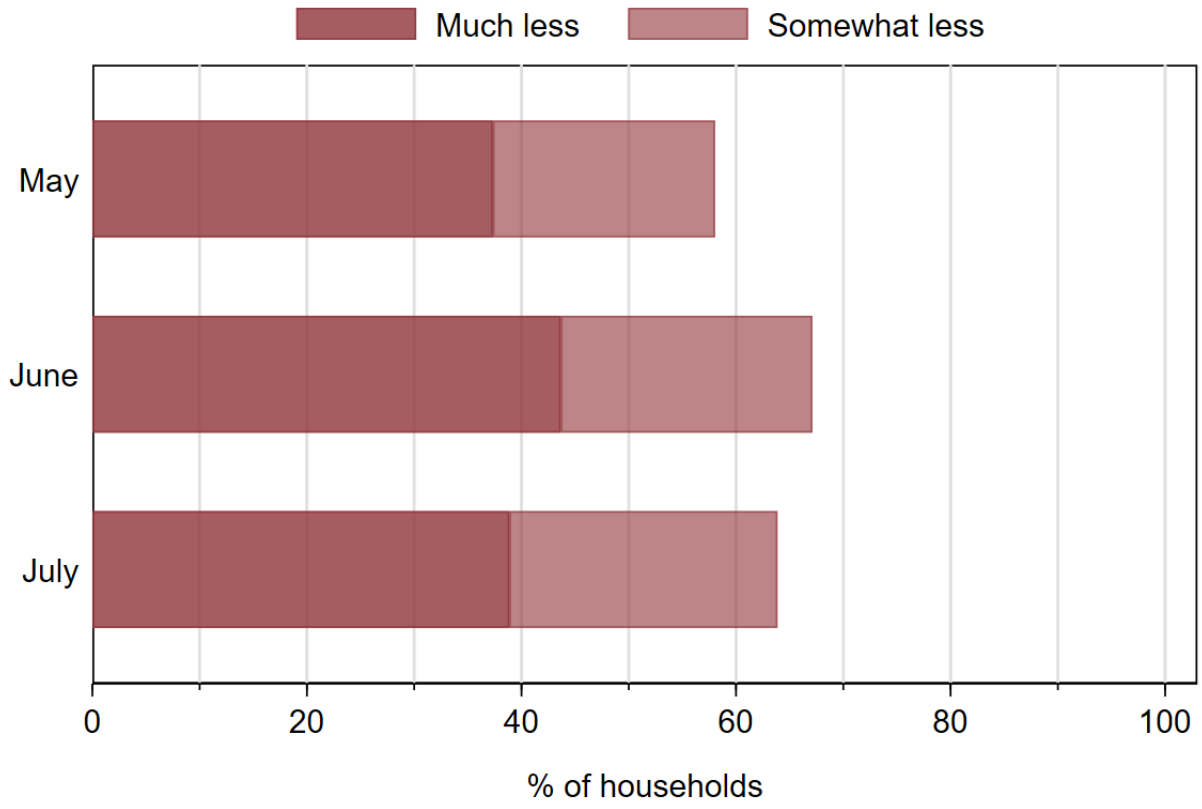
[7] We also asked about household knowledge and their behavioral responses to COVID-19. These are reported in Hirvonen, et al. (2020a), Abate, et al. (2020b) and de Brauw, et al. (2020).

IV. RESULTS

Self-reported income changes

In the May, June, and July phone surveys we asked respondents to compare incomes they received in the last month to the incomes they usually receive at this time of the year. Figure 1 shows that in each survey round, over 50 percent of respondents stated their household incomes were lower or much lower than usual. For example, in July 64 percent of respondents reported their incomes were lower in the past month than usual.

Figure 1. Self-reported changes in income levels in the past month compared to usual incomes, by survey round

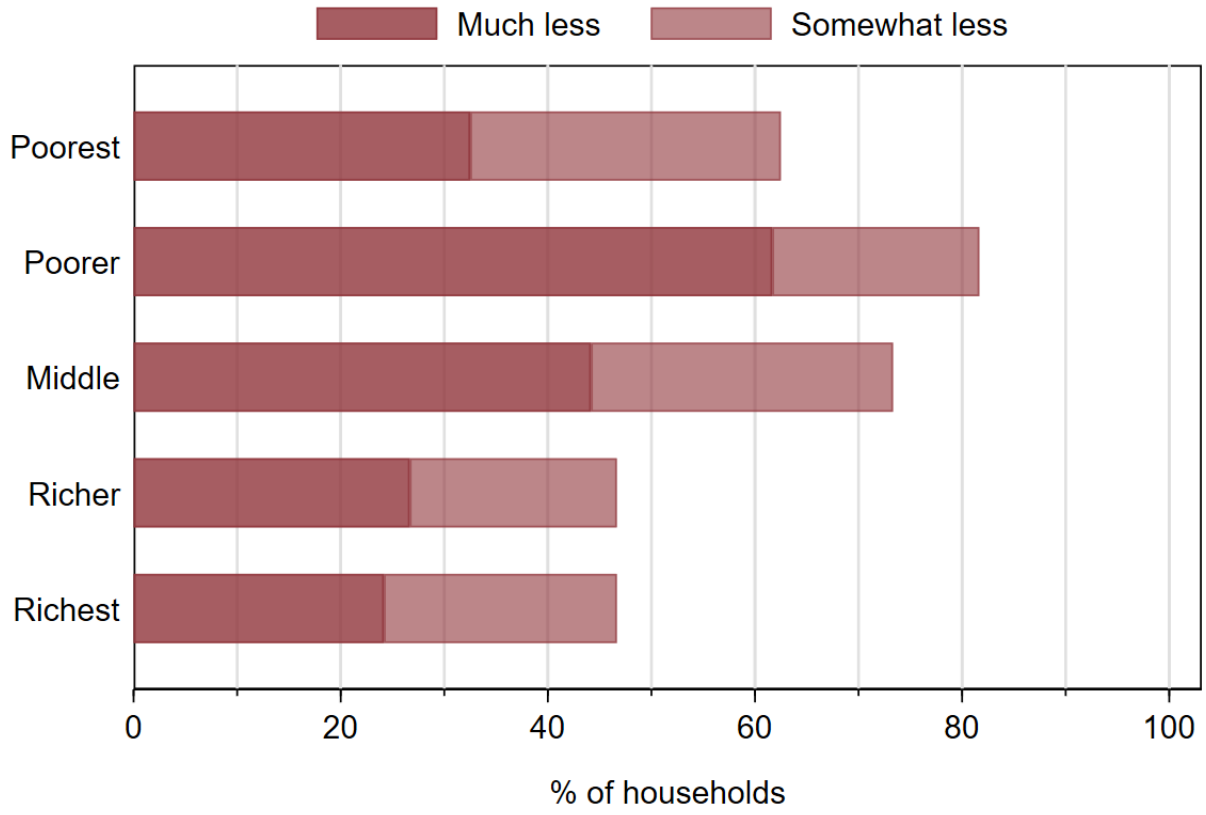


Note: N = 600 households in May; 589 households in June and 584 in July.

Using the pre-pandemic asset index described in the previous section, we can further assess how these responses varied across wealth quintiles. In the July survey, poorer households are considerably more

likely to report income losses than richer households (Figure 2). Whereas 60 to 80 percent of the poorest two quintiles reported subjective income losses, less than 50 percent of the richest two quintiles did so.

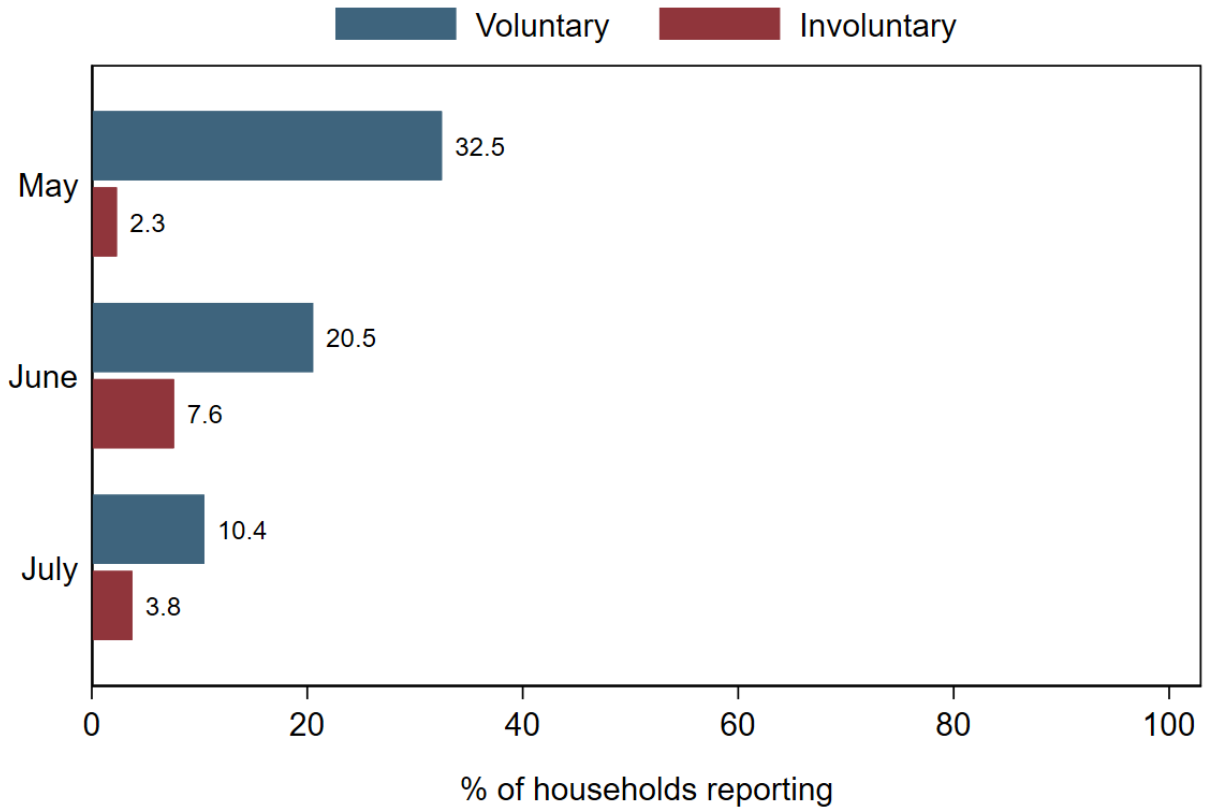
Figure 2. Self-reported changes in income levels in the past month compared to usual incomes, by asset levels (July survey only)



Note: N=584 households. The wealth quantile grouping is based on a wealth index constructed using a principal components method based on household asset ownership using data collected in the February-2020 survey.

We also asked respondents whether there were any changes in the employment status of the household members in the last 30 days prior to the interview. We see that job losses during the pandemic were high but mostly voluntary in nature where a household member him or herself terminated the contract (Figure 3). Ethiopia's private sector is characterized by very high job turnover (Abebe, et al., 2020, Blattman and Dercon, 2018, Söderbom, et al., 2020). Considering this turnover, it is not clear the pandemic has led to higher than usual unemployment rates in Addis Ababa.

Figure 3. Self-reported voluntary and involuntary job losses in the previous month, by survey round



Note: N = 600 households in May; 589 households in June and 584 in July. Voluntary job loss refers to a situation where one or more household member quit their job voluntarily and involuntary to a situation where one or more household member's written or verbal contract was terminated by the employer.

Food security indicators

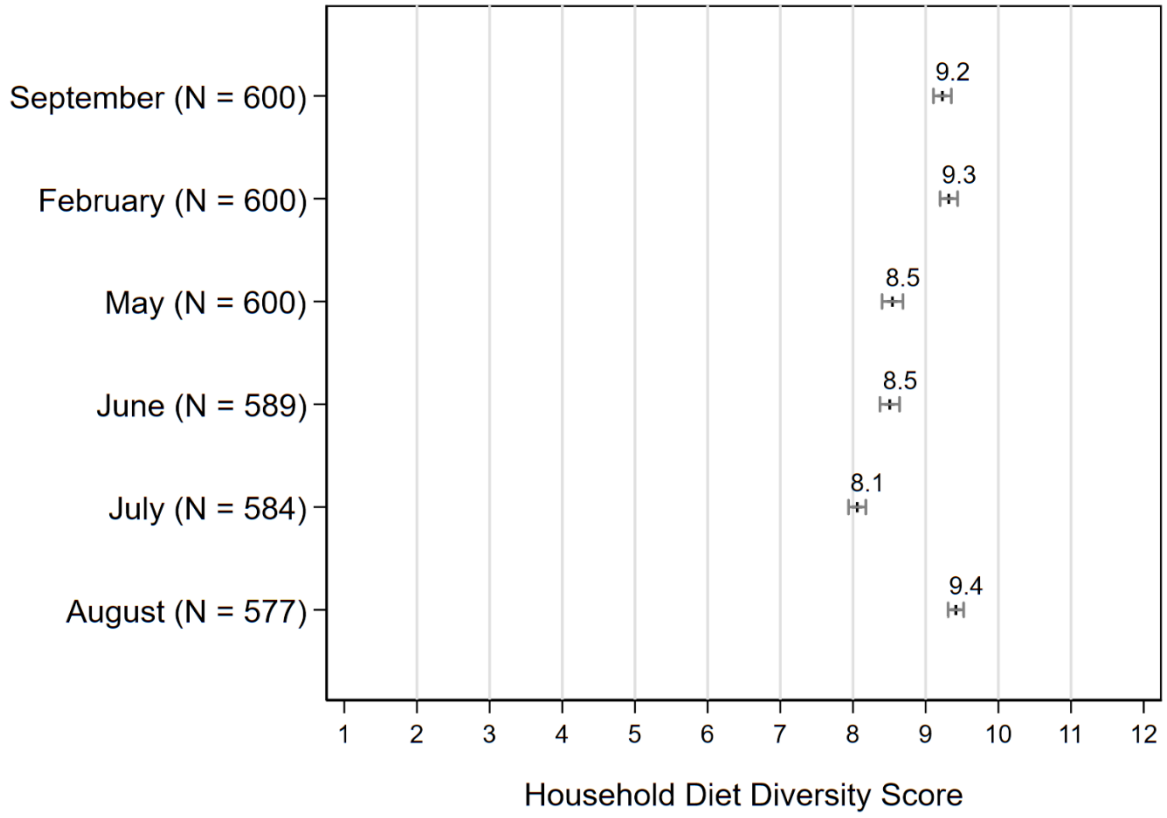
Given the reported decline in incomes, we next explore whether food security might have declined among sample households. If income declines were substantial, we might expect to observe a decline in dietary diversity. All survey rounds permit us to construct a Household Dietary Diversity Score (HDDS) in which consumed food items are grouped into 12 food groups (Swindale and Bilinsky, 2006).[8] Assigning a value of 1 for each food group that the household consumed from and summing, we can construct the HDDS in which higher scores indicate a better household food security situation. HDDS is a widely used food security indicator and previous work has found it to be highly correlated with caloric availability

[8] The 12 food groups are: Cereals; Roots or tubers; Vegetables; Fruits; Meat or poultry; Eggs; Fish and seafood; Nuts or pulses; Dairy; Oil or fats; Sugar/honey; and Miscellaneous foods.

(Hoddinott and Yohannes, 2002) and nutrient adequacy (Mekonnen, et al., 2020). In May, June, and July rounds, we administered the standard HDDS module that asks households whether they consumed from a given food groups. For September, February, and August rounds, we use data from a detailed food consumption module to construct the HDDS.

Figure 4 shows the mean HDDS for each survey round. We see that the mean HDDS initially fell during the first phone survey rounds. This could be due to the adverse impact of the COVID-19 pandemic – or because of the change in the survey methodology from detailed food consumption module to a series of yes/no questions about consumption from food groups (see Table 1). The mean HDDS in the sample was 9.2 in September and 9.3 in February. In the May and June surveys, the mean HDDS score was 8.5. In the July survey, the average HDDS fell to 8.1, most likely because the recall period coincided with an Orthodox fasting period during which Orthodox households abstain from animal sourced foods. In August, when we use the same survey module as in the in-person surveys, we obtain a mean HDDS of 9.4, very similar to the average estimated before the pandemic.

Figure 4. Mean Household Diet Diversity Score, by survey round

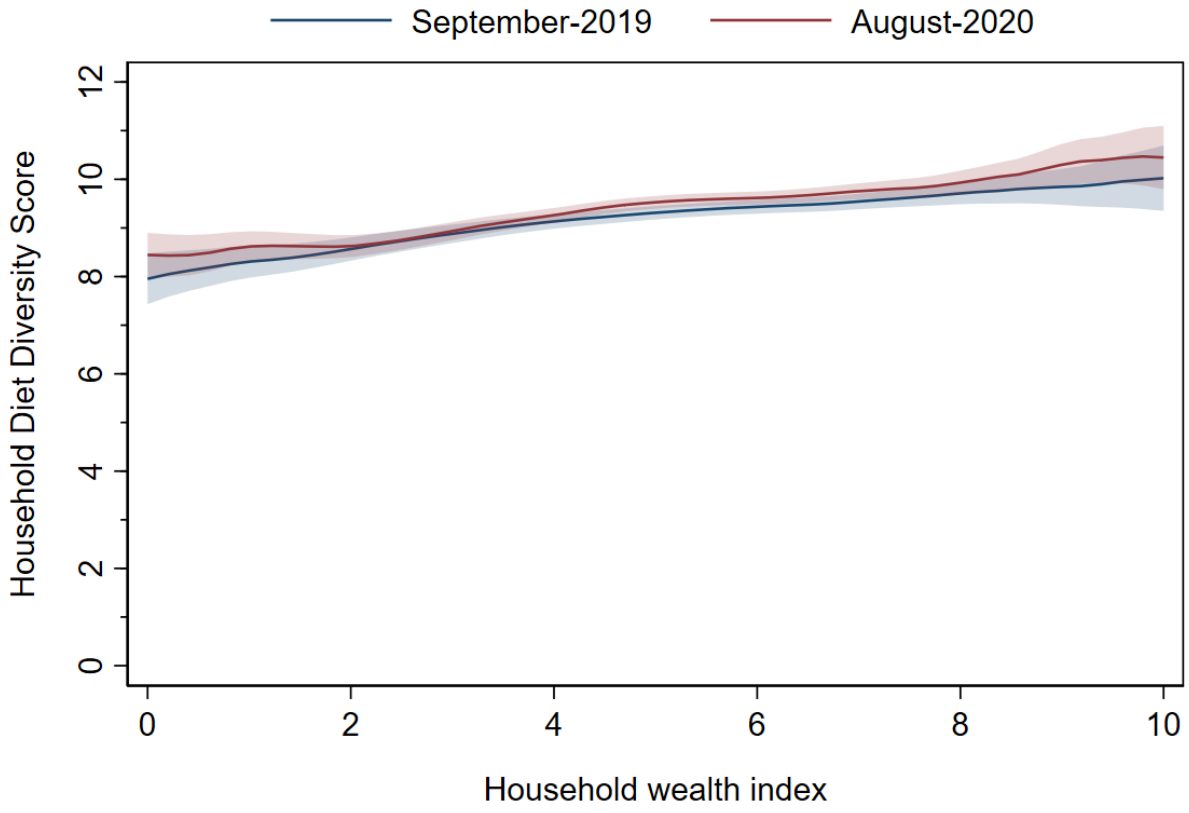


Note: Capped lines represent 95% confidence intervals. September, February and August estimates are based on data from a comprehensive item-level food consumption module. May, June and July estimates are based on data from a less detailed, food group-level food consumption module.

Of note is that even the lowest mean HDDS recorded during the pandemic is well above average scores recorded in other surveys administered before the pandemic. Using the nationally representative 2015/2016 Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA) survey for Ethiopia, Mekonnen, et al. (2020) estimate an average HDDS of 6.2 for rural areas and 7.9 for urban areas. Moreover, in July 2018, the mean household diet diversity score in chronically food insecure areas supported by the rural PSNP was less than 5 food groups (Berhane, et al., 2019a, Berhane, et al., 2019b). In Figure 5, we use data from September 2019 and August 2020 surveys, and estimate local polynomial regressions to examine HDDS across pre-pandemic asset levels. While richer households have higher HDDS than poorer households in both rounds, the two regression lines lie on top of each other. Statistically, this finding implies that we cannot detect a difference in HDDS between these two rounds.

This finding suggests that at least in relatively crude terms, diets have not been affected by the COVID-19 pandemic at any wealth level. However, it could be that the amount of food has been affected either overall or within specific food types.

Figure 5. Household wealth and Household Dietary Diversity Score



Note: Local polynomial regression. N=577 households in both rounds. The shaded areas represent 95 % confidence intervals. The recall period is last 7 days. The wealth index (horizontal axis) is constructed using a principal components method based on household asset ownership using data collected in the January and February 2020 Addis Ababa food consumption survey. The wealth index has been scaled to 0-10.

Food consumption outcomes

At this point, we have established that although more than half of households have been reporting reduced incomes relative to this time of year, household dietary diversity – a widely used measure of food security – has not suffered. However, it could be that households have had to reduce the amount of food consumed

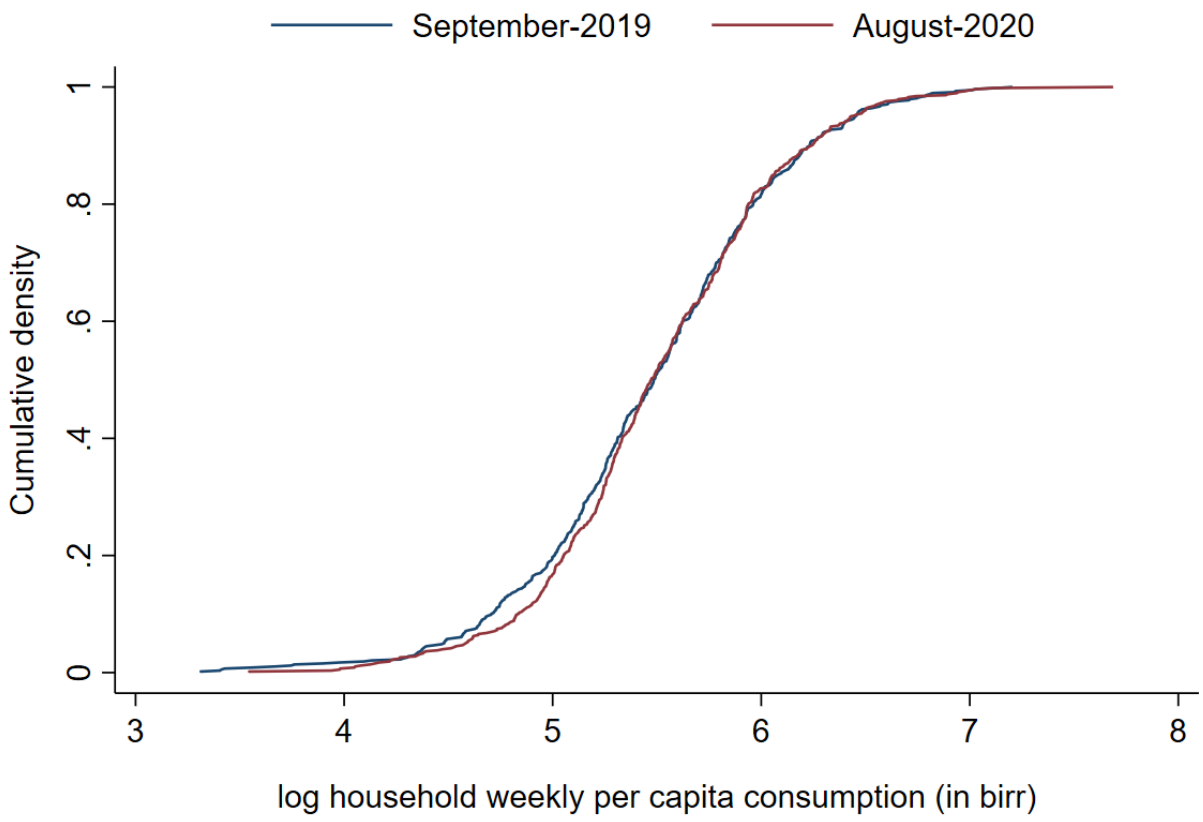
over time, or they could have changed the composition of consumption, without changing the amount of food consumed. We next explore both of these possibilities.

Both in-person surveys and the August phone survey collected detailed information on households' food consumption over the 7 days prior to the survey interview. The quantity of each food items consumed was reported in standard units (grams, kg, liter, etc.). We valued the amounts of food consumed in Ethiopian birr using monthly retail price data for Addis Ababa provided by the CSA. To adjust for inflation, we used CSA retail price data from September 2019 in all survey rounds. We also converted amounts consumed into kilocalories using food consumption tables provided by the Ethiopian Public Health Institute (EPHI, undated) with estimates of item-specific edible portions obtained from USDA (2013).

We first plot cumulative distribution functions (CDFs) of the value of log household consumption per capita among panel households in the September 2019 and August 2020 survey rounds (Figure 6).[9] If we expect that food consumption would have dropped due to the pandemic, the August 2020 CDF should be shifted to the left of the September 2019 CDF. If the only effects were among poorer households, the shift should occur at the bottom end of the distribution. We find no evidence of either type of shift. If anything, the August 2020 CDF is shifted to the right of the September 2019 CDF, suggesting that households on the poorer end of the distribution are consuming more valuable food during the pandemic than they did before. On average, in fact, the value of food consumption increased by 2 percent between the September 2019 and August 2020 surveys.

[9] Using the February 2020 data instead of September 2019 data yields similar findings; see Figures D1and D2 in Appendix D.

Figure 6. Household per capita consumption (in birr) distributions in September-2019 and August-2020

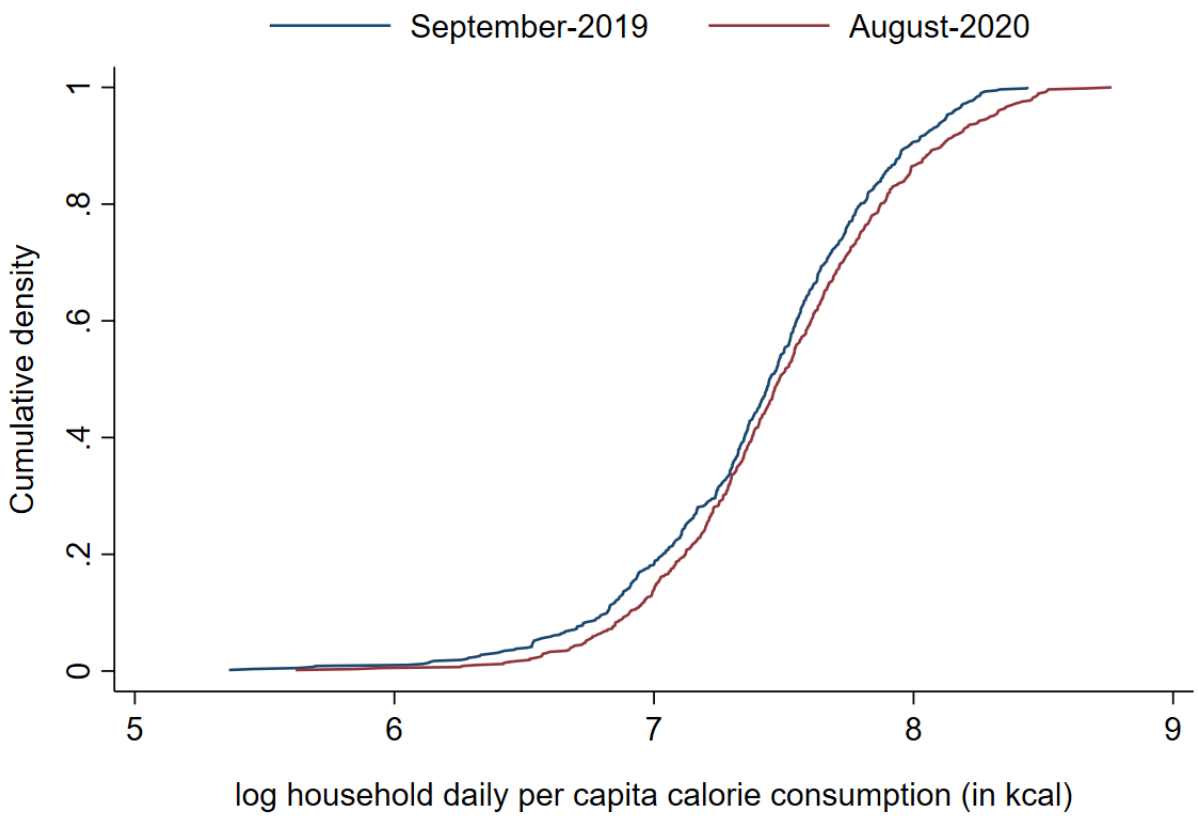


N=577 households in both rounds.

This pattern is confirmed when CDFs are plotted for log kilocalories consumed per capita rather than the value of consumption (Figure 7): the entire CDF in August 2020 is shifted to the right of that in the September 2019 survey, and calories per capita had increased by 9 percent, on average.[10] Clearly, there is no evidence that food consumption has fallen among any groups in our sample, regardless of total food consumption level.

[10] Using the February 2020 data instead of September 2019 data yields similar findings; see Figure D2 in Appendix D.

Figure 7. Household per capita consumption (in kcal) distributions in September-2019 and August-2020



N=577 households in both rounds.

Some factors that may have helped food consumption remain resilient during the pandemic are worth discussing. First, food consumption may have been resilient in part because a small share of food is eaten away from home; in the September 2019 survey, we placed substantial emphasis on collecting improved data on food consumed away from home, and we find that it only represents 7 percent of food expenditures (Wolle, et al., 2020). Unlike countries where consumers eat a substantial amount away from home, so long as value chains were resilient, there would be no reason to substantially change food distribution patterns. Second, note that consumers may have substituted non-food consumption for food consumption, especially as some outlets for spending (e.g. entertainment) have not been possible during the pandemic.

Even if food consumption has not declined or has even risen for most groups, it could be that the composition of consumption has changed. For example, in the July phone survey we asked if people were avoiding any foods during the pandemic, and 59 percent stated they were avoiding raw vegetables, while 61 percent stated they were avoiding raw meat.[11] In Table 2, we split food consumption into seven categories, combining some of the categories in the HDDS: staples (which includes cereals, roots, and tubers); legumes and nuts; vegetables; fruits; meat and eggs (including fish); dairy products; and other foods (which includes oil, sugar, and miscellaneous foods). We find that there has been a change in the composition of food consumption. Consumption of staples has increased by 11 percent on average, while consumption of legumes and nuts and vegetables have declined by 16 and 19 percent on average, respectively. Whereas there are differences for the other categories, they are relatively small in magnitude and not statistically different from zero. Since prices are held constant, these findings suggest there has been some shift from legumes and vegetables to staples (as nuts are a small share of consumption).

Table 2. Mean weekly per capita consumption in birr, by food group

Food group	September, 2019	August, 2020	Difference	Difference in %-terms
Staples	81.48	90.8	9.32 ***	11%
Legumes and nuts	21.38	18.00	-3.38 ***	-16%
Vegetables	57.39	46.32	-11.07 ***	-19%
Fruit	17.33	19.45	2.12	12%
Meat and eggs	60.37	67.65	7.28	12%
Dairy products	12.08	10.33	-1.75	-14%
All other foods	35.31	37.42	2.11	6%
Total	**285.34**	**289.97**	**4.63**	**2%**

*Note: N=577 households in both rounds. Difference in means between the groups tested with a t-test (null-hypothesis: difference in means = 0). Statistical significance denoted with * p < 0.10, ** p < 0.05, *** p < 0.01.*

We next examine the composition of average kilocalories consumed daily per capita, by food group (Table 3). Similar to Table 2, we find an increase in staple calories consumed, while the calories per

[11] Raw meat is a local delicacy in many parts of Ethiopia.

capita of legumes and nuts and vegetables both decline. We also find a statistically significant increase in per capita consumption of fruit, and a decline in caloric consumption of all other foods.

Table 3. Mean daily per capita calorie consumption, by food group

Food group	September, 2019	August, 2020	Difference	Difference in %-terms
Staples	1,025.9	1,263.6	237.7 ***	23%
Legumes and nuts	160.5	130.4	-30.1 ***	-19%
Vegetables	114.7	85.3	-29.4 ***	-26%
Fruit	33.2	39.8	6.6 **	20%
Meat and eggs	51.0	54.4	3.4	7%
Dairy products	33.1	37.9	4.8	15%
All other foods	410.0	387.1	-22.9 *	-6%
Total	**1,828.4**	**1,998.5**	**170.1 *****	9%

*Note: N=577 households in both rounds. Difference in means between the groups tested with a t-test (null-hypothesis: difference in means = 0). Statistical significance denoted with * p < 0.10, ** p < 0.05, *** p < 0.01.*

The combination of these two results suggests there has been a shift from some relatively expensive calories (e.g., vegetables) to cheaper ones (staples). Even within categories, the same appears to be true; for example, since the calories of fruit consumed rose more than the value of fruit consumed, there must have been a shift from slightly more expensive fruit, in terms of calories, to less expensive ones. However, note again that the total food budget did not change; therefore changes are happening along the intensive margin rather than the extensive margin.

There are a few potential explanations. First, recall that in the June and July surveys, about 60 percent of respondents suggested they were avoiding uncooked vegetables due to COVID-19 risk, and between 60 and 65 percent of respondents were avoiding uncooked meat for the same reason (Abate, et al., 2020; de Brauw, et al., 2020). It could be that this taboo affected overall vegetable consumption, though it would have had to affect vegetable consumption. However, when we split the sample by households that say they are avoiding uncooked vegetables versus those that are not, we find that per capita consumption of vegetables is actually higher in households avoiding uncooked vegetables than in other households,

negating this potential explanation. Since meat consumption did not decline in general, it seems that food taboos due to COVID-19 did not affect demand for specific classes of foods.

There are at least two other potential explanations for this pattern. First, it could be that relative prices for different types of foods have changed; for example, if vegetables and legumes became more expensive either for reasons related to COVID-19 or for other reasons, households may have reduced their demand for those foods and instead consumed cheaper staples (alternatively, prices for staples could have dropped). Since we lack price data for the current survey, we defer this hypothesis to the discussion. Alternatively, the decline in consumption of legumes and vegetables could be concentrated among households that had larger negative income shocks related to COVID-19. In other words, the summary statistics in Tables 2 and 3 may mask interesting heterogeneity, in which households exposed to income shocks shifted their diets towards staples and other households maintained their diets as in the previous year.

To examine the latter hypothesis, we split the sample by whether households reported having "much less" or "less" income in the July phone survey round than usual, relative to households that reported no change or a positive change. We choose the July survey as it was closest in time to the food consumption recall period. We then measure the difference between the average difference between the September 2019 and August 2020 surveys, and report whether the difference in differences is significantly different from zero. In Table 4, we study whether the value of consumption differs. We find that although the point estimate for the change in the total value of consumption is slightly larger for the "no income loss" group, the difference is not statistically significant. Whereas some of the results are suggestive that diets are poorer among those reporting income losses, others are not. For example, households reporting no income loss increase the value of their staple food consumption more than those reporting income losses; this difference is statistically significant. And whereas households reporting income losses have a larger decline in the value of vegetable consumption, they increase meat and eggs consumption more than those

reporting no income loss and have a smaller decline in the value of dairy consumption, though neither of the latter differences are statistically significant. In sum, these differences are only slightly suggestive of the patterns that we would have expected to observe.

Table 4. Change in mean weekly per capita consumption in birr between September-2019 and August-2020, by food group and income loss status in July

	Income loss	No income loss	Difference in difference
Staples	4.69	17.30	12.61 **
Legumes and nuts	-3.35	-3.43	-0.08
Vegetables	-13.87	-6.25	7.62 *
Fruit	0.51	4.91	4.40
Meat and eggs	8.59	5.02	-3.57
Dairy products	-1.31	-2.48	-1.17
All other foods	1.80	2.63	0.83
Total	**-2.94**	**17.70**	**20.64**

*Note: N=577 households in both rounds. Difference in means between the groups tested with a t-test (null-hypothesis: difference in means = 0). Statistical significance denoted with * p < 0.10, ** p < 0.05, *** p < 0.01. Household incurred an income loss if it reported to have received 'Much less' or 'Less' income than usual in the month preceding the July survey (see Figure 1).*

In fact, when we reconstruct the table using kilocalories instead of value (Table 5), we find an overall gain in per capita kilocalorie consumption by both groups, and the only difference significant at the 5 percent level is in staples consumption; reported staples consumption among households with no income loss increased by 346 calories per capita, versus 174 calories per capita among those reporting income losses. The difference-in-differences result for calories from vegetables is only significant at the 10 percent level, again suggesting that the difference is not that large.

Table 5. Change in mean daily per capita calorie consumption (in kcal) between September-2019 and August-2020, by food group and income loss status in July

	Income loss	No income loss	Difference in difference
Staples	174.4	346.8	172.4 **
Legumes and nuts	-32.3	-26.2	6.1
Vegetables	-34.1	-21.1	13.0 *
Fruit	4.1	10.9	6.8
Meat and eggs	3.4	3.2	-0.2
Dairy products	33.1	33.2	0.1
All other foods	-38.9	4.6	43.5 *
Total	**82.2**	**321.5**	**239.3 ** **

*Note: N=577 households in both rounds. Difference in means between the groups tested with a t-test (null-hypothesis: difference in means = 0). Statistical significance denoted with * p < 0.10, ** p < 0.05, *** p < 0.01. Household incurred an income loss if it reported to have received 'Much less' or 'Less' income than usual in the month preceding the July survey (see Figure 1).*

In Appendix E, we disaggregate changes in per capita consumption levels by using households' job loss status (see Figure 3) instead of their loss in income. Similarly, we find no clear evidence that the job losses reported by the households resulted in major changes in household consumption patterns between September 2019 and August 2020.

In sum, there is no clear pattern of heterogeneity that suggests there is a class of households that lose income or a job that shift towards staples away from more expensive types of foods (fruit, vegetables, animal source foods). In fact, regardless of categorization it seems that all households increased their consumption of staples relative to other types of foods. This pattern is much more suggestive of changes in relative prices than in heterogeneity of demand changes related to changes in income. Our results are limited in that we cannot disentangle to what extent government or non-governmental programs (e.g. the PSNP) may have helped maintain HDDS or kilocalorie consumption per capita. Moreover, we cannot definitively state the nutritional implications of the results; the decline in reported household vegetable consumption might be considered concerning, but we have household level rather than individual level data, and moreover other more nutrient dense foods have not declined or have potentially increased as a share of the diet.

V. CONCLUSIONS

In this paper, we use panel data collected before and after the COVID-19 pandemic began to assess whether and how food security has changed among a representative sample in Addis Ababa, the capital of the second largest country in Africa. Five months since the pandemic began, we find that a standard food security indicator (HDDS) has not changed from September 2019, and if anything, we find that an increase in calories consumed (in a seven-day recall). These results therefore suggest that food security in Addis Ababa is largely unchanged, even at the lower end of the distribution. This finding is in contrast both with evidence from subjective income measures from these households, as well as with concerns about increasing food insecurity that has been suggested by international humanitarian organizations (e.g., WFP, 2020).

Although the evidence in this paper is exclusively descriptive, the results at least cast doubt about the value of subjective questions about income in phone surveys. Based on a scan of the RECOVR website hosted by Innovations for Poverty Action and data made public by the Living Standards Measurement Surveys team at the World Bank, post COVID-19 phone surveys are primarily using subjective income shocks to study the effects of the pandemic on household well-being. The response options to these questions are typically qualitative, for example: 'incomes were much lower'; 'somewhat lower'; 'same'; 'higher'; 'much higher'. While these responses provide some idea of the direction of income trends, they are very difficult to interpret when it comes to magnitude of the income loss (De Weerdt, 2008). Apart from genuine differences in incomes changes across households, variation in responses can also arise from differences in interpretation of the response option thresholds, e.g., 'much lower' versus 'somewhat lower', or because some respondents are not willing to truthfully answer questions about their incomes. Moreover, despite the retrospective nature of these questions, responses may also be affected by expectations about future income streams amid the widespread uncertainty during the pandemic (Doss, et al., 2008). The results in this paper suggest these measures are misleading at best, wrong at worst, and may seriously over-exaggerate the welfare and poverty impacts of the ongoing pandemic.

Our results also provide indirect evidence about the effectiveness of value chains connecting Addis Ababa. While we cannot make definitive statements about individual value chains, the fact that a representative sample of households are consuming more food, in caloric terms, than they had before the crisis suggests most food value chains have been resilient to the shock associated with the pandemic. Several factors, some specific to Ethiopia, may have helped food value chains continue to function well during the pandemic. First, due to a lack of cold chains, perishables (fruit, vegetables, animal source foods) are produced nearby. Second, food away from home is not (yet) a large portion of the Ethiopian diet, so value chains to restaurants did not have to substantially reorganize themselves as demand from restaurants shrank. Third, although food imports play a role in the Ethiopian diet, in value terms, over half of imports are composed of wheat, palm oil, and sugar; therefore, problems with imports would largely only affect staples or "all other foods" in our formulation, and we only observe a small decrease in consumption of the latter category. As price data becomes available for the period during the pandemic, further research can help us understand the performance of individual value chains in Ethiopia. Such analysis can help us better understand factors that might lead value chains to break during a crisis, relative to those that are resilient to shocks.

APPENDIX A: SAMPLING APPROACH

The sampling frame for the 2019 baseline survey in Addis Ababa was based on a 2017 survey with the same households (Melesse, et al., 2019) and followed a multi-stage sampling approach. First, a stratified random sampling method was used to select sub-cities and districts (woredas) of Addis Ababa for the survey. To do so, sub-cities were grouped according to their welfare level, after which six sub-cities were randomly drawn from these groups. A similar welfare-based stratification was applied when 20 districts (woredas) were randomly selected from the selected sub-cities. Second, two urban neighborhoods (ketenas) from each selected woreda were then randomly selected and from each ketena, 25 households were randomly selected for interviewing. In total, 930 households were interviewed in August and September 2019 (Wolle, et al., 2020).[12]

The same households were revisited for the January and February 2020 endline survey. This time 895 households were interviewed; 96 percent of the households interviewed during the baseline survey in August and September 2019. Table A1 shows summary statistics for key household characteristics based on the January and February 2020 survey data. Forty-five percent of the households were female-headed, which corresponds to the previous estimates by CSA (2018a). The average household in our January and February face-to-face survey sample was 4.5 (median = 4). The average household head was 51 years old and she or he had 6.4 years of education. The average Food Consumption Score (WFP, 2008) was 68.2 and the average Household Dietary Diversity Score (Swindale and Bilinsky, 2006) was 9.3 food groups.

[12] A replacement household was randomly drawn if the household interviewed in 2017 was not available in 2019.

Table A1. Basic household characteristics, January and February 2020 survey

	Mean	Median	Standard deviation	Minimum	Maximum
Household size	4.54	4.0	1.9	1	13
Female-headed household	0.45	n/a	n/a	0	1
Head's age in years	51.2	50.0	15.4	11	92
Head's education in years	6.42	7.0	4.6	0	13
Food Consumption Score	68.2	64.0	20.9	8.5	112
Household Dietary Diversity Score	9.27	10.0	1.6	4	12

Note N = 895 households.

APPENDIX B: COMPARING CHARACTERISTICS OF SURVEY HOUSEHOLDS FROM THE JANUARY AND FEBRUARY 2020 SURVEY SAMPLE THAT WERE AND WERE NOT INCLUDED IN THE MAY 2020 PHONE SURVEY

Table B1 provides means for selected households characteristics from the January and February 2020 Addis Ababa food consumption survey for the households included in the May 2020 phone survey (N=600) and for the households from the sample for the earlier survey that were not selected to take part in the phone survey. We see that the two sub-samples are generally well balanced. The differences in means are not statistically different from zero, except for the age of the household head, for which the p-value is significant at the ten percent level. The household heads in the sample included in the phone survey are about two years younger, on average, than households that were not included in the phone survey sample.

Table B1. Comparing pre-pandemic household characteristics between households from the January and February 2020 survey sample that were and were not included in the May 2020 phone survey

	Included	**Not included**		
Number of households:	*600*	*295*		
	Mean	**Mean**	**Difference**	**p-value**
Household asset index	3.62	3.62	0.00	0.965
Household size	4.51	4.60	-0.08	0.547
Female-headed household	0.46	0.44	0.02	0.547
Head's age, years	50.4	52.7	-2.2	0.058
Head's education, years	6.57	6.11	0.46	0.153
Food Consumption Score	67.82	68.87	-1.05	0.471
Household Dietary Diversity Score	9.31	9.20	0.12	0.275

Note: Statistical significance tested using a two-sample t-test with standard errors clustered at the enumeration area level.

APPENDIX C: HOUSEHOLD SIZE AND DEPENDENCY RATIO ACROSS SURVEY ROUNDS

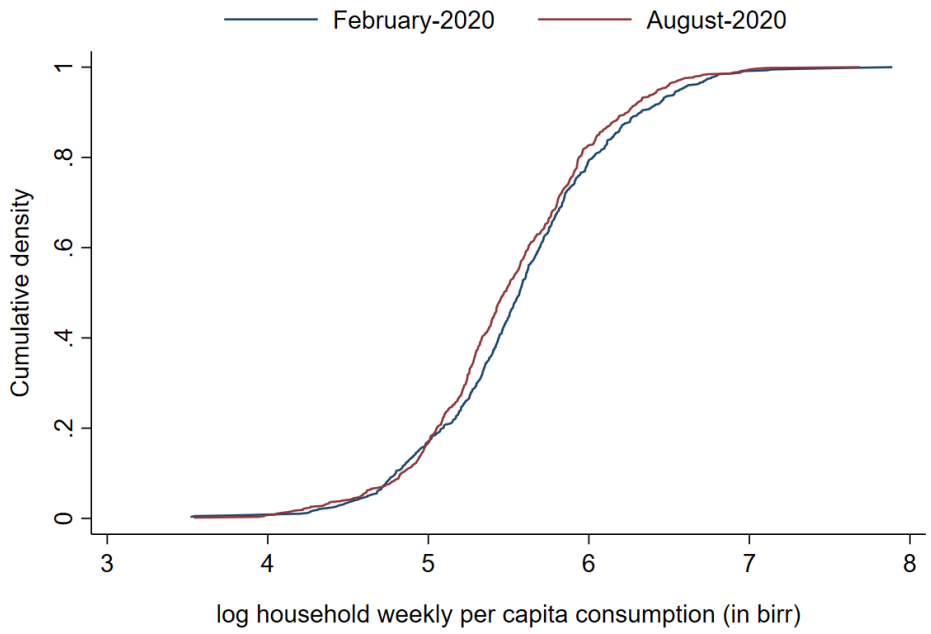
Table C1. Mean household size and dependency ratio, by survey round

	September-2019	February-2020	August-2020
Household size	5.06	4.52 ***	4.73 ***
Dependency ratio	0.32	0.33	0.31
Number of households	577	577	577

*Note: Difference in means tested against the September-2019 value. Statistical significance denoted with * p < 0.10, ** p < 0.05, *** p < 0.01. Dependency ratio is calculated by adding the number of household members who are less than 15 years and the number of household members who are above 65 years and dividing this sum with the total number of household members.*

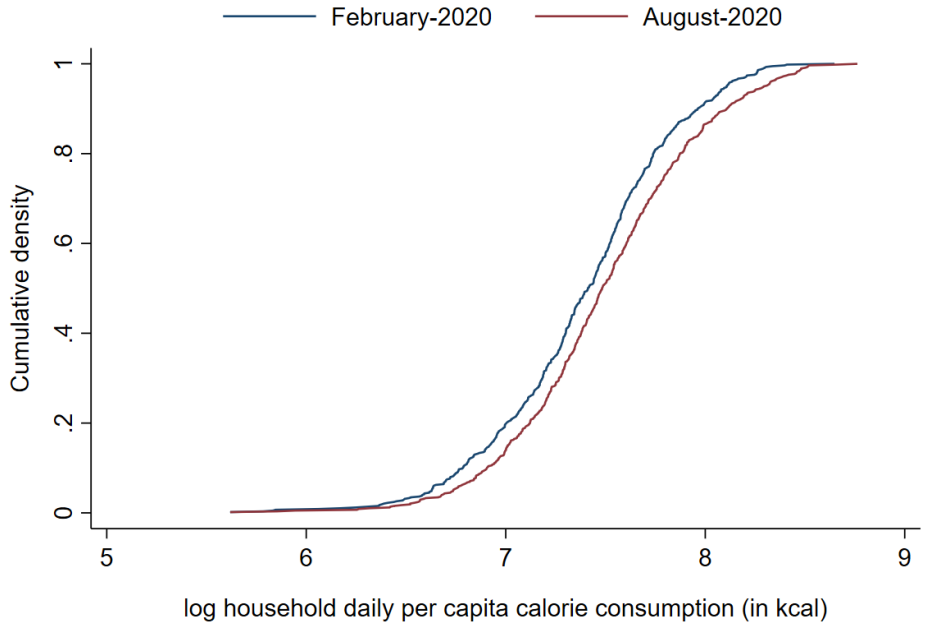
APPENDIX D: REPLICATING FIGURE 6 AND 7 USING CONSUMPTION DATA FROM FEBRUARY-2020

Figure D1. Household per capita consumption (in birr) distributions in February-2020 and August-2020



N=577 households in both rounds.

Figure D2. Household per capita consumption (in kcal) distributions in September-2019 and August-2020



N=577 households in both rounds.

APPENDIX E: REPLICATING TABLES 4 AND 5 USING HOUSEHOLD'S JOB LOSS STATUS

Table E1. Change in mean weekly per capita consumption in birr between September-2019 and August-2020, by food group and job loss status in July

	Job loss	No job loss	Difference in difference
Staples	10.61	8.17	-2.44
Legumes and nuts	-4.46	-2.40	2.06
Vegetables	-13.98	-8.45	5.53
Fruit	3.08	1.26	-1.82
Meat and eggs	17.54	-2.01	-19.55 *
Dairy products	-2.33	-1.21	1.12
All other foods	3.37	0.97	-2.41
Total	**13.84**	**-3.67**	**-17.51**

*Note: N=577 households in both rounds. Difference in means between the groups tested with a t-test (null-hypothesis: difference in means = 0). Statistical significance denoted with * p < 0.10, ** p < 0.05, *** p < 0.01. Household incurred a job loss if it reported a voluntary or involuntary job loss in the month preceding the July survey (see Figure 3).*

Table E2. Change in mean daily per capita calorie consumption (in kcal) between September-2019 and August-2020, by food group and job loss status in July

	Job loss	No job loss	Difference in difference
Staples	258.9	218.6	-40.3
Legumes and nuts	-37.2	-23.7	13.5
Vegetables	-31.9	-27.0	4.9
Fruit	9.2	4.3	-4.9
Meat and eggs	11.0	-3.6	-14.5 *
Dairy products	32.8	33.4	0.6
All other foods	-51.7	3.2	54.9 **
Total	**161.2**	**178.2**	**17.1**

*Note: N=577 households in both rounds. Difference in means between the groups tested with a t-test (null-hypothesis: difference in means = 0). Statistical significance denoted with * p < 0.10, ** p < 0.05, *** p < 0.01. Household incurred a job loss if it reported a voluntary or involuntary job loss in the month preceding the July survey (see Figure 3).*

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