

How Well is Humanitarian Assistance Targeted in Fragile Environments?

Evidence from the Announcement of a Food Emergency
in Yemen

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Abstract

The amount of assistance delivered during conflict is increasing to support the growing share of the extreme poor living in these settings. However, little is known about how well assistance is targeted, which can have implications for conflict itself. Using a novel data source in Yemen that tracks food assistance, which accounts for the largest share of assistance in the country, the authors find that the share of households receiving food assistance significantly increased following the U.N. announcement of a food emergency and that the increases were larger in regions identified by the U.N. as being closer to famine. Furthermore, the increases in

assistance helped to maintain food access through repeated and strong conflict-related shocks. The results demonstrate that the humanitarian community can rapidly and effectively increase assistance when needed. However, the lack of a stronger and more immediate impact on food access suggests potential improvements to data collection, which could help to better identify households most in need of humanitarian assistance and could help to better identify how food assistance impacts households in humanitarian emergencies.

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How Well is Humanitarian Assistance Targeted in Fragile Environments? Evidence from the Announcement of a Food Emergency in Yemen* †

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1. Introduction

The share of the world’s poor that live in fragile and conflict environments is projected to increase to over 50 percent by 2030, which suggests that much of the last mile of eradicating extreme poverty will occur in the midst of security and humanitarian emergencies (e.g., World Bank 2018a). The humanitarian-development nexus that is evolving to address these needs is increasingly providing large amounts of assistance in conflict environments to help minimize the long-term adverse impacts of health and nutrition shocks, and to try to sustain livelihoods until peace can be achieved (e.g., Oxfam 2019).

Despite the significant increase in assistance in humanitarian emergencies, little is known about how well assistance is targeted to those in the most need given a lack of data in the midst of fragile environments. There is growing evidence that assistance targeted to those most in need is the most effective at staving off the worst welfare outcomes (e.g., Kurdi et al. 2019). Additionally, targeting strategies are potentially very important to ensure that assistance might not have adverse impacts on the conflict itself. Although assistance has a stabilizing effect in some settings (e.g., Nielson et al. 2011, Berman et al. 2011), there has been an increase in conflict or the duration of conflict in response to assistance in other settings (e.g., Crost et al. 2014). The empirical ambiguity of the effect assistance has on conflict suggests that it is not assistance itself that increases conflict, but rather the type of assistance and the manner in which it is distributed that determines whether humanitarian operations might support the worst off while not worsening the conflict (e.g., Berman et al. 2013).

This article investigates the change in humanitarian assistance following a particularly interesting event- the announcement of a food emergency in Yemen in 2017. The United Nations announced the 2017 Integrated Food Security and Phase Classification (IPC) in March of 2017, which is a classification system that identifies food emergencies. Although the 2017 IPC announcement did not officially declare a famine, the announcement detailed a dire food emergency facing Yemen, and humanitarian agencies began describing the food emergency with more urgency (e.g., OCHA 2016, OCHA 2017).¹

In order to empirically estimate the impacts of the 2017 IPC announcement, this analysis utilizes a novel mobile phone survey conducted by the World Food Programme (WFP) that provides high-frequency data on food assistance and food access that are regionally disaggregated. The survey is one of the most complete data sources describing the evolution of food assistance during the course of a humanitarian disaster and offers a unique opportunity to investigate the targeting of humanitarian assistance. Although the survey misses households without access to mobile phones who potentially are more in need of assistance, the relatively high penetration of mobile phones allows an analysis of targeting for the majority of the population.

The 2017 IPC announcement led to an almost immediate and significant increase in the share of respondents receiving food assistance in the country that further increased in the year-and-a-

¹Food insecurity was already widespread in the early stages of the war (e.g., Tandon 2019), and the empirical analysis demonstrates that there was not a large change in food security in the country leading up to the announcement of the 2017 IPC. Section 2 presents possible reasons why the 2017 IPC announcement might have had a larger impact than other IPC announcements.

half following the announcement. Within months after the 2017 IPC announcement, the share of households receiving food assistance increased from 15.7 percent to 35 percent. Although the share receiving food assistance increased across the entire country, the increase was larger in regions that were identified in the announcement as being closest to famine. However, despite significant changes in the unofficial updates to the IPC classification over the course of 2017, there was little change to either the emphasis or total share of respondents receiving food assistance.

Importantly, the increase in the share receiving food assistance did have an impact on food access. Over the year and a half following the increase in the share receiving food assistance, food access improved modestly. However, the improvement was not evenly distributed throughout the time period following the 2017 IPC announcement. Food access slightly declined in the months before the increase in assistance, and the increase helped to immediately improve food access to the levels observed at the beginning of 2017. However, food access remained flat until the second quarter of 2018, when food access increased significantly across the entire country.

However, the lack of a stronger and more immediate improvement in food access following the increase in the share receiving food assistance is puzzling. We highlight three possible explanations here, all of which might have contributed to the lack of a stronger improvement. Specifically, households might have used the savings from increased food assistance in large part to purchase non-food items and maintain access to other basic services, such as purchasing diesel fuel for generators or medical care (e.g., OCHA 2017); given the conflict and restrictions on accessing some regions of the country, there was potentially less oversight over the distribution of food assistance and food assistance might have also reached households with less urgent food needs (e.g., OCHA 2017); and there were a number of adverse conflict-related shocks that might have had a worse impact had food assistance not increased with the 2017 IPC announcement (e.g., OCHA 2017, Tandon and Vishwanath 2020).

We draw two conclusions based on these results. First, the large improvement in assistance following the 2017 IPC announcement, that was more heavily targeted at the regions identified as being closest to famine, demonstrates that the humanitarian community is well positioned to effectively support households in the event of new conflict-related shocks. This finding helps to contribute to the literature investigating the best ways to target food assistance during humanitarian crises and their impacts on households (e.g., Maxwell et al. 2011, Coll-Black et al. 2012, Tranchant et al. 2019, Verme and Gigliarano 2019, etc.).^{2,3} The immediate response demonstrated here is particularly important given the growing evidence that assistance to the

²Although there is little evidence of how famine early warning systems affect the distribution of aid in a food emergency, some have argued that it is still difficult to harness aid resources prior to the onset of a food emergency based on the devastating effect many food emergencies have had on populations despite the existence of an early warning system (e.g., Buchanan-Smith and Davies 1995).

³Previous research on famines have addressed the general causes (e.g., Sen 1981) and their effects on the population (e.g., Dando 1981, Boyle and Grado 1986, Dreze 1990, etc.). Although not in the context of famine, a more recent literature investigates the advantages and disadvantages of locally procured emergency food assistance versus transoceanic shipments (e.g., Garg et al. 2013, Harou et al. 2013, etc.). An additional literature investigates the characteristics of food aid recipients in non-emergency settings (e.g., Clay et al. 1999, etc.).

worst-off households during active conflict is most effective in staving off the adverse outcomes associated with lifelong impacts (e.g., Kurdi et al. 2019). However, the lack of updating despite significant changes in both food security and conflict in the country suggests that official early warning systems need to be updated more regularly.

Second, the lack of a stronger and more immediate improvement in food access suggests potential improvements to data collection during humanitarian crises. In addition to monitoring traditional metrics that focus wholly on food access, capturing important categories of non-food consumption and access to basic services in high-frequency surveys could help to better understand how in-kind food assistance, cash transfers, and other types of humanitarian assistance might impact household wellbeing during humanitarian crises. In many crises, including in Yemen's, food is one of many urgent needs (e.g., OCHA 2017). Although it has long been recognized that the impacts of in-kind assistance might not increase consumption of the goods being provided to beneficiaries (e.g., Behrman and Deolalikar 1989, Jensen and Miller 2011, etc.), it is possible that the existence of many overlapping and potentially competing deprivations could make the situation more likely. Although some assessments, such as the 2017 IPC announcement, do take a wide variety of indicators into account and captures some of these other urgent needs (e.g., Maxwell et al. 2020), more systematic measurement of other important dimensions can potentially help with better targeting of assistance in Yemen and future crises.

The rest of the paper is organized as follows. Section 2 discusses the official 2017 IPC announcement in Yemen; section 3 discusses the data; section 4 presents important summary statistics of food assistance and food access; section 5 presents the empirical strategy and how food assistance and food access changed following the 2017 IPC announcement; section 6 discusses potential reasons why the increase in the share of households receiving assistance might not have had a larger or more immediate impact on food access; and section 7 concludes.

2. The 2017 Integrated Food Security and Phase Classification in Yemen

The official 2017 Integrated Food Security and Phase Classification (IPC) was released in March 2017 by the Yemen IPC Technical Working Group. The announcement classified each governorate and the municipality of the capital- 22 regions in total- on the IPC scale, which is a system that has been adopted by the United Nations and their humanitarian partners to identify food emergencies. To determine the classification, the technical committee combined information on food security, nutrition, and other indicators to best identify each region of the country on the IPC scale (IPC 2017).

The classification differentiates between five progressively worse food insecurity phases- generally food secure (IPC 1), borderline food insecure (IPC 2), acute food and livelihood crisis (IPC 3), humanitarian emergency (IPC 4), and famine/humanitarian crisis (IPC 5). The classifications respectively correspond to more than 80 percent of households can meet their food needs in absence of coping strategies, at least 20 percent of households have consumption that is lessened but still adequate, at least 20 percent of households have significant intake shortfalls that cannot be met without irreversible coping strategies, at least 20 percent of households have

significant intake shortfalls that cannot be met and result in high levels of acute malnutrition, and at least 20 percent of households face a complete lack of food that results in starvation.

In the announcement for Yemen, two governorates were identified as IPC 2; 10 governorates were identified as IPC 3; three governorates were identified as being IPC 3, but would be classified as IPC 4 if it were not for humanitarian assistance (we refer to these regions as IPC 3+); and seven governorates were identified as IPC 4.⁴ Throughout, we analyze how the distribution of food assistance changed following the 2017 IPC announcement, and how the distribution of assistance varied based on each governorate's IPC classification.

The 2017 IPC announcement listed 16 separate quantitative and qualitative data sources that were available to be used to collect all the different types of indicators used in the classification, including the high-frequency mobile phone survey used in this analysis.⁵ However, the data source listed most prominently in the announcement was the Emergency Food Security and Nutrition Assessment (EFSNA), which was conducted between November and December 2016. Furthermore, it is important to note that accessibility issues in Yemen since the beginning of the conflict in 2015 have made it difficult to collect data in the country that is necessary for the IPC classification. For example, the EFSNA avoided the two most conflict-affected governorates, was potentially plagued by a host of logistical difficulties given the security situation in the regions they were able to access, and was further made difficult by the structural break that has occurred since the last census. Thus, it is difficult to know how representative the survey is of the entire population (FAO 2017).

One example of how this difficulty in collecting data affected the 2017 IPC classification was the use of internal displacement, which was one of the statistics mentioned prominently by the official announcement. However, it is very difficult to accurately identify the size of the displaced population in the country. For example, the monthly mobile phone survey conducted by the WFP used in this analysis and the Gallup World Poll both find that the size of the displaced population is up to three times as large as is being identified by the Task Force for Population Movement (TFPM), which is the official source used in the IPC 2017 classification (e.g., World Bank 2017, WFP 2018a).

Despite these difficulties in constructing the 2017 IPC announcement, the classification had a large impact and the messaging around the food emergency in the country gained a new urgency. Even though there was little change between the 2016 and 2017 IPC announcements, and even though the 2017 IPC announcement did not declare a famine, the humanitarian and development community began describing "famine-like conditions" in the country and the importance of avoiding a famine (e.g., Nebehay 2017, OCHA 2017). However, there was no reference to famine in the last humanitarian needs assessment completed before the 2017 IPC announcement (e.g., OCHA 2016).

One potential reason for the larger impact was increased global attention on the food emergencies at the time of the 2017 IPC announcement. In March 2017, during a Security Council meeting, the U.N. declared that 20 million people faced starvation amid a funding gap in Nige-

⁴See Appendix 1 for the map identifying the IPC classification of each governorate.

⁵The survey- the mobile Vulnerability and Analysis Mapping Survey- is described in Section 3.

ria, Somalia, South Sudan, and Yemen (e.g., UN 2017). The increased attention to the food emergencies in these countries, including Yemen, potentially increased the amount of assistance as well.⁶

Another potential reason for why the 2017 IPC announcement had a larger impact than previous announcement was the turbulent time in Yemen’s conflict surrounding the announcement. There were many conflict-related shocks that had the potential to adversely impact food access during the same time period. Figure 1 presents a timeline of major events over the time period beginning in the second half of 2016.

First, the internationally recognized government began paying public sector salaries infrequently in the third quarter of 2016 (e.g., OCHA 2016), and this event has been widely cited as a primary driver of increased food insecurity in the country for the approximately 30 percent of the population that worked for the public sector (e.g., OCHA 2016, WFP 2016). Second, a cholera outbreak in Yemen began in October 2016, and re-emerged in spring of 2017 (e.g., OCHA 2017). The epidemic interacted with food security, where weakened immunity due to malnutrition made individuals more susceptible to the illness, and the illness further eroded the ability of households to earn a livelihood (e.g., OCHA 2017). Third, there was a significant escalation of violence during the latter half of 2017 that affected the port of Al Hudaydah, which limited the ability of the country to import necessary fuel, food, and medicine (e.g., OCHA 2017, Tandon and Vishwanath 2020, etc.). And lastly, there was a complete air and sea blockade of the country during November 2017 that had an adverse impact on food access and access to a number of basic services, most likely through a large increase in fuel prices (e.g., Tandon and Vishwanath 2020).

3. Data

As discussed above, it is very difficult to collect data that can assess how food assistance responds to food emergencies given the difficult environments in which many of these events occur. This article utilizes the mobile Vulnerability and Assessment Mapping Survey (mVAM) conducted by the World Food Programme (WFP). The survey is the most geographically complete survey covering both the time before and the time after the 2017 IPC announcement. Furthermore, the survey is conducted every month, which further allows us to more completely analyze the persistence of changes in food assistance and food access.

Specifically, the monthly mVAM began in August 2015 and has been conducted in nearly every month since.⁷ The 10-minute survey is conducted by mobile phone and reaches approximately 2400 households every month through random digit dialing. The survey is stratified by governorate, where potential respondents continue to be contacted until a sufficient number of

⁶One example is the Famine Action Mechanism announced by the World Bank immediately following the global reporting on food emergencies. The mechanism aimed to identify famines and food emergencies earlier and also automatically link funding to well-defined triggers. The countries cited in the development, and included in the piloting of the mechanism, were the four countries identified in the U.N. Security Council meeting and subsequent news reporting- Nigeria, Somalia, South Sudan, and Yemen (e.g., World Bank 2018b).

⁷In the 2016 IPC classification, the mVAM was actually the key component of determining food access across the country.

completed responses have been met in each governorate aside from the island of Soccatra. The number of minimum responses per governorate are determined by the governorate’s share of the total population. The number of respondents surveyed each month is approximately 2400.⁸

The survey is a rolling panel, where the call center acquired a list of 2400 phone numbers that answered the survey in the initial month via random digit dialing, subject to the governorate-level targets mentioned above. In the second month, the same 2400 phone numbers are contacted for an identical survey. Of these 2400, approximately 400 on average will not be able to be reached and will have to be replaced with a household from the same governorate via random digit dialing, and approximately 200 will not respond for two months in a row. However, those that are not reached will continue to be listed in the bank of possible phone numbers to be tried each month and will only be dropped from the survey completely if they have been tried to be contacted and not completed a survey for three straight rounds.⁹

Every month, the survey collects information necessary to construct the Food Consumption Score (FCS)¹⁰, information on food coping strategies necessary to construct the Reduced Coping Strategy Index (rCSI)¹¹, information on whether the household received food assistance in the past month, and information on the location of households (governorate and district). Other survey modules have been inserted in a subset of monthly surveys, including modules on displacement status and the type of housing in which the household lives.¹²

Although the survey reaches 2400 households each month, the household-level data is not publicly available. However, the WFP publicly shares each month the governorate-level averages and confidence intervals of all key variables collected¹³, and these monthly governorate-level estimates are used in the empirical analysis to analyze changes in food assistance and food access following the 2017 IPC announcement.¹⁴ We further merge the mVAM data with data on violence using data from the Armed Conflict Location & Event Data Project (ACLED) on the number of people killed in each governorate each month to be used as control variables.

However, there are important caveats to note about the data. First, it is likely that there is a significant amount of district-level variation, local factors, and household factors that impact both food assistance and food access. However, we are unable to analyze these factors in the present analysis given the data is publicly available at only the governorate level.

Second, the survey can only be representative of the mobile phone-using population following the beginning of the conflict. Although it is difficult to identify exactly how access to mobile phones have changed since the start of the conflict, all evidence suggests that access has remained

⁸See Appendix 2 for the number of responses by governorate.

⁹The WFP is unable to observe whether a phone number exists or not in the random digit dialing procedure, and thus we are unable to identify the share of active phone numbers that do not respond to the survey.

¹⁰The FCS is a weighted count of the number of days a household consumed particular food groups in the past week. A higher FCS is associated with better food access.

¹¹The rCSI is a weighted count of the number of times the household has relied on food coping strategies in the past week. A higher rCSI is associated with a worse food access.

¹²See Appendix 3 for the variable definitions used in the survey, and for an example of one of the monthly questionnaires.

¹³They also share the estimates and confidence levels of national-level estimates as well.

¹⁴An example of a similar empirical strategy is Dell et al. (2012), which use annual GDP estimates to demonstrate a relationship between well-being and temperature.

high. The share of the population that lived in a household that owned at least one mobile phone was high prior to the conflict across the entire country and amongst vulnerable groups¹⁵, there is anecdotal evidence that the share with access to mobile phones remained high following the start of the conflict¹⁶, the geographic coverage of the survey reaches the vast majority of the country that is the primary focus of this analysis¹⁷, and the WFP survey itself demonstrates that the number of mobile phones owned by households has mostly not changed at the national and governorate level.¹⁸

In addition to the issue of how mobile phone access has changed since the beginning of the conflict, there is the possibility that sample selection (i.e., non-random non-response) could be affecting the generalizability of the estimates. For example, in random digit dialing phone surveys in the United States of political preferences, the surveys are generally good at predicting party affiliation and many other political attributes relative to traditional household surveys but over-predict the amount of civic engagement due to differences in who is most likely to respond to a phone survey (e.g., Abraham et al. 2009).

To the degree that we are able to assess in such a data and evidence-scarce environment, we validate the WFP survey's representativeness of the broader mobile phone-using population by demonstrating that the survey is capturing trends that are independently corroborated by other sources. First, we demonstrate that the survey does in fact detect large declines in many welfare outcomes and access to basic services relative to the last nationally-representative survey that are consistent with the reports of humanitarian and news agencies on the ground.¹⁹ Second, the

¹⁵Prior to the escalation of the conflict, 85 percent of the total population lived in a household that owned at least one mobile phone and would be represented by the mVAM. Furthermore, this figure remained high for the rural population (81 percent), the population living below the poverty line (77 percent), and the population of all governorates (over 60 percent for each). Authors' calculations using the 2014 Household Budget Survey.

¹⁶Registration for the World Bank's cash transfers program being implemented by UNICEF, which covers approximately one-quarter of the total population and is aimed at relatively poorer households, demonstrates the vast majority of households can be reached via phone (e.g., World Bank 2018c); evidence from different WFP surveys of food aid beneficiaries suggests that the share of food aid recipients that can be reached via mobile phone has remained very high (e.g., WFP 2018b); and evidence from the WFP mobile phone survey itself suggests that particularly struggling households are well represented in the sample with approximately one-third of the sample being IDP's and over one-third receiving food assistance.

¹⁷See Appendix 4 for a map presenting the number of respondents by district over the entire course of the WFP survey, where there are only two districts out of 333 that do not have any respondents. Alternatively, the vast majority of districts are represented in any single month of the survey. For example, in the November 2017 survey, the survey reached respondents in 264 of the 333 districts in the country- nearly 80 percent of the total. It is important to note that the districts for which there are zero respondents tend to be less populated and in the east of the country. Only 9.2 percent of the country's 2017 population resided in the 69 districts for which there are zero respondents; and the districts overwhelmingly came from the governorates of Hadramaut and Al Mahrah, where only 39 and 33 percent of districts in each respective governorate had at least one respondent. Importantly, these governorates are the most food secure in the country over the time period under analysis and are not the primary focus of the analysis.

¹⁸See Appendix 5.

¹⁹Appendix 6 compares the 2017 WFP survey to population estimates in the 2014 HBS. The comparison demonstrates that every single indicator of food security collected that is replicable in the 2014 HBS dramatically declined, consistent with the reports of wide-spread food insecurity (e.g., IPC 2017, FEWS NET 2018, etc.); home ownership declined, the prevalence of renting increased, and the size of households all increased, which is consistent with the widespread issue of internal displacement in the country (e.g., TFFPM 2018); and access to services dramatically declined, where essentially no households had access to an electricity network and only 25 percent had access to a water network, which is consistent with the reporting of humanitarian agencies (e.g., OCHA 2017).

survey is very similar in its relative ranking of governorates based on food access as compared to the face-to-face Emergency Food and Nutrition Security Assessment that was undertaken during the survey period.²⁰ Additionally, the regions that the WFP survey identifies as receiving the most assistance roughly align with the population-level estimates of the share receiving food assistance.²¹

4. Summary Statistics of Food Assistance and Food Access

Table 1 reports average characteristics from the mVAM survey and illustrates a dire food security situation in Yemen over the course of the conflict. The share of respondents with a poor FCS, as defined by the WFP, was approximately 20 percent; the average prevalence of the food coping strategies collected were between 52 and 68 percent; households consumed fruit, vegetables, and protein less than half the days of the previous week and primarily relied on staples; and approximately one-third of the respondents received food assistance in the past month.²² The majority of food assistance takes the form of in-kind assistance, and the vast majority of food assistance is being provided by the WFP.²³

Table 1 further demonstrates how food access has changed over the course of the conflict. The estimates demonstrate that food consumption and food coping strategies were already poor in 2015. However, measures of food access continued to worsen in 2016 and 2017 before improving in 2018.

Importantly, the data allow us to further report food access and food assistance by each region's 2017 IPC classification.²⁴ Figure 2 reports the average FCS, rCSI, and the average share of respondents that received food assistance in each of the four different IPC classifications in the 2017 IPC announcement. The figure reports the averages of the variables in the months immediately before the 2017 IPC announcement.

There are three notable patterns apparent in Figure 2. First, the regions that were classified with the least severe food emergency in the 2017 IPC announcement (IPC 2) had significantly better food access than the rest of the country. For example, IPC 2 regions had an average FCS that was 31 percent higher and an average rCSI that was 75 percent lower than IPC 3 regions.

Second, food access was very similar in regions with an IPC classification that was more severe than IPC 2. Both the average FCS and rCSI are nearly identical in all these regions and

²⁰See Appendix 7. The relative ranking of governorates based on the share of respondents with either a poor or borderline FCS is similar, and the levels are nearly identical for a large number of governorates. However, in governorates that indicated the worst food access in both the mVAM and the EFSNA, the share of respondents with a poor or borderline FCS was higher in the EFSNA.

²¹See Appendix 8. Importantly, the WFP survey was not used as an input to the population-level estimates (IPC 2018). Also, the districts which are different between the two estimates tend to be districts that are large in area, but small in population (e.g., districts in Al Jawf, etc.).

²²Table 1 only reports food assistance statistics from January 2017 and on, which was when the governorate-level estimates begin in the publicly available data. However, the national share of assistance is reported since September 2015, and that data is reported in Figure 3a.

²³The share of the mobile phone-using population receiving aid from the WFP is higher than the share reporting receiving food assistance because the averages are reported over different time periods. The average share of food assistance is reported between January 2017 and July 2018, whereas the breakdown of assistance by form and whether it was from the WFP was only added to the survey in April 2018.

²⁴See Appendix 1 for the regional classification.

are very close to the average reported in 2017 given the very small share of the population that lives in the regions classified as IPC 2.

And lastly, prior to the 2017 IPC announcement, there were significant differences across IPC regions in the share of respondents that received food assistance in the past month. Essentially nobody received food assistance in IPC 2 regions; approximately 10 percent of respondents received assistance in IPC 3 regions; and slightly more than 20 percent received food assistance in both IPC 3+ and IPC 4 regions.²⁵

However, it is important to stress that the lack of difference in food access between all regions with an IPC classification that was more severe than IPC 2 is difficult to precisely interpret. For example, the lack of a difference could be driven by differences in the underlying data, where the mVAM is a mobile phone survey and the 2017 IPC used a variety of face-to-face surveys, key informant information, and other types of sources. Or the results could be consistent with the IPC classification being driven by some of the other indicators aside from food access. But regardless of the exact reason, food access was similarly poor across much of the mobile phone-using population in the country at the time of the 2017 IPC.

5. The Evolution of Food Assistance and Food Access over the Course of the Food Emergency

5a. Empirical Strategy

This article primarily focuses on the change in food assistance and food access following the 2017 IPC announcement. The overall goal is to better understand if the humanitarian community can quickly and effectively respond to new threats, and the degree to which assistance helps improve food access. Focusing on the change in food assistance is important to better understand the speed with which the humanitarian community responds, and to better understand if the population with the most needs receive the most increase in assistance. Furthermore, the change further allows us to estimate the impact that assistance has on food access, which can be easier to interpret than a simple correlation between food assistance and food access.

Illustrating the evolution of food assistance, Figure 3a reports the average share of respondents that received food assistance in the past month for each month of the survey. The share receiving food assistance amongst the mobile phone-using population was stable in the year-and-a-half leading up to the 2017 IPC announcement, and was approximately between 10 and 15 percent. However, within months of the announcement, the share receiving assistance more than doubled from approximately 15 percent to above 35 percent by July of 2017. Furthermore, figures 3b-3e demonstrate that there was a jump in the share for each of the four IPC classifications designated in the 2017 IPC announcement.

Although there was a large increase in the share receiving food assistance nearly immediately following the 2017 IPC announcement, Figure 4 demonstrates that there not an improvement of a similar magnitude in food access at the same time. Neither the FCS nor the rCSI jumped

²⁵As discussed in previous sections, IPC 3+ denotes regions that are classified as IPC 3, but would have been IPC 4 in absence of humanitarian assistance.

following the announcement. Rather, there was a slight improvement over the rest of 2017 and a large improvement in the second quarter of 2018.

We formally estimate the change in food assistance and investigate the uniformity of the increase over time and over different regions of the entire country. Specifically, we estimate the following specification using Ordinary Least Squares:

$$(1) \quad Assistance_{rt} = \rho_r + \beta_1 IPC_4_r + \beta_2 Post_{rt} + \beta_3 Post_{rt} * IPC_4_r + \gamma X_{rt} + \epsilon_{rt}$$

where $Assistance_{rt}$ denotes the share of respondents that received food assistance in the past month in governorate r and time period t ; $Post_{rt}$ denotes an indicator equaling one if the survey occurred after March 2017, which is the month during which the 2017 IPC announcement was made; IPC_4_r is an indicator equaling one if governorate r was classified as IPC 4 in the 2017 IPC announcement, which was the most severe classification in the announcement; ρ_r represents a governorate fixed effect; and X_{rt} denote time-varying control variables.²⁶ The sample is restricted to households surveyed between January 2017 and July 2018.^{27,28}

The estimate of β_2 represents the increase in the share receiving food assistance in non-IPC 4 regions following the 2017 IPC announcement, holding violence and time-invariant and governorate-specific factors fixed; and β_3 represents how much larger that increase was in IPC 4 regions. A positive estimate of β_2 would correspond to the 2017 IPC announcement having a strong and immediate impact on mobilizing assistance; and a positive estimate of β_3 would correspond to the increase being larger in IPC 4 regions than in the rest of the country.

In addition to estimating this change in the share receiving food assistance, we further estimate the change in food access to better understand how any increase in food assistance might have impacted food access. Specifically, we re-estimate the same specification as (1), but use average FCS as the dependent variables. Similar to the interpretation above, a positive estimate of β_2 would correspond to an improvement in food access following the 2017 IPC announcement in non-IPC 4 regions; and a positive estimate of β_3 would correspond to a larger improvement in IPC 4 regions relative to the rest of the country.²⁹

5b. The Change in the Share Receiving Food Assistance

Estimates of specification (1) are presented in Table 2, and describe the average change in the share receiving food assistance following the 2017 IPC announcement.³⁰ Column (1) of Table 2 estimates a very sparse specification including only the constant and a post indicator. The

²⁶Control variables include the number of conflict fatalities in the month before the survey in the governorate, and four lags of the same variable.

²⁷Although the national share of respondents receiving food assistance is reported since September 2015, the share at the governorate level is only reported from January 2017 onward.

²⁸All specifications weight observations by the governorate's share of the total population. All patterns are qualitatively identical when specifications are unweighted.

²⁹See Appendix 9 for estimates using rCSI as the dependent variable.

³⁰Estimates of all empirical specifications report standard errors clustered by the 21 governorates. All patterns are qualitatively identical if p-values are calculated to adjust for the small number of clusters (e.g., Wild Bootstrap, etc.).

estimate corroborates the average increase in assistance across the entire country documented in figure 1. Following the announcement in March 2017, the share receiving food assistance increased by 19.3 percentage points. Column (2) adds governorate fixed effects and control variables to the specification, and the estimates are qualitatively identical.

Column (3) re-estimates the specification estimated in column (2), but replaces $Post_{rt}$ with indicators equaling one if the survey came from individual quarters of each year.³¹ The estimates help indicate how uniform the change in food assistance was over time, and further corroborate the stability of food assistance both before and after the announcement. There was little change immediately after the announcement in the second quarter of 2017 relative to the first quarter; and beginning in the third quarter of 2017, there was a 20 percentage point increase in the average share receiving food assistance. However, the increase magnified over the time period, with the increase being approximately five percentage points larger by the second quarter of 2018.³²

Column (4) estimates the full form of specification (1) and demonstrates that there were larger increases in assistance targeted at regions that were classified as having the worst food emergency. The non-IPC 4 regions of the country, which represent the majority of the population, had an increase in the share receiving food assistance by 13.9 percentage points (coefficient on $Post_{rt}$). However, there was a 9.5 percentage point larger increase in IPC 4 regions (coefficient on $Post_{rt} * IPC4_r$).³³ Combined with the fact that IPC 4 regions were already receiving a larger amount of assistance prior to this increase, the share of respondents receiving food assistance after the 2017 IPC announcement was significantly higher than in the rest of the country.

Lastly, column (5) investigates whether the increase in assistance was uniform across all the governorates identified as IPC 4 in the 2017 IPC announcement. Specifically, column (5) re-estimates the specification reported in column (4), but further estimates the increase in assistance separately for each governorate classified as IPC 4.³⁴

The estimates in column (5) demonstrate that although the increase in assistance was the largest for IPC 4 regions on average, the increase was not uniform across all IPC 4 governorates. One can reject the hypothesis that the increase in all governorates was equal (p-value 0.0000). Additionally, there were some governorates that had increases that were similar to the increase experienced by the rest of the country (e.g., Shabwah), while there were two governorates that had increases that were nearly three times that of the majority of the country (e.g., Lahj and Sa'ada). Although we do not have a precise explanation for why there are large differences amongst IPC 4 regions, one possibility is that the targeting of food assistance does not rely exclusively on the official IPC announcements. For example, the results are consistent with

³¹For example, $Q2_{2017}$ denotes an indicator equaling one if the survey occurred in either April, May, or June of 2017; and $Post_{rt}$ is equal to the sum of all quarter indicators from $Q2_{2017}$ and on.

³²The p-value of the test of all increases following the 2017 IPC announcement being identical was 0.062.

³³In results not reported, the increase was similar in all non-IPC 4 regions.

³⁴Specifically, $Post_{rt}$ is interacted with indicators for each of the seven governorates that received the IPC 4 classification in the announcement. The sum of each of the governorate indicators would equal the IPC 4 indicator used in the specification in column (3).

humanitarian organizations using their own internal indicators to decide exactly where to focus assistance within the regions that have the most need in the IPC classification.³⁵

Importantly, there were substantial changes to the IPC classification in unofficial updates produced by another famine early warning system (FEWS NET 2017). These unofficial updates significantly changed the IPC classification in the country and had downgraded the severity of all IPC 4 regions to IPC 3 by the end of the year.³⁶ Given this substantial update to the regions that were originally classified as having the most severe food emergency, one might expect the regional emphasis in the share receiving food assistance to change.

However, Figures 3b-3e demonstrate that this did not happen. Rather, food assistance further increased in the regions originally classified as IPC 4 in the official 2017 IPC announcement following the downgrading of the seriousness of the food emergency relative to the rest of the country. Thus, food assistance did not appear to respond to these updates over the time period covered under this analysis.

One potential reason for the lack of a response to the IPC updates is that the majority of food assistance in Yemen is provided by organizations affiliated with the UN (e.g., OCHA 2017), and thus are potentially more responsive to IPC classifications endorsed by the UN. However, the organization that was updating the IPC most often during this time period (FEWS NET) is funded by the United States Agency for International Development, and thus might be more closely used for assistance provided by the US government. However, regardless of the exact reason, food assistance decisions in Yemen appear to be significantly influenced by the official 2017 IPC announcement that was not updated for nearly two years in a situation with constant conflict-related shocks and a rapidly changing food security situation (e.g., OCHA 2019).

5c. The Change in Food Access

We investigate the impact the increase in assistance had on food access in Table 3. The table re-estimates all the specifications from Table 2, but uses the average FCS as the dependent variable.³⁷ Columns (1) and (2) demonstrate food access did improve on average across the entire country following the 2017 IPC announcement and the subsequent increase in food assistance. In the most complete specification in column (2), FCS increased by 3.5 percent on average.

However, column (3) demonstrates that this improvement in food access was not uniform over the entire post-announcement period. Rather, the estimates demonstrate that food access was trending slightly down prior to the increase in food assistance.³⁸ In the second quarter of 2017, the average FCS was worse than in the first quarter (coefficient on *Q2_2017* Indicator). Following the large increase in the share receiving food assistance in the third quarter of 2017,

³⁵It is also possible that the distribution of assistance in Lahj and Sa'ada were easier for humanitarian agencies than in other IPC 4 governorates.

³⁶In the June 2017 update, only one governorate remained in the classification that was closest to famine (IPC 4), while the rest of the regions that were in that classification were downgraded to IPC 3. Beginning in October 2017, the update further downgraded that one remaining governorate to IPC 3 as well.

³⁷Appendix 9 demonstrates qualitatively identical patterns using average rCSI as the dependent variable.

³⁸Although food access was trending down, it was trending down similarly in all regions in the country.

the drop stabilized, and access increased to pre-announcement levels (coefficient on $Q3_{2017}$ Indicator). However, by the second quarter of 2018, there was a substantial improvement in access to food relative to pre-announcement levels (coefficient on $Q2_{2018}$ Indicator).

Lastly, column (4) demonstrates that the improvement in food access in IPC 4 regions was nearly identical to the improvement in the rest of the country. The estimate of the β_3 (coefficient on $Post_{rt} * IPC_{4rt}$) was small in magnitude and imprecisely estimated. Additionally, column (5) corroborates the lack of a uniform difference in the improvement in IPC 4 regions relative to the rest of the country. Specifically, the improvement was stronger in some IPC 4 governorates and less strong in others relative to the rest of the country. Of the two governorates that received the largest increases in assistance (Lahj and Sa'ada), one had a higher increase in food access than the rest of the country and another had a smaller increase. Combined, the results demonstrate that there was not a uniformly larger improvement in food access in regions that received the largest increase in food assistance.

6. Why Did the Increase in the Share Receiving Assistance Not Have a Larger and More Immediate Impact on Food Access?

Although there is evidence that food access improved following the large increase in the share of respondents receiving food assistance, the lack of a larger and more immediate impact across the country is puzzling and needs more investigation. Additionally, the lack of a larger increase in food access in IPC 4 regions, which received larger increases in assistance, also needs more investigation. Here we discuss three possible reasons for the lack of a stronger impact on food access and offer additional empirical support for one of the potential reasons.

First, in many models of consumption, it has long been recognized that the impact of in-kind assistance is equivalent to a cash transfer for households that receive less in assistance than they would have consumed in absence of that assistance (e.g., Behrman and Deolalikar 1989, etc.). In such cases, it is possible that the increase in food assistance would help households save money that they would have spent on the same foods, and households then could increase spending on non-food items (e.g., Jensen and Miller 2011, etc.). In the case of Yemen, where there are many urgent and competing needs aside from food, it is possible that households used much of the savings to purchase a minimally acceptable diet, and then spent the remaining savings on non-food goods. Thus, without data sources that look beyond food security, it is difficult to understand if there were indeed large increases in non-food consumption for the entire country, where the increases might have been potentially larger in IPC 4 regions.

Second, given the difficulty that humanitarian actors had in accessing large parts of the country (e.g., OCHA 2017), it is possible that oversight that is usually undertaken to target food assistance might have been significantly impaired. Given these constraints, it is possible that some of the food assistance could have reached households that already had decent access to food who might be more likely than the typical targeted household to spend the savings from assistance on non-food items. Furthermore, given distribution networks in IPC 4 regions in the 2017 IPC classification had worse accessibility constraints and fewer humanitarian partners operating (e.g., OCHA 2017), this can further explain the lack of a larger improvement in food

access in IPC 4 regions demonstrated above.

And third, as discussed above, the time following the 2017 IPC announcement was a very turbulent time in Yemen that affected all households (see Figure 1). The strong conflict-related shocks in the rest of 2017 and the beginning of 2018 might have had much stronger adverse impacts on access to food had there not been an increase in the share receiving food assistance following the 2017 IPC announcement, and this allowed households only to maintain food access. Additionally, it is possible that these shocks could have impacted IPC 4 regions more than the rest of the country given potentially more vulnerable households, and this impact could further have neutralized whatever additional increase in assistance was targeted to those regions.

Although all three of the above explanations could each contribute to the lack of a stronger and more immediate impact on food access, we are able to find additional empirical support for the last explanation. Given data and information constraints, it is not possible to estimate the impact of all the conflict-related shocks that affected the country. However, Tandon and Vishwanath (2020) were able to demonstrate that the complete air and sea blockade in November 2017 harmed food access and access to basic services using the individual-level data from the mVAM survey that month.³⁹

Using that same individual data from the November 2017 mVAM, we are able to demonstrate that the blockade did have stronger adverse consequences on IPC 4 regions than the rest of the country. Specifically, we estimate:

(2)

$$\ln(\text{Food_Access}_{hrd}) = \rho_r + \beta_1 \text{IPC_}A_r + \beta_2 \text{Post_Blockade}_{hrd} + \beta_3 \text{Post_Blockade}_{hrd} * \text{IPC_}A_r + \epsilon_{hrd}$$

where *Food_Access* denotes either the household FCS or rCSI; *Post_Blockade* is an indicator equaling one if the household was interviewed after November 6th, which is the day the blockade began; and *h*, *r*, and *d* refer to household, governorate, and day of interview respectively.⁴⁰ Similar to specification (1), estimates of β_2 denote the percent increase in food access following the blockade in all non-IPC 4 regions, and estimates of β_3 denote the additional percent increase in IPC 4 regions.

Additionally, the November 2017 survey also included a special module on access to basic services. Thus, we also estimate specifications that use indicators equaling one if the household was experiencing deprivations in access to electricity, water, and municipal garbage collection as the dependent variables. Lastly, we also estimate a specification using an indicator equaling one if the household suffered from three or more of the four deprivations measured (including poor FCS) simultaneously as the dependent variable.

Estimates of specification (2) are presented in Table 4. Consistent with Tandon and Vishwanath (2020), the estimates demonstrate that both food access and access to basic services did

³⁹The analysis above relied on monthly summary statistics at the governorate level as opposed to the individual-level data. Special permission was obtained to use the one month of individual-level data.

⁴⁰Given the use of a single month of individual-level data, the governorate fixed effects absorb the conflict variables that were used as controls in specification (1).

decline following the blockade. However, the results here demonstrate that in some dimensions there was a stronger impact in IPC 4 regions than in the rest of the country. Although the change in food access was very similar in IPC 4 regions and the rest of the country (columns 1 and 2), access to other basic services and the share of households with overlapping deprivations all increased by more in IPC 4 regions.⁴¹ Together, these results demonstrate it could be possible that households in IPC 4 regions might have been impacted more than the rest of the country by all the different shocks that occurred during 2017.

7. Conclusion and Policy Implications

We found that there was a large increase in the share of households receiving food assistance amongst the mobile phone-using population following the 2017 IPC announcement in Yemen. Furthermore, there was a small average increase in food access following the increase in the share receiving food assistance, but much of the improvement was delayed and the immediate improvement was small. We further explore potential reasons for why the improvement in food access was not stronger and more immediate.

There are two primary policy implications based on these results. First, although the results suggest that the humanitarian community is well positioned to effectively support households in the event of new conflict-related shocks, the results also suggest the potential need for more frequent updates to targeting strategies.⁴² And second, more systematic measurement of important dimensions of well-being aside from food security can potentially help with better targeting of assistance in Yemen and future crises.

Another policy issue highlighted by this analysis is the potential need for more transparency in the measures that are pivotal in the IPC classification. As demonstrated by the summary statistics, there was little difference between much of the country based on food access measures in the survey used here. More transparency of the data used and the ways in which the evidence was used to converge to an IPC classification could be helpful in interpreting the results.

However, it is important to note that there are caveats to this analysis. In particular, the population without access to mobile phones needs to be addressed with other survey methodologies. Although face-to-face interviews that are representative of the entire population are difficult in this setting, they could at least account for some of this difficult-to-reach population. And in cases where the security situation makes it difficult to reach these households, one can complement mobile phone surveys with key informant surveys of service providers and local government officials to at least paint as complete picture as possible about the needs of the entire population in a region.

⁴¹Tandon and Vishwanath (2020) demonstrate that the change in access to food and basic services was very similar across the entire country. The most likely mechanism identified was a very large increase in fuel prices, which similarly was uniform across the country. In results not shown, the increase in fuel prices was similar in all IPC regions identified in the 2017 IPC announcement.

⁴²As of January 2021, the next official IPC announcement following the December 2018 announcement was still being constructed. However, there have been unofficial and partial IPC updates produced for approximately one-third of the country (e.g., IPC 2019).

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Table 1. Summary Statistics

	Mean	St. Dev.	Mean-2015	St. Dev.	Mean-2016	St. Dev.	Mean-2017	St. Dev.	Mean-2018	St. Dev.
Food Consumption Score	47.7	[8.20]	48.8	[6.90]	46.8	[7.40]	45.1	[7.40]	51.4	[9.10]
Share with Poor Coping Strategy Group	0.221	[0.111]	0.255	[0.097]	0.223	[0.115]	0.206	[0.107]	0.211	[0.11]
Share with Poor Food Consumption Group	0.213	[0.11]	0.226	[0.088]	0.233	[0.097]	0.243	[0.108]	0.136	[0.099]
Reduced Coping Strategy Index	19.6	[4.50]	17.8	[3.70]	20.2	[4.50]	20	[4.40]	19.2	[4.50]
Share with Reduced Meals	0.591	[0.112]	0.51	[0.094]	0.581	[0.108]	0.62	[0.103]	0.619	[0.114]
Share with Restricted Consumption	0.573	[0.12]	0.522	[0.11]	0.557	[0.12]	0.59	[0.12]	0.606	[0.112]
Share that Borrowed for Food Purchases	0.523	[0.128]	0.383	[0.078]	0.566	[0.134]	0.516	[0.109]	0.537	[0.114]
Share Relied on Less Expensive Foods	0.658	[0.145]	0.629	[0.102]	0.577	[0.162]	0.723	[0.104]	0.722	[0.11]
Share with Reduced Portion Sizes	0.683	[0.115]	0.644	[0.099]	0.665	[0.12]	0.708	[0.108]	0.707	[0.109]
Days Consumed Protein in the Past Week	1.971	[1.005]	2.351	[0.869]	1.897	[0.869]	1.761	[0.996]	2.146	[1.194]
Days Consumed Pulses in the Past Week	2.811	[0.648]	2.921	[0.662]	2.746	[0.632]	2.684	[0.635]	3.088	[0.632]
Days Consumed Staples in the Past Week	6.188	[0.363]	5.751	[0.41]	6.108	[0.305]	6.241	[0.264]	6.457	[0.287]
Days Consumed Sugar in the Past Week	5.571	[0.674]	5.288	[0.583]	5.612	[0.632]	5.402	[0.672]	5.881	[0.656]
Days Consumed Vegetables in the Past Week	2.94	[0.84]	2.722	[0.725]	3.017	[0.802]	2.777	[0.83]	3.083	[0.883]
Days Consumed Fat in the Past Week	5.627	[0.679]	6.144	[0.377]	5.748	[0.597]	5.204	[0.653]	5.747	[0.624]
Days Consumed Fruit in the Past Week	1.147	[0.662]	1.215	[0.469]	1.145	[0.541]	0.897	[0.47]	1.273	[0.786]
Share Reside in a Camp	0.005	[0.011]	0.014	[0.018]	0.004	[0.01]	0.002	[0.005]	0.003	[0.007]
Share that Own House	0.613	[0.127]	0.655	[0.102]	0.594	[0.147]	0.619	[0.112]	0.614	[0.107]
Share Reside in Public Housing	0.004	[0.009]	0.004	[0.006]	0.003	[0.007]	0.005	[0.01]	0.007	[0.017]
Share that Rent House	0.278	[0.136]	0.247	[0.102]	0.32	[0.148]	0.255	[0.122]	0.214	[0.127]
Share that Host Others	0.053	[0.036]	0.052	[0.033]	0.047	[0.037]	0.059	[0.034]	0.065	[0.033]
Share Receiving Food Aid	0.333	[0.184]	-	-	-	-	0.284	[0.175]	0.403	[0.169]
Share Receiving In-Kind Aid	0.332	[0.142]	-	-	-	-	-	-	0.332	[0.142]
Share Receiving Cash Aid	0.007	[0.012]	-	-	-	-	-	-	0.007	[0.012]
Share Receiving Vouchers for Aid	0.089	[0.055]	-	-	-	-	-	-	0.089	[0.055]
Share Not Receiving WFP Aid	0.027	[0.071]	-	-	-	-	-	-	0.027	[0.071]
Share Receiving WFP Aid	0.371	[0.181]	-	-	-	-	-	-	0.371	[0.181]

This table reports summary statistics of variables collected in the WFP mobile phone survey. Governorate observations are weighted by the pre-conflict population so as to be representative of the population. All variables have 706 observations over the course of the entire survey (21 governorates, most of which were surveyed in each month), aside from the housing variables (601 observations), food assistance (378 observations), and the breakdown of aid into its form and whether it was from the WFP (63 observations). The lower number of observations is due to the variable being added to the survey over the course of the conflict.

Table 2. Change in Food Assistance Following the 2017 IPC Announcement

VARIABLES	(1) Share Receiving Food Assistance	(2) Share Receiving Food Assistance	(3) Share Receiving Food Assistance	(4) Share Receiving Food Assistance	(5) Share Receiving Food Assistance
Post Announcement Indicator	0.193*** [0.023]	0.177*** [0.025]	-	0.139*** [0.021]	0.138*** [0.021]
Quarter Indicators					
Q2 2017 Indicator	-		-0.001 [0.026]	-	-
Q3 2017 Indicator	-		0.200*** [0.031]	-	-
Q4 2017 Indicator	-		0.220*** [0.027]	-	-
Q1 2018 Indicator	-		0.202*** [0.026]	-	-
Q2 2018 Indicator	-		0.252*** [0.036]	-	-
Q3 2018 Indicator	-		0.227*** [0.042]	-	-
Interaction Between IPC Status and the Post Announcement Indicator					
Post Announcement Indicator * IPC 4 Indicator	-		-	0.095** [0.043]	-
Interactions Between the Post Announcement Indicator and Individual Governorates in IPC 4 Regions					
Post Announcement Indicator * Abyan Indicator	-		-	-	0.064*** [0.021]
Post Announcement Indicator * Al Hudaydah Indicator	-		-	-	0.008 [0.028]
Post Announcement Indicator * Hajjah Indicator	-		-	-	0.028 [0.021]
Post Announcement Indicator * Lahj Indicator	-		-	-	0.233*** [0.021]
Post Announcement Indicator * Sa'ada Indicator	-		-	-	0.279*** [0.021]
Post Announcement Indicator * Shabwah Indicator	-		-	-	0.016 [0.021]
Post Announcement Indicator * Taizz Indicator	-		-	-	0.130*** [0.021]
Observations	357	357	357	357	357
Controls and Governorate Fixed Effects	N	Y	Y	Y	Y

Note: This table estimates how the share of respondents receiving food assistance changed following the announcement of the 2017 IPC in March 2017. Column (1) estimates a sparse specification regressing the average share of respondents in each governorate on an indicator equaling one if the survey was conducted after March 2017; column (2) adds governorate fixed effects and control variables; column (3) estimates an identical specification but replaces the post indicator with indicators equaling one if the survey happened during that quarter-year time period; column (4) interacts the post indicator with an indicator for the most severe IPC classification in the 2017 IPC announcement (IPC 4); and column (5) further interacts the post indicator with governorate indicators for each governorate that was classified as IPC 4 2017 IPC announcement. Control variables include the number of people killed in the month before the survey, and four lags of the same variable. Standard errors are clustered by governorate and reported in parentheses. * denotes significance at the 1 percent level; ** denotes significance at the 5 percent level; and *** denotes significance at the 1 percent level.

Table 3. Change in Food Consumption Scores Following the 2017 IPC Announcement

VARIABLES	(1) ln (FCS)	(2) ln (FCS)	(3) ln (FCS)	(4) ln (FCS)	(5) ln (FCS)
Post Announcement Indicator	0.045*** [0.008]	0.035** [0.017]	-	0.038*** [0.012]	0.037*** [0.012]
Quarter Indicators					
Q2 2017 Indicator	-		-0.035** [0.013]	-	-
Q3 2017 Indicator	-		0.001 [0.014]	-	-
Q4 2017 Indicator	-		-0.022* [0.011]	-	-
Q1 2018 Indicator	-		0.016 [0.010]	-	-
Q2 2018 Indicator	-		0.247*** [0.012]	-	-
Q3 2018 Indicator	-		0.185*** [0.016]	-	-
Interaction Between IPC Status and the Post Announcement Indicator					
Post Announcement Indicator * IPC 4 Indicator	-		-	-0.007 [0.034]	-
Interactions Between the Post Announcement Indicator and Individual Governorates in IPC 4 Regions					
Post Announcement Indicator * Abyan Indicator	-		-	-	-0.021* [0.012]
Post Announcement Indicator * Al Hudaydah Indicator	-		-	-	-0.072* [0.035]
Post Announcement Indicator * Hajjah Indicator	-		-	-	-0.007 [0.012]
Post Announcement Indicator * Lahj Indicator	-		-	-	0.030** [0.011]
Post Announcement Indicator * Sa'ada Indicator	-		-	-	-0.053*** [0.018]
Post Announcement Indicator * Shabwah Indicator	-		-	-	0.049*** [0.012]
Post Announcement Indicator * Taizz Indicator	-		-	-	0.039** [0.015]
Observations	357	357	357	357	357
Controls and Governorate Fixed Effects	N	Y	Y	Y	Y

Note: This table estimates how the average Food Consumption Score changed following the announcement of the 2017 IPC in March 2017. Column (1) estimates a sparse specification regressing the average share of respondents in each governorate on an indicator equaling one if the survey was conducted after March 2017; column (2) adds governorate fixed effects and control variables; column (3) estimates an identical specification but replaces the post indicator with indicators equaling one if the survey happened during that quarter-year time period; column (4) interacts the post indicator with an indicator for the most severe IPC classification in the 2017 IPC announcement (IPC 4); and column (5) further interacts the post indicator with governorate indicators for each governorate that was classified as IPC 4 2017 IPC announcement. Control variables include the number of people killed in the month before the survey, and four lags of the same variable. Standard errors are clustered by governorate and reported in parentheses. * denotes significance at the 1 percent level; ** denotes significance at the 5 percent level; and *** denotes significance at the 1 percent level.

Table 4. The Impact of Conflict-Related Shocks by IPC Classification

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ln (FCS)	ln (rCSI)	Indicator for Water Source Being Insufficient	Indicator for Using a Primitive Energy Source	Indicator for No Municipal Garbage Collection	Indicator for Experiencing 3 or More Deprivations
Post Blockade Indicator	-0.031 [0.021]	0.176** [0.072]	0.048 [0.028]	0.009 [0.014]	0.023 [0.024]	0.065** [0.027]
Interaction Between IPC Status and the Post Announcement Indicator						
Post Announcement Indicator * IPC 4 Indicator	-0.014 [0.043]	-0.009 [0.111]	0.033 [0.037]	0.064** [0.029]	0.062 [0.058]	0.078* [0.045]
Observations	2,422	2,422	2,422	2,422	2,422	2,422

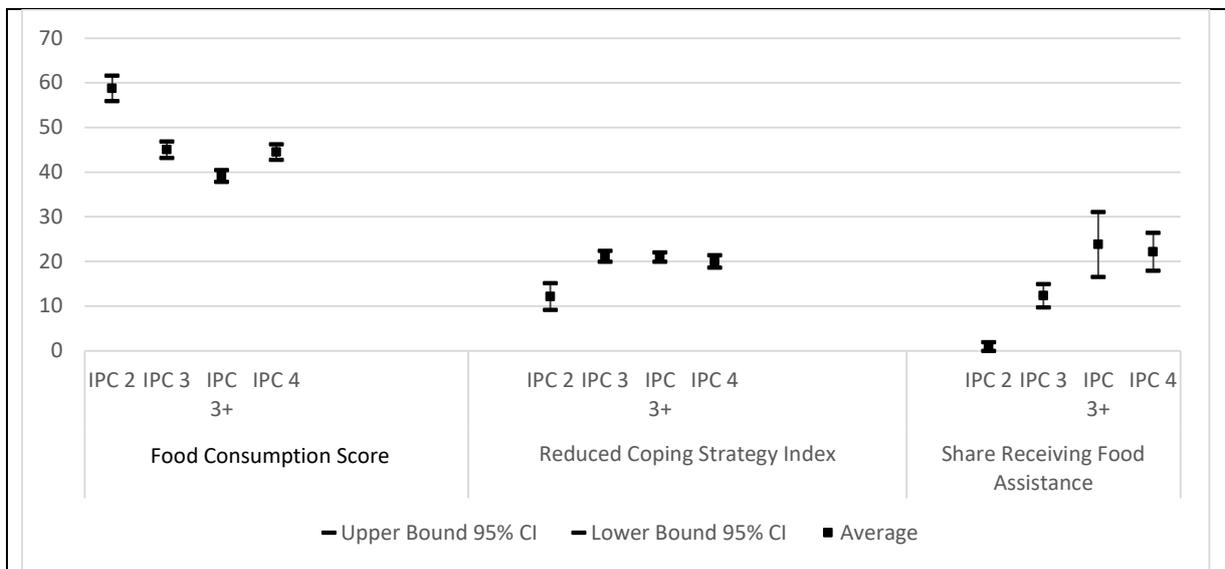
Note: This table estimates how households were impacted by the complete air and sea blockade that began during November 2017. The post blockade indicator is an indicator equaling one if the household was interviewed after November 6, 2017, which was the day the blockade began. All specifications include governorate fixed effects. Standard errors are clustered by governorate and reported in parentheses. The data used in these specifications is the household-level data from the November 2017 mobile Vulnerability and Analysis Mapping Survey. * denotes significance at the 1 percent level; ** denotes significance at the 5 percent level; and *** denotes significance at the 1 percent level.

Figure 1. Timeline of Major Events Before and After the 2017 IPC Announcement



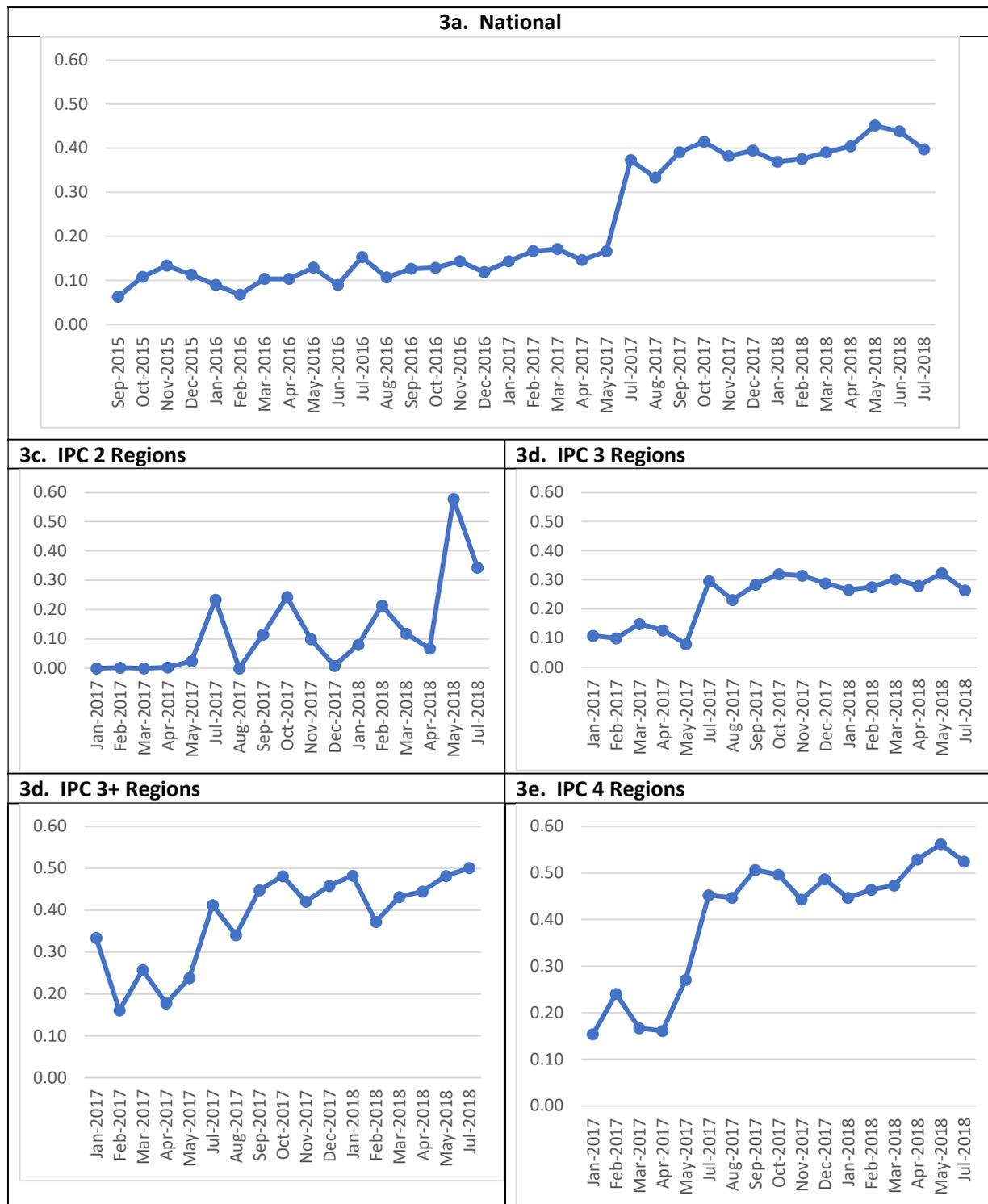
Notes: Dates were taken from the 2018 Humanitarian Needs Overview, published in December of 2017.

Figure 2. Food Access and Food Assistance by 2017 IPC Classification, January 2017 – June 2017



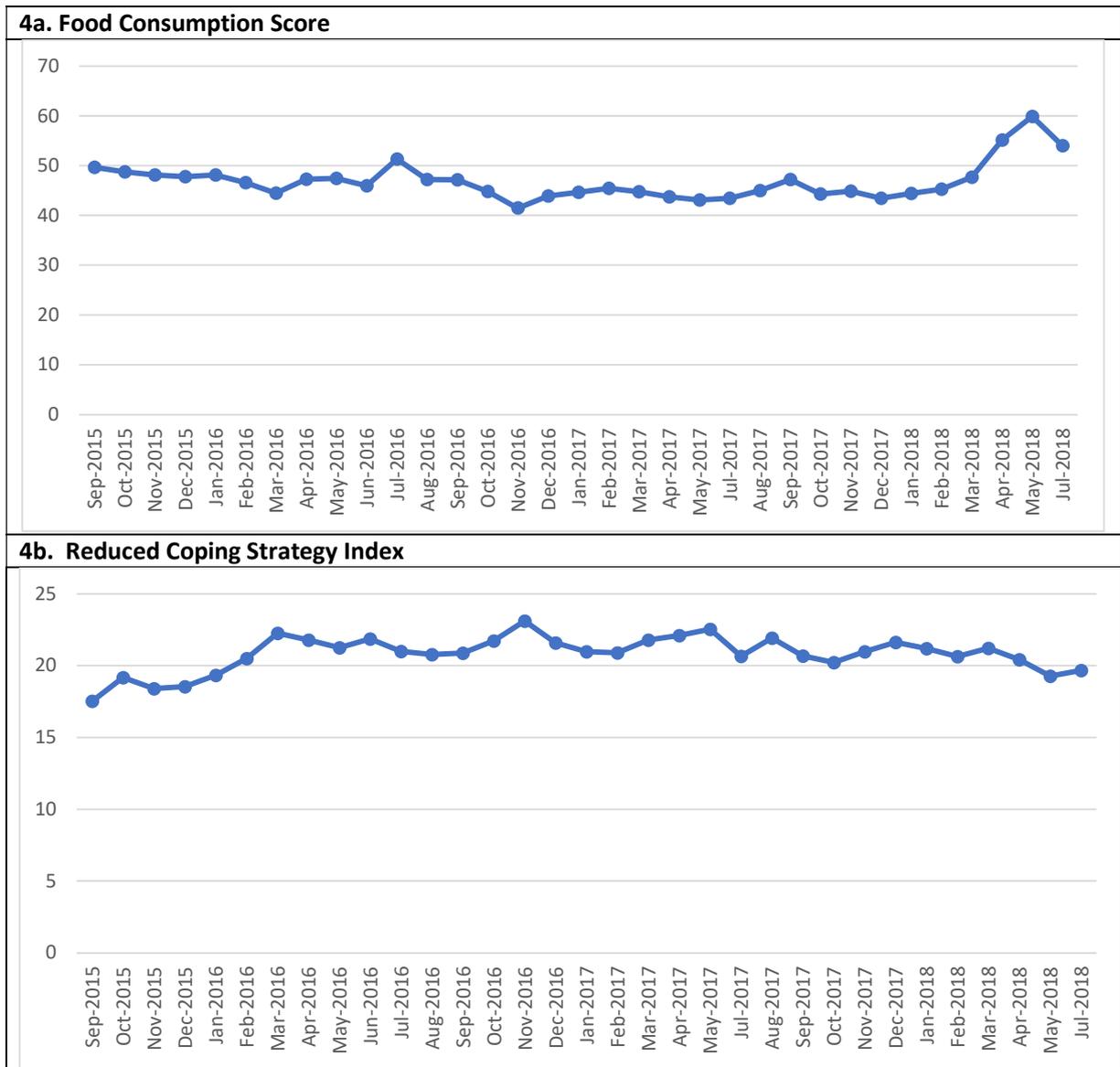
Notes: Authors' calculations using the WFP mobile Vulnerability Analysis and Mapping Survey. IPC groupings are as reported in the 2017 IPC announcement, and IPC 3 + governorates refers to regions that were classified as IPC 3 but would have been IPC 4 in absence of humanitarian assistance.

Table 3. Share of Respondents Receiving Food Assistance



Notes: Authors' calculations using the WFP mobile Vulnerability Analysis and Mapping Survey. The survey publicly reported the national share of respondents receiving food assistance since August 2015; and the survey publicly shared the governorate-level share of respondents receiving food assistance since January 2017. IPC groupings are as reported in the 2017 IPC announcement, and IPC 3 + governorates refers to regions that were classified as IPC 3 but would have been IPC 4 in absence of humanitarian assistance.

Figure 4. Average Food Access



Notes: Authors' calculations using the WFP mobile Vulnerability Analysis and Mapping Survey.

Appendix 2. Geographic Coverage of the Survey

Governorate	Number of Surveys Targeted
Abyan	87
Aden	65
Al Bayda	114
Al Hudaydah	147
Al Jawf	96
Al Mahrah	44
Al Mahweet	96
Amran	94
Dhale	116
Dhamar	140
Hadramout	70
Hajja	108
Ibb	155
Lahij	142
Mareb	94
Raymah	78
Sa'ada	141
Sana'a	125
Sana'a City	180
Shabwah	125
Taiz	204

Notes: This table presents the number of completed surveys by governorate in the November 2017 survey. The geographic distribution of responses is approximately identical in each round of the survey. For example, in Abyan, the monthly sample size for each month used in this analysis varied between 87 and 93 completed surveys.

Appendix 3a. Variables and Definitions in the WFP Mobile Phone Survey

Variable	Definition
BorrowOrHelp	# of days household using this coping strategy per week
Cereals	# of days household eating this food item per week
CSG==1	coping strategy group==poor
CSG==2	coping strategy group==borderline
CSG==3	coping strategy group==acceptable
Dairy	# of days household eating this food item per week
Eggs	# of days household eating this food item per week
FCG	food consumption group
FCS	food consumption score
Fruits	# of days household eating this food item per week
HouseType==Camp	prevalence-->where Household is staying
HouseType==Other	prevalence-->where Household is staying
HouseType==Own_home	prevalence-->where Household is staying
HouseType==Public_building	prevalence-->where Household is staying
HouseType==Rental	prevalence-->where Household is staying
HouseType==Staying_with_someone_for_free	prevalence-->where Household is staying
HouseType==Unfinished_building	prevalence-->where Household is staying
IDP_YN==Y	prevalence-->household is IDP
LessExpensiveFood	# of days household using this coping strategy per week
LimitPortionSize	# of days household using this coping strategy per week
Meat	# of days household eating this food item per week
Pulses	# of days household eating this food item per week
rCSI	reduced coping strategy
ReduceNumMeals	# of days household using this coping strategy per week
RestrictConsumption	# of days household using this coping strategy per week
Veg	# of days household eating this food item per week
FoodAssistance_YN==Y	prevalence-->household received food assistance in past month

Appendix 3b. Sample of a mVAM Questionnaire

Introduction:

Hello, my name is [name enumerator/operator]. I am calling on behalf of the United Nations World Food Programme. WFP is conducting nationwide phone surveys in Yemen to learn about its population's food security. If you agree to participate in this survey, we will ask you some questions about the household's food consumption and coping. Your participation in this survey is voluntary. Each survey will take maximum 10-15 minutes of your time. All your answers will remain confidential.

OPERATOR: What is your year of birth? _____. If respondent's age is less than 18, end survey

OPERATOR: What is the sex of the head of households? _____

Section 1: Geographic and Demographic info

Question 1: OPERATOR In which Governorate has your Household been living for the past 3 months? [List of Governorates] (drop-down list)

Question 2: OPERATOR In which District has your Household been living for the past 3 months? [List of District] (drop-down list)

Question 3: OPERATOR How many members living in the household for the past 3 months? (report the number)

Section 2: Food Assistance

Question 4: OPERATOR: When did you receive food assistance last time?

- Never received food assistance
- Less than a month ago
- Between 1 and 3 months ago
- More than 3 months ago

Question 5: OPERATOR: If yes, in which form did you receive it? [Select One]

- in-kind
- Cash
- Vouchers

Was this assistance from WFP? [Report Yes/No/I don't know]

Section 3: Food Consumption Score (FCS) Section

Question 6: OPERATOR How many members of your household were home in the last 7 days?

..... [Report the number of people]

Question 7: (Staples)

OPERATOR: In the past 7 days, how many days did your household eat **main staple starches**, including cereals, grains, tubers and/or roots (such as potatoes, rice, pasta, bread, wheat flour, or other grains/cereals)? [Report the number of days, from 0-7]

Question 8: (Pulses)

OPERATOR: In the past 7 days, how many days did your household eat **pulses, nuts, and/or seeds?** (Including beans, fava bean, peas, peanuts, lentils or others)?

..... [Report the number of days, from 0-7]

Question 9: (Vegetables)

OPERATOR: In the past 7 days, how many days did your household eat **vegetables and/or leaves** (including carrots, tomatoes, cucumbers, red peppers, pumpkin, kale, jarjir, onions, broccoli, spinach, lettuce or other vegetables)? [Report the number of days, from 0-7]

Question 10: (Fruits)

OPERATOR: In the past 7 days, how many days did your household eat **fruits** (including citrus fruits such as oranges and limes, apricots, apples, dates, tangerine and other fruits)? [Report the number of days, from 0-7]

Question 11: (Proteins)

OPERATOR: In the past 7 days, how many days did your household eat meat, eggs and/or fish or other seafood as a main dish, so not as a condiment? [Report the number of days, from 0-7]

Question 12: (Dairy)

OPERATOR: In the past 7 days, how many days did your household consume a substantial amount of **milk (powdered or fresh) or other dairy products (including yogurt/Kefir, cheese, curd, condensed milk, sour cream or others)? (Excluding butter)** [Report the number of days, from 0-7]

Question 13: (Fats)

OPERATOR: In the past 7 days, how many days did your household eat **oil, fat or butter?** (Including vegetable oil, palm oil, margarine, other fats / oil) [Report the number of days, from 0-7]

Question 14: (Sugar)

OPERATOR: In the past 7 days, how many days did your household consumed **sugar or sweets?** (Sugar, honey, jam, cakes, candy, cookies, sugary drinks, other) [Report the number of days, from 0-7]

Question 15: OPERATOR: What was the main source of food in the household in the past 7 days? [Report only one]

1. Produced by the household
2. Hunting/gathering/fishing
3. Bought using cash
4. Bought on credit
5. Borrowed/gifts (friends/relatives)
6. Begging
7. Swap
8. Food assistance

9. Received as payment

Section 4: reduced Coping Strategy Index

Question 16: OPERATOR: In the past 7 days, how many days did your household rely on less preferred and/or less expensive food due to lack of food or money to buy food?

..... [Report the number of days, from 0-7]

Question 17: OPERATOR: In the past 7 days, how many days did your household borrow food, or rely on help from a friend or relative due to lack of food or money to buy food?

..... [Report the number of days, from 0-7]

Question 18: OPERATOR: In the past 7 days, how many days did your household reduce the number of meals eaten in a day due to lack of food or money to buy food?

..... [Report the number of days, from 0-7]

Question 19: OPERATOR: In the past 7 days, how many days did your household limit portion sizes at mealtime due to lack of food or money to buy food?

..... [Report the number of days, from 0-7]

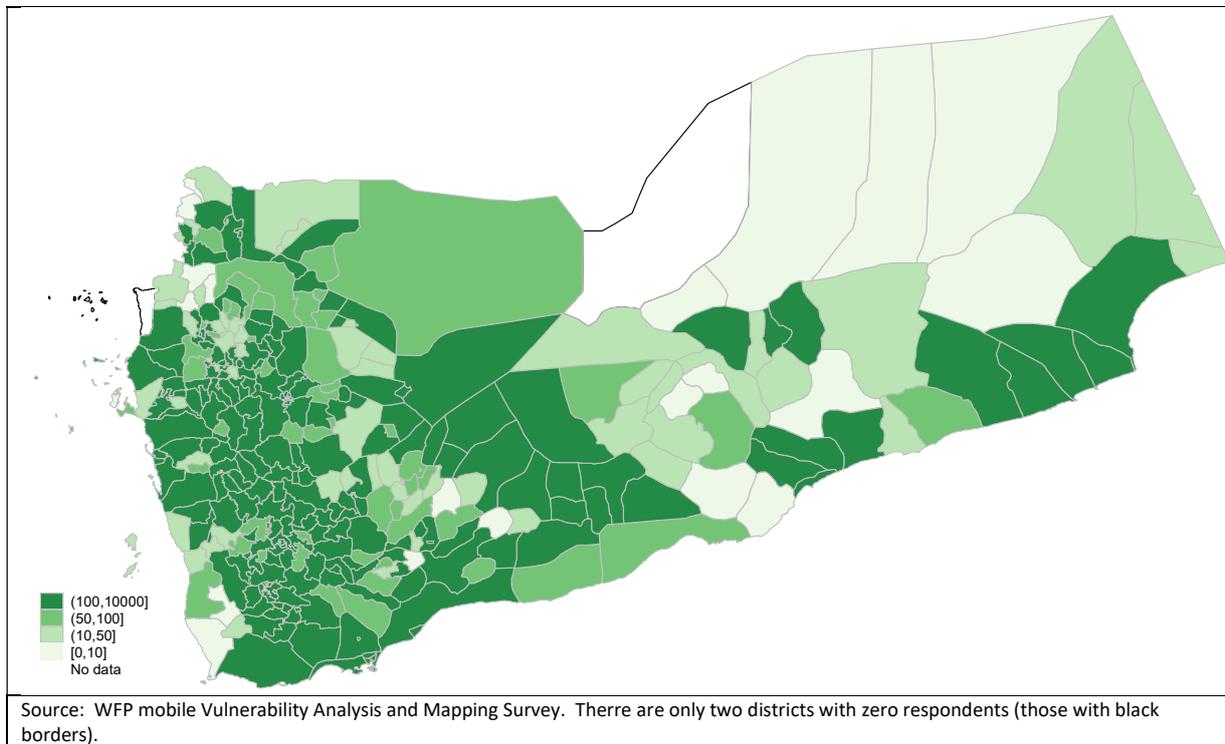
Question 20: OPERATOR: In the past 7 days, how many days did your household restrict consumption by adults so children could eat, due to lack of food or money to buy food?

..... [Report the number of days, from 0-7]

Question 21: OPERATOR: Have you ever had to borrow money to buy food or necessary commodities in the last 30 days (health, education)? [Report Yes/No/Refuse to answer]

Question 22: OPERATOR: How many active/functional mobile phones (working SIMs) does your household use? [Report Number]

Appendix 4. Number of Respondents to WFP Survey by District, August 2015-July 2018



Appendix 5. Comparison of Mobile Phone Ownership in November 2017 WFP Survey to 2014 Household Budget Survey

Region	2014 Household Budget Survey			November 2017 WFP Survey			CI Overlap
	Lower Bound- 95% CI	Upper Bound- 95% CI	Mean	Lower Bound- 95% CI	Upper Bound- 95% CI	Mean	
National	2.17	2.72	2.45	2.08	2.44	2.26	Y
Abyan	1.43	2.02	1.72	2.03	2.73	2.38	N
Aden	2.58	3.03	2.81	2.14	2.91	2.52	Y
Al_Bayda	2.40	2.95	2.67	1.70	2.22	1.96	N
Al_Hudayda	1.73	2.15	1.94	1.60	2.10	1.85	Y
Al_Jawf	2.00	3.13	2.56	2.21	3.00	2.60	Y
Al_Mahrah	2.44	3.72	3.08	2.38	3.98	3.18	Y
Al_Mahweet	1.66	2.38	2.02	1.67	2.38	2.02	Y
Amran	1.86	2.43	2.15	1.77	2.45	2.11	Y
Dhale	1.83	2.67	2.25	1.99	2.48	2.23	Y
Dhamar	1.76	2.51	2.14	1.68	2.14	1.91	Y
Hadramout	2.98	3.85	3.41	2.38	3.16	2.77	Y
Hajja	1.65	2.18	1.91	1.58	2.05	1.81	Y
Ibb	1.91	2.48	2.20	1.99	2.53	2.26	Y
Lahij	1.56	2.03	1.80	1.72	2.15	1.94	Y
Mareb	2.78	3.60	3.19	2.27	3.30	2.79	Y
Raymah	1.74	3.04	2.39	1.53	1.95	1.74	Y
Saada	0.96	2.47	1.72	2.23	2.90	2.57	Y
Sanaa	1.86	3.23	2.54	1.70	2.20	1.95	Y
Sanaa_City	3.33	3.89	3.61	2.45	3.26	2.86	N
Shabwah	2.82	3.69	3.25	2.34	3.10	2.72	Y
Taiz	2.32	2.78	2.55	1.85	2.24	2.04	N

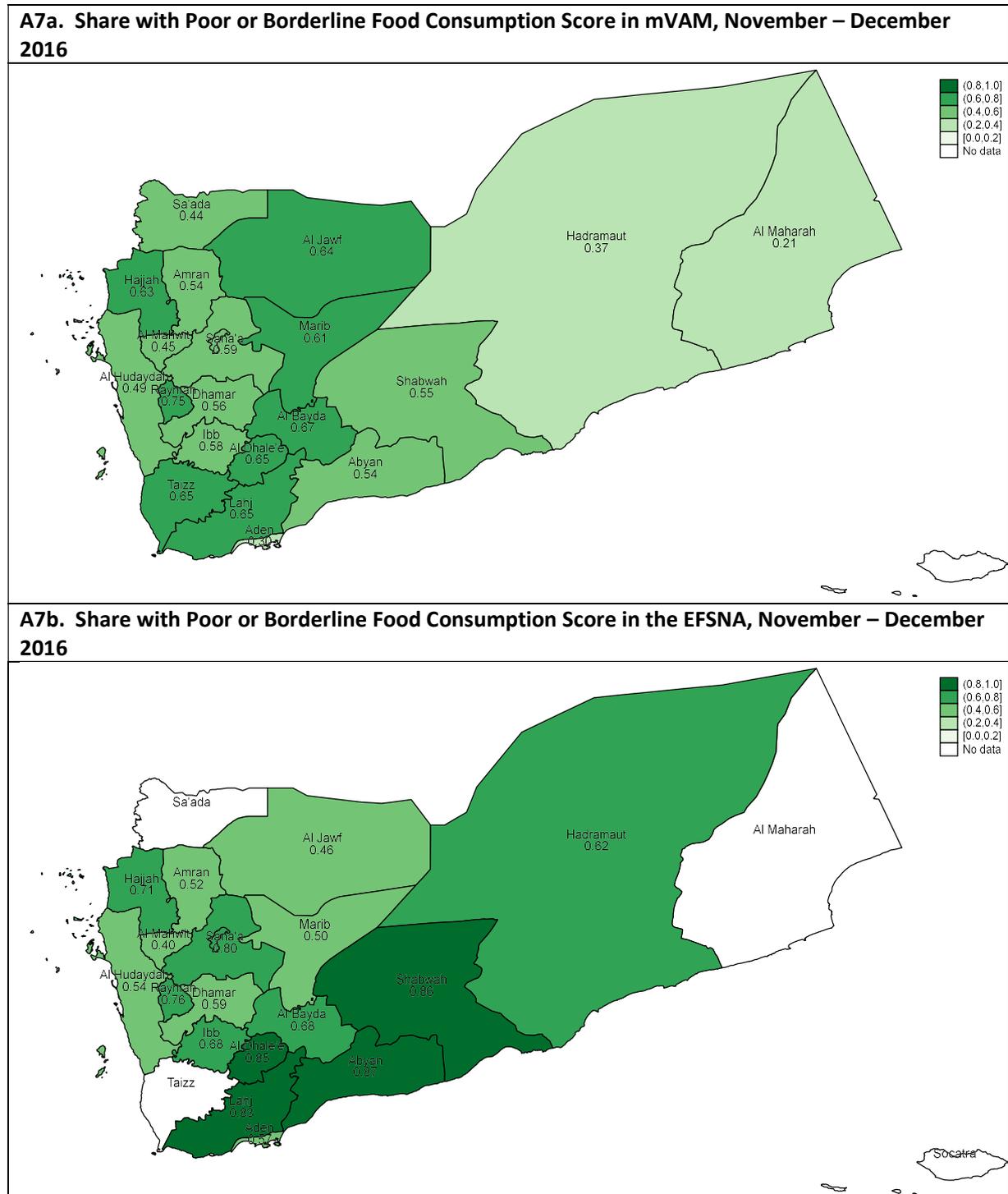
Notes: This table compares mobile phone ownership in the November 2017 WFP mobile phone survey and the 2014 Household Budget Survey (HBS), where the 2014 HBS summary statistics are restricted to the share of the population that resides in a household that owns at least one mobile phone. The 2014 HBS is the last known population estimates of these variables for Yemen.

Appendix 6. Comparison of the November 2017 WFP Survey to the 2014 Household Budget Survey

Variable	2014 Household Budget Survey			November 2017 WFP Survey		
	Lower Bound- 95% CI	Upper Bound- 95% CI	Mean	Lower Bound- 95% CI	Upper Bound- 95% CI	Mean
Own House	0.776	0.880	0.828	0.459	0.570	0.515
Rent House	0.070	0.165	0.118	0.224	0.373	0.299
HH Size	6.73	7.51	7.12	9.50	10.53	10.02
Share relying on Food Coping	0.040	0.123	0.082	0.851	0.901	0.876
Number of Days Eating Staples Last Week	6.99	7.00	7.00	5.92	6.11	6.01
Number of Days Eating Pulses Last Week	3.38	4.21	3.80	2.74	3.32	3.03
Number of Days Eating Vegetables Last Week	3.91	5.03	4.47	2.11	2.67	2.39
Number of Days Eating Fruits Last Week	1.20	1.71	1.45	0.74	1.08	0.91
Number of Days Eating Proteins Last Week	4.24	5.24	4.74	1.26	1.99	1.63
Number of Days Eating Dairy Last Week	4.00	5.04	4.52	1.99	2.53	2.26
Number of Days Eating Fats Last Week	6.76	6.97	6.87	5.05	5.46	5.25
Number of Days Eating Sugars Last Week	6.64	7.00	6.82	5.25	5.69	5.47
Share Living with Improved Water	0.347	0.561	0.454	0.177	0.332	0.254
Share with Access to Electricity Network	0.674	0.877	0.776	0.000	0.010	0.005
Share Relying on Solar Energy	0.000	0.044	0.022	0.444	0.657	0.550
Share Relying on Generator Energy	0.005	0.050	0.027	0.120	0.349	0.235

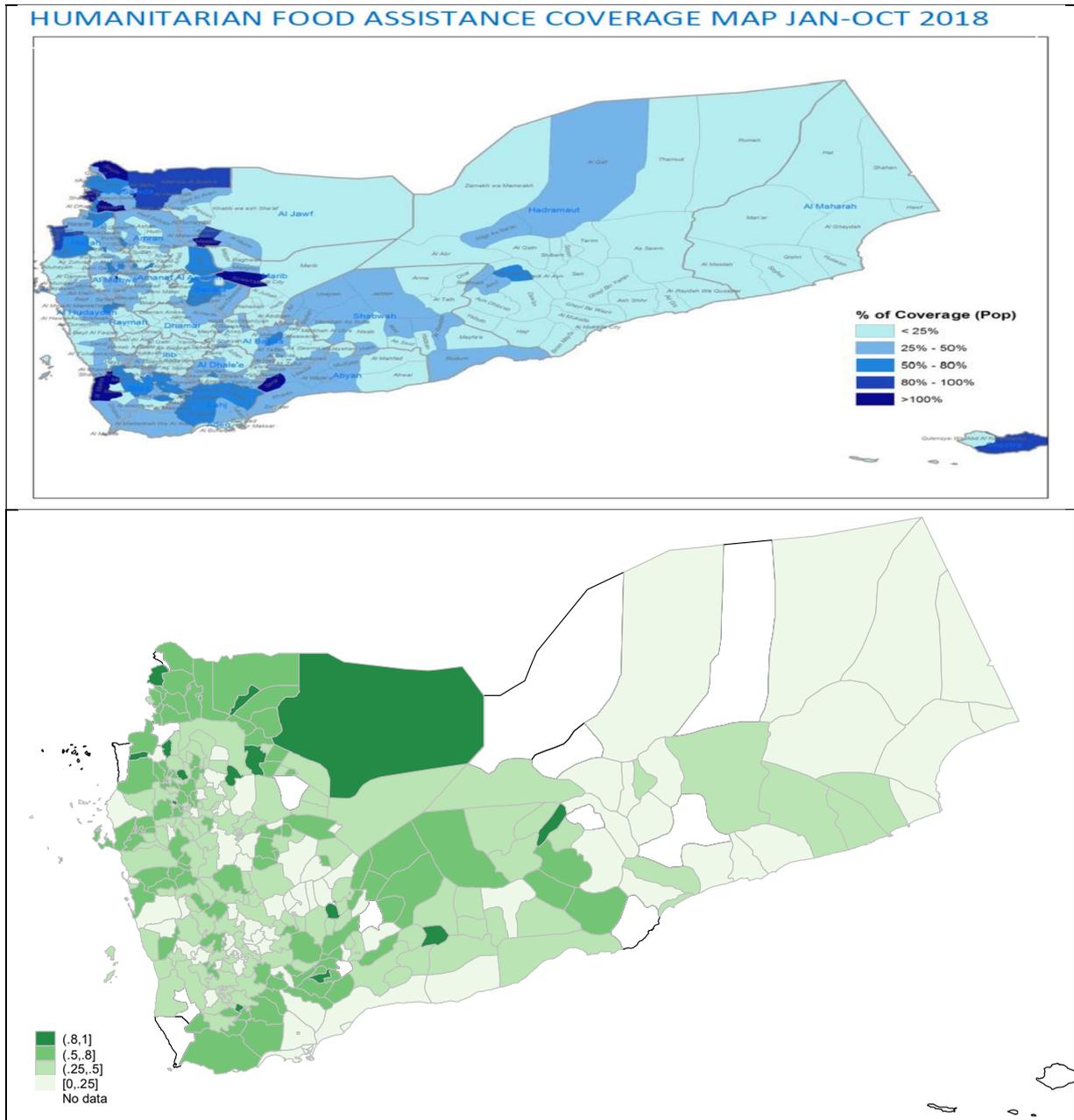
Notes: This table compares variables common to both the November 2017 WFP mobile phone survey and the 2014 Household Budget Survey (HBS), where the 2014 HBS summary statistics are restricted to the share of the population that resides in a household that owns at least one mobile phone. The 2014 HBS is the last known population estimates of these variables for Yemen. Consistent with reports of humanitarian and news agencies on the ground in Yemen, the WFP estimates report significantly worse welfare statistics and access to basic services relative to the 2014 HBS before the conflict.

Appendix 7. Comparison of Food Access between the mVAM and the Emergency Food Security and Nutrition Assessment



Notes: The first panel is the average share based on the authors' calculations using the WFP mobile Vulnerability and Analysis Mapping Survey between November and December, 2016; the second panel uses figures taken from the appendix of the 2016 Yemen Emergency Food Security and Nutrition Assessment.

Appendix 8. Comparison of 2018 IPC Food Assistance to Post-Announcement WFP Mobile Phone Survey



Source: Integrated Food Security Phase Classification 2018 Update, Yemen (IPC 2018); Authors' calculations, WFP mobile Vulnerability Analysis and Mapping Survey July 2017-July 2018.

Appendix 9. Change in Reduced Coping Strategy Index Following the 2017 IPC Announcement

VARIABLES	(1) ln (rCSI)	(2) ln (rCSI)	(3) ln (rCSI)	(4) ln (rCSI)	(5) ln (rCSI)
Post Announcement Indicator	-0.014 [0.019]	-0.009 [0.021]	-	0.014 [0.030]	0.014 [0.030]
Quarter Indicators					
Q2 2017 Indicator	-		0.057*** [0.020]	-	-
Q3 2017 Indicator	-		-0.003 [0.015]	-	-
Q4 2017 Indicator	-		-0.012 [0.021]	-	-
Q1 2018 Indicator	-		-0.012 [0.033]	-	-
Q2 2018 Indicator	-		-0.071** [0.030]	-	-
Q3 2018 Indicator	-		-0.078* [0.038]	-	-
Interactions Between IPC Status and the Post Announcement Indicator					
Post Announcement Indicator * IPC 4 Indicator	-		-	-0.056 [0.033]	-
Interactions Between the Post Announcement Indicator and Individual Governorates in IPC 4 Regions					
Post Announcement Indicator * Abyan Indicator	-		-	-	-0.033 [0.030]
Post Announcement Indicator * Al Hudaydah Indicator	-		-	-	-0.044 [0.030]
Post Announcement Indicator * Hajjah Indicator	-		-	-	-0.039 [0.030]
Post Announcement Indicator * Lahj Indicator	-		-	-	-0.048 [0.030]
Post Announcement Indicator * Sa'ada Indicator	-		-	-	0.008 [0.029]
Post Announcement Indicator * Shabwah Indicator	-		-	-	-0.129*** [0.030]
Post Announcement Indicator * Taizz Indicator	-		-	-	-0.089*** [0.030]
Observations	357	357	357	357	357
Controls and Governorate Fixed Effects	N	Y	Y	Y	Y

Note: This table estimates how the average Reduced Coping Strategy Index changed following the announcement of the 2017 IPC in March 2017. Column (1) estimates a sparse specification regressing the average share of respondents in each governorate on an indicator equaling one if the survey was conducted after March 2017; column (2) adds governorate fixed effects and control variables; column (3) estimates an identical specification but replaces the post indicator with indicators equaling one if the survey happened during that quarter-year time period; column (4) interacts the post indicator with an indicator for the most severe IPC classification in the 2017 IPC announcement (IPC 4); and column (5) further interacts the post indicator with governorate indicators for each governorate that was classified as IPC 4 2017 IPC announcement. Control variables include the number of people killed in the month before the survey, and four lags of the same variable. Standard errors are clustered by governorate and reported in parentheses. * denotes significance at the 1 percent level; ** denotes significance at the 5 percent level; and *** denotes significance at the 1 percent level.