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How Does Violence Force Displacement during Active Conflict?

Evidence from the Republic of Yemen

Anna D'Souza
Eliana Favari
Siddharth Krishnaswamy
Sharad Tandon

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Abstract

The ways in which violence forces displacement are not well understood given difficulties in collecting data during conflict. This paper investigates this issue during the Republic of Yemen's conflict, which has led to a large forced displacement crisis. First, it demonstrates that violence significantly escalated leading up to and following displacement in the districts from which displaced households fled, and this escalation exceeded that of households that did not become displaced and that of regions to which displaced households moved. Second, the paper demonstrates that the escalation of violence around the time of displacement varied by type of violence. Violence from ground battles escalated leading up to and following displacement- the type of violence with the largest number of fatalities per violent incident and that is most associated with the capture of territory; but other prevalent types of violence either peaked prior to displacement or did not appear to be strongly associated with displacement. And third, it demonstrates that there was a significant amount of heterogeneity in the violence experienced by households before displacement. A significant share of displaced households fled during times of no violence, but violence escalated in the regions from which these households fled following displacement. The paper argues that the last result is likely explained, in part, by these households being more averse to potential violence than other Yemeni households were. Combined, these results corroborate that violence is pivotal to forced displacement, but further illustrate the complexities of deciding whether and when to become displaced.

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How Does Violence Force Displacement during Active Conflict? Evidence from the Republic of Yemen*

By Anna D'Souza†, Eliana Favari‡, Siddharth Krishnaswamy§, and Sharad Tandon**

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†Baruch College, City University of New York, 55 Lexington Ave, New York NY 10010, USA, anna.dsouza@baruch.cuny.edu.

‡World Food Programme, Regional Bureau- Middle East, North Africa, and Eastern Europe, 72 El-Nahda, Maadi as Sarayat Al Gharbeyah, Maadi, Cairo, Egypt, eliana.favari@wrp.org.

§World Food Programme, Regional Bureau- Middle East, North Africa, and Eastern Europe, 72 El-Nahda, Maadi as Sarayat Al Gharbeyah, Maadi, Cairo, Egypt, siddharth.krishnaswamy@wfp.org.

**The World Bank, 1818 H St. NW, Washington, D.C. 20420, USA, standon3@worldbank.org.

Section1. Introduction

There is a growing amount of work investigating the causes of forced displacement. In addition to the onset of conflict being associated with many forced displacement crises (e.g., UNHCR 2016), there is a large amount of empirical evidence demonstrating that displacement is strongly associated with households living in close proximity to violence (e.g., Stanley 1987; Engel and Ibanez 2007; Williams 2008; Lozano-Garcia et al. 2010; Bohra-Mishra and Massey 2011; Adhikari 2013; etc.). However, displacement decisions are complex, and both the decisions of whether and when to become displaced are affected by the type, frequency, and timing of violence. Better investigating potential causes and possible heterogeneity can help to better contextualize the escalating forced displacement crisis across the world (e.g., World Bank 2017a).

This paper investigates the relationship between violence and forced displacement during the Republic of Yemen's current conflict. Importantly, this is a setting where the onset of conflict led to an immediate and widespread forced displacement crisis, where displacement might have been forced by either violence or the humanitarian situation caused by the conflict (e.g., TFPM 2016; OCHA 2018; etc.). Additionally, one of the reasons there has been limited investigation into the events forcing displacement is the difficulty in collecting information from displaced households before, during, and immediately following displacement. However, the World Food Programme (WFP) has been implementing a monthly monitoring survey in the Republic of Yemen that includes both cross-sectional and panel components, and the survey reached a large number of households before they later became displaced. The survey is able to track the food security and displacement status of these households in the months leading up to and following displacement, which allows us to identify the violence occurring in the district from which households were forcibly displaced (origin district) at the time of displacement.[1,2]

[1]Although the survey misses households without access to mobile phones, the relatively high penetration of mobile phones allows an analysis that is representative of the majority of the population. Furthermore, the survey reaches a large number of displaced households, where the share of displaced households in each round varied between 20 and 40 percent. See the data section for a description of mobile phone penetration in the Republic of Yemen.

[2]Even for households that were only interviewed once, a displacement module asks whether the household was displaced, and if so, the month, year, and governorate of displacement. However, only for households interviewed before and after displacement are we able to observe the actual district of

We demonstrate a number of important patterns using the WFP survey. First, we demonstrate that households that became displaced tended to leave districts where violence was high and escalating before and after displacement. In our baseline specification, monthly fatalities in origin districts increased following displacement by 1.43, which represents approximately 36 percent of the average monthly fatalities in regions where non-displaced households lived in the months prior to their most recent survey.[3] Importantly, displaced households tended to flee to districts where violence did not escalate as rapidly as in origin districts, illustrating that that displacement decisions were strongly affected by violence.

Second, the average patterns mask significant heterogeneity in the ways that different types of violence might have forced displacement. Only for ground battles do we observe an increase in the numbers of fatalities and violent incidents leading up to and following displacement. For terrorism and violence against civilians, violence tends to peak in the months before displacement; and violence from airstrikes does not appear to be strongly associated with displacement. This heterogeneity likely reflects the ways each type of violence affects the local security situation, with ground battles being more persistent, deadly, predictable, and more often associated with capture of territory than other forms of violence in the country (e.g., Al Jazeera 2019; OCHA 2019; etc.). Thus, pooling all violence together likely obscures the timing in which sudden surges of specific types of violence are strongly associated with displacement.

And lastly, we find significant heterogeneity in the amount of violence in origin districts of displaced households both before and after they fled. Approximately one-third of displaced households fled regions with no violent incidents occurring in the month of displacement or the prior six months, and nearly half of households fled with no fatalities during that time period. Furthermore, violence increased in origin districts following displacement of these households, but the average level of post-displacement violence in

displacement.

[3]The largest share of non-displaced households only responded to a single survey. And for the households that responded to more than one survey, the responses tend to be from time periods that are very close to each other rather than spread out over the course of the conflict, and the choice of the exact survey is not important to the results. Importantly, the results are qualitatively identical when using the first survey to which households that never became displaced in the WFP survey responded.

these districts was still lower than other regions in the country given the low base of violence.

Although there are a number of potential explanations for households fleeing before violence begins, such as households fleeing the humanitarian situation caused by violence as opposed to violence itself, it is difficult to distinguish between all the potential explanations because one typically does not have welfare information collected from households *before* they become displaced. However, given the unique data used here, we are able to demonstrate that there was very little difference in pre-displacement food access between households that fled significant violence and those that fled only future violence[4], which suggests that many of these potential explanations are unlikely to fully explain this pattern.[5] However, one possibility that we are unable to rule out is that some households were more averse to a potentially poor security situation than households that became displaced long after violence escalated.

Our results contribute to the literature describing the causes of forced displacement. First, we demonstrate that there is a great deal of variation in when and how violence forces displacement, which is consistent with qualitative and more descriptive evidence on the complexity of displacement decisions (e.g., Verwimp and Maystadt 2015; World Bank 2017a; etc.). The two sources of this heterogeneity emphasized here- type of violence and aversion to a potentially poor security situation- have not, to our knowledge, been previously emphasized in other settings following the onset of a conflict.[6] In the Republic of Yemen, the sheer size of the population that fled little-to-no violence and the size of the population that continued to live in their homes in the midst of tremendous violence further illustrate how the heterogeneity emphasized here and potentially other factors are likely important to deciding whether and when to become displaced.

[4]The differences were low in magnitude and the estimates were precise enough to rule out economicially meaningful differences between the households

[5]In light of these food access patterns, there are other potential explanations that are unlikely to fully explain a large share of households fleeing before violence begins, such as only households of sufficient means can flee early or afford to flee uncertain increases in violence.

[6]There are numerous examples of large displacement crises occurring just before groups take control of territory. Both the recent Taliban capture of Afghanistan in 2021 and the large displacement crisis at the beginning of the Republic of Yemen's conflict before violence escalated even further are examples (e.g., TFPM 2016; Sayad et al. 2021; etc.)

Second, our results suggest that the complexities in the displacement decision are important factors to consider when trying to infer the potential size and needs of forcibly displaced populations. It is quite difficult to estimate the size of the displaced population in fragile and conflict settings (e.g., TFPM 2016; World Bank 2017b), and often times estimates might rely only on key informant interviews and other indirect methods. However, these results suggest that it might be difficult to infer the size and identity of the population indirectly by the level of violence in aggregate or by inferences made by individuals without having more information on the tolerance of the population to violence and the type of violence experienced. Additionally, the wide differences in pre-displacement experiences of forcibly displaced households suggest significant heterogeneity in services needed to support forcibly displaced populations. For example, it might be the case that psychological support is more critical for a subset of displaced households that actually experienced violence, as opposed to the potentially large share of households that became displaced before any violence occurred.

The rest of paper is organized as follows. Section 2 presents background information on the conflict and resulting displacement crisis in the Republic of Yemen; section 3 presents the data; section 4 estimates how living in close proximity to violence impacts the likelihood of becoming displaced; section 5 discusses potential heterogeneity in the ways violence forces displacement; and section 6 concludes.

Section 2. Background- Violence and Displacement in the Republic of Yemen

The Republic of Yemen is in the midst of a violent conflict and forced displacement crisis. The conflict escalated in March 2015, after Houthi forces from the north of the country captured the capital and large swaths of the country while trying to detain the internationally recognized president (e.g., BBC 2016). In response, a coalition of countries in the Middle East and North Africa region began targeting Houthi forces with air strikes and supporting ground forces that were resisting Houthi advances (e.g., World Bank 2017b). The conflict has been raging since then, with Houthi forces controlling much of the north of the country, and with the internationally recognized government

basing their government at different times in the south of the country and in the Kingdom of Saudi Arabia (e.g., OCHA 2019).

Importantly, there was a significant increase in violence between 2015 and 2018, our period of analysis (e.g., OCHA 2019). In the initial years of the conflict (2015 and 2016), the numbers of violent incidents and fatalities were approximately 2000 per quarter. However, by the end of 2018, fatalities had more than quadrupled to nearly 9000 per quarter (e.g., Tandon and Vishwanath 2020). Furthermore, the geographic concentration of the violence changed over time as the emphasis of fighting on the front lines changed (e.g., OCHA 2019; Almoayad 2020; etc.).

The manner in which violence increased and safety declined over this period varied across regions and over time. For example, in Taizz, the third largest city in the Republic of Yemen, the front lines of the war bisected the city and people were forced to live amid active fighting and snipers (e.g., Doucet 2020); in some instances, there were active ground battles surrounding military instillations on the outskirts of cities (e.g., Al Jazeera 2020); and in other cities, there were intermittent air strikes and terrorist attacks (e.g., Amnesty International 2019). Furthermore, some regions were captured by different parties to the conflict (e.g., Al Jazeera 2019), which interrupted or completely changed the governance of regions and worsened the displacement crisis.

Although a forced displacement crisis began immediately after the conflict escalated in March of 2015, there is little agreement on the size of the crisis. Official estimates suggest that initially approximately 10 percent of the population became displaced, with a constant flow of new displaced households and returnees that were roughly equal over time (e.g., TFPM 2016; OCHA 2019). However, other sources suggest that displaced households may represent upwards of 25 percent of the population (e.g., World Bank 2017b; WFP 2019; etc.). The difference between the estimates might be due to differences in survey methodologies, where the official estimates are based on key informant interviews at the sub-district level, and other methodologies are based on household surveys. In any case, all methodologies suggest that the initial surge in forced displacement was large, with continued flows of newly displaced households and households returning

to their origin regions (e.g., World Bank 2017b; D'Souza et al. 2022; etc.).

The escalation of the conflict in 2015 also led to a dramatic worsening in living standards and precipitated a humanitarian crisis, which might also have forced displacement. There was an immediate and widespread loss of livelihoods (e.g., EFSNA 2017; Tandon 2019; etc.); transportation costs and the prices of key goods and services escalated (e.g., World Bank 2018; ACAPS 2020); and there was a breakdown of access to basic services such as health care, sanitation, and electricity (OCHA 2018). However, the regions that experienced the most violence were not the regions suffering from the worst of the humanitarian crisis, likely due in part to specific instances of violence having had impacts far beyond the location where they occurred and other conflict-related factors having had a larger impact on the humanitarian situation (e.g., Tandon and Vishwanath 2020).

Given all of these challenges, estimates of poor food access, which are the most reliable welfare indicators that have been measured since the conflict began, increased precipitously. The 2015 Integrated Phase Classification (IPC) estimated a 21 percent increase in the share of the population classified as IPC 3 (Crisis) or worse relative to 2014— only three months after the conflict escalated; and the Emergency Food Security and Nutrition Assessment (EFSNA) in November 2016 estimated that 65 percent of Yemenis had poor or borderline food consumption in 2016, a 57 percentage point increase relative to 2014 (EFSNA 2017; World Bank 2017). Importantly, there was an affordability crisis where households were not able to afford either food or basic services available for purchase (e.g., World Bank 2018; ACAPS 2020; Favari et al. 2021). Given the desperate humanitarian situation immediately following the escalation of the conflict, there was and continues to be an unprecedented scale-up of humanitarian and development assistance, on which much of the population relies (e.g., OCHA 2021).

Furthermore, numerous shocks—many a direct result of conflict—continue to worsen the already severe crisis. Shocks include intermittent air and sea blockades, natural disasters, widespread disease outbreaks, and currency crises (OCHA 2017; OCHA 2019; OCHA 2021). Importantly, the severity of the emergency has varied along with variation in the frequency and types of shocks that have occurred over time. Shocks that have

caused rapid rises in food prices (e.g., currency crises, etc.), in particular, have played a key role in pushing the country to a near famine in 2018 and again beginning in 2020 (e.g., OCHA 2019; Favari et al. 2021; OCHA 2021).

Section 3. Data

Since the conflict escalated in March 2015, traditional data collection in the country has been significantly limited. In parts of the country, permission from authorities is needed for any data collection, survey teams are unable to perform longer and more detailed surveys that are needed for traditional welfare metrics and national accounts information, and there are widespread reports of interference in sampling and household responses to try to influence the outcome of data collection (e.g., OCHA 2021; Tandon and Vishwanath 2021; Favari et al. 2022). These hurdles, in addition to an already difficult security situation, make it impossible to rely on traditional data collection.

Given the substantial constraints and the need for high frequency data, we use the most complete household survey that captures displacement status- the mobile Vulnerability and Assessment Mapping Survey (mVAM) conducted by the WFP. The monthly survey began in August 2015, just months after the escalation of violence and the initial surge in forced displacement. Importantly, the data provide an opportunity to analyze household decisions during an active conflict.

The mVAM is a monthly survey of approximately 2400 households used to assess the food security situation in the Republic of Yemen. The survey is stratified by governorate/capital city, where potential respondents continue to be contacted until a sufficient number of completed responses have been met in each governorate based on its share of the total population (aside from the island of Soccatra).[7] The survey is a rolling panel, where the call center initially surveys 2400 households reached via random digit dialing (RDD). In each subsequent month, 80 percent of the sample is composed of households that answered a previous survey round, and 20 percent of the sample is composed of newly reached households via RDD.[8]

[7]The Republic of Yemen has 333 districts that fall within 20 governorates and one municipality (capital city).

[8]The WFP is unable to observe whether a phone number exists in the random digit dialing procedure,

In addition to a full food security module[9], the survey also included a full displacement module between August 2015 and December 2018. The module collected information regarding a household's district and whether the household was currently displaced. Furthermore, if the household was currently displaced, the module also inquired about the month and year of displacement, and the origin governorate. Because of the panel component of the survey, we are able to identify the origin and migration districts of 1,116 households that became displaced only after their first interview, and these are the households on which the analysis primarily focuses.[10] Importantly, previous work illustrates that there is little observable difference in food access following displacement of these 1,116 displaced households for whom we can observe more detailed displacement information and the 6,970 displaced households that were only first reached by the survey after they had become displaced (e.g., D'Souza et al. 2022).

We further merge the WFP survey with data on violence from the conflict. For the 1,116 displaced households for which we observe the origin and migration district, we merge the number of violent incidents and the number of fatalities occurring in both the origin and migration districts at and around the time of displacement; and for non-displaced households we merge the same violence outcomes in the district in which the household lives at the time of the most recent survey. Prior to 2016, we use conflict data from the Uppsala Data Program; and after 2016, we used data from the Armed Conflict Location and Event Data Project (ACLED). From these data sources, we use number of fatalities caused by violent incidents and the number of violent incidents as our main indicators of violence. However, for 2016 and on, we are also able to disaggregate each indicator by major types of violence- ground battles, remote violence (e.g., airstrikes),

and thus we are unable to identify the share of non-responses related to active phone numbers.

[9]The survey captures the number of times households in the week before the survey have consumed from important food groups, the number of times households have resorted to five common food coping strategies, and whether the household received food assistance in the past 30 days. These questions form the basis for computing the household Food Consumption Score (FCS) and reduced Food Coping Strategies Index (rCSI).

[10]For households that were surveyed only after displacement, we can identify the origin governorate but not the specific district. Governorates are very large and similar in size to a state in the United States, while districts are much smaller and more similar to a county in the United States.

and other types of violence.[11,12]

Over this time period, the entire survey includes 18,078 separate households that were interviewed at least once, with 45 percent ever displaced. In the baseline empirical specifications, we compare how violence is changing at and around the time of displacement for the 1,116 displaced households on which we focus in origin and migration districts to the violence occurring in the district of residence at and around the time of the latest survey of the 9,992 households that never became displaced in the WFP survey.[13]

Importantly, RDD mobile phone surveys have limitations. Specifically, they are only potentially representative of the mobile phone-using population and might suffer from sample selection biases based on who has access to mobile phones and which households choose to respond to the survey. However, all available evidence suggests that access to mobile phones (85 percent prior to the conflict) has remained high, and the survey is capturing changes in the population that are independently corroborated by other sources, including the timing and general evolution of the humanitarian and forced displacement crises (e.g., WFP 2019; Almoayad et al. 2020; Tandon and Vishwanath 2020; Tandon and Vishwanath 2021; D'Souza et al. 2022; etc.).

Figure 1 reports the number of violent incidents by types of violence- ground battles, remote violence (e.g., airstrikes), and all other violence (e.g., terrorism, violence against civilians, etc.). During the analysis period, 60 percent of all fatalities were from ground battles, with 38 percent from remote violence, and the remaining 2 percent were from other types of violence. However, despite there being significantly more fatalities from ground battles, the most common type of violence in the conflict was remote violence. Approximately two-thirds of violent incidents were instances of remote violence,

[11] We are only able to identify these groupings when using the ACLED data from 2016 and on. Although the Uppsala Data Program has some information on types of violence, they are not very compatible with the ACLED groupings. Furthermore, the vast majority of violence that occurred during our period of analysis occurs after 2015.

[12] Other types of violence are mostly violence attributable to terrorism or violence against civilians.

[13] As mentioned in the introduction, 34 percent of these non-displaced households were only interviewed once. And of the ones that were interviewed more than once, the largest share were interviewed only twice (15 percent of the total non-displaced sample), and all households that answered more than one survey tended to respond to surveys that were close in time and the choice of the exact survey is not important to the results. Importantly, all results are robust to using the first survey to which non-displaced households respond.

26 percent were instances of ground battles, and the remaining 8 percent were instances of other types of violence. Thus, ground battles have significantly larger fatalities per violent incident than other forms of violence in the conflict.

Figures 2 and 3 report a number of summary statistics for displaced and non-displaced households. Figure 2a reports the average number of fatalities in the origin district in the months leading up to and following displacement on average; and Figure 2b reports the number of fatalities in the district of residence for non-displaced households around the months of their latest survey. Figure 3 reports the same summary statistics for the number of violent incidents.

A number of important patterns emerge from these summary statistics. First, there was a large amount of violence across the country, both in the origin districts that displaced households fled and in districts of residence of non-displaced households. On average, during the analysis period, between four and eight people were killed each month; and there were between two and four violent incidents each month.

Second, violence was increasing leading up to and following displacement for displaced households, and the increase was especially pronounced for the number of fatalities. Six months before displacement, the average number of people killed was 3.6; however, this figure more than doubled, to 8.6, one year following displacement.

And lastly, consistent with the significant increase in violence over the entire time period under analysis, violence was increasing for non-displaced households leading up to and following their most recently completed survey. However, this increase was significantly less than the increase leading up to and following displacement. There were four fatalities on average per month six months before the most recent survey, and there were 6.3 fatalities per month one year after the most recent survey, on average. Alternatively, there was essentially no change in the number of violent incidents.

Section 4. The Change in Violence Leading up to and Following Displacement

We formally estimate how violence changed following displacement in origin districts, comparing this change to that occurring in the district of residence for non-displaced

households following their most recent survey. The comparison to non-displaced households is important in the current context because, as discussed above, violence was increasing over this entire time period. We estimate variants of the following baseline specification:

$$(1) \quad Violence_{irt} = \sigma_i + \rho_t + \beta Post_{irt} + +\delta Displaced_{irt} + \gamma Displaced_{irt} * Post_{irt} + \epsilon_{irt}$$

where $Violence_{irt}$ denotes the number of fatalities or the number of violent incidents in district r (origin district for displaced households and district of residence for non-displaced) of household i during month t; $Post_{irt}$ denotes an indicator equaling one if the observation was following the displacement of household i; $Displaced_{irt}$ denotes an indicator equaling one if the observation was for a displaced household and zero if the household was never displaced; σ_i denotes household fixed effects to capture region- and household-specific heterogeneity; and ρ_t denotes time (month-year) effects to distinguish the change in violence from changes that were occurring across the entire country over time. Standard errors are clustered at the district level.

The sample includes the 1,116 displaced households for which we can identify their district of origin and 9,992 households that were never displaced during the analysis period. For each displaced household, the sample is restricted to violence observations from the six months leading up to displacement, the month of displacement, and the 12 months following displacement; and for each non-displaced household, the sample is restricted to the same number of months leading up to and following their most recent survey.[14]

The coefficient of interest is γ, which represents how much more the monthly violence outcome increased on average for displaced households in the month of and 12 months following displacement relative to the increase in the month of and 12 months following the most recent survey of non-displaced households. Estimates of the baseline specification

[14]Many displaced and non-displaced households were constantly dropping out of the survey, and the latest survey of non-displaced households are spaced across the entire time period of the analysis (2015-2018).

are presented in Table 1. Column (1) estimates a sparse specification; column (2) adds household fixed effects; and column (3) adds both household and month-year effects.

Violence clearly escalated more following displacement in origin districts than for non-displaced households following their most recent survey. Column (1) demonstrates there was an average increase of 1.58 more monthly fatalities in origin districts after displaced households fled than following the most recent survey of non-displaced households in their districts of residence. The overall increase for displaced households is large, and represents 40 percent of the monthly fatalities prior to the most recent survey of non-displaced households in their district of residence. Furthermore, the increase is more than double the increase in the district of residence of non-displaced households following their most recent survey (1.37 monthly fatalities).

Importantly, this difference persists when accounting for regional, household, and time-specific factors. In the most complete specification estimated in column (3), the relative increase in fatalities following displacement remained nearly constant at 1.44 more monthly fatalities. However, the increase in fatalities in the district of residence for non-displaced households reduces in magnitude and becomes indistinguishable from zero when these additional factors are included.

Furthermore, we examine how violence was changing in the districts to which households fled (migration districts). Columns (4)-(6) of Table 1 re-estimate the baseline specification but use the district of migration for households that became displaced outside of their origin district.[15] We find that displaced households tended to flee to districts where violence was increasing similarly to the rest of the country (in contrast to escalation in their origin districts), further illustrating that violence was important to displacement decisions. In all specifications, the sign of the estimate for migration districts is the opposite of origin districts, the magnitude is significantly smaller, and the estimates are all statistically indistinguishable from zero. Importantly, given the sign and precision of the estimate, we can rule out relative increases of greater than 0.89 monthly fatalities in the most complete specification (column 6).

[15]Not all displaced households became displaced out of their origin district. Approximately 29 percent of displaced households became displaced outside of their origin districts.

Combined, Table 1 demonstrates that violence significantly affects displacement decisions. But despite the stronger increase in fatalities following displacement in origin districts, there are a number of ways in which the violence in origin districts of displaced households is similar to violence in the districts of residence of non-displaced households. First, Table 2 re-estimates the baseline specifications presented in Table 1, but uses the number of violent incidents as the dependent variable. The results demonstrate that there is little evidence for a similar pattern in the number of violent incidents. In the most complete specification in column (3), the increase in violent incidents in origin districts is indistinguishable from the increase for non-displaced households. Furthermore, we can rule out a relative increase in the number of violent incidents in origin districts of displaced households of larger than 0.44 monthly violent incidents.

Second, apart from the increase in violence over time, the average level of pre-displacement violence in origin districts for displaced households is very similar to the average violence in the months before the most recent survey of non-displaced households. This is true of both fatalities and the number of violent incidents. Specifically, the coefficients on the displacement indicator in column (1) of Tables 1 and 2 are small in magnitude, vary in signs between specifications, and are indistinguishable from zero.[16] The same is true of migration districts in column (4) of Tables 1 and 2, as well.

Combined, these results demonstrate that living in close proximity to violence is a factor in displacement. But the results also raise questions about why the change in violence in origin districts of displaced households relative to the change in the district of residence of non-displaced households was not stronger in magnitude and more robust across measures of violence, particularly given the significant share of respondents reporting that violence was the primary reason for their displacement (e.g., TFPM 2016; OCHA 2018).

Section 5. Heterogeneity in How Violence Forces Displacement

In this section, we empirically explore two potential sources of heterogeneity in how

[16]The displacement indicator is absorbed by the household fixed effects in the other specifications estimated in the table.

violence forces displacement – how displacement might be especially sensitive to particular types of violence and how the decision to become displaced depends on a household's tolerance for violence. These sources of heterogeneity can potentially explain why the average escalation of all violence leading up to and immediately following displacement is not as large or as robust across measures of violence in Tables 1 and 2 as might be expected.

Yemeni households have been subjected to a number of different kinds of violence, each of which might force displacement in different ways. As mentioned above, it might be possible that displacement decisions are more driven by particular types of violence, and estimating the changes separately by the type of violence might make the relationship between violence and displacement clearer. Furthermore, by triangulating between the types of violence that are escalating most rapidly, we might be able to better understand the mechanisms by which people are being driven from their homes.

Table 3 re-estimates the baseline specifications, analyzing the post-displacement change in fatalities and violent incidents in origin districts, but disaggregates the measures into ground battles, remote violence, and other violence. Columns (1)-(3) use fatalities from each type of violence as the dependent variable; and columns (4)-(6) use the number of violent incidents as the dependent variable.

The results demonstrate significantly different changes based on the type of violence, with ground battles emerging as the pivotal driver of the results presented in Table 1. The relative increase in violence from ground battles is more robust across measures of violence, with there being a relative increase in both the numbers of fatalities and violent incidents. Despite restricting the type of violence to only a subset of the overall violence that occurred, the magnitude of the increases in ground battles in Table 3 are similar to those in Tables 1 and 2. Furthermore, the relative increase in violence from ground battles in origin districts was more precisely estimated in columns (1) and (4) of Table 3 than in the baseline specifications.

Alternatively, the other forms of violence did not increase relative to non-displaced households. The relative change in remote violence following displacement was small in

magnitude, imprecisely estimated, and statistically indistinguishable from zero (columns 2 and 5); and there is evidence that other types of violence actually *decreased* relative to non-displaced households following displacement.

To further investigate these patterns, we estimate how violence changed each month leading up to and following displacement between 6 months before displacement to 12 months after. Specifically, we estimate specifications that break up the *post* indicator in the baseline specification into month indicators for each month included in the sample (e.g., an indicator for the violence observation being from 5 months before displacement, etc.). We interact each of these month indicators with the displacement indicator to estimate by how much more violence changed for displaced households relative to non-displaced households. All coefficient estimates are changes relative to six months prior to displacement (the omitted category).

The estimates of how much violence changed each month are presented in Figure 4. Panel A reports estimates using fatalities from all forms of violence as the dependent variable, and panels B - D report estimates using fatalities from ground battles, remote violence, and other forms of violence respectively.

Panel A demonstrates that the change following displacement estimated in Tables 1 and 2 reflects increasing levels of fatalities throughout the time period. The magnitude of the estimates begins increasing five months before displacement, but the relative differences in violence are not precisely estimated and are statistically indistinguishable from zero at conventional significance levels. Only in the months after displacement are the monthly differences from six months before displacement statistically different from zero.

Similar to Table 3, panel B demonstrates that the baseline patterns using all violence are being driven by violence from ground battles. The increasing levels of violence are qualitatively identical to those estimated using all violence and are more precisely estimated. Additionally, fatalities from ground battles were unambiguously increasing prior to displacement, on average, with many of the pre-displacement differences being statistically different from zero.

In contrast, there is little evidence of an escalation either before or after displacement

due to remote violence. Fatalities are slightly higher immediately before and after displacement, but these changes relative to six months before displacement are not precisely estimated. Furthermore, the magnitudes are smaller than those reported for ground battles.

For other forms of violence, we find that fatalities were highest prior to displacement, and for many months after displacement, there was actually a declining trend in other forms of violence. This pre-displacement peak explains why the post-displacement change estimated in Table 3 is actually negative.

Combined, these estimates demonstrate that there is a great deal of heterogeneity in whether and how certain types of violence cause displacement, and this is one of the reasons that the baseline estimates in Tables 1 and 2 were not larger. Ground battles are particularly important to the decision to become displaced and differ from other forms of violence in important ways- ground battles are often associated with the capture of territory and a change in governance, likely indicate a longer period of violence as many of the front lines have remained relatively stable over much of the conflict, and are more deadly than other types of violence in the country (e.g., OCHA 2019a).[17] Each of these factors could be particularly important to the decision of whether and when to become displaced.

But in addition to investigating heterogeneity in the types of violence that tend to force displacement, we also investigate heterogeneity in the amount of violence experienced before households become displaced.[18] Figure 5 reports the share of displaced households by the amount of total violence in the six months leading up to and during the month of displacement. Strikingly, 47 percent of the sample became displaced with zero fatalities

[17]The importance of ground battles to displacement has been corroborated by news sources over the conflict as well. For example, when Houthi forces captured Al Jawf in 2019, the increase in fatalities from ground battles and the capture of territory led to a significant increase in displacement (e.g., BBC 2020).

[18]We focus on households that flee districts with no violence in the months before displacement. However, we could similarly focus on households that chose not to become displaced in very violent districts. However, given the relatively large size of districts and data limitations, we are unable to infer how close households actually are to the violence that occurs in their district. Alternatively, we focus on households that become displaced with zero violent incidents precisely because, short of measurement error, can infer that there was no violence in close proximity.

in the that period, and 36 percent became displaced with zero violent incidents.[19] Along with the high violence experienced in large portions of the country, the significant share of households that became displaced prior to any violence occurring is one of the reasons that the average violence experienced by households before displacement was not significantly different than the violence experienced by non-displaced households before their latest survey in Tables 1 and 2.

However, even for households fleeing districts that were non-violent prior to displacement, the expectation of future violence might have still forced displacement. Figure 6 presents the average pre- and post- displacement violence for these households that fled districts with no violent incidents in the month of or six months prior to displacement and those that fled districts with one or more violent incidents. The figures demonstrate that although some households fled non-violent districts, the violence in those districts significantly escalated in the months after they became displaced. The increase was larger than the increase following the latest survey of non-displaced households; and for the number of violent incidents, the increase was larger than even for households being displaced from more violent districts.

There are a number of potential explanations for these patterns. First, it could be the case that the humanitarian situation, that was caused by the conflict, could have been driving a significant portion of displacement. Or second, it could have been the case that only households of sufficient means were able to either better predict violence or afford to become displaced prior to any violence actually occurring. But in either of these cases, there would be a significant difference in the financial well-being of households that became displaced prior to violence occurring and those becoming displaced only after significant violence occurred.

We empirically investigate this possibility, where we estimate the difference in all average food security outcomes collected in the most recent pre-displacement surveys for households that fled districts with no violence and for households that fled districts with violence. Food access measures- particularly diet diversity- are strongly correlated

[19]The timing of these displacements during periods of little violence occur proportionately across all years of the sample.

with monetary poverty and other indicators of well-being (e.g., Headey and Ecker 2013; Lain et al. 2022), and have been shown to be particularly sensitive to the many conflict-related shocks that have occurred in the Republic of Yemen's conflict (e.g., Tandon and Vishwanath 2020; Favari et al. 2021; D'Souza et al. 2022; Favari et al. 2022). A difference in pre-displacement food access measures of those who became displaced before violence began and those who became displaced after violence had begun would be consistent with either the humanitarian situation causing a significant amount of displacement or the lack of resources limiting how early some households might be able to become displaced.

However, there is little evidence of any difference between the two samples in Table 4. Signs on the differences vary between specifications and are low in magnitude. Additionally, only one variable was statistically significant at the 10 percent level, which is what would be expected by chance; and a joint test of significance of all the variables is not statistically significant at conventional levels (p-value 0.174).

The lack of any difference in food access measures is also consistent with a growing amount of evidence suggesting that sharp changes in the humanitarian situation are not driving forced displacement in the Republic of Yemen's conflict. Food access was not becoming worse for displaced households leading up to displacement – which one might expect if worsening humanitarian conditions were forcing displacement (e.g., D'Souza et al. 2022); households that would have had the most incentive to become displaced due to the humanitarian situation- those with the worst pre-displacement food access- had an identical and large drop in food access following displacement as other households, which might not have been expected if these households were migrating for better economic opportunity (e.g., D'Souza et al. 2022); and, as mentioned above, key informant interviews with displaced households suggest that violence was pivotal to the displacement decision (e.g., TFPM 2016; OCHA 2019; etc.).

However, another potential explanation for a significant share of households becoming displaced prior to any surge in violence is that some households might have been especially intolerant of the potential of a poor security situation. Along with the lack of other explanations, this explanation is consistent with the violence patterns. The total

amount of violence experienced in the regions they fled reported in Figure 6, even with the post-displacement escalation, was very small on average compared to other displaced households. The average number of monthly fatalities after displacement for households from no-violence districts was less than one-third that of other displaced households in Figure 6; and the number of monthly fatalities was approximately one-half that experienced in the months after the latest survey of non-displaced households. Consistent with having a much stronger aversion to a poor security situation, the households that fled regions before violence occurred were also fleeing from what turned out to be much smaller post-displacement violence on average than other displaced households.[20]

Section 6. Conclusion

Using unique displacement data from the ongoing conflict in the Republic of Yemen, we find that violence was strongly associated with displacement. But we also find that there was significant heterogeneity in how different types of violence forced displacement and in the amount of violence experienced before becoming displaced. Importantly, the heterogeneity in the ways different types of violence force displacement is not emphasized in many of the previous studies analyzing the relationship between violence and forced displacement (e.g., Stanley 1987; Engel and Ibanez 2007; Williams 2008; Lozano-Garcia et al. 2010; Bohra-Mishra and Massey 2011; Adhikari 2013; etc.), and the results suggest a potentially sharper difference among the population in in the tolerance of violence than is typically assumed (e.g., World Bank 2017a).

However, there are several caveats to this analysis. First, the present analysis only addresses households with access to mobile phones, leaving a portion of displaced and non-displaced households excluded from the analysis. Although mobile phone penetration is high in the country (even among displaced populations), other survey modalities need to be used to reach the population without access to mobile phones.

[20]As mentioned above, it is also possible that some households are able to better predict future violence than others. However, it is unlikely that this explanation can fully explain the differences between households that become displaced before violence occurs and others that become displaced only after. The vast majority of displaced households coming from regions of significant violence do so long after the violence has already begun. Additionally, the escalation of violence in non-violent regions was identical for types of violence, including the types that might be more difficult for households to predict than others (e.g., coalition air strikes and terrorism).

Second, this analysis largely misses the beginning of the displacement crisis because the mobile phone survey began only five months after the escalation of the conflict. It is possible that the onset of conflict has a different impact on displacement than surges in violence in later periods. Although the survey captures many households that were part of the large initial displacement surge, the displacement module only captures the origin governorate. Without more detailed information on the origin locations, it is difficult to make strong inferences about the role violence played in displacement. It would be useful if future work addresses the onset of displacement crises.

And lastly, it is difficult to understand how applicable these results are to other displacement crises in different contexts. For example, it is unclear whether some of these results generalize to settings in which only part of a country is in conflict, or to settings in which households are forced to become displaced in foreign countries. Given the sheer size of the global displaced population and the challenges they face in meeting basic needs, more analysis is needed in a variety of contexts to better our understanding of this population and the complex set of factors that forced them to flee their homes.

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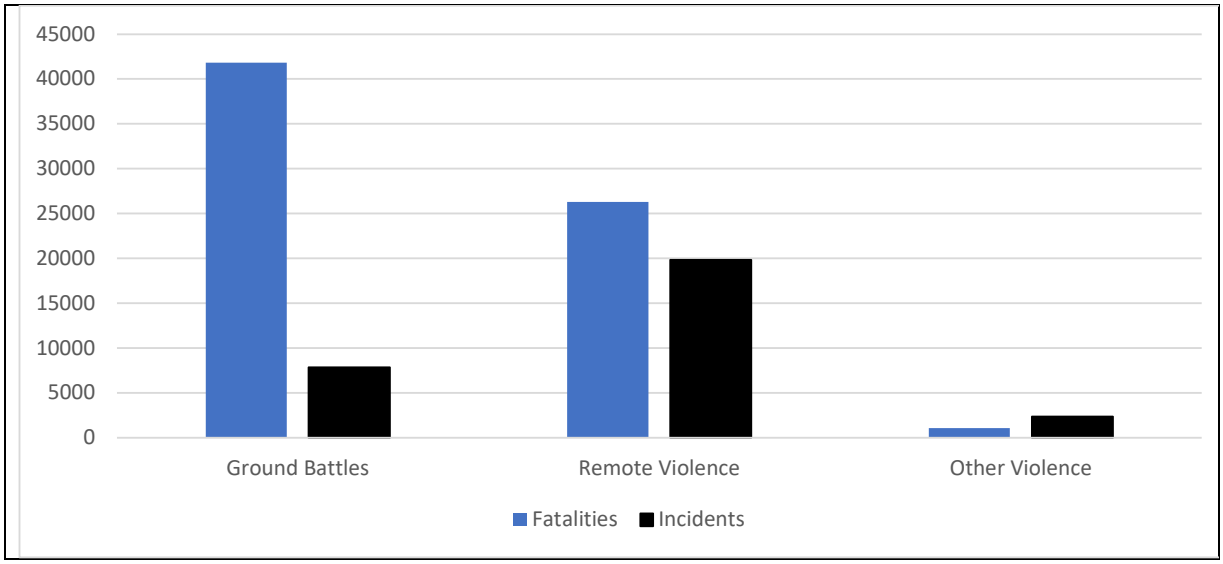
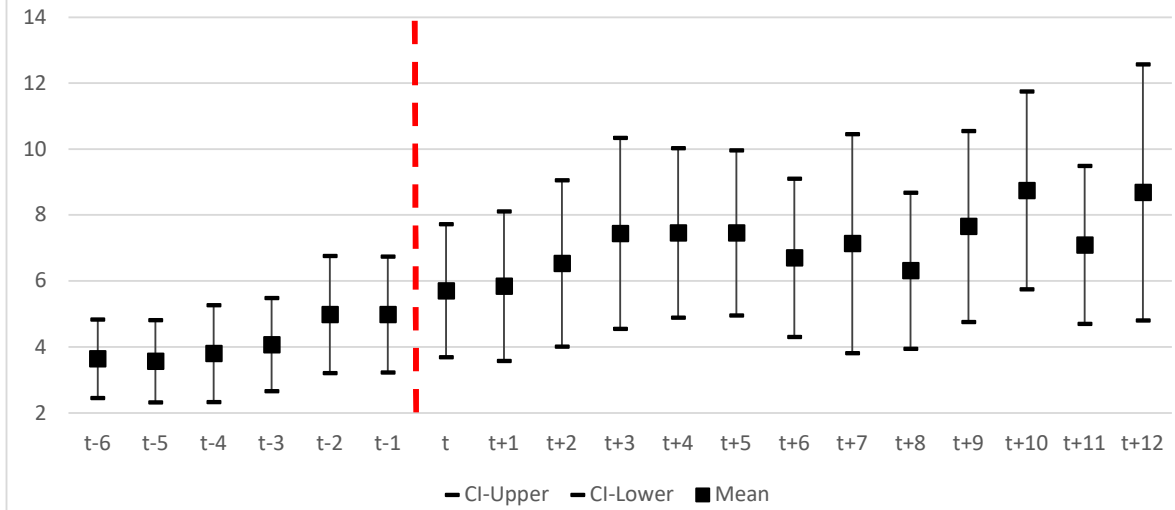
Figure 1. Summary Statistics- Type of Violence



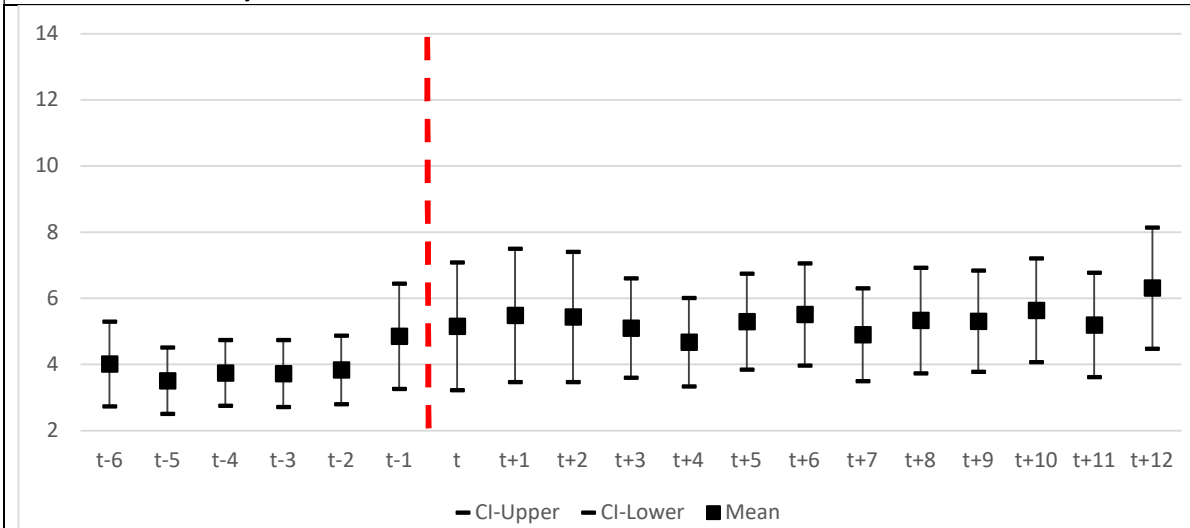
Notes: Figures report the average number of fatalities and violent incidents by the type of violence captured in the ACLED database from 2016 through the end of 2018. Ground Battles are mostly fighting on the front lines between Houthi and Coalition forces; Remote Violence largely refers to airstrikes; and Other Violence is mostly composed of terrorism and violence against civilians.

Figure 2. Summary Statistics- Fatalities

2a. Average Fatalities in District of Origin for Displaced Households Around the Time of Displacement



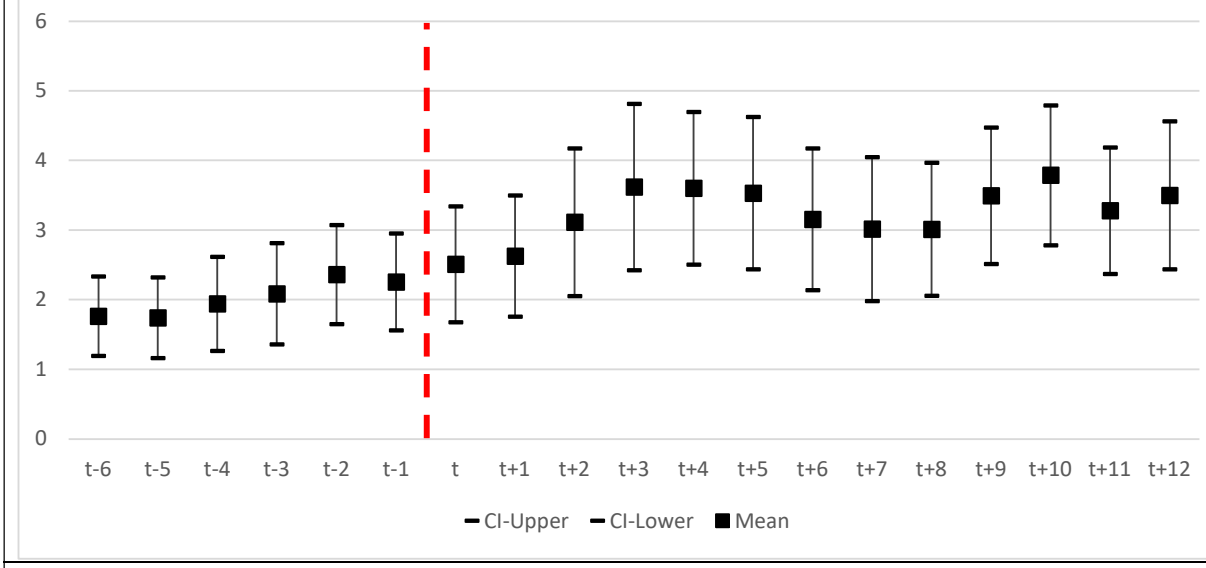
2b. Average Fatalities in District of Residence for Non-Displaced Households Around the Time of Most Recent Survey



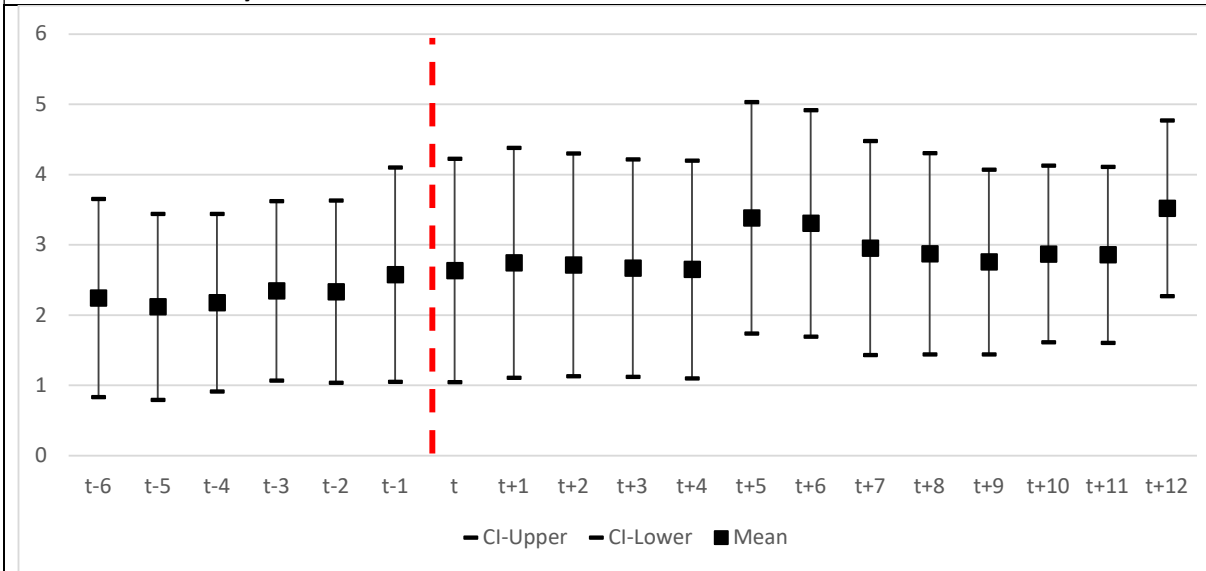
Notes: Figures report the average number of fatalities in the district of origin and district of residence for displaced and non-displaced households respectively. Time period t refers to either the month of displacement or the month of the most recent survey and associated 95 percent confidence intervals are reported. Standard errors are clustered at the district level.

Figure 3. Summary Statistics- Violent Incidents

3a. Average Fatalities in District of Origin for Displaced Households Around the Time of Displacement

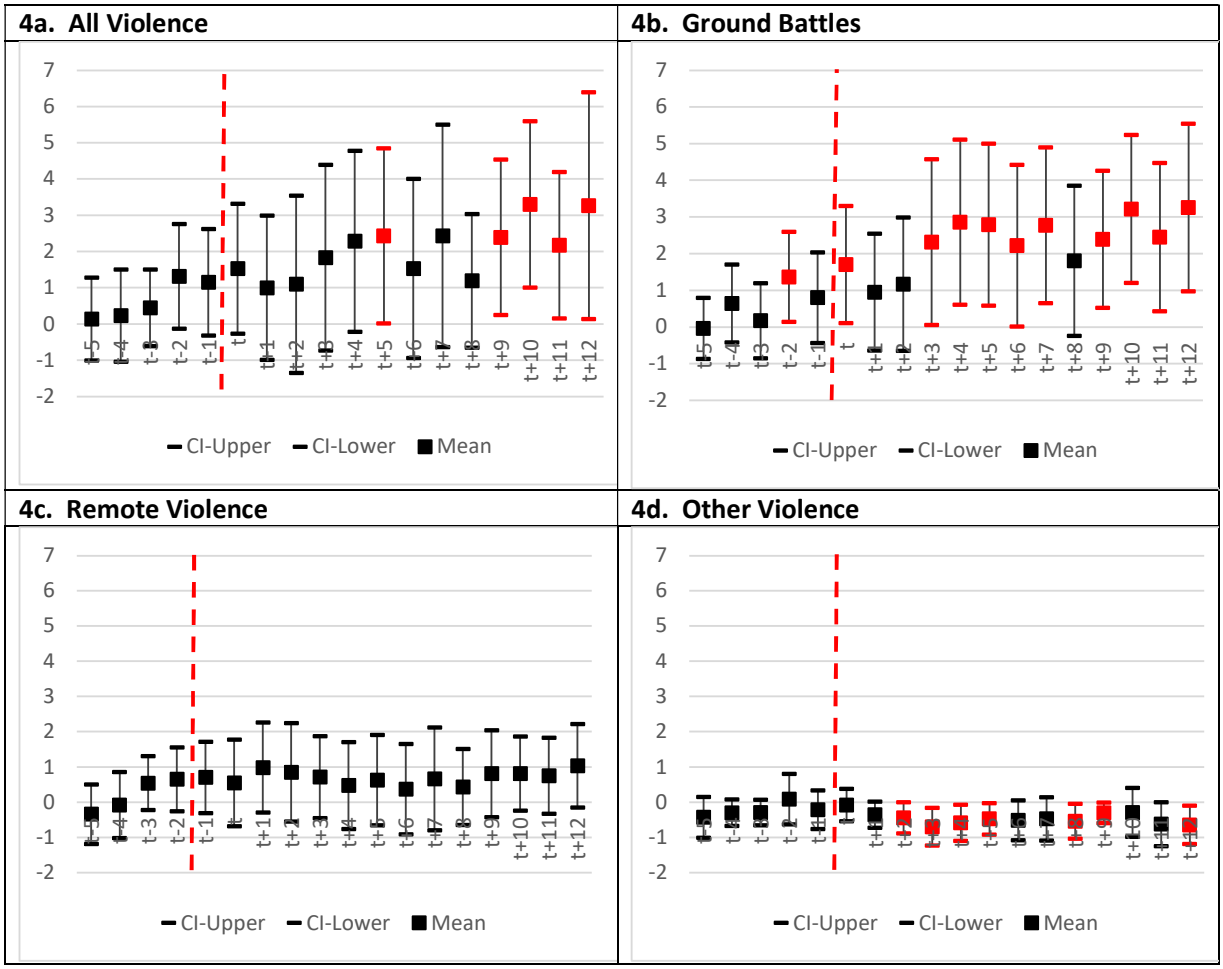


3b. Average Fatalities in District of Residence for Non-Displaced Households Around the Time of Most Recent Survey



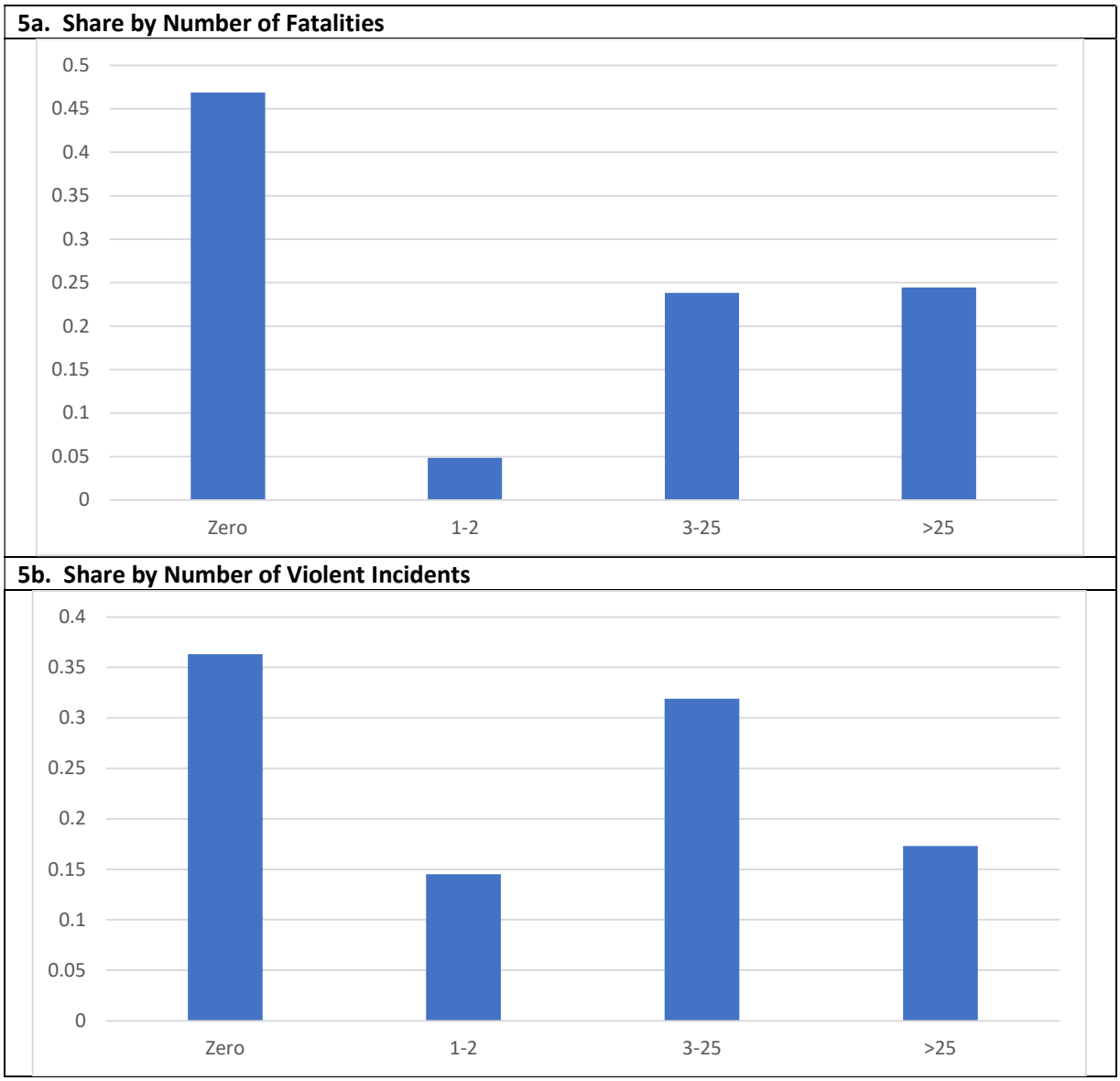
Notes: Figures report the average number of violent incidents in the district of origin and district of residence for displaced and non-displaced households respectively. Time period t refers to either the month of displacement or the month of the most recent survey and associated 95 percent confidence intervals are reported. Standard errors are clustered at the district level.

Figure 4. Change in Fatalities for Displaced Households Relative to Six Months Before Displacement



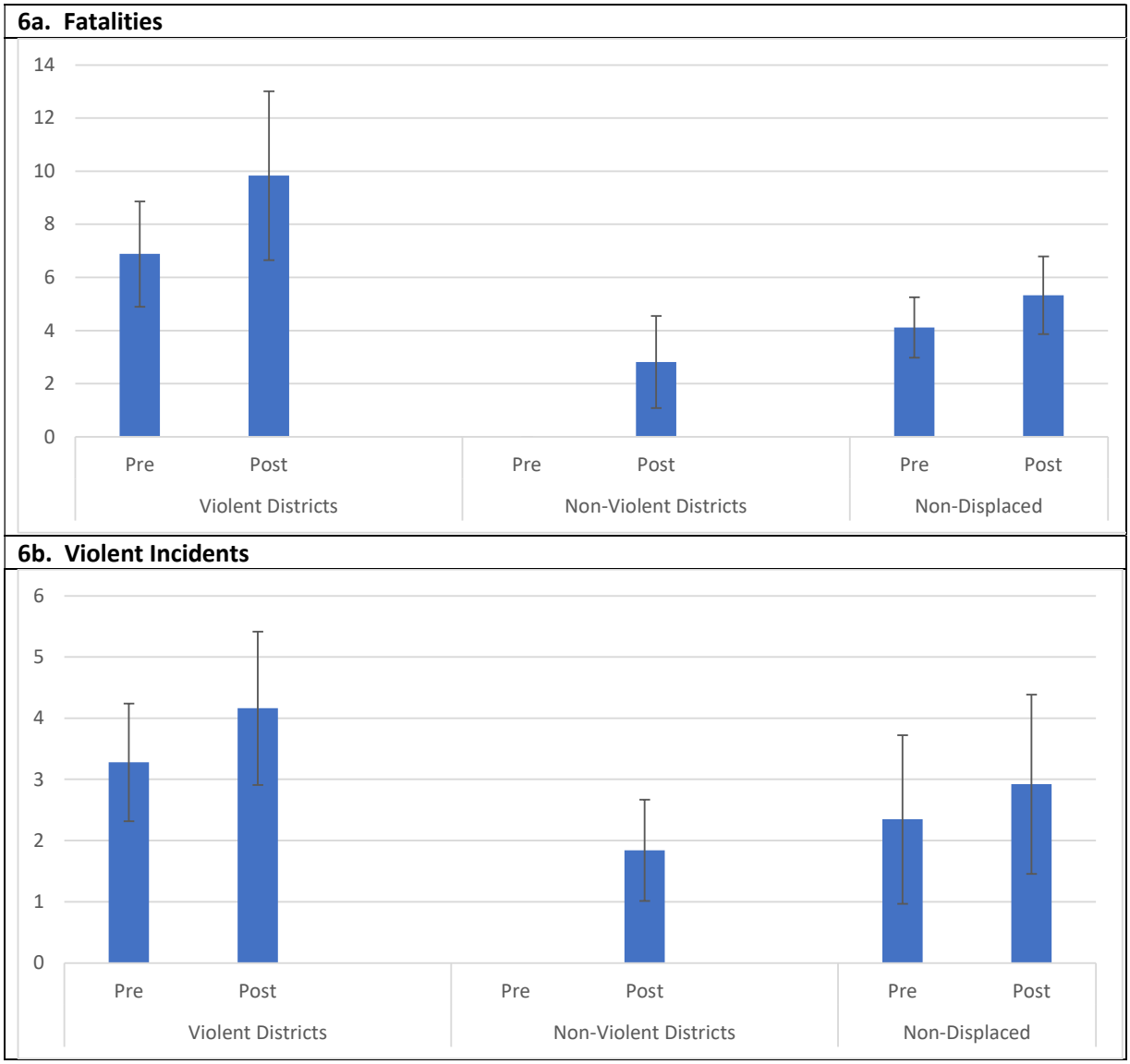
Notes: Figures report the coefficient estimates and the 95 percent confidence intervals from specifications estimating how much violence is changing for displaced households relative to six months before displacement (the omitted category). Furthermore, the estimates represent how much more the violence is changing in origin districts of displaced households than for non-displaced households in the months around their most recent survey. Each panel reports the estimates using fatalities from each type of violence- all violence, ground battles, remote violence, and other violence, which includes terrorism, political violence, etc. Estimates that are statistically significant at the 95 percent level are highlighted in red.

Figure 5. Share of Displaced Sample by Amount of Total Violence Occurring in the Six Months Leading to and During Month of Displacement



Notes: Share of sample based on the total amount of violence occurring in the six months leading up to and during the month of displacement. The total number of displaced households in the sample is 1,116.

Figure 6. Change in Fatalities Following Displacement by Amount of Pre-Displacement Violence



Notes: Figures report the average number of fatalities and violent incidents before and after displacement for displaced households, by the amount of pre-displacement violence experienced. The pre-period is the average monthly figure for the six months prior to displacement, and the post-period is the average monthly figure for the month of and 12 months following displacement. The estimates for violent districts are the average monthly violence indicators for households that became displaced from districts in which there was at least one violent incident in the month of or the six months prior to displacement; and the estimates for non-violent districts are the average monthly violence indicators for households that became displaced from districts that had zero violent incidents over the same time period. These figures are similarly compared to average monthly violence indicators for non-displaced households in the 6 months before and the 12 months following their most recent survey. Associated 95 percent confidence intervals have been reported for each estimate.

Table 1. Changes in Fatalities in Origin and Migration Districts Relative to Violence Experienced by Non-Displaced Households

VARIABLES	(1) Fatalities from All Violence-Origin District	(2) Fatalities from All Violence-Origin District	(3) Fatalities from All Violence-Origin District	(4) Fatalities from All Violence-Migration District	(5) Fatalities from All Violence-Migration District	(6) Fatalities from All Violence-Migration District
post x displacement indicator	1.576**	1.456*	1.433**	-0.013	-0.479	-0.468
	[0.698]	[0.841]	[0.687]	[0.689]	[0.924]	[0.689]
post	1.366***	1.819**	0.438	1.366***	1.819**	0.621*
	[0.400]	[0.713]	[0.322]	[0.400]	[0.713]	[0.368]
displacement indicator	0.227	-	-	-0.562	-	-
	[0.499]			[0.733]		
Constant	3.944***	3.712***	4.453**	3.944***	3.668***	3.839**
	[0.540]	[0.401]	[2.064]	[0.540]	[0.404]	[1.950]
Household Fixed Effects	N	Y	Y	N	Y	Y
Month-Year Fixed Effects	N	N	Y	N	N	Y
Observations	162,796	162,796	162,796	147,546	147,546	147,546

Notes: This table estimates how much larger the change in violence in origin and migration districts was for displaced households following displacement than for non-displaced households following their most recent survey. The estimates reported in the table are from a specification that regresses the number of monthly fatalities on a post (displacement or survey) indicator interacted with a displacement indicator. The interaction term is how much larger the increase in violence is for displaced households on average following displacement than for non-displaced households following their most recent survey. Standard errors clustered at the district level reported in parentheses. *** denotes statistical significance at the 1 percent level; ** denotes significance at the 5 percent level; and * denotes significance at the 10 percent level.

Table 2. Changes in Violent Incidents in Origin and Migration Districts Relative to Violence Experienced by Non-Displaced Households

VARIABLES	(1) Incidents from All Violence-Origin District	(2) Incidents from All Violence-Origin District	(3) Incidents from All Violence-Origin District	(4) Incidents from All Violence-Migration District	(5) Incidents from All Violence-Migration District	(6) Incidents from All Violence-Migration District
post x displacement indicator	0.627***	0.469**	0.253	0.423*	0.111	-0.059
	[0.171]	[0.237]	[0.182]	[0.227]	[0.394]	[0.255]
post	0.591***	0.890***	0.072	0.591***	0.890***	0.100
	[0.121]	[0.331]	[0.101]	[0.121]	[0.331]	[0.102]
displacement indicator	-0.276	-	-	-0.539	-	-
	[0.498]			[0.707]		
Constant	2.299***	2.099***	3.440***	2.299***	2.111***	3.287***
	[0.684]	[0.186]	[0.896]	[0.684]	[0.187]	[0.880]
Household Fixed Effects	N	Y	Y	N	Y	Y
Month-Year Fixed Effects	N	N	Y	N	N	Y
Observations	162,796	162,796	162,796	147,546	147,546	147,546

Notes: This table estimates how much larger the change in violence was in origin and migration districts for displaced households following displacement than for non-displaced households following their most recent survey. The estimates reported in the table are from a specification that regresses the number of monthly violent incidents on a post (displacement or survey) indicator interacted with a displacement indicator. The interaction term is how much larger the increase in violence is for displaced households on average following displacement than for non-displaced households following their most recent survey. Standard errors clustered at the district level reported in parentheses. *** denotes statistical significance at the 1 percent level; ** denotes significance at the 5 percent level; and * denotes significance at the 10 percent level.

Table 3. Changes in Violence in Origin Districts Relative to Non-Displaced Households by Type of Violence

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Fatalities from Ground Battles-Origin District	Fatalities from Remote Violence-Origin District	Fatalities from Other Violence-Origin District	Incidents from Ground Battles-Origin District	Incidents from Remote Violence-Origin District	Incidents from Other Violence-Origin District
post x displacement indicator	1.679***	0.397	-0.278*	0.141**	0.076	-0.019
	[0.638]	[0.285]	[0.146]	[0.071]	[0.183]	[0.020]
post	0.238	0.240**	0.002	0.012	0.113	-0.000
	[0.264]	[0.121]	[0.019]	[0.029]	[0.099]	[0.010]
Constant	2.347	2.538*	0.028	1.076**	1.927	0.117
	[2.166]	[1.487]	[0.084]	[0.534]	[1.515]	[0.106]
Observations	146,204	146,204	146,204	146,204	146,204	146,204

Notes: This table estimates how much larger the change in violence was in origin districts for displaced households following displacement than for non-displaced households following their most recent survey. The estimates reported in the table are from a specification that regresses the number of monthly fatalities or the monthly number of violent incidents on a post (displacement or survey) indicator interacted with a displacement indicator. The interaction term is how much larger the increase in violence is for displaced households on average following displacement than for non-displaced households following their most recent survey. All specifications include household and month-year fixed effects. Standard errors clustered at the district level reported in parentheses. *** denotes statistical significance at the 1 percent level; ** denotes significance at the 5 percent level; and * denotes significance at the 10 percent level.

Table 4. Differences in Food Security Between Households becoming Displaced from Regions with No Violence and the Rest of Displaced Households

	How much larger Each Food Access Measure is for Households who Became Displaced from Regions with no Violence Prior to Displacement
Share of Months Household Received Food Assistance	0.003
	[0.037]
Average Number of times in the week before the survey the household consumed: _____	
Staples	-0.007
	[0.007]
Pulses	-0.008
	[0.005]
Veg	-0.004
	[0.005]
Fruits	-0.001
	[0.007]
Proteins	-0.011
	[0.007]
Dairy	0.008*
	[0.005]
Sugars	-0.005
	[0.005]
Fats	-0.001
	[0.006]
Average Number of times in the week before the survey the household: _____	
Relied on Less Expensive Foods	-0.006
	[0.005]
Borrowed to Purchase Food	-0.002
	[0.005]
Reduced Number of Meals	-0.004
	[0.005]
Limited Portion Size	0.000
	[0.005]
Restricted Consumption	-0.006
	[0.004]
P-value from test of all food security coefficients jointly equaling zero	0.1741
Observations	1,116

Notes: This table regresses an indicator equaling one if the household became displaced from a region with zero violent incidents in the six months leading up to and during the month of displacement on each of the food security variables contained in the monthly WFP survey individually. All specifications include district and time (month-year) fixed effects. The p-value is a joint test of all coefficients jointly equaling zero from a separate specification in which the indicator for becoming displaced from a district with no violent incidents on all the food security variables. *** denotes statistical significance at the 1 percent level; ** denotes statistical significance at the 5 percent level; and * denotes statistical significance at the 10 percent level.