CHAPTER 6

The Impact of Humanitarian Food Assistance on Household Food Security during Conflict in Mali

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Conflict and political instability are important drivers of undernutrition. Of the six emergency situations currently listed on the World Food Programme (WFP) website, five (Iraq, Lake Chad Basin, South Sudan, Syria, and Yemen) are directly the result of conflict. Depriving populations of access to food is often an explicit war tactic. Armed conflicts are also responsible for weakening food production and health systems and undermining the functioning of markets and institutions (Justino 2012). Armed conflicts have been found to profoundly impact mortality, morbidity, and malnutrition, among other health outcomes (Altare and Guha Sapir 2013). Children exposed to violent conflict at an early age or in utero are found to be more likely to suffer from moderate or severe acute malnutrition, even controlling for household background and nonrandomness of conflict location (see, for example, Alderman, Hoddinott, and Kinsey 2006; Camacho 2008; Akresh et al. 2012; Domingues and Barre 2013; Minoiu and Shemyakina 2014).

Ensuring timely and adequate delivery of food assistance to conflict-affected populations is therefore critical. And indeed, food assistance has become a key element of humanitarian aid. In the past decade, school feeding has been scaled up in emergencies as a rapidly deployable safety net, while generalized food distribution is the largest component of humanitarian assistance globally (Harvey et al. 2010; WFP 2013). However, little is known about the effectiveness of aid, including food aid, in conflict areas. There is evidence of the effectiveness of these types of safety net interventions, but this evidence usually comes from nonemergency, nonconflict contexts. And both the implementation and the effectiveness of food aid are likely different in conflict settings. For instance, it is usually challenging for aid actors to reach vulnerable populations in the most severely conflict-affected areas due to a variety of logistical and political challenges. Indeed, a thematic evaluation of WFP's school feeding operations in emergencies identified a range of context-specific challenges related to implementation, including security, limited accessibility, and weak in-country technical capacity (WFP 2007). Given this dearth of empirically rigorous studies on the effectiveness of any type of humanitarian aid during conflict, this chapter aims to fill an important gap in the literature and provide some insights for aid practitioners.

The chapter is centered on assessing the impact of WFP's food assistance on the food security and nutrition outcomes of rural households in the Mopti region of Mali. In our assessment, we relied on data from a unique precrisis baseline to design a longitudinal, quasi-experimental study based on two survey rounds executed five years apart. Data were collected from 66 communities randomly selected from within food-insecure districts. Study outcomes included household expenditures, food consumption (measured through seven-day recall), and nutritional status in children from two to five years of age. We estimated program impact by combining propensity score matching and difference-in-difference techniques.

We achieved very good balance of potential confounders between the treatment and comparison groups after matching, and the area of common support between the estimated propensity scores for both groups is wide enough to warrant a meaningful analysis. We did find that receipt of emergency food aid helped protect households. This was particularly the case when aid was distributed as school feeding and when at least two forms of food aid were combined. We also found that the effects of food aid on children's height and caloric and micronutrient consumption were mostly concentrated in areas not in the immediate vicinity of conflict, unlike increases in food expenditures, which were driven by households located in close proximity to armed groups.

The remainder of the chapter is structured as follows: we first describe the context and the intervention, and then present the data and empirical strategy, followed by descriptive statistics on conflict and humanitarian aid (and how they overlap). The final sections present key findings and discuss the results.

Country Context and WFP's Emergency Food Assistance

Mali, a vast landlocked country at the heart of West Africa in the Sahel region, is one of the most food-insecure countries in the world, ranked 179 out of 188 on the United Nations Development Programme's 2015 Human Development Index. Life expectancy is 58 years, and the infant mortality rate is 78 per 1,000 live births.

Mali has suffered from a series of political, constitutional, and military crises since January 2012. In particular, the situation was aggravated by the loss of government control of northern territories from April 2012 until January 2013. In early 2012, the National Movement for the Liberation of Azawad (MNLA) allied with Islamist groups and increased its attacks in the north, triggering a coup d'état in Bamako. Conflict events escalated, according to the Armed Conflict Location and Event Data (ACLED) project, from 25 episodes of violence in 2011, to 184 events in 2012, 237 in 2013, and 106 in 2014. The overwhelming majority of the violence took place in the north of the country. An international military intervention in January 2013, known as Operation Serval (Shurkin 2014), and the deployment of a United Nations (UN) mission in July 2013 stabilized the situation in the country. The conflict period involved considerable refugee outflow and internal displacement (UNHCR 2017). In 2013, more than 300,000 internally displaced people (IDPs) were sheltering with host communities in southern Mali. The displaced were dispersed across arid areas where they suffered from food insecurity, also fueling tensions among the various communities. As of November 2016, the number of Malian refugees exceeded 135,000 and IDPs numbered more than 36,000, while approximately 25,000 people were counted as returnees (UNHCR 2017).

Amid these crises, the complex emergency combining drought throughout the country and the conflict in the north was the focus of two projects by WFP in Mali. These two projects reached approximately 100,000 IDPs and 200,000 vulnerable people in the targeted regions of the country. The WFP food assistance activities included in the response are summarized in Table 6.1. These included supplementary feeding to prevent and treat acute malnutrition, generalized food distribution, and school feeding.

TABLE 6.1—INTERVENTIONS INCLUDED IN THE WORLD FOOD PROGRAMME'S FOOD ASSISTANCE ACTIVITIES IN NORTHERN MALI FROM JANUARY 2013 ONWARD

Intervention	Targets	Objectives	Activities
Blanket supplementary feeding	Children 6–59 months and pregnant and lactating women	Help prevent an increase in acute malnutrition	Provide children half a sachet of Plumpy'Sup per day Provide Super Cereal and vegetable oil to pregnant and lactating women Disseminate nutrition and hygiene messages for mothers
Targeted supplementary feeding	Children 6–59 months with moderate acute malnutrition and malnourished pregnant and lactating women	Treat moderate acute malnutrition among children 6–59 months and malnourished pregnant and lactating women	Provide 92 g of Plumpy'Sup per day Rely on partners and community health workers' screening and referral capacities, as well as functioning health centers
Targeted food assistance (generalized food distribution)	Food-insecure populations, internally displaced people, women-headed households, households that have lost income/assets, and households with elderly or disabled people	Assist all accessible moderately and severely food-insecure households and nondisplaced people, displaced people, and host communities	Provide 2,100 kcal per person per day, consisting of cereals, pulses, vegetable oil, and salt, with Super Cereal to increase micronutrient intake
School feeding	Primary school children in areas with high food insecurity	Prevent hunger and provide incentives to arrive on time and attend school until lunchtime (school attendance will also reduce children's exposure to other risks)	Provide two daily meals: a morning porridge of Super Cereal and a midday meal consisting of cereals, pulses, vegetable oil, and salt

Source: Authors.

Data and Methods

Data Sources

This mixed-methods study relied on qualitative and longitudinal quantitative data collected at the household and village levels. The baseline, conducted in January 2012, was undertaken as part of a cluster-randomized trial of school feeding in Mali that was interrupted because of the onset of conflict a month later (Masset and Gelli 2013). As part of this study, 70 villages were randomly sampled among the 35 most food-insecure communes in the Mopti region. In each village, 25 households were randomly sampled for the survey interviews. The baseline survey collected detailed information on household food security, economic activities, and sociodemographics. A follow-up survey was undertaken in January 2017. Anthropometric data were also collected for every child between 2 and 15 years of age in the sampled households. This survey entailed most of the modules from the baseline plus new modules that were added to measure exposure to conflict and emergency aid at both the household and village levels. The key feature of the study is our ability to draw from data collected on the eve of the onset of the armed conflict in Mali, providing us with a rare opportunity to control for preconflict characteristics.

Outcomes of Interest

We considered two levels of outcomes in the survey population based on the analysis of the program theory of the intervention. The first level included measures of household food security calculated from the consumption and expenditure modules of the household survey. These included monthly (food) expenditures; share of food-related expenses in the household budget; dietary diversity; and the quantities of calories, protein, iron, zinc, and vitamin A consumed. All these outcomes were calculated per capita and per adult equivalent. The second level focused on a proxy measure for the nutrition status of children, namely height.

Each of these outcomes should positively respond to the receipt of food assistance. We decided to measure consumption of vitamin A, iron, and zinc, as deficiencies in these micronutrients are widespread and linked with well-known health and nutrition issues. Existing evidence suggests widespread prevalence of micronutrient deficiencies in Mali. Fifty-nine percent of preschool children are estimated to suffer from vitamin A deficiency and 83 percent are anemic (as a result of iron deficiency). The corresponding figures for pregnant women are 17 percent and 73 percent, respectively (WHO 2008, 2009).

Attrition

Due to safety concerns, we were not able to reach 4 of the initial 70 villages covered at baseline, leading to a loss of 91 households. In addition, we were not able to survey 210 households that were included in the remaining 66 villages. Overall, the attrition rate stood at 22 percent including the 4 villages that could not be reached at endline, or 15 percent excluding those villages. Considering the relatively long period between the baseline and follow-up surveys and the conflict situation, these levels of attrition are not surprising. However, they can pose an issue for the estimation of the treatment impact if rates of attrition differ across groups.

We then estimated the likelihood that a household would drop from the sample based on baseline characteristics. Three variables were found to be significantly associated with attrition: household size (attrited households tend be smaller), ethnic group (attrited households are more likely to come from minority ethnic groups), and school infrastructure index (attrition rates increase with this index). To correct for attrition-related bias, we included these variables in the estimation of the propensity score.

Qualitative Research

The qualitative research was undertaken in Bamako and Mopti region at both the district and community levels. Three tiers of interviews were conducted, including

- in Bamako with key stakeholders who provide humanitarian assistance, including the government of Mali, WFP, and international nongovernmental organizations;

- at the district level in the Mopti region, with mayors, health workers (formal and informal, that is, including traditional healers), and other community stakeholders; and
- in selected communities in same-sex focus groups with adult men and women and individually with the same individuals.

Eight different tools were developed for the qualitative research. Two of the research tools were open-ended and required input from the community, including a timeline of events that defines both the conflict and the humanitarian aid response, and a free list of responses to specific questions posed about individual exposure and reactions to the conflict and presence or absence of humanitarian aid. Two additional tools were pretested for inclusion in the household survey modules to assess the implicit impact of the civil conflict and the effects of humanitarian aid via data on individual emotional and physical states.

Mayors of communities that were occupied and unoccupied during the civil conflict were assembled to create a timeline of events and to identify villages located on both sides of the border whose members had diverse experiences during the conflict. The free list questions were posed to them individually, with their responses collected by the data collectors. Community members from the villages that were identified by the mayors were assembled in same-sex groups to create a conflict timeline. Subsequently they were interviewed individually to elicit responses to the free list questions and complete the two short questionnaires. Questioning ended once no new responses to the free list question were generated.

Empirical Strategy

The study entailed two research phases. The first stage was exploratory and dedicated to describing the exposure to conflict and to humanitarian aid in the sample as well as to uncovering potential links between the two. This phase was important given the dearth of prior information in the context of Mopti, and the need to ascertain whether enough variation existed in the sample in terms of exposure to conflict and aid to allow us to adopt our quasi-experimental research approach.

The goal of the second stage of the study was to assess the causal impact of WFP's interventions using quasi-experimental methods. This was a challenging task as it is likely that there are systematic differences between households (and/or villages) that receive food assistance and those that do not. Humanitarian actors want to prioritize the most fragile areas (so food aid recipients would tend to appear poorer compared to nonrecipients in the absence of the intervention), but they may also be prevented from doing so for logistical, economic, or political reasons (so food aid recipients would tend to appear less poor than nonrecipients in the absence of the intervention). In addition to such placement bias, there is a risk that households that receive food assistance within villages where aid is available may be different from households that do not receive aid. Indeed, our data show that not everyone received humanitarian aid within a given locale.

Thanks to the availability of a rich baseline dataset, collected prior to the crisis, we were able to employ a matched difference-in-difference approach to estimate the impact of food assistance in conflict-affected areas. The difference-in-difference approach compares the evolution of the outcomes of interest across treatment and comparison groups. The matching procedure consists of comparing only treatment and comparison households that shared a similar profile at baseline.

The treatment group was made up of households that received food aid between 2014 and 2016, whereas the comparison group refers to households that did not receive aid over this period. Given that food aid coverage was well below 100 percent in the sample villages (the coverage rate was 27 percent for generalized food distribution in villages where generalized food distribution was available and 22 percent for school feeding in villages where school feeding was available), we did not need to rely on comparing households living in different locales in estimating the treatment effects.

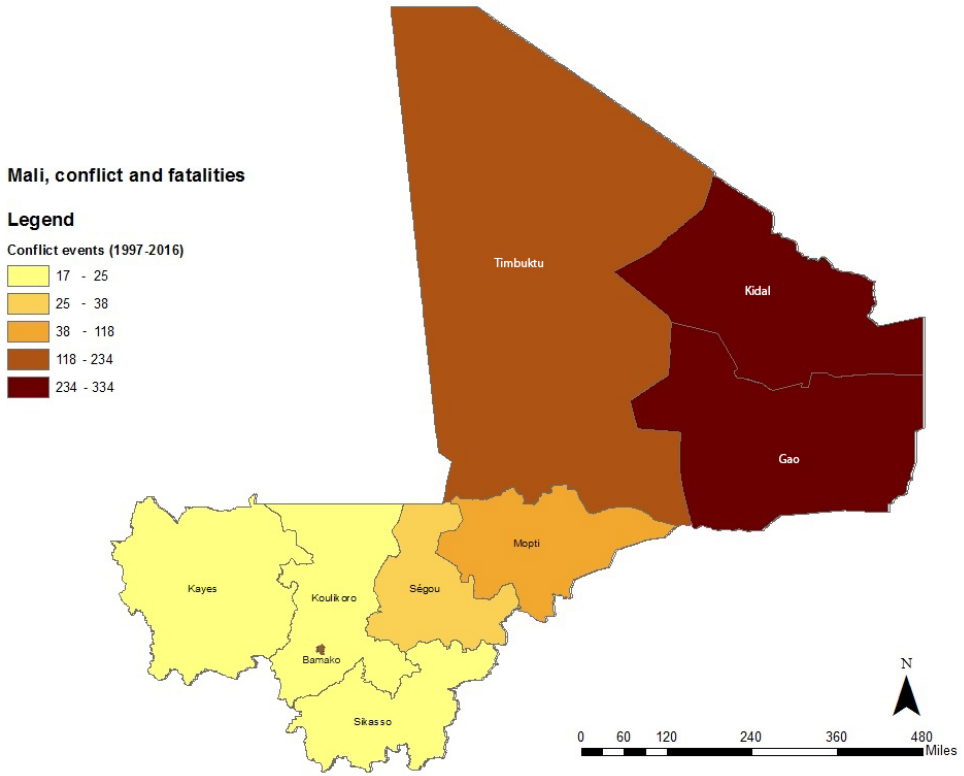
We matched based on the following variables: presence of a secondary school within 5 kilometers, presence of a market within 5 kilometers,

presence of past development projects, village considered very unsafe by teachers, age of the household head, expenditures per capita, household size, dependency ratio, number of food groups consumed, whether the household is polygamous, whether the household head works for pay, amount of land cultivated, share of food in the budget, asset ownership, and presence of armed groups between 2012 and 2014.

The matched difference-in-difference approach has been found to effectively mitigate the issue of selection bias (Chabe-Ferret 2015). First, looking at the change in outcome variables across the treatment and comparison groups (rather than the level of outcomes) allowed us to control for time-invariant systematic differences. Second, the matching procedure enabled us to ensure that households in the treatment and comparison groups were as similar as possible with regard to a wide range of potential confounders.

However, our empirical strategy remained vulnerable to selection bias arising from time-varying confounders. For instance, if areas that received food assistance were also more likely to suffer from negative economic shocks, then we would underestimate the true impact of the intervention. One key concern is whether the presence of armed groups is itself a function of availability of aid. If the delivery of aid in a given locale attracts (or deters) armed groups, then our approach would not be able to disentangle the specific impact of aid from that of the armed groups' presence. To limit the effect of this issue, we estimated the impact of aid received between 2014 and 2016 while we controlled for the presence of armed groups in the period 2012 to 2014. This was meant to alleviate the concern that the presence of armed groups is itself linked with aid delivery.

FIGURE 6.1—TOTAL CONFLICT EVENTS IN MALI BETWEEN 1997 AND 2016, BY REGION



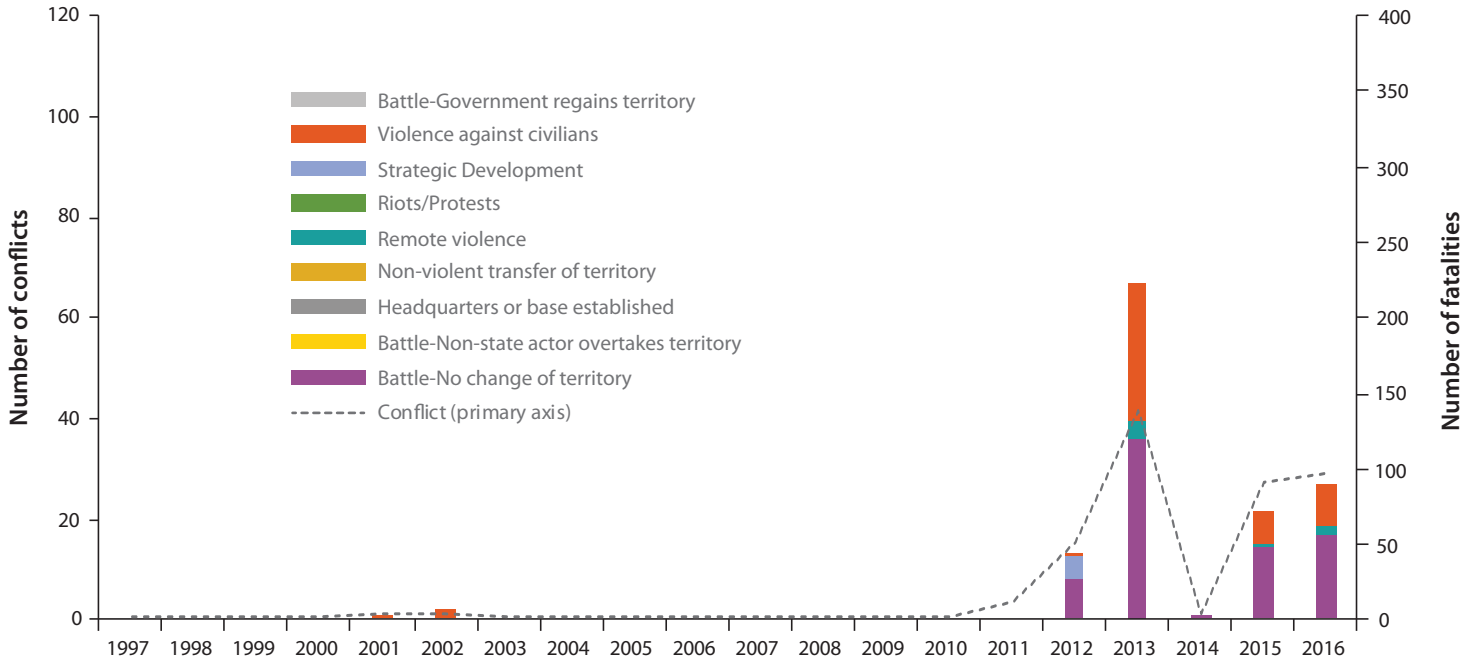
Source: Authors, based on ACLED data.

Conflict and Food Aid in Mopti

Armed Conflict in Mali and Mopti

The analysis of ACLED (Armed Conflict Location and Event Data) project data on conflict in Mali highlighted some important findings. First, the data clearly confirmed the absence of large-scale conflict before 2012 and the surge in conflict intensity between 2012 and 2016. The data also confirmed that the concentration of violent conflict was mainly in the northern regions of Mali (Figure 6.1).

FIGURE 6.2—CONFLICT EVENTS AND FATALITIES IN MOPTI REGION BETWEEN 1997 AND 2016, TOTAL BY YEAR AND EVENT TYPE

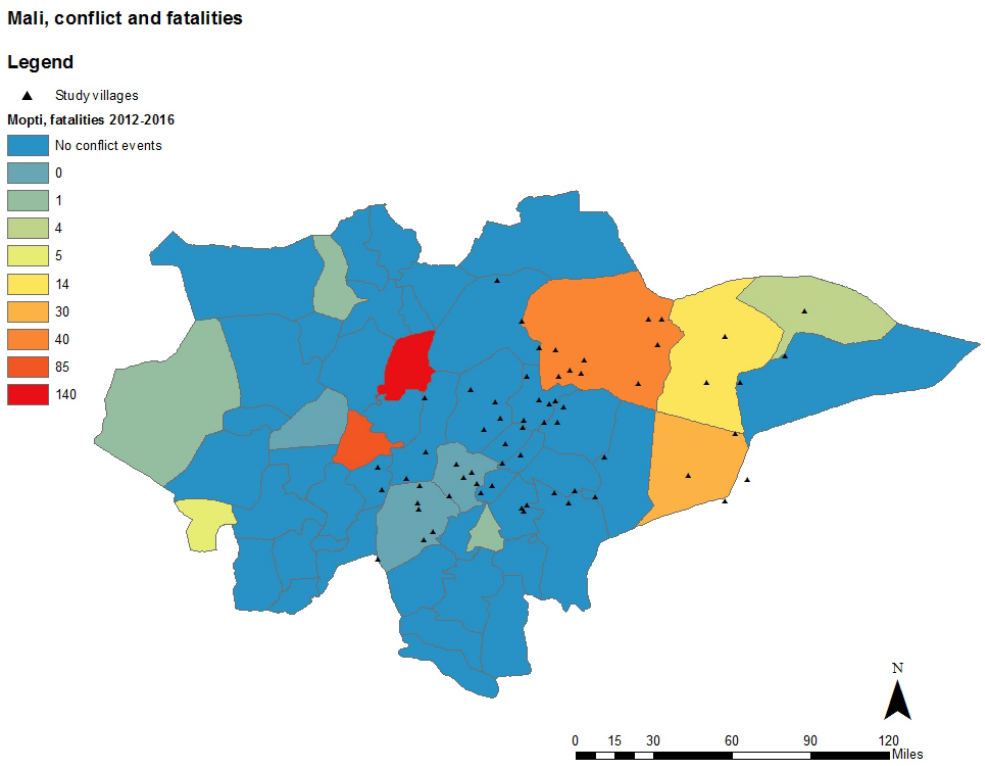


Source: Authors, based on ACLED data.

Second, as Mopti is located between the conflict hot spots in the north and the relatively peaceful southern regions, it experienced a medium intensity of conflict, lower than that of the three northern regions but substantial nevertheless. As in Gao, Kidal, and Timbuktu, the Mopti region witnessed a surge in conflict-related events between 2012 and 2016, with conflict activity peaking in 2013. However, unlike in the three northern regions, which saw an aggregate decline in conflict in 2015 and 2016, in Mopti the number of fatalities increased over the last two years of the period (Figure 6.2). This worrying new trend may herald a different type of conflict-related dynamic in central Mali.

Third, overlaying the location of conflict events with information on delivery of food assistance showed that the villages included in the study were exposed to varying degrees of conflict and humanitarian aid (Figures 6.3 and 6.4). These variations allowed us to conduct a quasi-experimental assessment of the impact of food assistance.

FIGURE 6.3—FATALITIES IN CONFLICT EVENTS IN MOPTI REGION BETWEEN 2012 AND 2016

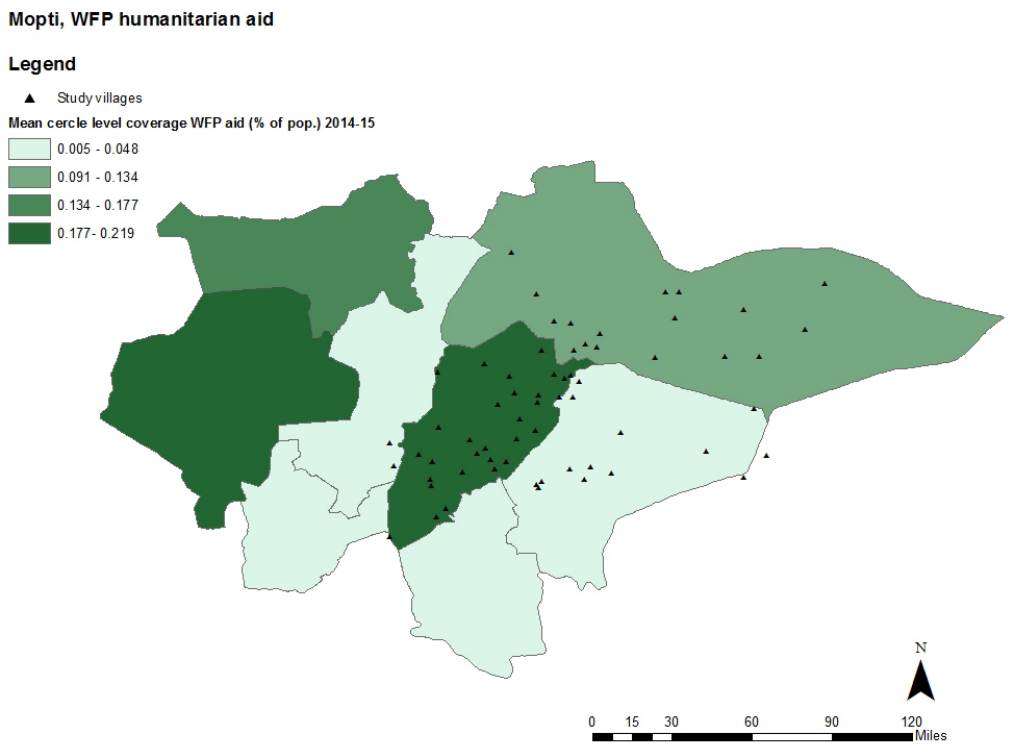


Source: Authors, based on ACLED data.

Exposure to Armed Groups

We primarily captured exposure to armed conflict through questions on the presence of armed groups. Community leaders in 7 villages reported experiencing the presence of armed groups in the locale itself between 2012 and 2014. In 34 villages, community leaders reported that armed groups were not present in the village itself over this period but that armed groups were in the surrounding area. And leaders in 22 villages reported that armed groups were absent from the region. We used this variable of armed groups in the estimations, as opposed to the distance from or extent of violence, in order to capture indirect effects of conflict and insecurity, which go beyond direct exposure to combat (Tranchant, Justino, and Mueller 2014). Specifically, we created a trichotomous variable of exposure to armed groups, which took

FIGURE 6.4—NUMBER OF BENEFICIARIES AND ESTIMATED MEAN COVERAGE OF HUMANITARIAN AID ACTIVITIES BY THE WORLD FOOD PROGRAMME IN MOPTI REGION IN 2014 AND 2015



Source: Authors, based on WFP data (2015).

the value 0 for unaffected villages, 1 for indirectly affected villages (that is, armed groups were present in the vicinity of the village but not in the village itself), and 2 for directly affected villages (armed groups were present in the village).

Conflict Exposure at the Household and Village Level

From the survey data, 23 percent of households overall were exposed to violence linked with the presence of armed groups between 2012 and 2016. Disaggregating by types of violence showed that 17 percent of households

TABLE 6.2—PRESENCE OF ARMED GROUPS AND MOBILITY IN MALI

Response (%)	No armed groups in village or vicinity	No armed groups in village but armed groups in vicinity	Armed groups in village	Pearson's chi-squared statistic
Share of respondents declared fear when traveling:				
to the market to buy food	43	42	67	41.16***
to the market to sell food	41	41	66	42.9***
to look for work	35	38	68	63.3***
to the health center	29	21	53	79.1***
to the aid center	26	20	44	50.0***
to buy/sell agricultural inputs	24	26	46	36.2***
anywhere outside the village	47	49	78	59.4***
Share of respondents' children reduced trips to school	12	17	34	40.4***

Source: Authors.
Note: Asterisks represent the p-value associated with the Pearson's chi-squared test: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

reported that banditry attacks had taken place in their village, 7 percent reported terrorist/armed attacks, 5 percent reported political violence, 2 percent reported kidnappings, and 1 percent reported violence/lynching in the presence of armed groups or destruction of infrastructure.

Conflict, Control, and Violence in the Study Population

There was overlap between presence of armed groups and conflict-related violence in our sample. Whereas 16 percent of households in villages free from the presence of armed groups experienced conflict-related violence, 47 percent experienced conflict-related violence in villages where armed groups had been present. There was a strong discontinuity between villages where armed groups had been present and other villages on all types of conflict-related violence. However, there was not a clear demarcation between villages located in areas where armed groups had been present and villages located in areas free from armed groups. Political violence, kidnappings, and lynchings were more prevalent in the former, but the differences were not substantive, and there was no difference in the prevalence of banditry or terrorist attacks.

The presence of armed conflict also exerted a detrimental impact on households through fear and reduced mobility. Table 6.2 shows the cross tabulation between households' self-reported levels of fear of traveling and presence of armed groups. Households living in villages where armed groups had been present were much more likely to have reduced their travels than households living in villages where armed groups had not been present (irrespective of whether the presence of these armed groups was reported in the wider region). The data also highlighted a widespread fear of traveling in conflict-affected villages, which affected more than 78 percent of households. This translated into fewer trips to the market, the health

TABLE 6.3—PRESENCE OF ARMED GROUPS, SAFETY, AND SOCIAL CAPITAL IN MALI

Share of respondents (%)	No armed groups in village or vicinity	No armed groups in village but armed groups in vicinity	Armed groups in village	Pearson's chi-squared statistic
Feel safe in the community	63	48	47	15.8***
Felt safe in the community over the last 4 years	52	37	20	46.0***
Feel that people in the community commonly discuss problems	94	92	88	4.6*
Feel that people in the community commonly help each other out	92	86	79	14.0***

Source: Authors.
Note: Asterisks represent the p-value associated with the Pearson's chi-squared test: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

center, job fairs, and so on, as well as in reduced trips to school for children. For all the variables in Table 6.2, the Pearson's chi-squared test rejects the null hypothesis that the observed distribution of the variable is independent from the exposure to armed groups.

With regard to feelings of safety (Table 6.3), the presence of armed groups at the regional level was important. Whereas 63 percent of respondents in regions where no armed groups were present felt safe, only 47 percent of respondents in regions with armed groups felt similarly safe. There was a monotonic relationship between proximity to armed groups and reported feelings of safety over the past four years. Fifty-two percent of households in villages without armed groups felt safe, 37 percent of households in villages indirectly affected by armed groups felt safe, and only 20 percent of households in villages directly affected by armed groups felt safe. The relationship between responses connected to social capital and proximity to armed groups was less strong, with the main difference arising between villages with direct presence of armed groups and others.

The qualitative data suggested that security services such as police and the army were largely absent throughout the study period, with services limited to occasional patrols by the Malian army in villages that were unoccupied by armed groups. However, from April 2012 until the French intervention in January 2013, armed groups themselves regularly patrolled villages in the occupied areas. Though basic social services existed before the outbreak of armed conflict, their functioning was heavily impacted. In zones occupied by armed groups, schools and health centers were closed during the full period of occupation, whereas in the nonoccupied zone, this period did not exceed three months. Respondents also indicated that the presence of armed groups caused men, able-bodied household members, and entire families to flee. Fear, panic, and destruction of government buildings, combined with hatred of administrative staff, also caused health and education staff to flee, thus closing health centers and schools. Many pregnant women who were unable to flee found their antenatal care suspended, and postnatal consultations were interrupted as well. It is in this context that respondents thought morbidity and malnutrition in children and lactating women increased considerably. Thus, the focus groups' discussions identified the most vulnerable groups as pregnant women, nursing mothers, the sick, old people, and children for whom health care and school services were no longer available.

Receipt of Humanitarian Aid at the Household and Village Levels

At the village level, generalized food distribution was the most common form of food assistance experienced by the study population, with 51 out of 63 village respondents declaring that generalized food distribution had occurred in their village since 2012. School feeding and targeted supplementary feeding were reported to have been implemented in 26 and 24 villages, respectively. It is interesting to note that targeted supplementary feeding and school feeding programs were mostly implemented in villages where general food distribution was also present. Hence, only 3 villages experienced targeted supplementary feeding or school feeding without any generalized food distribution program. At the household level, 67 percent of households did not receive any food assistance, 23 percent of households received aid in the form of generalized food distribution, 14 percent in the form of school feeding, 2 percent in the form of targeted supplementary feeding, and 2 percent in the form of participation in food-for-work programs. There was limited overlap between modalities of aid at the household level, as only 7 percent of households received two or more forms of aid. The overlap overwhelmingly involved generalized food distribution, which was reported in 94 percent of households that received at least two forms of aid.

Food Assistance and Conflict in the Study Population

Access to aid tended to decrease with greater proximity to armed groups, contrary to what the logic of prioritization of conflict-affected populations would imply, though perhaps reflecting the practicalities of operations during conflict. This relationship manifested itself in a higher likelihood of conflict-affected populations living in villages without any access to aid, and a lower likelihood of conflict-affected populations living in villages with one form of food assistance. Specifically, while all unaffected villages had access to at least one form of food assistance, 10 percent of villages indirectly affected by conflict and almost a quarter (23 percent) of villages directly affected by conflict had no access to food assistance at all. However, villages where armed groups were present were as likely to have access to two forms of aid as villages in peaceful environments.

The relationship between proximity to armed groups and access to aid was not as marked at the household level. The strongest effect of conflict was to reduce the chance of receiving two forms of aid (10 percent in unaffected villages, 7 percent in indirectly affected villages, and 4 percent in affected villages) and a lower likelihood of obtaining school feeding (16 percent, 13 percent, and 9 percent, respectively), in contrast to the village-level results.

Key Findings

Changes in Outcomes during the Study Period

The crisis in Mopti is manifest in that households increased average expenditures per adult equivalent by less than 2,200 CFA francs over the whole period, corresponding to less than US$0.70 per year. It is unsurprising, then, that calorie intake per adult equivalent decreased by 136 calories per day on average, compared to baseline values. Daily consumption of protein, iron, and zinc also tended to decrease in the study population. In contrast, consumption of vitamin A increased by 430 micrograms, a near doubling of the baseline value. Insights from the qualitative research confirmed that households had been exposed to a range of shocks and stresses throughout the five-year survey period, including erratic rainfall, drought, flash flooding, poor harvests, loss of harvest due to pests, and migration to the south in search of employment in the mining sector.

Table 6.4 displays changes in study outcomes between baseline and endline, by exposure to armed groups. Surprisingly, households located nearer to the armed groups (that is, armed groups were present in their village or in the vicinity) increased their (food) expenditures substantially more than households living in regions free from these groups' presence. Intake of calories, iron, and zinc tended to decrease the most in villages indirectly affected by the presence of armed groups and to decrease the least in villages directly affected by the presence of armed groups. This pattern could signal that the presence of armed groups was rather innocuous and/or that food assistance was more effective in areas directly affected by the conflict. Decreased calories coupled with increased expenditures suggests that the increases in expenditures in households in proximity to rebels were driven by increases in prices. The increase in vitamin A consumption was equally strong when armed groups were present in the village or region. Examining child growth, however, reveals that children in directly affected villages grew by about 2 centimeters less than their counterparts in villages indirectly affected or unaffected by the presence of armed groups, which is consistent with increased expenditures being due to inflation.

TABLE 6.4—MEAN CHANGES IN STUDY OUTCOMES BETWEEN 2012 AND 2017, BY EXPOSURE TO ARMED GROUPS

Response	No armed groups in village or vicinity	No armed groups in village but armed groups in vicinity	Armed groups in village
Monthly expenditures per adult equivalent (CFA francs)	196.1	1,839.2	3,041.6
Monthly food expenditures per adult equivalent (CFA francs)	-21.2	1,277.0	1,929.3
Share of food expenditures in household budget (%)	0.02	0.04	0.07
Calories (kcal) consumed daily per adult equivalent	-17.5	-71.5	144.6
Protein (g) consumed daily per adult equivalent	-10.1	-10.8	-8.9
Iron (mg) consumed daily per adult equivalent	-2.8	-2.7	-1.8
Zinc (mg) consumed daily per adult equivalent	-2.6	-1.6	2.8
Vitamin A (mcg) consumed daily per adult equivalent	307.6	356.1	493.6
Dietary diversity score	-0.5	-0.5	-1.7
Height (cm) of children 2–5 years old in 2012	24.7	24.3	22.6

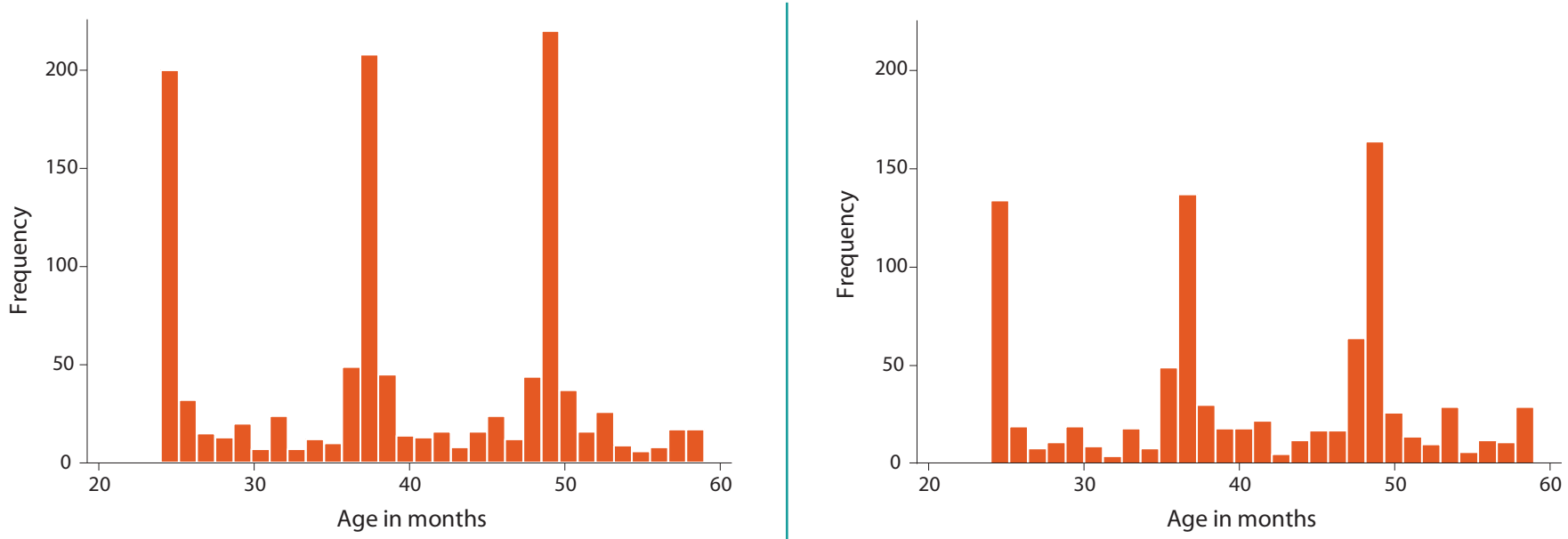
Source: Authors.

Households that received any aid (and especially school feeding) increased their (food) expenditures more than households without access to aid. The opposite holds true for generalized food distribution, however, and households that received two forms of aid saw the smallest increases in expenditures. The share of food expenditures in the budget did not vary significantly with aid categories. Caloric intake decreased the most for households that received generalized food distribution aid and two forms of aid, which may indicate that aid prioritized the most vulnerable. Consumption of protein, iron, and zinc did not significantly change over the period, and no strong pattern emerged with respect to aid. Consumption of vitamin A increased the most for recipients of aid (in any form). Finally, there is no obvious relationship between child growth and aid status.

Anthropometry and Recording Error in Dates of Birth

Figure 6.5 presents the distribution of ages in months in the two survey rounds for children under five years of age, showing a clear tendency of heaping at specific ages. Analysis of the distribution of months of birth showed evidence of heaping during the months of January and December.

FIGURE 6.5—DISTRIBUTION OF CHILDREN'S AGES IN MONTHS AT BASELINE AND ENDLINE, CHILDREN UNDER 5 YEARS OF AGE IN MALI



Source: Authors

Similarly, analysis of the distribution of days of birth found heaping on the first and last days of the month. Heaping was far more pronounced at baseline, suggesting that the recording of dates of birth had improved during the survey period.

The analysis of the nutrition status of young children was therefore limited by this well-documented issue related to misreporting of dates of birth, which is common in areas of low parental education like Mali (Oshaug et al. 1994; Grellety and Golden 2016; Larsen, Headey, and Masters 2017). In a first stage, we limited the scope of the analysis of anthropometric data to weight for height (repeated cross-sections of children ages two to five years) and to changes in height within the youngest cohort in the panel study population, including children ages two to five at baseline.

Balance and Overlap

Very few household-level covariates were found to predict a household's likelihood to receive aid. Household heads who identified as workers were more likely to receive generalized food distribution aid (but marginally less likely to receive any form of aid), and households that dedicated a larger share of their budget to food were less likely to participate in school feeding programs. Households with a higher value of assets were also more likely to participate in school feeding programs. Village-level covariates were

more important in terms of allocation of aid. Aid was less likely to be received in villages with access to a nearby market (remote areas seem to have been prioritized), in villages perceived to be very unsafe at baseline (although this did not influence school feeding), and in villages where armed groups were present (for generalized food distribution and school feeding). The likelihood of receiving any aid or generalized food distribution was also lower in villages located in regions where armed groups were present. Finally, the existence of past development projects before the baseline explains access to food aid in subsequent years. After weighting, none of the covariates displayed significant imbalance (defined as the standardized difference being greater than 0.1 standard deviation).

The distribution of the estimated propensity scores displayed a high degree of overlap across the treatment and comparison groups. Nevertheless, to estimate the treatment effects, we restricted the sample to the area of common support, leading us to drop about 750 observations out of 2,750, for an actual sample size of around 1,980 observations (see Table 6.5; the actual figures vary across our definitions of the dependent variable and the variables of interest).

Estimating the Impact of Humanitarian Aid

In the first set of estimations, we assumed that the whole study population was affected by the conflict, whether directly or indirectly. Such a view is consistent with insights from the survey data, which show that in areas where armed groups were not present, almost half

TABLE 6.5—ESTIMATIONS OF THE IMPACT OF FOOD ASSISTANCE ON HOUSEHOLD FOOD EXPENDITURES, FOOD CONSUMPTION, AND CHILDREN'S HEIGHT (FULL SAMPLE, MALI)

	Any aid	GFD	SF	1 form	2 forms
	(1)	(2)	(3)	(4)	(5)
ΔMonthly expenditures (CFA francs)	2,332.37 (1,522.6) [1,970]	3,208.77* (1,947.04) [1,973]	2,228.95 (1,480.4) [1,962]	2,159.05 (1,995.67) [1,968]	2,804.18 (2,028.2) [1,649]
ΔMonthly food expenditures (CFA francs)	1,873.02 (1,567.08) [1,971]	2,680.5 (1,915.8) [1,974]	2,364.1* (1,393.5) [1,963]	1,468.1 (2,152.0) [1,969]	**3,108.3**** **(1,434.3)** **[1,646]**
ΔFood expenditures as % of budget	-0.001 (0.016) [1,969]	0.000 (0.021) [1,972]	0.008 (0.021) [1,961]	-0.001 (0.017) [1,968]	-0.015 (0.026) [1,645]
ΔCalories (kcal) consumed daily	-2,979.5 (3,515.6) [1,996]	-4,463.1 (6,211.8) [1,998]	1,390.9 (1,285.1) [1,987]	-4,057.4 (4,633.7) [1,994]	970.95* (502.4) [1,674]
ΔProtein (g) consumed daily	-62.1 (73.3) [1,979]	-95.4 (108.3) [1,982]	36.5 (30.3) [1,971]	-91.3 (112.15) [1978]	**36.7**** **(17.4)** **[1,650]**
ΔIron (mg) consumed daily	-16.7 (21.5) [1,982]	-25.9 (36.1) [1,984]	9.0 (8.0) [1,973]	-23.4 (23.0) [1,980]	**7.73**** **(3.67)** **[1,653]**
ΔZinc (mg) consumed daily	-40.6 (45.6) [1,992]	-59.2 (91.2) [1,994]	13.57 (16.6) [1,983]	-53.3 (53.3) [1,990]	7.08 (5.8) [1,664]
ΔVitamin A (mcg) consumed daily	128.4 (84.5) [1,978]	168.4 (113.4) [1,981]	**270.3***** **(82.9)** **[1,970]**	88.3 (95.8) [1,975]	247.04* (147.7) [1,651]
ΔDietary diversity score	0.026 (0.157) [2,290]	0.291 (0.195) [2,294]	-0.231 (0.252) [2,282]	0.051 (0.189) [2,288]	-0.251 (0.274) [1,920]
ΔHeight (cm)	-0.107 (1.444) [1,947]	-0.652 (1.784) [1,953]	0.045 (1.529) [1,960]	-0.305 (1.445) [1,956]	0.818 (3.201) [1,866]

Source: Authors.

Notes: GFD = generalized food distribution; SF = school feeding. Bootstrapped standard errors in parentheses. Number of observations in square brackets. All expenses are scaled per adult equivalent. The variables "1 form" and "2 forms" refer to the number of forms of aid received by the household, as indicated by the types of aid variables. Estimations for height restricted to children under 5 years of age at baseline. *p < 0.1, ** p < 0.05,*** p < 0.01. Coefficients that remain statistically significant at the 10% level after adjustment for multiple hypothesis testing are indicated in bold.

(47 percent) of the households reported fearing travel outside their village. Such a high proportion indicates widespread insecurity and fear, even in areas that were supposedly out of the direct reach of armed groups. In addition, the proportion of household respondents who feared traveling outside their village was virtually the same in villages not directly affected by armed groups but where armed groups were present in the wider region. This suggests that the demarcation between areas not affected and areas indirectly affected may not be very clear (unlike the distinction between indirectly and directly affected villages). Household respondents tended to feel safer in areas supposedly out of reach of armed groups than in villages indirectly affected by armed groups (63 percent versus 48 percent), but the very high proportion of respondents who felt unsafe in either area further justified considering the whole study population as affected by insecurity.

Generalized food distribution was found to increase total expenditures, whereas school feeding and the combination of two forms of aid were found to increase food expenditures. These effects were statistically significant at the 10 percent level. In terms of total expenditures, the effect of generalized food distribution was estimated at 3,208 CFA francs per month per adult equivalent, corresponding to an increase of 20 percent from baseline. For food expenditures, the impact of school feeding was 2,364 CFA francs per month per adult equivalent, equivalent to an increase of 21 percent from baseline values. There were also positive effects on micronutrient availability from household food consumption during the seven-day recall period. Households that received two forms of aid were found to have a statistically significant (at the 5 percent or 10 percent level) increase in their availability of calories, protein, iron, and vitamin A. The magnitude of these effects was substantial, ranging from 29 percent of the baseline value for calories to 50 percent of the baseline value for vitamin A. Consumption of vitamin A also strongly increased for recipients of school feeding, and the effect was significant at the 1 percent level. A marginally significant negative effect of two forms of aid was found for weight-for-height z-scores; however, no effects were found on the prevalence of moderate acute malnutrition (not reported). There was no statistically significant effect of any type of food assistance on height.

Heterogeneity Analysis by Level of Conflict Exposure

The treatment effects reported above were estimated under the assumption that the entire sample was affected by insecurity. In the subsequent estimations, we investigated whether stronger, or more direct, exposure to armed conflict influenced the impact of food assistance. Specifically, we estimated the impact of aid on three subgroups: (1) villages unaffected by the presence of armed groups, (2) villages indirectly affected by the presence of armed groups (they were present in the region but not in the village), and (3) villages directly affected by the presence of armed groups. The number of observations was small for estimations on the subsample of directly affected villages. We dropped from the table of results all the estimations that were based on fewer than 30 observations in either the treatment or control group at baseline and/or endline. This condition was always met on the subsamples of unaffected and indirectly affected villages. For directly affected villages, however, the condition was systematically violated for school feeding and when there were two types of aid. There was also an insufficient number of observations to estimate the impact of any treatment variable on children's height.

One word of caution is necessary about the interpretation of the findings in this section. These estimations are meant to assess whether the impact of food aid is heterogenous with respect to the presence of armed groups. But they are not meant to estimate the causal effects of conflict itself, nor are we claiming that the interaction between food aid and conflict is fully identified in an econometric sense. In other words, we are not claiming that the presence of armed groups is exogenous in these estimations.

In villages with no armed groups in the region (Table 6.6), humanitarian aid in the form of school feeding had a positive impact on food expenditures, whereas generalized food distribution was found to increase total food expenditures. These results were comparable in magnitude and statistical precision to those presented in Table 6.5. However, the positive effect of aid on food consumption found for the full sample was not present for the subsample of "conflict-free" villages, with the exception of vitamin A consumption. Iron consumption was even slightly lower for households receiving two forms of aid than for others. A marginally significant negative effect of generalized food distribution was found for weight-for-height z-scores in children under five years of age.

In villages where armed groups were present in the region (Table 6.7), total and food expenditures tended to be higher for aid recipients than for other households, but the standard errors of the estimates were quite large, so that none of these effects are statistically distinguishable from zero. Aid was, however, responsible for a strong increase in food consumption. Households receiving two forms of aid were found to have their availability of calories, protein, iron, and zinc increase by 47, 74, 68, and 35 percent, respectively. These effects were statistically significant at the 1 percent level for protein, at the 5 percent level for iron, and at the 10 percent level for calories and zinc. Furthermore, generalized food distribution was found to significantly increase caloric intake, by 52 percent ($p < 0.05$) and zinc consumption by 64 percent ($p < 0.1$), while school feeding was found to

TABLE 6.6—ESTIMATIONS OF THE IMPACT OF FOOD ASSISTANCE ON HOUSEHOLD FOOD EXPENDITURES, FOOD CONSUMPTION, AND CHILDREN'S HEIGHT (SAMPLE: VILLAGES NOT AFFECTED BY ARMED GROUPS, MALI)

	Any aid	GFD	SF	1 form	2 forms
	(1)	(2)	(3)	(4)	(5)
ΔMonthly expenditures (CFA francs)	1,716.8 (1,538.4) [718]	3,296.6* (1,957.6) [704]	2,439.1 (1,806.03) [721]	1,372.7 (2,013.4) [712]	-999.0 (2,682.2) [658]
ΔMonthly food expenditures (CFA francs)	916.9 (1,265.7) [717]	1,684.4 (1,658.8) [699]	2,375.4* (1,274.6) [718]	336.1 (1,682.9) [708]	-409.1 (2,156.5) [657]
ΔFood expenditures as % of budget	-0.021 (0.026) [711]	-0.036 (0.031) [694]	-0.002 (0.038) [714]	-0.018 (0.035) [701]	-0.049 (0.045) [653]
ΔCalories (kcal) consumed daily	-9,000.6 (7,605.1) [750]	-1,300 (1,600) [684]	26.1 (368.0) [703]	-1,300.0 (1,200.0) [692]	-362.1 (648.8) [644]
ΔProtein (g) consumed daily	-205.3 (220.8) [694]	-289.1 (297.9) [676]	-2.6 (11.2) [694]	-288.5 (321.8) [684]	-19.3 (18.6) [635]
ΔIron (mg) consumed daily	-57.2 (61.3) [690]	-78.8 (76.7) [674]	-2.8 (2.7) [692]	-79.0 (79.1) [680]	-7.0* (3.9) [635]
ΔZinc (mg) consumed daily	-120.7 (113.5) [682]	-167.8 (166.4) [665]	-5.75 (6.05) [685]	-168.06 (148.8) [672]	-8.7 (9.1) [628]
ΔVitamin A (mcg) consumed daily	153.7 (102.3) [705]	256.4* (148.9) [689]	275.8** (126.67) [704]	20.4 (89.1) [698]	**307.35***** **(114.9)** **[643]**
ΔDietary diversity score	-0.03 (0.247) [806]	0.386 (0.330) [790]	-0.236 (0.413) [810]	-0.171 (0.338) [798]	0.14 (0.466) [744]
ΔHeight (cm)	-2.222 (2.817) [745]	-3.813 (2.798) [669]	-1.302 (3.204) [699]	-0.837 (2.215) [706]	-5.609 (4.450) [725]

Source: Authors.

Notes: GFD = generalized food distribution; SF = school feeding. Bootstrapped standard errors in parentheses. Number of observations in square brackets. All expenses are scaled per adult equivalent. The variables "1 form" and "2 forms" refer to the number of forms of aid received by the household, as indicated by the types of aid variables. Estimations for height restricted to children under 5 years of age at baseline. *p < 0.1, ** p < 0.05,*** p < 0.01. Coefficients that remain statistically significant at the 10% level after adjustment for multiple hypothesis testing are indicated in bold.

TABLE 6.7—ESTIMATIONS OF THE IMPACT OF FOOD ASSISTANCE ON HOUSEHOLD FOOD EXPENDITURES, FOOD CONSUMPTION, AND CHILDREN'S HEIGHT (SAMPLE: VILLAGES INDIRECTLY AFFECTED BY ARMED GROUPS, MALI)

	Any aid	GFD	SF	1 form	2 forms
	(1)	(2)	(3)	(4)	(5)
ΔMonthly expenditures (CFA francs)	1,253.4 (2,733.7) [1,036]	2,762.5 (4,181.1) [1,021]	229.6 (2,528.7) [981]	1,139.75 (3,938.15) [1,032]	3,100.8 (2,361.9) [764]
ΔMonthly food expenditures (CFA francs)	654.5 (2,847.8) [1,036]	1,498.2 (3,872.12) [1,019]	714.8 (2,810.4) [980]	226.9 (3,713.4) [1,032]	2,839.28 (1,767.8) [763]
ΔFood expenditures as % of budget	0.001 (0.024) [1,043]	-0.002 (0.030) [1,028]	0.025 (0.027) [981]	0.009 (0.029) [1,038]	-0.016 (0.039) [770]
ΔCalories (kcal) consumed daily	554.13 (704.6) [1,066]	**1,737.4**** **(699.44)** **[1,050]**	51.17 (800.12) [1,004]	378.5 (848.7) [1,061]	1,572.5* (875.1) [795]
ΔProtein (g) consumed daily	15.1 (25.1) [1,062]	35.9 (32.04) [1,046]	11.86 (27.3) [998]	3.2 (28.09) [1,057]	**72.04***** **(27.5)** **[785]**
ΔIron (mg) consumed daily	6.42 (6.06) [1,064]	11.76* (1.74) [1,049]	3.23 (5.3) [1,003]	4.25 (5.39) [1,059]	**15.76**** **(6.4)** **[791]**
ΔZinc (mg) consumed daily	6.09 (9.2) [1,083]	20.78* (10.74) [1,064]	-3.33 (11.9) [1,014]	4.94 (8.73) [1,077]	12.03* (7.23) [805]
ΔVitamin A (mcg) consumed daily	1.115 (117.93) [1,066]	-184.7 (180.4) [1,049]	240.4** (114. 7) [1,005]	13.35 (158.3) [1,059]	38.0 (196.38) [801]
ΔDietary diversity score	-0.179 (0.230) [1,238]	-0.004 (0.355) [1,218]	-0.326 (0.357) [1,164]	-0.04 (0.28) [1,230]	-0.904* (0.498) [924]
ΔHeight (cm)	2.265 (1.791) [1,002]	3.273 (2.286) [979]	-0.070 (1.842) [965]	0.829 (1.645) [1,006]	7.244*** (2.661) [961]

Source: Authors.

Notes: GFD = generalized food distribution; SF = school feeding. Bootstrapped standard errors in parentheses. Number of observations in square brackets. All expenses are scaled per adult equivalent. The variables "1 form" and "2 forms" refer to the number of forms of aid received by the household, as indicated by the types of aid variables. Estimations for height restricted to children under 5 years of age at baseline. *p < 0.1, ** p < 0.05,*** p < 0.01. Coefficients that remain statistically significant at the 10% level after adjustment for multiple hypothesis testing are indicated in bold.

increase vitamin A availability by 48 percent ($p < 0.05$). Interestingly, the provision of two forms of aid increased the height of children ages two to five years at baseline by approximately 7 centimeters in the intervention households compared to controls, which is equivalent to an increase of about 8 percent from baseline. A marginally significant negative effect of generalized food distribution was found for weight-for-height z-scores in children under five years of age.

In villages with armed groups present (Table 6.7), a significant positive impact was identified on food expenditures in households receiving any aid, generalized food distribution, or one form of aid, with effect sizes of substantively larger magnitude compared to those observed in the full sample. Consumption of zinc was also significantly increased for recipients of any food aid (or one form of aid). No statistically significant results were found for the other outcomes.

Multiple Hypothesis Testing

Each table of results displays 9 food security–related coefficients (and 1 coefficient for nutrition) as well as five treatment variables. Overall, each table shows 45 coefficients for food security (and 5 coefficients for nutrition). In Table 6.5, eight food security coefficients (out of 45) are statistically significant. In Tables 6.6 and 6.7, six and eight food security coefficients are statistically significant, respectively. In Table 6.8, five food security coefficients out of 30 are statistically significant.

Setting the rate of type I error at 5 percent, we would expect to find 1 in 20 coefficients to be statistically

TABLE 6.8—ESTIMATIONS OF THE IMPACT OF FOOD ASSISTANCE ON HOUSEHOLD FOOD EXPENDITURES, FOOD CONSUMPTION, AND CHILDREN'S HEIGHT (FULL SAMPLE, MALI)

	Any aid	GFD	SF	1 form	2 forms
	(1)	(2)	(3)	(4)	(5)
ΔMonthly expenditures (CFA francs)	7,478.9 (4,887.3) [220]	7,191.2 (4,590.3) [216]	. . [43]	5,946.3 (3,742.8) [208]	. . [45]
ΔMonthly food expenditures (CFA francs)	**8,639.6***** **(3,312.7)** **[223]**	**7,907.1**** **(3,616.6)** **[219]**	. . [42]	6,197.5** (3,217.2) [210]	. . [46]
ΔFood expenditures as % of budget	0.022 (0.06) [214]	0.013 (0.073) [211]	. . [41]	0.003 (0.061) [200]	. . [49]
ΔCalories (kcal) consumed daily	2,474.7 (1,848.8) [223]	2,387.5 (1,725.2) [218]	. . [41]	1,758.0 (1,194.2) [209]	. . [46]
ΔProtein (g) consumed daily	135.7 (93.8) [224]	140.3 (97.5) [219]	. . [41]	102.7 (66.65) [209]	. . **[48]**
ΔIron (mg) consumed daily	35.02 (24.86) [223]	35.27 (26.94) [218]	. . [41]	26.05 (17.8) [210]	. . **[47]**
ΔZinc (mg) consumed daily	34.15* (17.9) [223]	32.15 (19.6) [218]	. . [42]	26.71* (13.84) [209]	. . [46]
ΔVitamin A (mcg) consumed daily	522.2 (471.8) [205]	230.5 (311.17) [202]	. . [38]	349.6 (280.9) [194]	. . [44]
ΔDietary diversity score	0.203 (0.621) [242]	0.226 (0.549) [238]	. . [44]	0.122 (0.605) [226]	. . [54]
ΔHeight (cm)	-0.107 (1.444) [1,947]	-0.652 (1.784) [1,953]	0.045 (1.529) [1,960]	-0.305 (1.445) [1,956]	0.818 (3.201) [1,866]

Source: Authors.

Notes: GFD = generalized food distribution; SF = school feeding. Bootstrapped standard errors in parentheses. Number of observations in square brackets. All expenses are scaled per adult equivalent. The variables "1 form" and "2 forms" refer to the number of forms of aid received by the household, as indicated by the types of aid variables. Estimations for height restricted to children under 5 years of age at baseline. *p < 0.1, ** p < 0.05,*** p < 0.01. Coefficients that remain statistically significant at the 10% level after adjustment for multiple hypothesis testing are indicated in bold.

significant even if food assistance had no impact across the board. Thus, we would expect only 2 to 3 coefficients (out of 55) to be statistically significant in each table. The numbers shown above thus suggest that food aid did have a real impact.

Nevertheless, with nine variables, the risk of having at least one false positive among food security variables reaches 37 percent, much higher than the intended 5 percent rate. To deal with this issue, we have adjusted the p-value associated with each food security coefficient, following the procedure proposed by Sankoh, Huque, and Dubey (1997). These adjusted p-values are consistent with a family-wide rate of false positives of 5 percent. As a result of the adjustment, p-values increase, and the lower the mean correlation between a given variable and the other outcomes, the larger the adjustment. If variables are completely unrelated, the Sankoh, Huque, and Dubey (1997) procedure is the same as a Bonferroni adjustment.

In each table, we have indicated in bold which food security coefficients remain statistically significant (at the 10 percent level) after adjusting for multiple hypothesis testing. In Table 6.5, half the variables remain statistically significant. In Tables 6.6, 6.7, and 6.8, the corresponding figures are 17, 38, and 40 percent, respectively.

Discussion

In this mixed-methods study, we examined new survey data to assess the impact of food assistance on food security and nutrition outcomes during conflict in northern Mali. The findings presented in this study highlight several important considerations.

First, the survey data showed that during the five years after the conflict peaked, households experienced continued food insecurity, as evidenced by the modest increases in average expenditures per adult equivalent (less than 1,250 CFA francs over the whole period, corresponding to less than a 1 percent increase) as well as decreases in overall food consumption and micronutrient availability.

Second, the survey data underlined the extent and intensity of conflict exposure in the study population. More than one in five households in our study were exposed to violence linked to the presence of armed groups, including episodes of banditry, terrorist/armed attacks, political violence, kidnappings, and destruction of infrastructure. Of the 68 villages included in the survey, 11 (16 percent) were still experiencing the presence of armed groups at the time of the follow-up survey in January 2017, with most of these villages reporting that the presence of armed groups had persisted following the coup in 2012. Only 3 of the 55 villages that did not have armed groups present at the time of the follow-up survey had experienced their presence previously. These groups were violent and were perceived as threats by the population. The data also indicated that the presence of armed groups overlapped with conflict-related violence, as well as with fear and reduced mobility in the communities, affecting actions such as visits to farms, markets, health centers, and schools. These findings confirm the potential for conflict to affect households' food security and nutrition through a range of direct and indirect channels, as also highlighted by the focus groups and individual interviews. Respondents described how the fleeing of government staff and subsequent closing of health centers had important consequences in terms of the provision of basic health services for pregnant women, infants, and young children. Though coverage of these services was by no means pervasive before the conflict peaked in 2013, the interruptions in the few services that were available at the community level were likely to have directly affected nutrition and health among these vulnerable groups. Moreover, the data also suggested that the resulting limited mobility had indirectly exacerbated the negative effects of conflict on households more broadly, including limiting visits to farms and markets, affecting the food environment and food security in an already highly food-insecure context.

Third, the household and village surveys suggested that humanitarian aid—including food assistance in the form of generalized food distribution, school feeding, and other modalities—had been scaled up in the study areas during the five-year period following the 2012 coup. Of the different forms of food assistance, generalized food distribution was most common, followed by school feeding. Coverage of targeted supplementary feeding, a key intervention to prevent and treat acute malnutrition, was extremely low in the study population. Moreover, the survey data also indicated that access to aid tended to decrease with greater proximity to armed groups, as highlighted by the higher likelihood of conflict-affected households to live in villages without any access to aid, though this relationship was not as marked at the household level. These findings suggest that the logistics of safely scaling up aid in conflict areas may override the necessity to reach the most vulnerable populations. Of particular relevance to this study is the very low coverage of targeted supplementary feeding, thus reducing the likelihood of identifying the possible effects of WFP food assistance on malnutrition in infants and young children.

Fourth, the analysis of treatment effects suggests that the scaling up of food assistance by WFP and development partners in Mali had important positive impacts on the food security of the targeted population. We find evidence of protective effects on household total expenditures and food expenditures as well as on food consumption and on changes in height in children ages two to five years at baseline (but the latter effect is restricted for children living in villages indirectly affected by the conflict). The positive impacts were particularly pronounced in households receiving two forms of food assistance. The effects on food consumption were comparable to those reported in the literature on social assistance in development settings. A recent meta-analysis of social assistance programs including 48 studies of

39 social protection programs found that transfers increase monthly food expenditures by 17 percent on average (Hidrobo et al. 2015), compared to the 25 percent estimate found in our study. The fact that the receipt of food assistance causes food consumption to increase is consistent with an endowment effect when food assistance is inframarginal (that is, the food transfer is less than the value of what the household would have consumed in its absence). If food is a normal good (as it typically is), the food transfer relaxes the budget constraint and leads to greater consumption of both food and other goods (see, for example, Margolies and Hoddinott 2014).

The analysis of the nutrition status of young children was hampered by the well-documented issue relating to the recording of dates of birth in areas of low parental education like Mali (Oshaug et al. 1994; Grellety and Golden 2016; Larsen, Headey, and Masters 2017). This recording error is of concern when calculating height-for-age indicators for young children. To minimize the bias from recording error, in this report we limited the scope of the analysis of anthropometric data to changes in height within the youngest cohort in our study population as well as in weight for height in repeated cross-sections for children ages two to five years. The analysis of the panel data identified a large protective effect of aid on the height of children in the cohort ages two to five at baseline (of the order of 0.5 standard deviations), where armed groups were present near the targeted communities, though not present in the communities themselves. The effect was concentrated on households receiving at least two forms of aid (usually generalized food distribution with school feeding). In the repeated cross-sectional study in children ages two to five years, we found evidence of a marginally significant negative impact on weight for height and no effect on acute malnutrition. However, this finding should be interpreted with caution, as the age distributions in the two cross-sections were substantially different, thus making meaningful comparisons difficult across the two points in time. Sensitivity analysis, including outcomes from the single cross-section at follow-up (using propensity score matching but not difference-in-differences), found no evidence of impacts on anthropometry. Further sensitivity analysis focusing on the recording of dates of birth is currently under way to allow for a more detailed assessment of child nutrition in the study population.

Limitations

The study was limited by several important considerations. First, as the allocation of treatment was not random, there is a high risk of selection bias related to any unobserved characteristics that are correlated to both selection into food assistance and the study outcomes. The panel structure of the dataset (and a precrisis baseline) allowed for risk mitigation by estimating the impact of emergency food assistance with a matched difference-in-difference approach. This removed selection bias stemming from unobserved time-invariant (but not time-varying) differences between the treatment and comparison groups.

Second, we had to deal with nonrandom attrition. Some baseline characteristics were significantly different between households that were lost to follow-up and those we were able to trace and reinterview. We introduced these variables in the estimation of the propensity scores to mitigate the threat to internal validity. However, the fact that 4 out of 70 villages were entirely lost to follow-up due to safety concerns means that we were not able to draw inferences from the most severely conflict-affected areas.

A third limitation stems from the sample size, which is quite small due to a combination of the attrition rate and missing observations for key variables of interest (or control variables). This contributes to reducing the scope of the study and limits our ability to conduct subgroup analyses (focusing our analysis on types of aid or types of contexts). In particular, the subsample of households directly affected by conflict is quite small, so results for this group should be interpreted with caution. However, we still had enough observations to meaningfully compare the effect of aid across aid modalities for the general population as well as to compare the effect of aid in non-conflict-affected versus indirectly affected areas.

A fourth, more general, limitation is simply due to the challenge of conducting household surveys in a context such as Mali. The ongoing conflict situation has restricted our ability to travel to all survey sites and has put a strain on the data collection team. For security reasons, the teams could not travel at night and thus had to complete the interviews in a short span of time. We believe that the relatively high rate of missing observations is mostly due to this constraint, as enumerators could not afford to wait for additional respondents to return home and undertake lengthy interviews.

Conclusions and Highlights for Policy Makers

In settings characterized by chronic food insecurity and conflict, food transfers may have a protective effect on the food security and nutrition of vulnerable populations. Furthermore, there is emerging evidence that in these particular contexts, providing two forms of food assistance may be more effective than one form of transfer alone.

The findings on changes in linear growth in children ages two to five at baseline in populations indirectly affected by conflict suggest that, in these contexts, food assistance may also provide a platform to improve children's growth outside the priority age group for nutrition interventions during the first thousand days. These findings will require further detailed investigation.

Considering that coverage of targeted supplementary feeding was extremely low (around 2 percent) in the study population, the null results on moderate acute malnutrition in the repeated cross-sections and single cross-section at follow-up are not surprising. This finding is consistent with the literature on social transfers, indicating that the provision of household food transfers, or generalized food distribution alone without specific complementary foods targeting young children, generally does not result in improvements in the nutrition outcomes of young children.

Evidence from this study suggests that there is scope to improve the design and scale-up of food assistance to improve nutrition outcomes during conflict. Increasing the coverage of nutrition-specific interventions during conflict, including the provision of specialized complementary foods for supplementary feeding, appears to be a critical gap. This coverage gap may also be due to the need to have elements of the health system working at the community level to ensure adequate service provision. As health systems are often targeted by conflict actors, this may pose a critical constraint on operations in conflict settings. The findings suggest that in terms of intervention design, systematically bundling different forms of food assistance alongside generalized food distribution may be an effective strategy to support vulnerable populations during conflict. This is likely to be particularly important in terms of inclusion of nutrition-specific interventions that are essential to support nutrition for vulnerable groups (see point above).

Providing evidence on how to optimize the cost-effectiveness of food assistance packages is an important area for further research. The evidence presented in this chapter highlights some of the critical trade-offs that humanitarian operations face in conflict-affected settings, involving on the one hand program scale and cost-effectiveness, and on the other the practicalities of operating in areas under the control of armed groups, including issues relating to security, governance, and transparency. There is clearly no silver bullet in terms of addressing these trade-offs during operations. Understanding the political economy of food assistance in these contexts is a critical starting point to improve the effectiveness of operations.