Household Economic and Food Security after the 2010 Pakistan Floods

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Household economic and food security after the 2010 Pakistan floods

Shannon Doocy, Eva Leidman, Tricia Aung, and Thomas Kirsch

Abstract

Background. *The 2010 floods inundated one-fifth of Pakistan and affected more than 20 million people.*

Objective. *To characterize the impact of the floods and subsequent humanitarian response on household economy and food security.*

Methods. *A cross-sectional 80 × 20 cluster survey (n = 1,569 households) was conducted using probability proportional to size sampling in the four most flood-affected provinces 6 months after the floods. Analysis included both descriptive statistics and regression models, with receipt of food aid (in the first month), dietary quality, and household income at 6 months postflood as outcomes.*

Results. *Need for food aid was nearly ubiquitous (98.9%); however, only half of the study population ever received food aid. Displacement was not a significant predictor of food aid receipt (OR, 1.28; 95% CI, 0.83 to 1.98); however urban location (OR, 2.78; 95% CI, 2.00 to 3.86) and damage to the home (OR, 2.73; 95% CI, 1.34 to 5.60) were significantly associated. Some of the hardest-hit groups, including both farmers and day laborers, were significantly less likely to receive food aid (p < .05). Additionally, receipt of food aid was not neces-sarily associated with improved household economy or food security; although households in internally displaced people (IDP) camps were more likely to receive food aid (OR, 2.78; 95% CI, 2.00 to 3.86), they were less likely to report same or improved dietary quality (OR, 0.63; 95% CI, 0.46 to 0.88) or income status (OR, 0.55; 95% CI, 0.35 to 0.86).*

Conclusions. *Food aid coverage following the 2010 floods was relatively low, and many of the most affected populations were less likely to receive aid, suggesting that targeting should be improved in future responses.*

Key words: Disaster, economic recovery, floods, food aid, food security, livelihoods, Pakistan

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Introduction

The 2010 floods in Pakistan were among the largest disasters in recent history, inundating one-fifth of the country and affecting nearly 20 million Pakistanis [1]. Despite the extent of flooding, there were relatively few deaths and injuries, which were estimated at 1,980 and 2,946, respectively [2]. Perhaps the most significant impact of the floods was economic and infrastructure damage; 1.9 million homes were either damaged or destroyed, and the agricultural and livestock industries were devastated, with the total cost of property, crop, and infrastructure damage estimated at US$9.7 billion [3]. The World Food Programme (WFP) estimated that 10.1 million people needed immediate food assistance, 7.8 million were vulnerable to lasting food insecurity, and 3.6 million would require longer-term food assistance via recovery and rehabilitation programs [4].

Small farmers, unskilled laborers, and populations that were already vulnerable, including those living at or below the national poverty line, were the most severely affected. An estimated 60% lost their primary livelihood and experienced decreases in income of 50% or more [4]. Rising food prices in flood-affected areas exacerbated the situation. To mitigate the impact of the floods on food security, the international community donated over 725,000 metric tons of emergency food aid, which accounted for 19% of global emergency food aid in 2010 [5]. Ensuring access to food is a main component of humanitarian response following disas-ters, especially in cases like Pakistan, where addressing basic survival needs was a major concern in the early

stages of the response. Increases in the prevalence of acute malnutrition were observed in severely affected areas, and longer-term disruptions in the national food supply were also a concern, with the inundation of 17 million acres of cropland and the prospect of food shortages in 2011 if farmers missed the fall planting season [6].

Although the absolute volume and financial commitment has declined, food aid remains the largest single category of humanitarian aid, accounting for more than half of the UN Consolidated Appeals [7]. In 2010, 5.7 million metric tons of food aid were provided globally, and 73% of this was for humanitarian emergencies [8]. Yet despite the widespread use of food aid in emergency contexts, evaluations and studies of food assistance consistently note a lack of documented impact [9]. Poor postdistribution monitoring of nutritional and livelihood impact has been noted in contexts globally, as well as by the WFP's executive board [10, 11]. Moreover, the impact of food aid from the perspective of beneficiaries, a seemingly instrumental component of a comprehensive evaluation, is often lacking, in large part due to the methodological and logistical constraints posed by emergency contexts. Given the scope of food aid, understanding the relationship between food aid distribution, long-term food security, and household economic recovery is instrumental to insuring the effectiveness of humanitarian responses. To systematically assess flood impact and food assistance receipt from the perspective of the affected population, we conducted a survey in January and February 2011, 6 months after the Pakistan floods began.

Methods

Study area and population

A cross-sectional cluster survey of households affected by the 2010 floods in Pakistan was conducted in January and February 2011. A total of 78 districts in the provinces of Balochistan, Khyber Pakhtunkhwa, Punjab, and Sindh were classified as flood affected, including 29 that were severely flood affected [12, 13]. The survey encompassed the 29 severely affected districts (**fig. 1**).

Sample size and sampling

Sample size was calculated based on the objectives of characterizing population perspectives on quality of the humanitarian response. The sample allowed for a detection of a 6.25% or greater difference in prevalence rates of key characteristics (based on the most conservative prevalence rate of 50%) after incorporating for a design effect of 1.5 for the cluster sample design. A 80 × 20 cluster survey design ($n = 1,600$)

with probability proportional to size sampling was used. The number of clusters assigned to each province was identified based on the proportion of the affected population in the province, resulting in 33 clusters in Sindh, 27 in Punjab, 17 in Khyber Pakhtunkhwa, and 3 in Balochistan. Clusters were assigned at the district level, using a similar probability proportional to size process.

Randomly identified Global Positioning System (GPS) coordinates were selected from within each district to identify the starting location of each cluster. Three starting points were inaccessible due to security concerns or snow-blocked roads, which resulted in the use of alternative starting points within the same district. The dwelling closest to the randomly selected GPS coordinate was identified as the first household within a cluster. In rural areas with large distances between residences, the next nearest house was chosen until all 20 cluster households had been surveyed. In urban and camp settings with dense populations, every fifth shelter was sampled.

FIG. 1. Map of the survey area and the most flood-affected districts

Data collection and variables

Interviewers were recruited from each province based on language skills and prior public health and/or survey experience and were trained prior to survey implementation. A household was defined as a group of people living in the same living quarters and sharing meals, regardless of biological relation. Households were eligible for the survey if they had been affected by the flood through economic, health, or physical damage and if an adult member (> 18 years of age) was present. If a household was not eligible, the selected residence was unoccupied, or household members did not agree to participate, the next closest household was approached.

Food security was assessed by reported change in dietary quality (same or better vs. worse), and reported change in income (same or better vs. worse) was used as a measure of economic security. Dietary quality and household income were self-reported comparisons of status during the month immediately before the flood and during the month of the assessment. Receipt of food aid referred to assistance within the first month postflood and included both donations or distributions and food distributed through Food for Work programs.

Statistical analysis

Data entry was done in Microsoft Access, and analyses were conducted with Stata 11 software. Descriptive statistics and summary measures were calculated, and comparisons were drawn using standard statistical significance tests, including chi-square and t-tests. Analysis was conducted on STATA using descriptive statistics, comparisons by standard tests for statistical significance based on proportions. Current food quality was compared with food quality before the floods using a Likert scale and assessed with respect to receipt of food aid at the time of the survey, location, living conditions, and measures of household economy.

Logistic regression was used to test the univariate and multivariate associations between covariates with receipt of food aid, change in dietary quality, and change in income. Models controlled for demographic characteristics (preflood location, household size, gender of household head, age of household head, education of household head, income, and primary income source), flood impact on the household (home damage, displacement, and flood-related injuries and deaths), and humanitarian assistance (camp residence, participation in cash for work programs, and receipt of humanitarian aid). Humanitarian aid was defined as receipt of any of the following within the first month after the flood: shelter, drinking water, other water, household items, hygiene items, or healthcare. Model covariates were selected based on significance in simple regression models, with consideration to those traditionally controlled for in the disaster literature.

The Johns Hopkins School of Public Health Institutional Review Board and the Pakistan Ministry of Health approved the survey.

Results

Household demographics and flood impacts

The final sample included 1,569 households composed of 12,779 individuals. Forty-three households refused to participate, primarily because the male head of household was not present in the home at the time of the interview request. The survey population was predominantly rural (85.6%), with an average household size of 8.0 members. Consistent with the demographic profile of Pakistan, the population was young, with children residing in 92.9% of households. The majority (96.7%) of households were headed by males with low educational attainment: 20.1% and 16.0% of household heads had completed primary and secondary school, respectively, with the majority (64.0%) reporting no formal education or incomplete primary schooling. Overall, 95.1% of households reported damage to their homes, including 82.2% that suffered significant or irreparable damage. Displacement was widespread, with 85.3% of households being displaced for 2 weeks or longer and 38.9% having resided in an internally displaced people (IDP) camp.

Household economy

Lost income or negatively affected livelihoods were nearly ubiquitous and were reported by 95.4% of households. The primary income sources of the population were farming (39.9%), wage or day labor (34.1%), salaried work (11.8%), and small businesses (8.9%). The majority (59.0%) reported having only one income source, although some reported animal husbandry (16.7%), farming (16.4%), and other (16.3%) additional sources of income. The postflood decline in income was widespread, with the proportion of households earning less than US$100/month (5,000 Rs/month) tripling from 24.6% to 74.1% after the floods. The distribution of household incomes is illustrated in **figure 2**. Urban households had significantly higher incomes both pre- and postflood ($p < .05$ for both comparisons) and were significantly less likely to report that their income had been negatively affected by the floods ($p < .01$). Overall, 86.6% of households perceived their postflood income as worse, while 12.3% reported no change and 1.1% reported an increase. The primary reasons for declines in income were crop (61.6%) and animal (33.4%) losses. A variety of financial coping mechanisms were used, including spending savings (57.8%), borrowing (65.8%), and asset sales (55.8%). Some households (18.1%) reported engaging in new
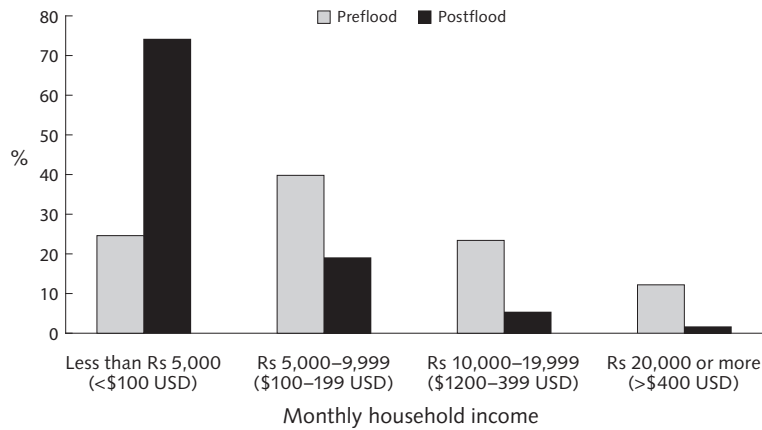
FIG. 2. Change in household income distribution before and after floods

types of income generation activities, and 5.4% had participated in cash for work programs, although the proportion involved in cash for work at 6 months postflood had declined to 1.5%. Despite widespread humanitarian assistance and use of financial coping strategies, the majority of households (64.2%) reported being unable to meet essential needs 6 months after the floods began. Optimism for livelihood recovery was tempered, with only 1.5% reporting that their livelihood and income generation had returned to normal, and 19.0% anticipating full recovery within a year.

Receipt of food aid

Approximately half of the survey population reported receiving food aid during the 3-month period following the floods, and this proportion declined to approximately one-third by 6 months (**fig. 3**). Only around a third of food aid recipients perceived food aid to be adequate in the initial 3 months after the floods

FIG. 3. Postflood food aid receipt by time period

(**table 1**). A smaller proportion of urban households than rural households reported receiving food aid. Among those reporting food assistance, urban households were significantly more likely to perceive food aid as adequate, even though it accounted for a smaller portion of the household diet than in rural households.

Household food security

Despite widespread food distribution efforts, the need for food aid was nearly universal, with 95.5% of households reporting a need for food aid 6 months after the onset of the floods. At this time, 64.2% of households reported an inability to meet essential household needs, suggesting that a critical need for humanitarian assistance persisted well after the floods. Although decreases in the use of diet-related coping mechanisms were observed over the postflood period, the prevalence of these behaviors remained high. At the time of the survey, 54.1% of households reported reducing portion sizes, 45.9% indicated that adults consumed less to allow children enough to eat, and 24.6% were consuming seed stock. Overall, 6.8% of households consumed one or fewer meals per day, and consumption of animal protein and dairy was low, averaging 0.6 and 1.5 days per week, respectively; dietary diversity appeared to be better in urban than rural areas (**table 1**). Access to food and dietary quality were reportedly worse than before the floods in 69.4% and 74.5% of households, respectively.

Regression models

Logistic regression models were fitted to assess factors associated with postflood dietary and economic security 6 months after the floods began (**table 2**). With respect to the severity of flood impact, damage to the home was associated with increased odds of receiving food aid (OR, 2.73; 95% CI, 1.34 to 5.60) but not with food or economic security. Flood-related injury or
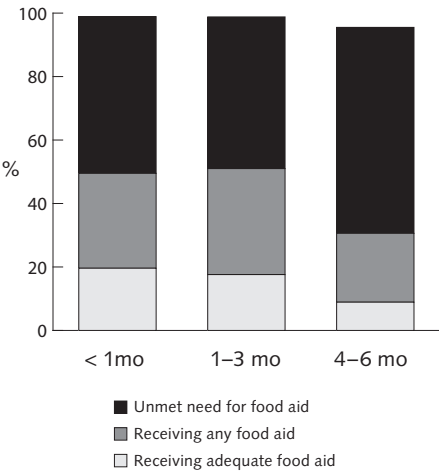
TABLE 1. Food aid receipt and household diet according to urban or rural residence

Food aid or diet	Urban (n = 226)	Rural (n = 1,343)	p
Food aid receipt by time period (1st 6 mo)			
In need of food aid			
< 1 mo after floods began	98.6%	99.0%	.68
1–3 mo after floods began	97.3%	99.0%	.03
4–6 mo after floods began	90.9%	96.3%	<.01
Receiving food aid perceived as adequate			
< 1 mo after floods began	30.5%	17.8%	< .01
1–3 mo after floods began	32.4%	15.1%	< .01
4–6 mo after floods began	13.7%	8.1%	< .01
Receiving food aid perceived as inadequate			
< 1 mo after floods began	30.0%	31.7%	< .01
1–3 mo after floods began	23.7%	34.9%	< .01
4–6 mo after floods began	15.5%	22.7%	< .01
Not receiving any food aid (of those in need of aid)			
< 1 mo after floods began	38.7%	50.0%	< .01
1–3 mo after floods began	42.3%	49.5%	.05
4–6 mo after floods began	67.8%	68.0%	.97
Food aid receipt at 6 mo postflood			
Currently receiving food aid	29.1%	28.1%	.76
Proportion of household diet provided by food aid (among food aid recipients only)			
Almost all (76%–100%)	4.8%	8.2%	
More than half (50%–75%)	19.4%	32.4%	
Less than half (25%–49%)	43.6%	16.9%	< .01
Little (1%–25%)	25.8%	34.4%	
None	6.5%	8.2%	
Food aid sales within the past month	9.1%	7.6%	.92
Household diet at 6 mo postflood			
Meals consumed/day in the past week			
Mean	2.5	2.2	< .01
Proportion consuming ≤ 1 meal/day	4.4%	7.2%	.13
Animal protein consumption (mean no. of days in the past week)	0.8	0.5	< .01
Dairy or egg consumption (mean no. of days in the past week)	1.9	1.4	< .01
Fresh fruit and vegetable consumption (mean no. of days in the past week)	4.7	4.3	.04

death in a household was not significantly associated with any of the outcome measures. The most consistent finding among measures of flood impact was that displacement was associated with decreased odds of better or same dietary quality (OR, 0.42; 95% CI, 0.29 to 0.62) and income status (OR, 0.35; 95% CI, 0.23 to 0.54)

Several preflood household characteristics were significantly associated with economic and food security at 6 months postflood. The multivariable analysis suggests that urban households were more likely to report same or better dietary quality (OR, 2.76; 95% CI, 1.93 to 3.95). Compared with salaried workers, farmers were less likely to have maintained or improved their dietary quality (OR, 0.28; 95% CI, 0.18 to 0.44) or income status (OR, 0.09; 95% CI, 0.05 to 0.15); day laborers were similarly disadvantaged (dietary quality: OR, 0.36; 95% CI, 0.25 to 0.52; income status: OR, 0.17; 95% CI, 0.10 to 0.28). Both groups were also significantly less likely to receive food aid (p < .05). Variables such as household size and gender of head of household that are often used for food targeting were not significantly associated with receipt of food aid or economic recovery.

TABLE 2. Logistic regression model of factors affecting economic and food security

Factor	Received food aid (1st mo)[a] OR (95% CI)		Similar or improved dietary quality[b] OR (95% CI)		Similar or improved income[c] OR (95% CI)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Prefloodhousehold characteristics						
Urban household	1.58 (1.18–2.12)	2.04 (1.31–3.18)	3.10 (2.31–4.16)	2.76 (1.93–3.95)	2.66 (1.88–3.75)	1.84 (1.20–2.80)
Large household size (> 10)	0.86 (0.69–1.13)	—	1.11 (0.84–1.47)	—	1.11 (0.84–1.47)	—
Female-headed household	1.69 (0.94–3.04)	—	2.59 (1.47–4.57)	2.22 (1.11–4.45)	1.66 (0.82–3.38)	—
Age of household head (per 10 yr)	1.03 (1.00–1.01)	—	1.01 (1.00–1.02)	—	0.99 (0.99–1.01)	—
Education of household head						
None	0.94 (0.68–1.30)	—	0.55 (0.41–0.73)	0.91 (0.63–1.30)	0.41 (0.29–0.58)	0.66 (0.43–1.01)
Primary	0.91 (0.70–1.18)	—	0.68 (0.48–0.96)	0.98 (0.64–1.49)	0.58 (0.38–0.88)	0.80 (0.48–1.33)
Secondary or beyond	Reference	Reference	Reference	Reference	Reference	Reference
Income category						
≤ Rs 5,000	0.43 (0.30–0.62)	0.77 (0.45–1.32)	1.09 (0.75–1.59)	1.01 (0.62–1.64)	0.41 (0.24–0.69)	3.48 (1.82–6.69)
Rs 5,000–9,999	0.53 (0.37–0.75)	0.68 (0.42–1.10)	0.58 (0.42–0.81)	0.58 (0.37–0.90)	0.31 (0.20–0.49)	1.19 (0.63–2.22)
Rs 10,000–19,999	0.45 (0.31–0.65)	0.77 (0.46–1.28)	0.63 (0.47–0.85)	0.54 (0.33–0.86)	0.45 (0.32–0.64)	0.73 (0.37–1.46)
Rs 20,000+	Reference	Reference	Reference	Reference	Reference	Reference
Primary income source						
Other	0.81 (0.46–1.42)	0.60 (0.30–1.28)	0.67 (0.39–1.67)	0.61 (0.32–1.16)	0.66 (0.36–1.19)	0.53 (0.27–1.05)
Farming	0.59 (0.41–1.42)	0.59 (0.36–0.98)	0.25 (0.17–0.35)	0.28 (0.18–0.44)	0.09 (0.52–0.14)	0.09 (0.05–0.15)
Wage or day labor	0.47 (0.33–0.68)	0.41 (0.24–0.68)	0.36 (0.25–0.52)	0.33 (0.21–0.52)	0.28 (0.19–0.42)	0.17 (0.10–0.28)
Small business	0.62 (0.38–1.00)	0.34 (0.18–0.64)	0.74 (0.67–1.19)	0.63 (0.37–1.09)	0.38 (0.22–0.66)	0.28 (0.15–0.53)
Salaried work	Reference	Reference	Reference	Reference	Reference	Reference
> 1 household income source	1.34 (1.09–1.65)	1.24 (0.92–1.68)	1.56 (1.23–1.97)	1.32 (1.00–1.76)	1.08 (0.80–1.47)	—
Flood impact on household						
Damage to home	3.78 (2.19–6.58)	2.73 (1.34–5.60)	0.48 (0.30–0.76)	0.71 (0.40–1.27)	0.52 (0.29–0.90)	1.09 (0.56–2.13)
Displaced > 2 wk	2.38 (1.76–3.22)	1.28 (0.83–1.98)	0.41 (0.30–0.54)	0.42 (0.29–0.62)	0.31 (0.22–0.43)	0.35 (0.23–0.54)
Death or injury	1.02 (0.70–1.48)	—	0.78 (0.50–1.23)	—	0.83 (0.47–1.49)	—
Humanitarian assistance						
Ever resided in a camp	2.94 (2.34–3.68)	2.78 (2.00–3.86)	0.59 (0.46–0.77)	0.63 (0.46–0.88)	0.39 (0.26–0.56)	0.55 (0.35–0.86)
Ever participated in CFW	2.20 (1.36–3.56)	1.36 (0.76–2.44)	2.07 (1.13–3.27)	1.47 (1.08–2.51)	1.13 (0.61–2.14)	1.08 (0.53–2.21)
Currently receiving food aid	N/A	—	1.40 (1.09–1.80)	1.48 (1.10–2.01)	0.90 (0.65–1.27)	1.11 (0.77–1.59)
Humanitarian assistance (nonfood)	32.22 (22.53–46.09)	28.19 (18.72–42.44)	1.98 (1.52–2.58)	1.91 (1.37–2.66)	1.32 (0.96–1.82)	1.30 (0.87–1.95)

CFW, cash for work; N/A, not available

a. Receipt of food assistance during the first month postflood; Hosmer–Lemeshow goodness of fit test, $p = .66$.
b. Similar or improved dietary quality at 6 months postflood compared with decreased dietary quality; Hosmer–Lemeshow goodness of fit test, $p = .38$.
c. Similar or improved income at 6 months postflood compared with decreased income; Hosmer–Lemeshow goodness of fit test, $p = .34$.

With respect to residence location, the 38.9% of households in IDP camps were more likely to receive food aid (OR, 2.78; 95% CI, 2.00 to 3.86) but less likely to report same or improved dietary quality (OR, 0.63; 95% CI, 0.46 to 0.88) or income status (OR, 0.55; 95% CI, 0.35 to 0.86) as compared with households that were not displaced into camps. After controlling for demographic and flood impact variables, receipt of food aid significantly improved the likelihood of reporting improved food security (OR, 1.48; 95% CI, 1.10 to 2.01). Receipt of food aid was not significantly associated with economic security. Similarly, participation in cash for work programs had no significant impact on either food or economic security.

Humanitarian assistance priorities

When asked about top household priorities for humanitarian assistance, shelter was the top priority for the majority (51.6%) of respondents, followed by food aid (29.9%), loans or capital for rebuilding livelihoods (27.7%), employment (23.5%), health (17.1%), water and sanitation (8.4%), and education (8.0%). Rural respondents were significantly more likely to prioritize shelter as a need (54.1% in rural areas vs. 36.8% in urban areas), whereas urban populations were significantly more likely to identify employment (36.8% in urban areas vs. 21.4% in rural areas) and health (27.3% in urban areas vs. 15.5% in rural areas) as priorities. Food was similarly prioritized in rural and urban areas; among households that prioritized food as a top need, 17.0% were receiving food aid at the time of the assessment, as compared with 32.7% of those that did not prioritize food.

Discussion

The 2010 floods in Pakistan have been called the greatest humanitarian crisis in recent history by the United Nations, with more people affected than were affected by the South-East Asian tsunami and the 2010 earthquake in Haiti combined [14]. Findings from this study suggest that although food aid reached half of the affected population, food insecurity was nearly ubiquitous. Distributions were scaled back within the first 6 months, despite persistent and widespread needs. With respect to agricultural impact, destruction of crops, seeds, and transportation infrastructure, and damage to fertile fields resulted in widespread household food insecurity in the affected areas. However, at a national level, staple grain prices did not increase, suggesting that good harvests before the floods, use of national food stocks, and imports stabilized grain prices and limited the impact of the floods on markets in the 6 months following the onset of the floods [15].

The challenges of targeting food aid are reflected in the observations of this study. The actual distribution of food aid was not aligned with common targeting practices in complex emergencies [16]. Vulnerability criteria, such as household size, gender of household head, and displacement, were not significant predictors of food aid receipt. Households particularly susceptible to food insecurity, including those reliant on farming as their primary income source, were statistically less likely to receive food aid. Despite the fact the majority of the flood-affected households were in rural farming communities, urban populations were significantly more likely to receive food aid. Displaced rural households that were not in IDP camps were among the most vulnerable demographic, yet were significantly less likely to be food aid recipients.

After controlling for many key vulnerability criteria, urban households (OR, 2.78; 95% CI, 2.00 to 3.86) and households residing in an IDP camp (OR, 2.04; 95% CI, 1.31 to 3.18) were significantly more likely to benefit from food aid. This finding may suggest that geographic targeting and allocations are made to different areas, based on aggregate needs and logistical considerations. The concentration of flood-affected households in urban centers and IDP camps makes it easier to distribute rations quickly and to large numbers of food-insecure households. Distribution to rural households scattered over a widespread geographic area requires different strategies and supply chains and is significantly more costly; adapting targeting strategies to ensure adequate coverage of rural populations should be prioritized in future emergencies.

Distribution patterns may also reflect an assumption that affected populations are primarily displaced to IDP camps. The findings of this report suggest that more than half of assessed households displaced by the floods (61.1%) were displaced to the homes of friends and family, not IDP camps. Those displaced into camps and those displaced to the homes of friends or family differed significantly with respect to location of origin (urban vs. rural), household size, education and gender of head of household, and income distribution ($p > .05$ for all comparisons). Households displaced for more than 2 weeks and those displaced into camps were more vulnerable than noncamp populations at 6 months postflood with respect to both dietary quality and household income. These findings parallel outcomes of the 2004 Asian tsunami, where displacement was shown to negatively impact livelihoods in both Sri Lanka and Indonesia, and in an assessment following the 2010 Haiti earthquake [14, 16, 17]. That camp populations have poorer food security is noteworthy, as it may be indicative of poor food aid targeting, a common criticism of the Pakistan response, which has been attributed to inadequate monitoring [18, 19]. More broadly, decreased economic security is consistent with theoretical arguments that suggest that restricted movement negatively affects livelihoods and

that resettlement within communities may be disruptive and provide more livelihood opportunities than relocation to camps [16]. Extending household access to credit and cash transfers and relief programs that aim to restore small and medium-size businesses can facilitate local economic recovery by enabling workers to remain economically active and by sustaining demand for goods and services [20].

Limitations

Cross-sectional cluster surveys are commonly used in emergency settings because of the absence of a nominal list of affected individuals from which to sample, but they have important limitations. Our survey did not include households in which all members died or those that were inaccessible because of security concerns or impassable roads. Since food distributions are often tied to family size and need, we cannot exclude the possibility that respondents exaggerated the size of their household or the severity of their need. Similarly, self-reporting of the receipt of aid also has limitations. Respondents may have felt that falsely reporting that aid had not been received would lead to further assistance. Another important limitation relates to the difficulties of collecting income data in a predominantly rural economy with large seasonal fluctuations in earnings. Incomes were reported by range rather than exact values to reduce calculation and recall errors, but it is possible that the observed changes in income were due to seasonal differences in addition to the impacts of the floods and displacement. Given the long time period

under study, there may have been recall bias in reports of preflood behaviors or assistance received during the first month; detailed questions on ration composition were not asked for this reason but would have been useful in gaining a more in-depth understanding of food aid receipt, targeting, and unmet needs of the population.

Conclusions

The findings of this research further contribute to the unresolved discussion concerning the effectiveness of food-based interventions to promote food security and poverty alleviation. Existing literature and independent reviews have documented impact ranging from "guardedly positive to cautiously negative" [21]. In terms of maintaining or improving nutritional status, a recent literature review suggested that in a majority of cases food aid proved successful [22]. The findings from this survey concur. Households that received food-based support were significantly more likely to report same or better dietary quality (OR, 1.48; 95% CI, 1.10 to 2.01) after demographics and flood impact had been controlled for. Although food aid was effective in reducing food insecurity, the data suggested no significant impact of food aid on household economic security at 6 months postflood. The findings of this study suggest that although food aid meets basic needs, it does not contribute to medium-term improvements in household economic recovery, and that the need for scalable economic and livelihood interventions in large-scale emergencies persists.

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