WFP EVALUATION

Impact evaluation of Anticipatory Action in Nepal

Impact evaluation report

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Executive summary

Climate change has led to an increase in the frequency and intensity of extreme weather events. Over the last two decades, floods have negatively affected a minimum of 1.65 billion people globally, marking a 20–24 percent surge compared with earlier decades.[1,2] These shocks disproportionately affect poorer households.[3,4] As they struggle to cope, affected households often resort to negative coping strategies by reducing or foregoing food consumption, taking children out of school, selling productive assets and acquiring high-interest loans.[5]

Anticipatory action (AA) – sometimes referred to as forecast-based financing (FbF) – uses credible forecasts to trigger the delivery of assistance to vulnerable households ahead of shock peaks. AA is an innovative approach to humanitarian assistance that may mitigate the negative impacts of severe climate shocks. WFP started its AA work in 2015 and gradually scaled up its operations to cover 3.2 million people across 28 countries in 2022.[6]

Despite its growing use, there are still evidence gaps related to the causal impacts of AA. Generating more robust evidence on AA is crucial for understanding any trade-offs between the speed of assistance and the precision of targeting; acting early may not reach the most affected if forecasts are inaccurate. To navigate these trade-offs, judge the cost-effectiveness of AA and further improve humanitarian actions, rigorous evidence is needed on which outcomes are affected, specifically when shock response is delivered as quickly as possible, and how these impacts compare with other standard post-shock responses. The key objective of this impact evaluation in Nepal was to produce rigorous evidence to understand the impact of initiating anticipatory humanitarian assistance around a severe flooding event on food security, coping, psychological well-being, and livelihood outcomes. The impact evaluation was designed as a cluster randomized controlled trial (RCT), comparing recipients of AA cash transfers with a group receiving regular post-shock cash assistance.

During the 2022 monsoon season, WFP Nepal was prepared to support 12,500 vulnerable households (selected based on a prior vulnerability assessment) in response to potential severe flooding across the Karnali basin (Kailali and Bardiya districts), near the border with India. The support consisted of early-warning messages and unconditional one-off cash-in-hand transfers. The response was coordinated by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and funded by the United Nations Central Emergency Response Fund (UN CERF).

The main evaluation question (EQ) was:

- EQ1. What is the impact of providing anticipatory humanitarian assistance in the form of an unconditional cash transfer made on the basis of pre-defined forecast triggers, on households' food security, coping strategies, and mental health and well-being?

Additionally, the impact evaluation posed the following secondary question:

- EQ2. What is the impact of providing anticipatory humanitarian assistance in the form of an unconditional cash transfer on agricultural outcomes, livelihood, migration, and other financial outcomes during the months of recovery after the flood?

[1] Browder, G., et al. 2021. *An EPIC Response: Innovative Governance for Flood and Drought Risk Management*.
[2] Tellman, B., et al. 2021. Satellite Imaging Reveals Increased Proportion of Population Exposed to Floods. *Nature* 596: 80–86.
[3] Bangalore, M., et al . 2016. *Shock Waves: Managing the Impacts of Climate Change on Poverty*.
[4] Dercon, S. 2002. Income Risk, Coping Strategies, and Safety Nets. *World Bank Research Observer* 17(2).
[5] Skoufias, E. 2005. *PROGRESA and Its Impacts on the Welfare of Rural Households in Mexico*. Research Report 139.
[6] WFP. 2023. Scaling up Anticipatory Actions for Food Security. Anticipatory Action Year in Focus 2022..

The impact evaluation used a clustered RCT design, where 140 medium-sized settlements were identified and then randomly allocated to one of two intervention groups:[7]

I. **Group A, AA group (70 villages):** receiving support within the framework of forecast-based AA and as early as possible.

II. **Group B, regular "post-shock" group (70 villages):** receiving support in accordance with regular WFP procedures, within around one to two months of the flood peak.

The transfer values for both groups were the same, valued at NRS 15,000 (approximately USD 117), and they were issued once via remittance agents.

Due to political instability, 2 out of 140 villages in the sample had to be dropped after the randomization, rendering the total sample to 138 villages, with 68 villages in the AA group and 70 in the post-shock group.

Forecast triggers reached activation in early October 2022, and the transfers for the AA group were initiated immediately. Cash transfers were initiated as quickly as possible. The first households received transfers within two days of the flood peak, the majority within a week, and more than 90 percent within two weeks. The post-shock group received their transfer in late November 2022, approximately six weeks after the flood peak.

To understand the relative impacts of the AA response (AA group) compared with the traditional post-flood assistance (post-shock group), impact evaluation data were collected in three rounds:

- **First round:** in November 2022, approximately four weeks after the transfers to the AA group.
- **Second round:** in January 2023, approximately six weeks after transfers to the post-shock group.
- **Third round:** in May and June 2023, approximately four months after transfers to the post-shock group to account for post-harvest effects (after the 2023 winter–spring harvest season).

In addition to quantitative data collection, the impact evaluation also employed qualitative methods – in the form of focus group discussions (FGDs).

The results for this study suggest there is a benefit to delivering anticipatory cash transfers. Households receiving transfers in the immediate aftermath of the flood consumed more food (especially animal proteins), avoided food insecurity and showed better mental health. For example, the food consumption score (FCS, an indicator to measure food security) was 2.88 points (or 6 percent) higher in the AA group compared with the post-shock group, and AA transfers decreased the PHQ-4 score (mental health) by 0.10 standard deviations (or about 3 percent) when measured in the first round. Moreover, AA group households were less likely to engage in negative coping strategies, as 19 percent fewer households relied on less preferred food and 25 percent fewer households borrowed food from others compared with post-shock households.

These initial gains tended to dissipate in the medium term when compared with the standard post-shock response group. Second and third round results showed that the post-shock group no longer lagged on important consumption outcomes after receiving the transfer as well. The effects on the psychological well-being of the AA recipients were positive but smaller in the second than in the first round, after both groups received the same sized transfer. There was an overall net benefit for the AA group in the form of better food security, fewer negative coping strategies and better psychological well-being, which stemmed from acting early. During the medium-term recovery period, the AA group achieved similar or better outcomes than the post-shock group, even though – at this point – the post-shock group had received support more recently.

Consistent with the programme objective of covering humanitarian needs, no differential impacts in livelihoods were observed between the two groups when measuring agricultural activities, wage income, earnings from livestock and business profits during the third round of data collection.

More evidence is required to better understand whether AA can be even more impactful, for example by testing whether:

(i) targeting is further improved (identifying the most vulnerable);

[7] Two villages had to be dropped due to political instability, rendering the effective sample 138 villages.

(ii) cash assistance is disbursed even faster (prior to the flood peak); (iii)

(iii) cash assistance is paired with other forms of assistance to build longer-term resilience (e.g. adding cash+ components, social and behaviour change communication, or other intervention types);

(iv) transfer sizes are varied; and

(v) impacts vary based on the types (flood vs drought) and intensity of shocks. More evidence is needed to better understand trade-offs when implementing AA, including measuring the cost-effectiveness of AA interventions when including the full set-up costs of AA implementation, any potential market disruptions which could diminish the impacts of AA, the risk of forecast errors when triggers are based on disaster forecasts, and any potential disincentivization of flood preparedness that may result from the expectation of receiving anticipatory cash transfers.

This WFP impact evaluation is part of WFP's Climate and Resilience impact evaluation window, which has been created by the WFP Office of Evaluation (OEV), the Climate and Resilience Division, in partnership with the World Bank's Development Impact Evaluation (DIME) Department. It is also part of the cross-window Humanitarian Workstream, which is generously supported by USAID's Bureau of Humanitarian Assistance (BHA).

1. Introduction

1. Extreme weather events are becoming more frequent and more severe due to climate change. During the past 20 years, floods have adversely impacted at least 1.65 billion people worldwide, representing a 20–24 percent increase compared with the preceding decades.[8,9] According to the World Food Programme (WFP), more than 80 percent of the world's food-insecure people already live in countries prone to natural hazards, which only further aggravates their vulnerability to climate change.[10] In parallel, the ability to predict these extreme weather events has significantly increased. Much of that improvement is attributable to the development of sophisticated measurement tools (satellites, ocean buoys, ground weather stations, balloons) coupled with an improvement in computing power.[11]

2. The primary goal of this impact evaluation (IE) – in the form of a clustered randomized controlled trial (RCT) – is to generate robust evidence regarding the effects of implementing anticipatory humanitarian assistance, specifically through unconditional cash transfers, prior to severe flooding in Nepal. WFP Nepal joined the Climate and Resilience impact evaluation window in October 2021 with the aim of assessing the effects of AA programmes on food security, avoidance of negative coping strategies, and psychosocial well-being. The evaluation seeks to experimentally compare the impacts of early assistance for a flood shock with a standard post-shock response delivered weeks after the shock, using extensive household-level data.

3. The Climate and Resilience impact evaluation window was created by the WFP Office of Evaluation (OEV), the Asset Creation and Livelihood Unit, the Climate and Disaster Risk Reduction Unit of the Programme (PRO) Division, in partnership with the World Bank's Development Impact Evaluation (DIME) Department.

4. The Climate and Resilience window aims to establish portfolios of impact evaluations across a series of countries utilizing the same or very similar designs to increase the generalizability of results. This impact evaluation is also part of the OEV's Humanitarian Workstream, which has the goal to optimize humanitarian programming through the use of impact evaluations.

5. The report begins by describing the country context and the AA programme itself. This is followed by a discussion of the evaluation methodology and design. The report then presents the results, combining findings from the different rounds of data collection using regression analysis on key outcome variables and qualitative results that corroborate quantitative results. Lastly, the report discusses the main findings and lays out conclusions and considerations that follow from the results.

[8] Braman, L.M., et al. 2013. Climate Forecasts in Disaster Management: Red Cross flood operations in West Africa, 2008. *Disasters* 37(1): 144–164.
[9] Tellman, B., et al. 2021. Satellite Imaging Reveals Increased Proportion of Population Exposed to Floods.
[10] WFP. 2019. Forecast-based Financing (FbF) Anticipatory Actions for Food Security.
[11] The Economist. 26 July 2023. The High-tech Race to Improve Weather Forecasting.

2. Programme description

2.1 Nepal's anticipatory action programme

6. Extreme weather events and conflict are two crucial impediments to food security in the world today. More than 80 percent of the world's food-insecure people live in countries prone to natural hazards that further aggravate food insecurity and malnutrition by destroying land, livestock, crops, livelihoods and food supplies.[12]

7. Nepal is severely affected by climate-related disasters, including river floods, ranking tenth in the world on the long-term Global Climate Risk Index (CRI), with 80 percent of its land mass vulnerable to natural hazards. The monsoon season usually starts in June and ends in October, with flooding peaking in July and August. Monsoon rains also frequently cause landslides, erosion of hill slopes, and rockfalls in the hill and mountain areas. The recurrent rainfall-induced floods can have devastating humanitarian effects.

8. Nepal's flat plains of the Terai (one of the country's three geographical zones) are at the highest risk of flooding during the monsoon season due to low-lying land, continuous erosion on embankments across the Nepal–India border, settlements across flood plains due to fertile soil, and economic activities mainly related to agriculture (UN, Nepal: Monsoon Emergency Response Preparedness Plan 2020).[13] Consequently, the largest prevalence of economic poverty, including stunting and wasting, exists along the flood plains of Terai. These areas are home to socio-economically marginalized populations with high physical, social and economic, and environmental vulnerability.

9. In 2022, WFP Nepal – with funding from the United Nations Central Emergency Response Fund (UN CERF) and coordination support by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) – was ready to implement AA to address severe monsoon flooding across two river basins: the Koshi basin (Sunsari and Saptari districts) in the east and the Karnali and West Rapti basin (Kailali and Bardiya districts) in the west. The lower Karnali river basin is the longest river basin in Nepal. The river bifurcates into the Geruwa river and Karnali river. The two rivers form a fertile delta known locally as "Bhanwara Tappa". The Karnali basin river flow is seasonal and dominated by the Indian summer monsoon. The average daily discharge recorded at the Chisapani gauging station (since 1962) from November to April ranges from 400 to 600 cubic metres per second, but can be as low as 200 cubic metres per second. The peak monsoon flood has been observed as early as June and as late as October, and peak flood usually arrives in August. From the gauging station records, peak flood discharges exceed 5,000 cubic metres per second annually. The maximum instantaneous discharge since 1962 was recorded on 15 August 2014, estimated as 22,000 cubic metres per second.

10. The pre-planned WFP support for up to 26,000 vulnerable households included preparedness actions at national and regional levels, distribution of warning messages and direct cash assistance to vulnerable households.[14] (See the annex for more details on the recipient targeting process.) The cash assistance is in

[12] WFP. 2019. Forecast-based Financing (FbF) Anticipatory Actions for Food Security.

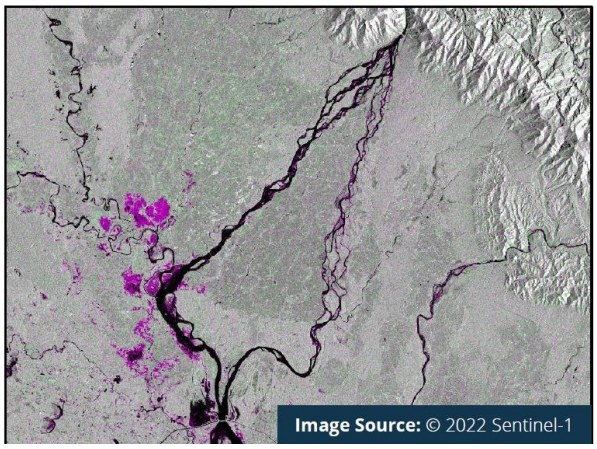
[13] For example, the monsoon floods of 2017 affected some 1.7 million people in the Terai, including 460,000 who were displaced (OCHA, 2021). Economic losses were estimated at USD 705 million or NRS 83,07,01,50,000. The flooding impacted 35 of the country's 75 districts, with the Ministry of Home Affairs reporting at the time that over 80 percent of the land in the Terai – Nepal's breadbasket – was inundated (Government of Nepal, 2017).

[14] On behalf of UNFPA, WFP also provided cash assistance to 65 women with pregnancy-related complications for emergency transportation for SRH services, and 1 GBV survivor for multi-sectoral GBV services. UNFPA's key AA intervention included distribution of 12,855 dignity kits containing several important household essential items to support the affected families cope with flood effects. The dignity kits were distributed to the same cohort of beneficiaries identified in Kailali and Bardiya districts by WFP in collaboration with local governments. In addition, UN Women partnered with the Women-Friendly Disaster Management (WFDM) Group/Forum for Law and Development (FWLD) to design and implement the AA intervention, which included the distribution of comprehensive relief packages to 250 vulnerable women.

the form of unconditional one-off cash transfers of NPR 15,000 or USD 117 per household to be sent days before the forecasted flood peak (distributed through remittance agents).[15]

2.2 Anticipatory action activation

Figure 1: Sentinel-1 image highlighting the flooded area (11 October 2022)



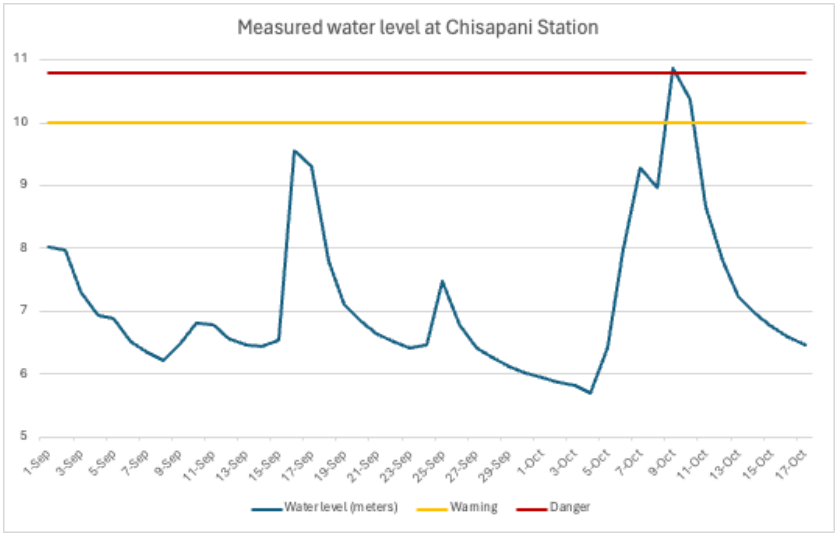
11. On 7 October 2022, the first condition for flood trigger activation was met for the west basin, Karnali Chisapani, as indicated by the Government DHM Flood bulletin issued on the same day. Following the AA framework, the UN Resident Coordinator's office issued a notice to United Nations agencies, including WFP, to initiate readiness activities. Subsequently, on 8 October, the second condition was also met in the west basin, with the Global Flood Awareness System (GloFAS) predicting a 73 percent probability of a one-in-two-year flood event in the Karnali basin (see Figure 2). With both conditions satisfied, the UN Resident Coordinator activated the flood action trigger, initiating AA activities such as cash payouts.

12. This activation meant that 17,243 households in three districts became eligible for assistance, out of which two districts (Bardiya and Kailali) became part of the impact evaluation.[16] The floods resulted in at least 35 deaths with more missing, and displaced around 3,000 families.

[15] WFP benefits from a pre-existing agreement with a financial service provider (FSP) with a wide network of remittance agents (mapped jointly with the FSP and cooperating partners), which were adequate for the intervention areas.

[16] From the west Karnali basin, the Banke district was excluded from the impact evaluation due to political sensitivities; however, the AA programme response was implemented there as well.

Figure 2: Water level at Karnali river, Chisapani station, October 2022



Source: Graph reproduced using data from Nepal Department of Hydrology and Meteorology, October 2022.

Figure 3: Coverage areas for 2022 anticipatory action activation

Source: Authors 2024.

3. Evaluation design and methodology

13. The following section outlines how the evaluation questions and literature informed impact evaluation design.

3.1 Evaluation theory

14. AA transfers are made as quickly as possible to at-risk households once a flood peak is forecast to affect them. The money is intended to empower households during times of humanitarian crisis by enhancing their economic capacity. The aim is to facilitate household purchases of essential items such as food, fortification materials for dwellings, and transportation for goods or family members. These transfers are also anticipated to augment the means necessary for securing food and fulfilling other essential needs such as healthcare, education and vital resources.

15. Potential outcomes of early cash transfers include increased food security, decreased reliance on risky coping mechanisms, preservation of household assets and a reduction in psychological stress caused by floods. Over the long term, AA transfers – when compared with households receiving post-shock assistance – could foster increased livelihood opportunities, mitigate income loss and enhance sustained food security.

16. Despite the potential benefits and the imperative nature of humanitarian intervention, empirical evidence regarding the efficacy of early cash assistance in climate-induced disaster scenarios remains scarce. A recent literature review found only 20 experimental or quasi-experimental studies that test the impacts of any kind of transfers in humanitarian settings.[17] Most of these 20 studies are not directly comparable as they focus on different *types* of transfers (in-kind, unconditional cash transfers (UCT), conditional cash transfers (CCT), school feeding) and the circumstances vary. In line with the general lack of causal evidence on transfers in humanitarian settings, knowledge of causal impacts of AA transfers and similar interventions specifically remains scarce, and the need for more insights is pressing as they have the potential to inform strategic policy planning.

17. While in theory it is advantageous to reach beneficiaries quickly, there remains uncertainty around whether floods will be as severe as forecasted, and whether the pre-selected households are the most vulnerable (there is a trade-off between speed and targeting precision). Thus, given limited resources, a more traditional (slower) response may have the advantage of allowing time to more precisely target the most affected or most vulnerable beneficiaries.

18. Descriptive studies on AA suggest prospective potential gains from early forecast and responding to disaster risk sooner across African and Asian countries.[18] Some studies detail how AA programmes are more cost-effective compared with a regular humanitarian response, but the cost–benefit ratios in these studies vary widely, depending on other confounding factors, and are based on theoretical modelling rather than empirical studies.[19,20] A study in West and Central Africa stipulates that AA and early response in humanitarian settings saved more lives in a disaster response compared with a year earlier when early warning systems were not operational. However, this is a simple before–after comparison and the authors warn that – in the absence of rigorous and quality data regarding the severity of flooding, response times and delivery of interventions – the increase in lives saved cannot be directly attributed to AA.[21]

[17] Jeong, D., & Trako, I. 2022. *Cash and In-kind Transfers in Humanitarian Settings*.
[18] Cabot Venton, C. 2013. *The Economics of Early Response and Resilience*; Cabot Venton, C. 2018. *Economics of Resilience to Drought in Somalia, Kenya, and Ethiopia*.
[19] Pappenberger, F., et al. 2015. The Monetary Benefit of Early Flood Warnings in Europe. *Environmental Science & Policy* 51: 278–291.
[20] Rogers, D. & Tsikurnov, V. 2013. *Weather and Climate Resilience*.
[21] Braman, L.M., et al. 2013. Climate Forecasts in Disaster Management.

19. Other existing studies on AA are based on theoretical modelling and institutional learning, with very few providing empirical assessments.[22] The studies by Gros et al. (2019) and Gros et al. (2020), in Bangladesh and Mongolia respectively, suffer from small sample sizes and imbalanced comparison groups.[23,24] Gros et al. (2019) studied an early response for flooding on key outcomes and found that households that received earlier cash transfers as part of an anticipatory response accumulated fewer debts.[25] Mansur et al. (2017) and Ivaschenko et al. (2020) investigated the impacts of cash transfers to households that were hit by cyclone Winston in Fiji.[26,27] However, these studies also do not compare the timing of cash transfers.

20. A 2020 WFP report[28] summarized the evidence base on AA and finds only a few quasi-experimental studies or evaluations. A study by Pople et al. (2021) tested the impacts of AA in Bangladesh.[29] The authors found "that the anticipatory cash transfer was mostly spent on food and water, and that treated households were 36% less likely to go a day without eating during the flood". However, the study does not compare the timing of assistance, but rather contrasts those who received assistance with those who did not. Another study by Baliki et al. (2024), is looking at the impact of OCHA's AA response in Bentiu, South Sudan, and found positive effects on coping strategies.[30]

21. A recent study conducted by Balana et al. (2023), which focused on the International Rescue Committee's (IRC's) AA flood response in northeast Nigeria, found that households that received large amounts of cash assistance before the floods experienced a significant increase in income-generating investments in agricultural assets and livestock, indicating that early assistance prior to a shock has the potential to enhance long-term resilience.[31] While being the most similar study to this impact evaluation in Nepal, since it also compares the timing of assistance, there are key differences. The cash transfer size for this intervention was four times larger (USD 400 per household) than the usual AA amounts disbursed by WFP (USD 50–100). Additionally, the time lag between the AA and the post-shock group was four months, rather than several weeks in our case. The other difference lies in targeting, as the IRC intervention particularly targeted agricultural smallholders, whereas the WFP intervention in Nepal aimed to target the most vulnerable households, who are not necessarily engaged in agriculture.

22. The dearth of causal evidence can be partially explained by the fact that AA programmes have only been around for half a decade, and with differing mechanisms and designs (WFP, 2019). A key additional caveat in evaluating AA programmes lies in difficulties associated more broadly with conducting impact evaluations in humanitarian contexts.[32] However, the persistent funding gap for humanitarian responses globally renders

[22] Weingärtner, L., et al. 2020. *The Evidence Base on Anticipatory Action*.
[23] Gros, C., et al. 2019. Household-level Effects of Providing Forecast-based Cash in Anticipation of Extreme Weather Events: Quasi-experimental evidence from humanitarian interventions in the 2017 floods in Bangladesh. *International Journal of Disaster Risk Reduction* 41: 101275.
[24] Gros, C., et al. 2020. The Effectiveness of Forecast-based Humanitarian Assistance in Anticipation of Extreme Winters: Evidence from an intervention for vulnerable herders in Mongolia. *Disasters* 46(1): 95–118.
[25] Gros, C., et al. 2019. Household-level Effects of Providing Forecast-based Cash in Anticipation of Extreme Weather Events.
[26] Mansur, A., et al. 2017., *Social Protection and Humanitarian Assistance Nexus for Disaster Response*.
[27] Ivaschenko, O., Doyle, J., Kim, J., Sibley, J., & Majoka, Z. 2020. Does 'Manna from Heaven' help? The role of cash transfers in disaster recovery—lessons from Fiji after Tropical Cyclone Winston. *Disasters* 44(3): 455–476.
[28] Weingärtner, L., et al. 2020. *The Evidence Base on Anticipatory Action*.
[29] Pople, A., et al.. 2021. *Anticipatory Cash Transfers in Climate Disaster Response*.
[30] Baliki, G., et al. 2024. *Impacts of early action support on lives and livelihoods in South Sudan: The Life in Bentiu Study - Final impact report.* Berlin, International Security and Development Center (ISDC).
[31] Balana, B., et al. 2023. *Anticipatory Cash Transfers for Climate Resilience: Findings from a randomized experiment in northeast Nigeria*.
[32] Puri, J., et al. 2017. Can Rigorous Impact Evaluations Improve Humanitarian Assistance? *Journal of Development Effectiveness* 9(4): 519–542.

evidence for what works – and what is most cost-effective – even more relevant.[33,34] This evaluation contributes to filling these important knowledge gaps.

3.2 Evaluation questions

23. The main impact evaluation question (EQ1) is:

EQ1. *What is the impact of providing anticipatory humanitarian assistance in the form of an unconditional cash transfer based on pre-defined forecast triggers on households' food security, coping strategies, and mental health and well-being?*

24. Additionally, the impact evaluation poses the following secondary question (EQ2):

EQ2. What is the impact of providing anticipatory humanitarian assistance in the form of an unconditional cash transfer on agricultural outcomes, livelihood, migration, and other financial outcomes?

25. The main outcome measures were selected based on consultations with WFP and a review of relevant literature and previous studies. The evaluation team worked in close collaboration with the WFP Nepal country office, as well as with WFP's Regional Bureau in Bangkok (RBB), to ensure operationally relevant measures are captured. Lastly, a fit with outcomes from other evaluations in the Climate and Resilience impact evaluation window was key. The impact evaluation captures the following outcomes:

- Food Consumption Score (FCS)
- Food Insecurity Experience Scale (FIES)
- well-being (psychosocial)
- asset loss and damage
- coping strategies (positive and negative)
- consumption and expenditures (food and non-food)
- agricultural inputs, investments and production
- financial outcomes (loans and remittances)
- migration

3.3 Evaluation design

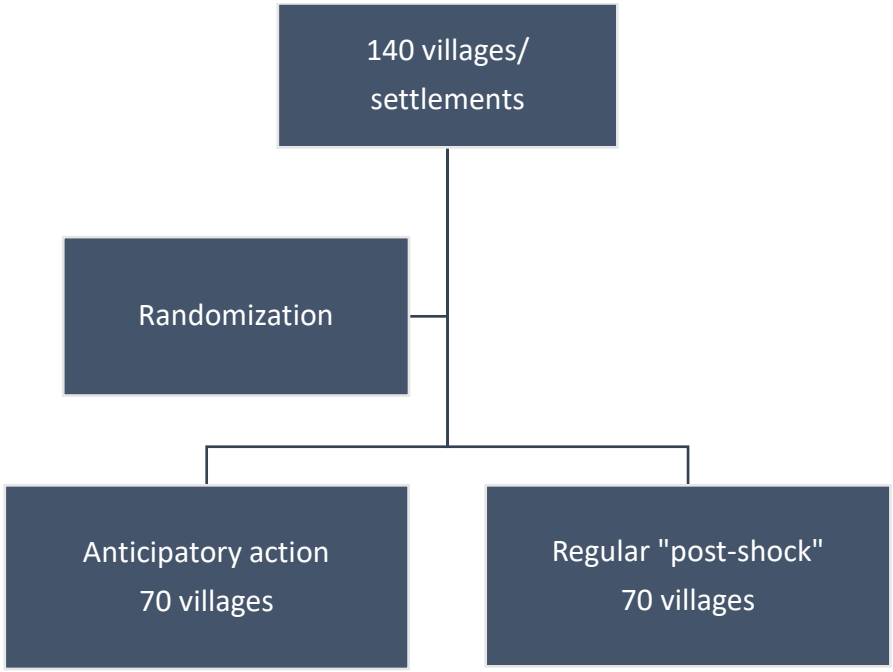
26. The key objective of the evaluation was to examine the effect of timing of AA transfers on well-being indicators and compare them with a post-shock humanitarian response. The impact evaluation followed a two-arm cluster RCT design – encompassing a sample of 140 villages and 2,983 households. This was complemented by qualitative data collection. The settlement/village was used as the unit of randomization and households the unit of observation.

27. The sampling procedure relied on beneficiary registration data collected by the WFP Nepal country office in July 2022. The country office identified households that were eligible for transfers based on their key vulnerability criteria. The evaluation team supported the country office to randomly select the required number of villages, from villages ranked as most vulnerable. Each village contained on average 30 transfer-eligible households, with the minimum village size being 8 transfer-eligible households and the maximum being 70. Within each sampled village, households eligible for transfers were randomly selected proportional to the village size. On average, 20 households were sampled per village with an additional 5 provided as replacements. In villages with fewer than 20 households, everyone become part of the impact evaluation sample.

[33] OCHA – United States Office for the Coordination of Humanitarian Affairs. 2019. *Global Humanitarian Overview 2019*.

[34] Slim, H. 2015. *Humanitarian Ethics*.

Figure 4: Planned impact evaluation design



28. Of the 216 villages in the programme in the western basin, 140 medium-sized villages (settlements with between 8 and 70 households) were pre-selected and randomly allocated to two groups after the trigger had been activated. However, due to community tensions during the election period, 2 villages out of the 140 were dropped from the impact evaluation, leaving **138 villages** in the final evaluation sample:[35]

I. **68 villages (1,499 households) – Group A: AA group** – receiving cash USD 117 support early, within the framework of forecast-based AA, during or just a few days after the flood peak.

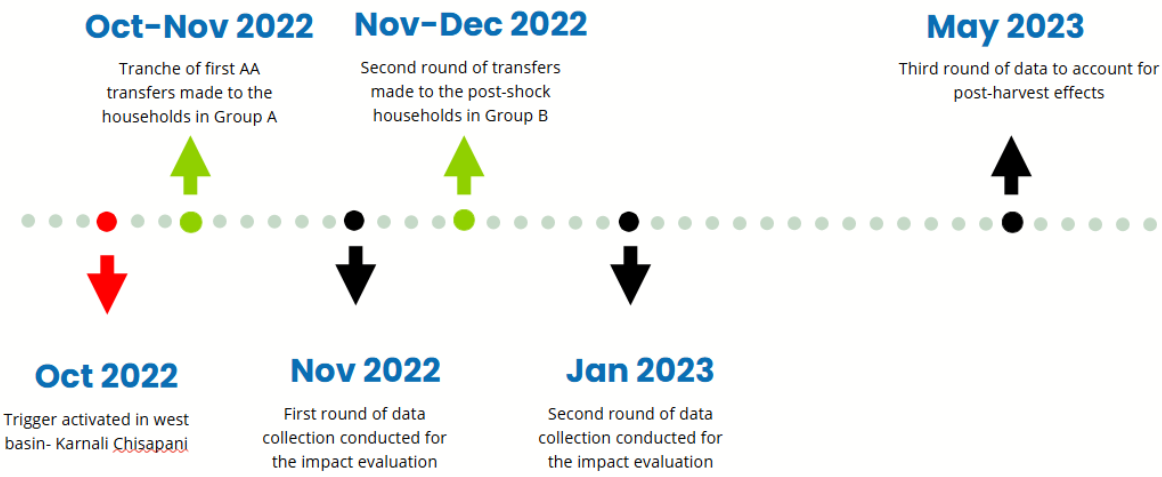
II. **70 villages (1,484 households) – Group B: "post-shock" group** – receiving USD 117 cash support in accordance with normal WFP procedures, within around one to two months of the flood peak.

29. Given the humanitarian context, there was no "pure" control group (a group that does not receive any support), and instead both groups received a cash transfer. The remaining 9,452 households in the 56 non-impact evaluation villages also received AA assistance and were not included as part of the study.

30. Due to cost concerns, and the fact that it was not clear whether a flood would happen or where flood-affected households would be located, there was no dedicated baseline data collection for the impact evaluation. Instead, the impact evaluation used WFP's targeting database as a (limited) baseline. Follow-up panel data were collected in three rounds (more details on data collection are presented below).

[35] In the first data collection round, 12 villages could not be surveyed due to political conflicts and security concerns for the enumerators. Out of these, 10 villages were surveyed in the second and third rounds. The remaining two villages not surveyed in any of the three rounds were part of the AA arm.

Figure 5: Timeline of impact evaluation data collection



31. In addition to quantitative data collection, the impact evaluation also employed qualitative methods, in the form of focus group discussions (FGDs), to gather perspectives from different intervention arm beneficiaries.

32. The evaluation analyses all outcomes using the following regression model for all three data collection rounds:

$$y_{ijkt} = \beta_t AA_j * Round_t + \theta_{tk} + X_{ijk} + \epsilon_{ijkt}$$

where y_{ijkt} is an outcome for household i in village j and district k measured in survey round t. Our coefficient of interest is β_t, the impact in survey round t of being in a village assigned to receive AA transfers. Fixed effects at the round level (θ_{tk}) were included, and X_{ijk} is a set of household-level controls selected via double-selection LASSO to maximize precision following Belloni, Chernozhukov and Hansen (2014).[36,37] Standard errors were clustered at the level of villages j. Randomization of assignment of AA ensures that β_t measures the impact of receiving transfers early.

[36] The baseline/targeting variables considered to include as Lasso controls are the following eight: whether the household contains an agricultural labourer; whether the household contains a skilled non-agricultural labourer; whether the household contains a disabled person; whether the house wall is made of bricks; whether the household receives welfare transfers; whether a member of the household has a citizenship card; whether the household contains a pregnant woman; and whether the members of the household belong to a low caste or are marginalized.

[37] Belloni, A., et al. (2014). Inference on Treatment Effects after Selection among High-dimensional Controls. *Review of Economic Studies* 81(2): 608–650.

4. Main findings

33. The following sections provide details on flood damage, and the timing and use of transfers, before illustrating the main causal impact findings from the evaluation for immediate responses (first round of data collection), short-term responses (second round) and long-term responses (third round).

4.1 Flood damage

34. In the survey's second round, after both groups received their transfers, the majority (59 percent) of households across both intervention groups reported that floods had damaged their house. Business damage was reported in 11 percent of households, and moderate or severe farm damage was reported by 67 percent of households. However, only 50 percent of households reported that floodwater entered the house in the second round.

Table 1: Share of households reporting flood damage by treatment arm

	AA	Post-shock	Diff.	Combined
Impacted by the floods in October 2022	88%	90%	-2%	89%
Flood entered house in October 2022	47%	52%	-5%	50%
Flood damage – house	59%	60%	0%	59%
Flood damage – business	11%	11%	0%	11%
Flood damage – farm	66%	69%	-3%	67%
Severe flood damage – house	15%	16%	-1%	16%
Severe flood damage – business	3%	3%	0%	3%
Severe flood damage – farm	31%	37%	-5%*	34%
WFP Asset Impact Monitoring System (AIMS) score (0–4)	2.26	2.23	0.03	2.2
House flood height (cm)	22.11	25.83	-3.72	24.0
House flood height (cm) (conditional on flooding)	47.05	49.44	-2.38	48.3
Observations	1,182	1,183		

Source: Second round survey, January 2023.

35. Of the households surveyed, 16 percent reported **severe** damage to their house and around 32 percent of households reported severe damage to their farm (see Table 1). The height of floodwater was similar in both AA and post-shock groups, both at around 48 cm (for households that reported that they experienced flooding). The assets most reported by respondents in the second round as damaged by the floods included crops in the field (51 percent), crops stored at home (14 percent), livestock (12 percent), poultry (21 percent) and irrigation pumps (11 percent).

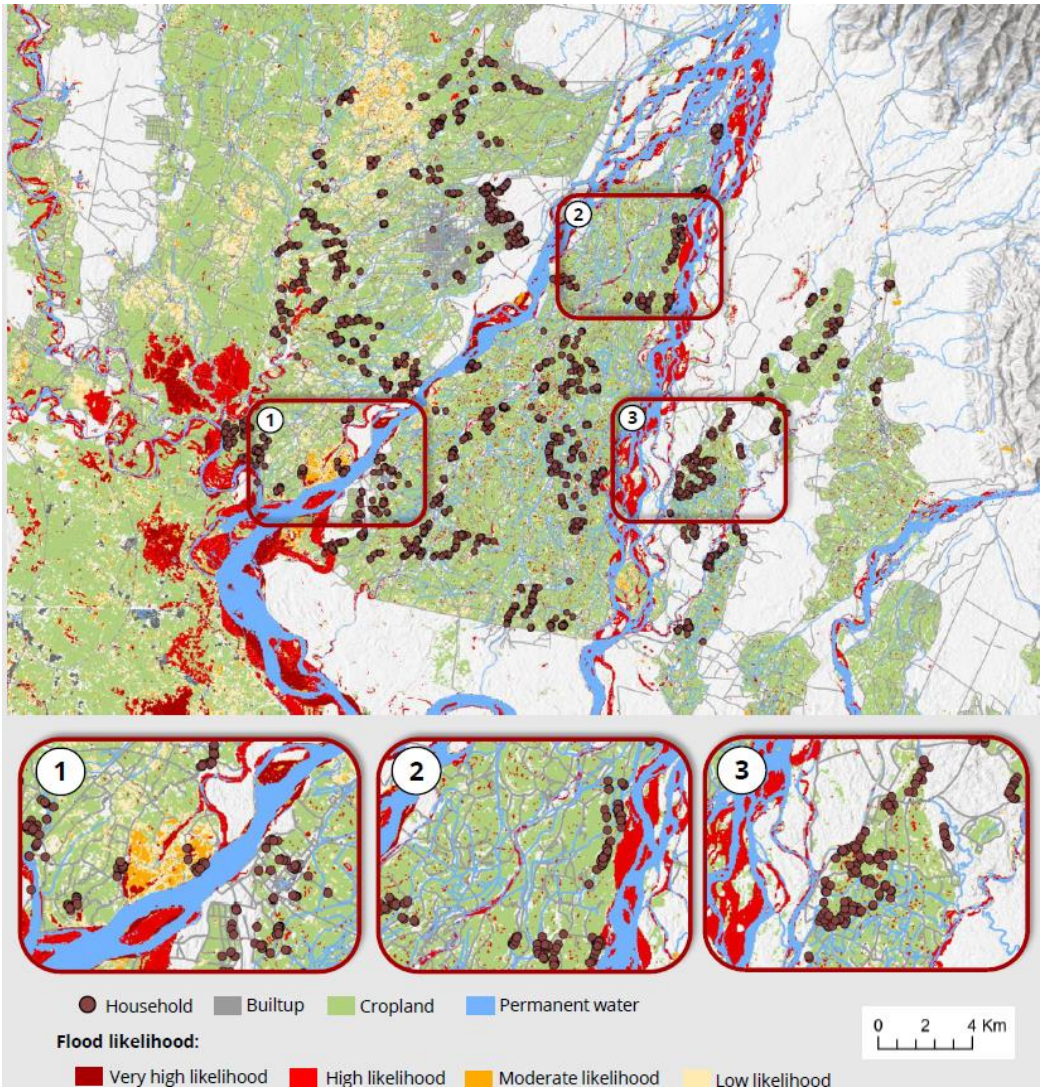
Table 2: Damage to assets – second round of data collection

	Post-shock	AA	Diff.	Combined
Severely damaged – crop in the field	56%	47%	-9%***	51%
Severely damaged – crop stored at home	15%	12%	-3%	14%
Severely damaged – fish (farm)	64%	60%	-4%	62%

Severely damaged – fruit plantation	17%	10%	-7%	14%
Severely damaged – irrigation pump	14%	9%	-5%	11%
Severely damaged – livestock	14%	11%	-3%	12%
Severely damaged – poultry birds	23%	20%	-3%	21%
Severely damaged – rickshaw, van, bicycle	2%	1%	-1%	1%
Severely damaged – animal cart	0%	2%	2%**	1%
Observations	1,134	1,103		2,237

Source: Second round survey, January 2023.
Notes: * p < 0.1; ** p < 0.05; *** p < 0.01

Figure 6: Cropland affected by the October 2022 flood event



Source: WFP Asset Impact Monitoring System (AIMS) unit, 2023

36. AIMS analysis visualized extensive flooding in October 2022, with an estimated 25 percent of the agricultural land in the study area affected by floods. Figure 6 shows the cropland affected by the floods in October 2022. More details on flood damage are presented in the Appendix.

4.2 Transfer timing and use

37. Transfers were initiated with a slight delay of three days after the flood trigger was announced on 8 October 2022. Transfers were sent on 11 October for the AA group. The main reason for the delay was the fact that Nepal celebrated Dashain, the country's biggest and most important Hindu festival, during the time the activation took place. Dashain is a 15-day celebration that usually occurs in late September to early October, and in 2022 it spanned from 26 September to 10 October (this period also included bank holidays).

38. Figure 7 displays the transfer timeline along with the three data collection rounds. People started receiving transfers on the third day after the activation. After three days, 22 percent of people had received the transfer, which increased to 50 percent after six days and reached 74 percent after nine days. When the first survey round commenced, 97 percent of AA households had received their transfer.

Figure 7: Cash-based transfer timeline

NOTE: Each bar represents the number of households surveyed or receiving transfers within a three day bin.

39. Households in both the AA group and post-shock group reported having received an early flood warning before the floods at equal rates (84 percent for the post-shock group and 82 percent for the AA group). In the first survey round, it was observed that 97 percent of AA households had received their transfers. However, due to administrative errors, 1 percent of post-shock households also received their transfers before the intended date (as an AA transfer).

40. Table 3 shows what households reported as the most important use for AA funds.[38] Most households reported food as their most important use case, followed by medical needs. The third most important use category was split between medical needs, children's education and paying back loans.

[38] The question asked was: *"How did you utilize the cash received from WFP? (Select all that apply)"*.

Table 3: Self-reported most important use for AA funds

	(1) R1: AA	(2) R1: Post	(3) R2: AA	(4) R2: Post	(5) R2: Diff.
To buy food or water	76%	1%	82%	79%	3%
To buy medicine	44%	1%	49%	45%	4%
Festivals	44%	0%	32%	9%	23%***
For agricultural purposes	23%	0%	24%	21%	3%
To pay back loan	21%	0%	21%	26%	-5%**
To repair home	14%	0%	10%	15%	-4%**
Educational expenses	12%	0%	14%	16%	-2%
Saved the money	10%	0%	3%	5%	-2%**
Salvaging paddy crop	6%	0%	2%	4%	-1%
For transport costs	1%	0%	1%	1%	0%
Gave money to others	1%	0%	0%	0%	0%
Observations	1,074	1,138	1,181	1,178	

Source: First and second round survey data.

41. Post-shock households were slightly more likely to report that paying back loans was important compared with the AA group; however, indebtedness in the post-shock group was not significantly higher.

4.3 Food security

Summary of findings: Households in the AA group that received early cash assistance showed significantly better food security immediately following the floods. Transfers appeared to allow beneficiaries to buy more meat, as AA transfers increased the number of days of consumption by 0.32 per week. These differential food security effects faded by the second round of data collection, once the post-shock group had also received their transfers, indicating that AA creates an overall improvement in welfare by allowing recipients to achieve better food security and mental health immediately after the flood while still maintaining similar outcomes in the later recovery period compared with a group who receives support in this later window.

42. The FCS index developed by WFP in 1996 was used as the main measure of food security. To construct this index, respondents were asked about the frequency of consumption of several different food groups, customized to the local context. These values were weighted according to their nutritional values. In addition to the raw score, the FCS can be used to classify households into three categories of food security – poor, borderline and acceptable –based on standard thresholds.[39,40]

43. The impact evaluation found significant early benefits in terms of food security and animal protein consumption for the AA group. FCS was found to be 2.88 points (6 percent) higher in the AA group compared with the post-shock group during the first round. This translated to an increase of 9 percentage points of households shifting to acceptable food security compared with the post-shock group.

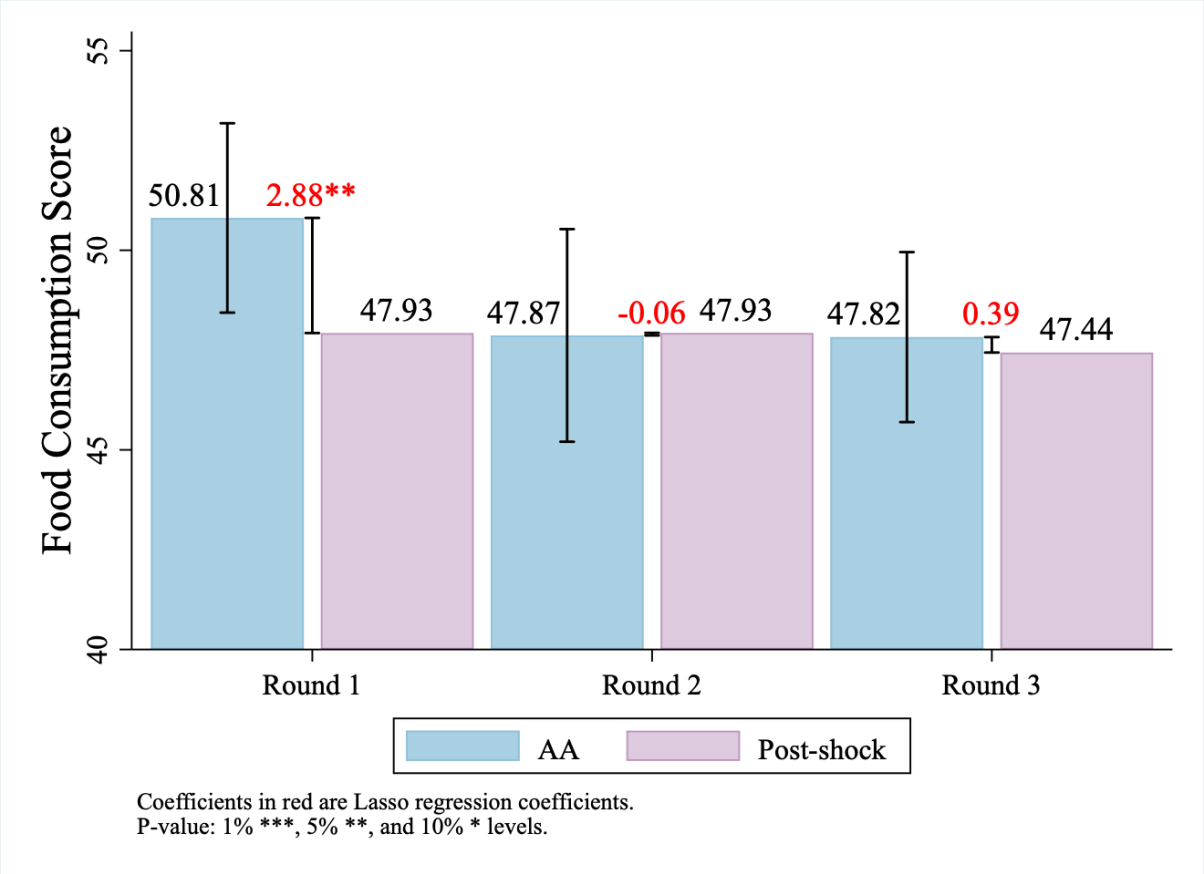
44. Using standard thresholds of food security categories, it was found that the AA transfers:

[39] The standard thresholds are poor: 0–21, borderline: 22–35, and acceptable 35+ on a scale from 0 to 112.
[40] Although not the primary focus of the study, in order to align more closely with the outcomes documented in Pople et al. (2021), data on whether children consumed at least three meals on the previous day were collected. Additionally, a reduced Coping Strategies Index (rCSI) that assesses whether households employed specific strategies to manage food consumption over the past four weeks was included.

- decreased the share of households with poor food security by 2 percentage points compared with 2 percent prevalence in the post-shock transfer group;
- decreased the share of households with borderline food security by 7 percentage points compared with 23 percent prevalence in the post-shock group; and
- increased the share of households achieving acceptable food security by 9 percentage points compared with 73 percent prevalence in the post-shock group.

45. The initial boost in food security was diminished by time of the second round – after the post-shock group received its transfer – with no significant differences between the two groups.

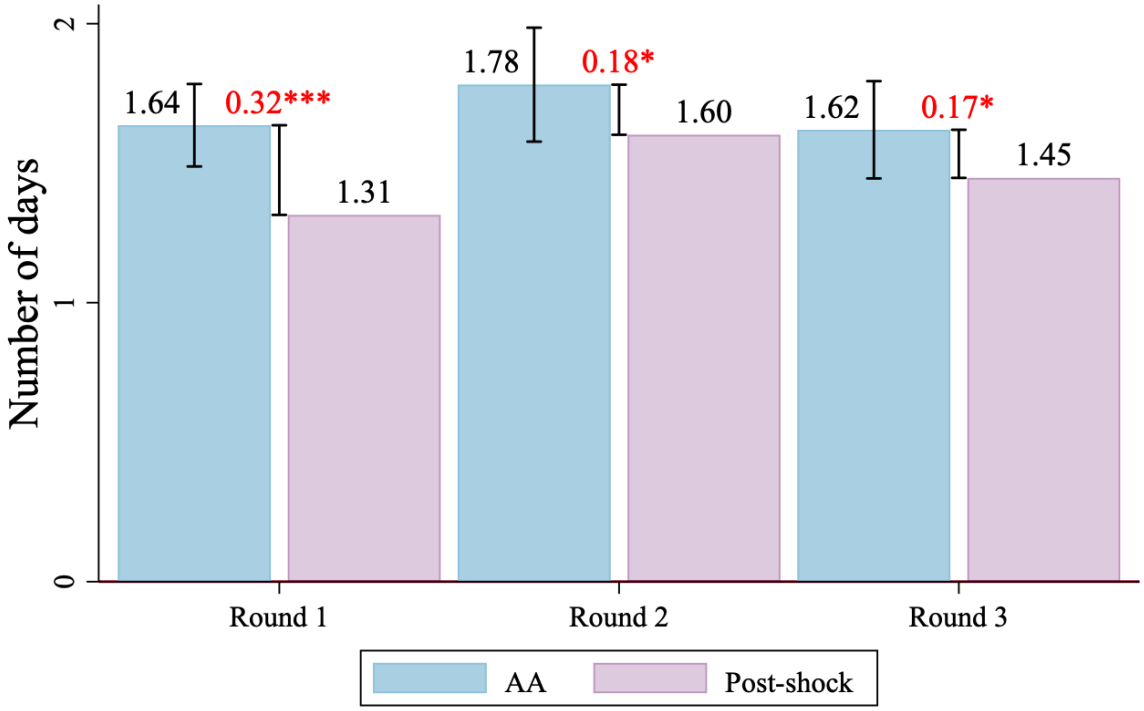
Figure 8: Food Consumption Score (FCS)



46. The evaluation also breaks down the impacts on different food categories consumed in the previous week (in the last seven days from the date of survey), from which the FCS is derived (Table 15). It was observed that the impact of transfers is most notable in meat consumption (see Figure 9). While staples and oil were consumed daily by almost all households, meat and dairy were consumed one to two times per week in the first round. Receiving AA transfers increased meat consumption by 24 percent (i.e. increase of meat consumption by 0.32 days per week compared with before the transfer). At the first round, there were also increases for pulses (8 percent), vegetables (7 percent) and oil (3 percent), which while positive are not statistically significant. While the overall difference in FCS scores levelled at the second round, the significant impact for meat consumption persists (increasing by 11 percent in the second round and 12 percent in the third round; see Figure 9).

47. By the second and third survey rounds (the latter after most households would have harvested their winter crops), no differences in raw FCS scores or any binary measures for poor, borderline or acceptable food security were found.[41]

Figure 9: Animal protein (meat) consumption



Coefficients in red are Lasso regression coefficients.
P-value: 1% ***, 5% **, and 10% * levels.

Number of days in last week consumed meat.

48. **In the qualitative FGDs**, being able to buy food was broadly quoted as the most urgent need during and after floods for both the groups.

> *"The essentials like food become critical. Felt like if someone could give us rice, I could feed my family…" (AA household, Madhuwan)*

> *"I had two small children then. Being hungry was more difficult during the flood. I had to go to neighbour's house for food. I tolerated despite being hungry, but my small kids could not that's why I had to go to the next household. I think in my experience, food is most important during and after the flood… Food and the clothes are the most pressing need." (AA household, Madhuwan)*

49. Consistent with the quantitative findings, most of the qualitative coded responses showed that the cash transfer was utilized for buying food items such as paddy, rice, lentils, vegetables, oil and salt. By district, more respondents from Kailali bought food items compared with those from Bardiya district. Interestingly,

[41] These effects are consistent with e.g., Pople et al. (2021), a quasi-experimental AA study conducted on WFP's early cash assistance to affected households in Bangladesh during the 2020 flood activation. Our findings on food security are also consistent with emerging evidence from the World Bank's impact evaluation on Government-led shock-responsive social protection in Niger, where the households that received early cash transfers based on forecasts in response to severe droughts experienced improved overall welfare in the immediate run (Dercon et al., 2023).

from the qualitative interviews, it seems that food was also bought more in settlements where microphones ("miking") were placed for early warning messaging. Though very few, in settlements where "miking" was practised as an early warning mechanism, households were able to pack dry foods that do not require cooking, in advance.

> *"We received the information about an incoming flood. We packed dry foods and brought them to the shelter." (AA household, Tikapur)*

50. The practice of sharing food during festivals and during emergencies, i.e. during or after the floods, was standard across all the settlements where qualitative discussions were conducted. The most frequent items mentioned by the qualitative participants for sharing, particularly during or after the flood, were food items like rice, lentils, oil and salt, vegetables, and wheat flour. The major festivals celebrated in the sampled communities were Maghi, Diwali, Gudiya, Holi and Dashain. The major food items shared during festivities were primarily animal proteins – fish, ghongi, meat (pork and goat) – as well as other items such as Dhikri, yam, sel roti and alcohol. Many respondents appreciate the communal spirit of sharing food, finding it invaluable for receiving assistance when needed, and simplifying their lives during difficult times, including climate shocks.

> *"Sometimes we divide (chop) the vegetable and give the pieces to others. and give the pieces to others when we bring or harvest fruit/vegetables (carrot, jackfruit) normally not available in our area." (post-shock household, Geruwa)*

> *"When we have no food at home, then we ask others for pulses, fish, ghonghi and tarul/pidalu (wild roots/tubers) and mango and other fruits." (post-shock household, Janaki)*

> *"People living in highland provide us food. If we have near or dear ones living near, they bring us food for us. They say – my son and daughter are starving with hunger. We eat by sharing with each other. (AA household, Tikapur)*

4.4 Coping strategies

Summary of findings: Both AA and regular post-shock households appeared to resort to adverse coping methods after the flood, but the AA group showed fewer instances of relying on less preferred food, borrowing food and reducing meal portions compared with post-shock households, leading to a reduction in the overall reduced Coping Strategies Index (rCSI) immediately after the floods.

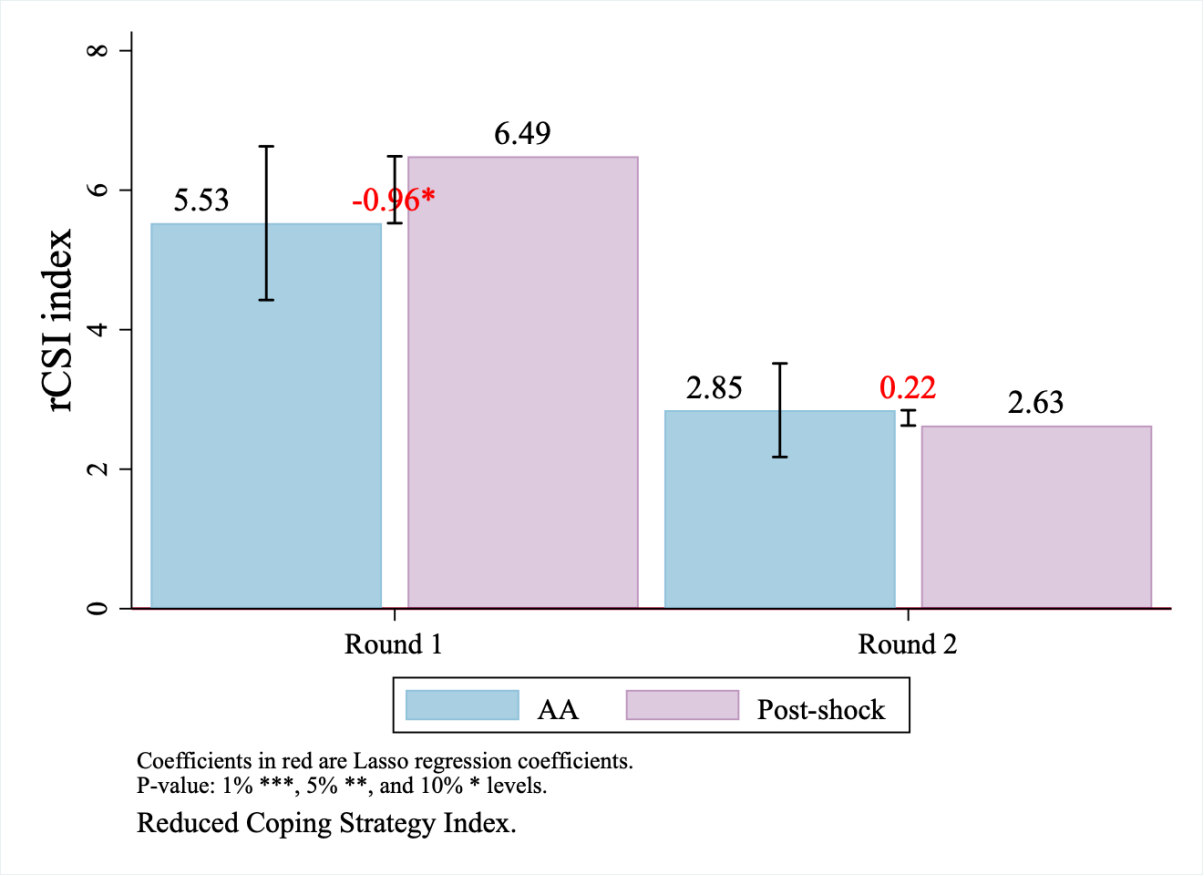
51. The reduced Coping Strategies Index (rCSI) was used to examine whether AA is helping households avoid adverse coping strategies related to food consumption. Immediately after the flood, 60 percent of households (across both groups) reported resorting to risky coping strategies in the first round of the survey. However, households that received AA were 15 percent less likely to engage in risky coping strategies by the first data collection round, driven by reductions in these coping strategies:

- 19 percent fewer households relied on less preferred food;
- 25 percent fewer households borrowed food from others; and
- 19 percent fewer households reduced the number of meals per day compared with post-flood households.

52. By the second round, there was no difference between AA and post-shock households in utilizing risky coping strategies, suggesting that the temporary effect of AA ended by the second round.

53. This is corroborated further in Tables 20 and 28, where AA (early transfer) households reported eating more meat during the last week than comparison group households, and this effect was persistent across all three rounds of data collection.

Figure 10: Reduced Coping Strategies Index



54. No significant effects were observed on migration (hosting migrants or household members migrating for work or for shelter).

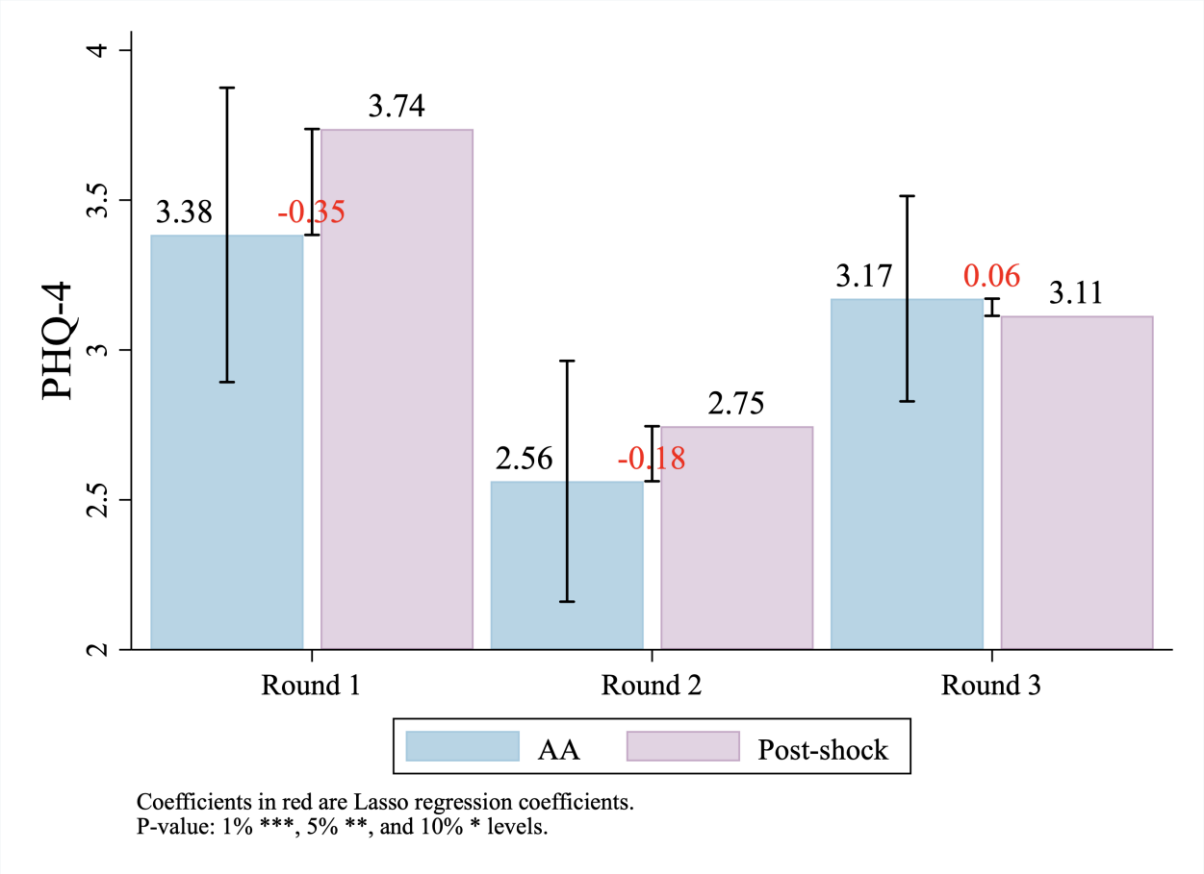
4.5 Mental health and subjective well-being

Summary of findings: The evaluation examined whether AA transfers have an impact on the psychological well-being of beneficiaries, using standardized indicators that measure anxiety, depression and subjective well-being. The four-question patient health questionnaire for anxiety and depression (PHQ-4) was collected. Compared with the post-shock group, AA recipients showed a decrease in anxiety (2 percentage points) and depression (3 percentage points) in the first round. AA recipients reported 0.29 units higher subjective well-being starting from a base of 3.98, measured using the Cantril Ladder on a 10-point scale.

55. Natural disasters can inflict significant psychological distress on individuals, as they often result in loss of homes, livelihoods and loved ones, leading to increased stress, anxiety and depression among affected communities. Our study examined whether AA transfers have an impact on the psychological well-being of beneficiaries, using standardized indicators that measure anxiety, depression and subjective well-being. The four-question patient health questionnaire for anxiety and depression (PHQ-4) was collected. As with the FCS score mentioned previously, the PHQ-4 raw score can be classified into anxiety or depression subcategories (higher scores meaning more anxiety or depression symptoms). Self-reported life satisfaction was also collected using the Cantril Ladder (see also Table 11 in the Appendix).

56. AA recipients reported 0.29 units higher subjective well-being starting from a base of 3.98, measured using the Cantril Ladder on a 10-point scale. This finding suggests that AA transfers can have benefits, not only in terms of food security but also in mitigating negative mental health impacts following climate disasters.

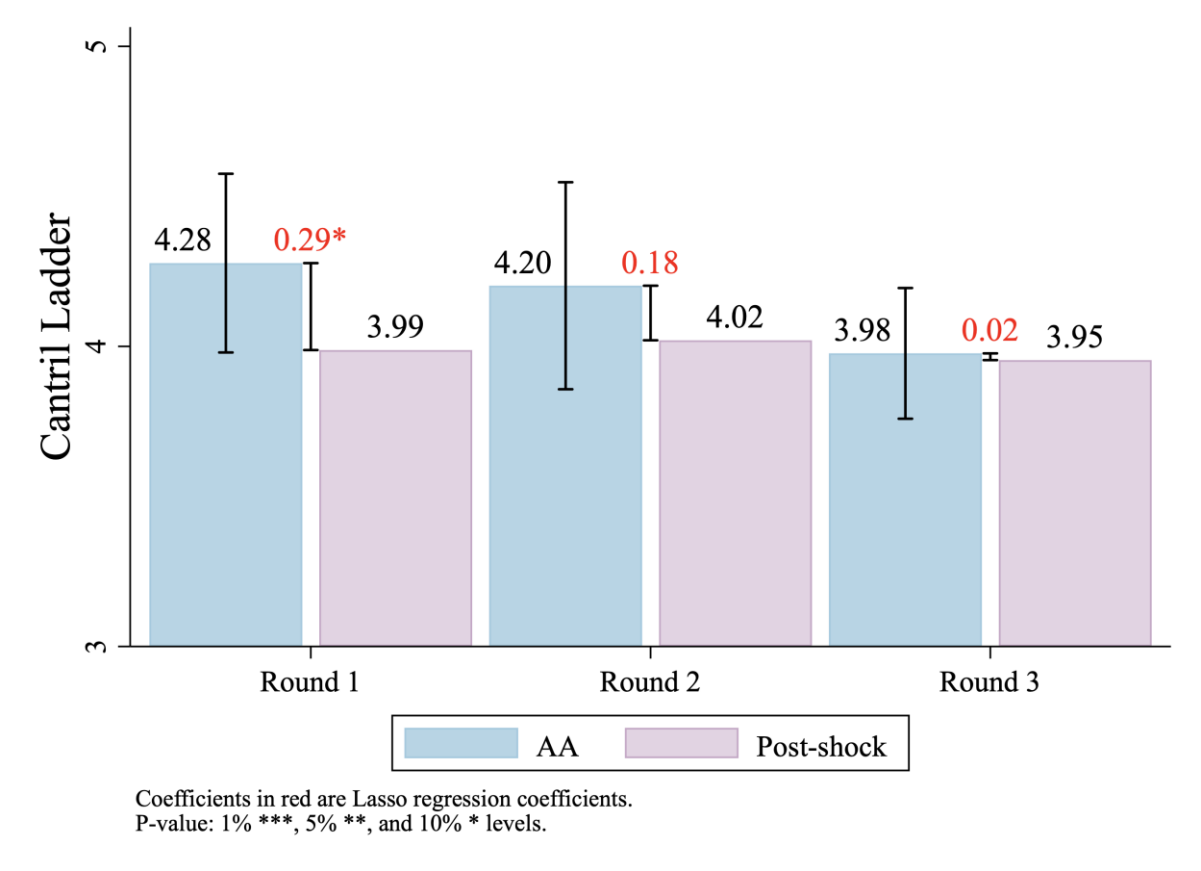
Figure 11: Mental health (PHQ-4)



57. Figure 11 shows that the AA group reported better mental health outcomes in the first round, but the effect is short term and not significant. Both groups reported equal PHQ-4 scores in the third round which took place almost six months after initial flood damage.

58. These results suggest there is a benefit to delivering transfers immediately after a flood, since households consume more food (especially animal proteins), avoid food insecurity, avoid negative coping strategies associated with food and exhibit better mental health in the short term.

Figure 12: Mental health (Cantril Ladder)



59. During qualitative FGDs, most of the respondents reported that the cash transfers supported and helped a lot (26), followed by those saying they made them happy (19) and those saying they contributed to solving their immediate problems (10). Respondents cited that the money helped to alleviate the feeling of panic during and after the floods (8), decreased their stress level (8) and made them less tense (5). These responses came predominantly from villagers in the Kailali district, compared with those in Bardiya.

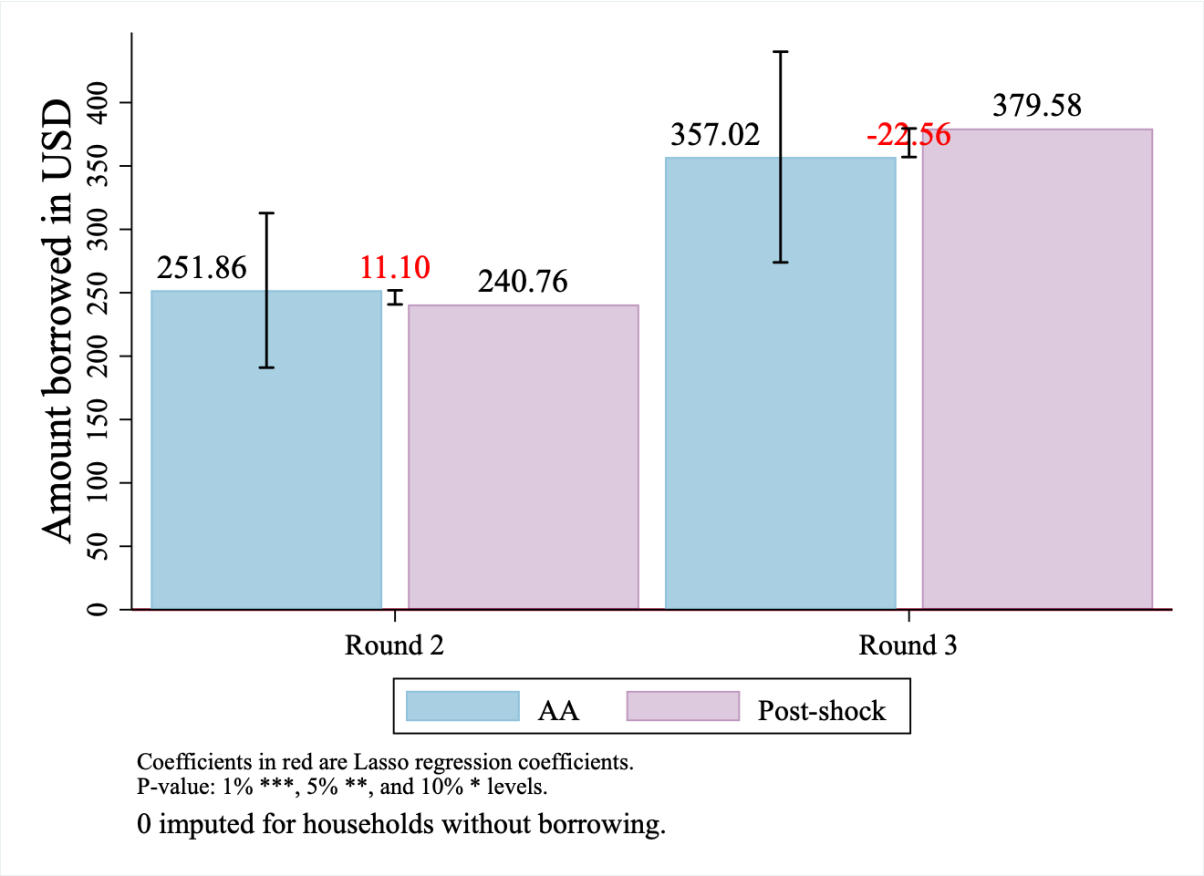
> *"We thought of you as God when you gave us the money immediately when our houses were flooded. We were relieved from all the tension and anxiety. At that time, we had so much of tension and became sick due to that." (AA household, Rajapur)*
>
> *"I got less tense after receiving money. It helped to pay for medical treatment when we got sick." (post-shock household, Geruwa)*
>
> *"If we have money, we get common sense, if we don't have money, we lose common sense." (AA household, Tikapur)*
>
> *"It would have been difficult if we did not receive 15,000 rupees. We would be agitated and in panic on how to manage household expenditures." (post-shock, Geruwa)*
>
> *"There has been some change. We all have a feeling of self-confidence right now." (post-shock household, Janaki)*
>
> *"My decisions matter more than my husband's." (post-shock household, Tikapur)*

4.6 Financial outcomes

Summary of findings: The evaluation did not find statistically significant impacts on financial outcomes such as borrowing, assets and income.

60. In the second and third rounds of data collection, other financial outcomes such as borrowing, assets, wage income and business profits were captured. However, the evaluation found no evidence of impacts on any of these outcomes. There is no statistically significant change in the likelihood of borrowing or amount borrowed, interest rate charged, assets owned, wage income or business profits (Tables 13 and 14).

Figure 13: Borrowing

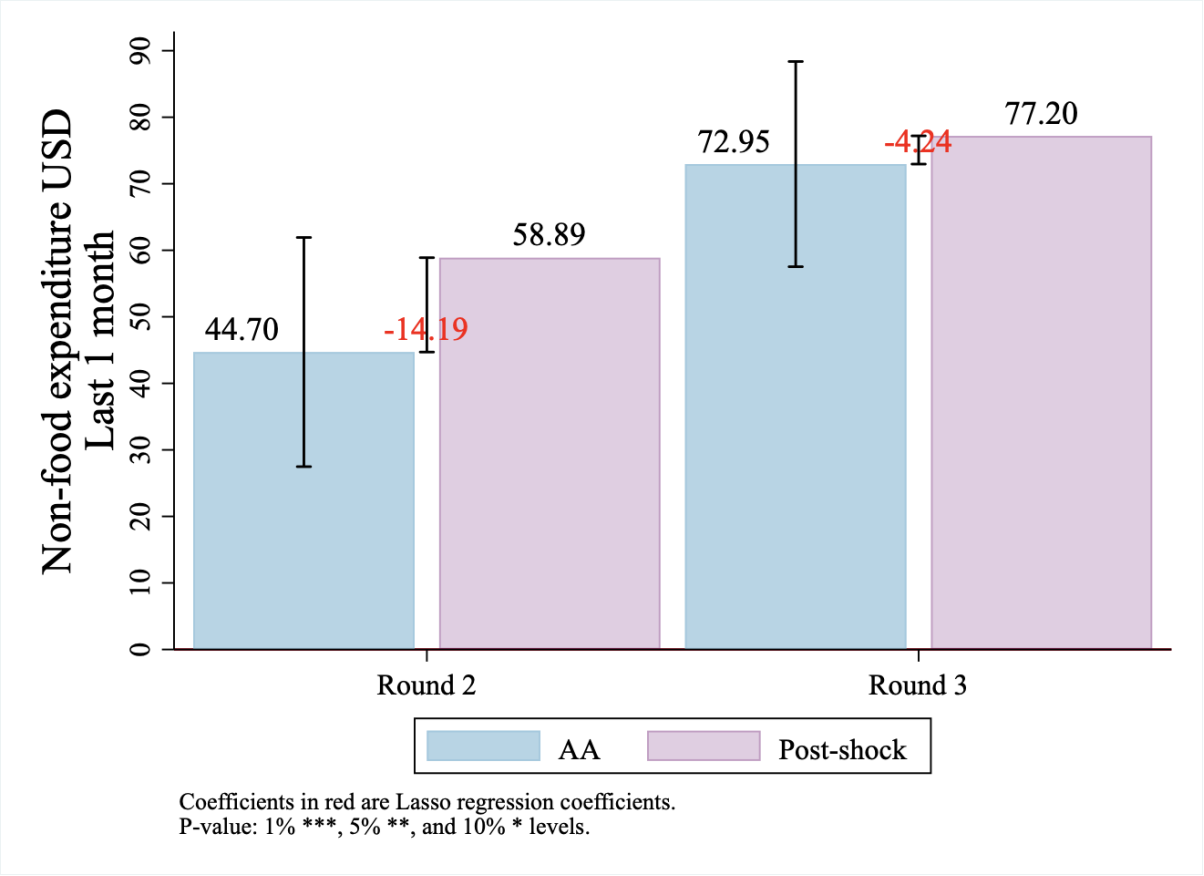


4.7 Non-food expenditure

Summary of findings: While no statistically significant effect on total non-food expenditure was observed in the second round, the AA group showed a reduction in house repair expenses, possibly due to addressing repairs earlier after receiving their transfer (which was not captured in the first round). In the third survey round, households receiving AA assistance reported having spent more on education and housing rent compared with the post-shock group, despite both groups receiving equivalently sized transfers.

61. During the second round of data collection, the larger survey instrument also captured additional non-food expenditure including electricity, education, fuel, home repairs, medicine and rent.

Figure 14: Non-food expenditure (in USD)



62. While there was no discernible effect on total non-food expenditures, a decrease in house repair expenses among the AA recipients by USD 11.62 (Table 16) in the previous month was observed.[42] This reduction could stem from the AA recipients addressing necessary home repairs earlier, soon after receiving their transfer, while those in the post-shock group did so after their cash infusion weeks after the flood peak. Unfortunately, due to survey duration constraints, non-food expenditure data could not be collected during the first survey round, hence this hypothesis cannot be confirmed.

63. In the third and final survey round, households in the post-shock group allocated more funds towards education, with the AA group spending USD 3.16 less on education in the previous month compared with the post-shock group (Table 16). Considering both groups received transfers of equal value and the AA group allocated more of their transfer towards food in October, the increased spending by the post-shock group on certain categories later is not unexpected.

4.8 Agriculture

Summary of findings: The evaluation did not find significant impacts of AA transfers on agricultural outcomes. However, differences were observed for a subgroup of households most affected by the floods.

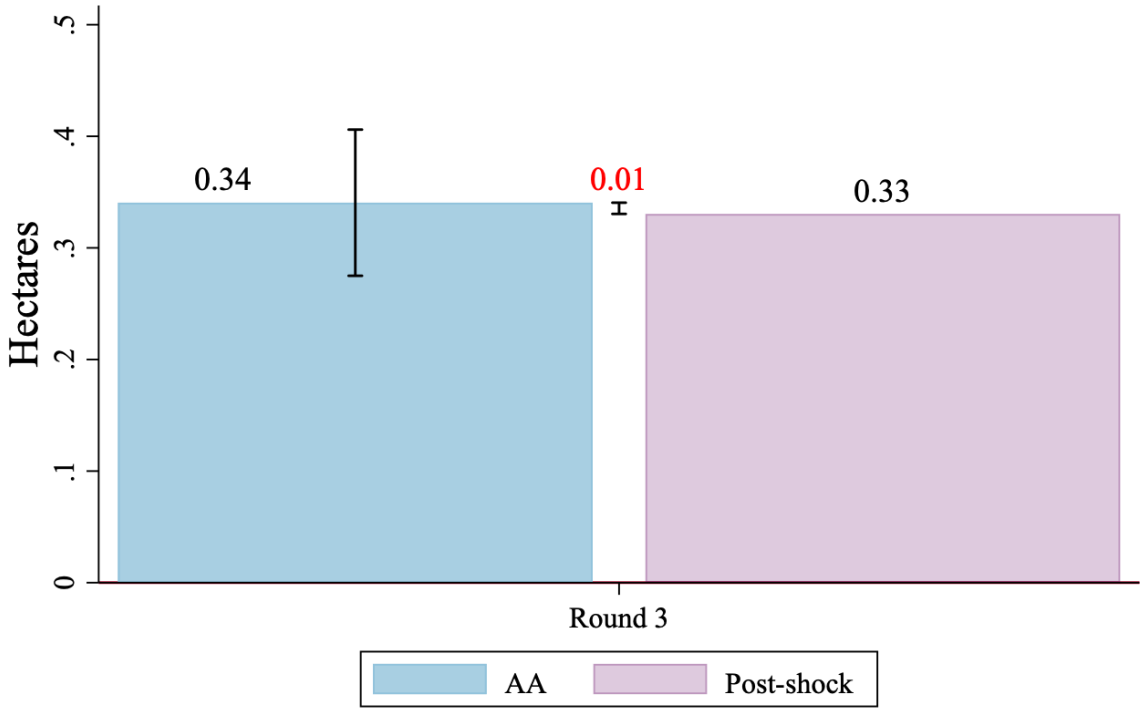
64. While not the main objective of the AA programme, early cash transfers could potentially help households to plan and make their agricultural investments. The third survey round captured outcomes 33 weeks after the AA households received transfers, and 26 weeks after the post-shock households received them. By this period, it was hypothesized that households would have harvested any winter season crops

[42] Log transformation is often used for expenditure and income variables due to large standard deviation in such outcomes. Using the log transformation, the AA group showed significantly lower non-food expenditure in the third round.

they had planted in the months following the 2022 monsoon season. If income from these periods is sensitive to the timing of agricultural investments that could be better leveraged by receiving early cash assistance, it may be likely that agricultural income, and consequently food security or mental health, could be different in this period.

65. However, our findings showed no significant differences between AA recipients and post-shock households who received transfers later when measuring outcomes among the entire sample. Table 12 indicates no variations in crop cultivation (also Figure 15), agricultural input spending or crop revenue, suggesting that the timing of transfers relative to the flood peak did not significantly impact agricultural investment decisions for this season.

Figure 15: Area cultivated



Coefficients in red are Lasso regression coefficients.
P-value: 1% ***, 5% **, and 10% * levels.

Area cultivated in winter season 2022-2023 in Hectares.

66. While quantitative data did not reveal a statistically significant impact of the one-off cash transfer on livelihoods overall, FGDs offered some qualitative insights. These discussions highlighted individual cases where the cash transfer demonstrably improved participants' farming practices and overall livelihood.

> *"I had all my vegetables rotten due to flood. I bought seeds with the money [NPR 15,000 cash] and restarted ... farming and sold vegetables. I earned up to NPR 12,000. I am continuing the farming and getting profit. Had I not received the cash, couldn't revive my farm as I had no money at the time."* (*post-shock household, Janaki*)

> *"It helped. We did not have any money during that time. We spent NPR 15,000 on seeds for agriculture which helped to move our business further. Earning was more than before. This year, we leased additional land of 6 kattha for vegetable farming."*[43] *(AA household, Tikapur)*

[43] Kattha is a land measurement in Nepal, especially in the Terai region, equating to approximately 338.63 square meters.

"The flood of 2022 washed away all my chilli plants in an area of 1 kattha land. I used some portion of NPR 15,000 and replanted the chilli again in 1 kattha of land. I also used few portions of that money to buy rice. I was able to profit around NPR 25,000 by selling them." (post-shock household, Shivnagar)

"*Due to flood, the vegetables in the field were rotten. I used the money of NPR 15,000 for seeds and fertilizers. I produced 4 quintals after that. And now the business has taken a proper path." (post-shock household, Janaki)*

67. Although no significant impacts from the timing of transfers on measures of agricultural production were found, it is possible that early transfers enable greater investment in agriculture for the most flood-affected households. To understand this heterogeneity, the previously mentioned remote/satellite-sensed data were used, provided by WFP's AIMS team, on the predicted flood status of households. An indicator for "flood affected" was constructed in the following four steps:

1. Construct buffers of incrementally increasing size around each household.
2. Calculate the share of area within each buffer that is predicted to have been flooded based on AIMS data.
3. Check correlation of households' **self-reported** severe flooding on their cultivated plots with the share of land within each buffer size. The buffer size that maximizes this correlation was found to be 771 m.
4. Define a household as flood-affected based on whether household is located within the 771-m buffer. This threshold was chosen to minimize exclusion errors (households report flooding but no flooding is detected within 771 m) and inclusion errors (households do not report flooding but flooding is detected with satellite data within 771 m).

68. The assignment to receive the AA transfers was then interacted with this binary indicator of flood-affected status. The analysis found suggestive evidence that early transfers may have led to increased investment in agricultural inputs and costs for households identified by remote sensing data as likely being the most flood affected. These households spend 44 percent more on agricultural inputs for the winter season compared with the post-shock transfer group mean, resulting in an additional USD 103 in the value of agricultural harvests (64 percent of the post-shock transfer group mean) and an additional USD 48 in the sales value of agricultural products (112 percent of the post-shock group mean) (Table 24).

69. It was also examined if flood-affected households report different outcomes on food security, negative coping strategies and mental health, but no consistent evidence for differential effects for this group were found.

Banke, Nepal. WFP/Srawan Shrestha

5. Conclusions

70. Overall, the evaluation finds positive impacts of AA transfers on household food security, coping mechanisms and mental well-being, when compared with those who received post-shock assistance. As a humanitarian initiative, AA appears to fulfil its primary programme objective. There are net welfare gains from speedy cash assistance designed to support vulnerable communities impacted by severe climate events immediately.

71. In the short run (measured by the **first survey round**), the AA group exhibited higher FCS compared with the post-shock group. Specifically, AA transfers decreased the prevalence of poor and borderline food security while increasing the proportion of households achieving acceptable food security. The positive impact on food consumption was concentrated on increased meat consumption (which remained significant for all three survey rounds).

72. The programme had a positive impact on household's coping strategies immediately following the floods. AA transfers helped households to avoid negative coping strategies related to food consumption using the rCSI. Despite reporting a need to resort to some adverse coping methods after the flood, AA households showed fewer instances of relying on less preferred food, borrowing food and reducing meal portions compared with post-shock households, leading to a reduction in the overall rCSI immediately after the floods.

73. The programme also had positive impacts on the mental health and well-being of beneficiary households immediately following the floods. AA recipients experienced a 2 percent decrease in anxiety and a 3 percent decrease in depression compared with the post-shock group, as well as higher levels of life satisfaction. These findings suggest that AA transfers can yield benefits, not only in terms of food security but also in mitigating negative mental health impacts following climate disasters.

74. Once the post-shock group received the same transfer, these differential impacts diminish over time. By the **second survey round**, no significant differences were found anymore for food security, coping and psychological well-being between the AA and post-shock groups.

75. There was also no differential effect on total non-food expenditure. However, the AA group showed a reduction in expenditure on house repairs, possibly due to addressing repair needs earlier using the AA transfer they received (this was not captured in the first survey round). There were not significant differences between the two groups in terms of other, secondary financial outcomes such as borrowing, assets, wage income, employment and business profits.

76. While outcomes in the post-shock group caught up with the AA group by the second round, their recent cash infusion did not lead to higher consumption relative to the AA group (there was no reversal in trends). This indicates an overall net benefit in receiving AA transfers, distinct from a mere function of the timing of transfers.

77. By **the third survey round**, most differences had diminished. There were no significant differences between the two groups in terms of overall food security (although meat consumption remained significantly higher for the AA group), coping and psychological well-being. Other outcomes – such as borrowing, assets, wage income and business profits – showed no significant differences between the two groups. There were no differential impacts on crop cultivation, input spending, crop value or revenue from sales, suggesting that the timing of transfers did not affect agricultural investment decisions for the winter season.

78. Examining non-food expenditure, households in the post-shock group spent more on education and housing rent compared with the AA group by the third survey round. However, it cannot be ruled out that the AA group spent more during the first survey round, as these indicators were only measured in the second and third rounds.

79. Differential impacts might differ, and could be larger, if: (a) a flood is more severe than the one observed in October 2022; (b) the transfers are disbursed even faster (prior to the flood peak); and (c) the selection and prioritization of beneficiaries ensures that all of the most vulnerable households are included.

Table 4: Evaluation questions against summary of findings

Evaluation question	Summary of findings
EQ1: What is the impact of providing anticipatory humanitarian assistance in the form of an unconditional cash transfer ahead of a severe flooding event (based on pre-defined forecast triggers) on **food security, coping, and psychological well-being?**	**Food security:** The early cash assistance (AA group) had significantly better food security immediately following the floods. Moreover, early transfers allowed the beneficiaries to buy more protein-rich food. While the initial boost in food security (as measured by the FCS) subsequently faded by the second round of data collection, the effect on meat consumption persisted through all three rounds of data collection. No significant effects were detected on both food and non-food consumption and expenditures in the longer-run follow-ups. **Coping:** While both the groups reported resorting to negative coping strategies immediately after the floods, the AA group was significantly less likely to resort to negative coping strategies such as reducing or skipping meals, borrowing or selling assets. However, the impact on coping strategies was short term, and dissipated by the second round of data collection. **Mental health:** Compared with the post-shock group, AA recipients showed a decrease in anxiety (2 percentage points, or 9 percent) and depression (3 percentage points). AA recipients reported higher subjective well-being. These findings suggest the benefits of AA transfers in mitigating negative mental health impacts following climate shocks. However, these positive effects on mental well-being diminished over time.
EQ2: What is the impact of providing anticipatory humanitarian assistance in the form of an unconditional cash transfer ahead of a severe flooding event (based on pre-defined forecast triggers) on **agricultural outcomes, financial outcomes, and migration?**	**Agriculture:** Significant effects for agricultural outcomes were only detected for the subgroup of households who were most flood affected. There were no impacts on other measures of livelihoods, migration and financial outcomes.

6. Considerations for future programming

80. The impact evaluation finds that WFP's AA programme in Nepal had positive impacts on food security, on coping strategies and on mental well-being. Additionally, the evaluation gained insights that can inform future AA programmes.

Consideration 1: Optimization of AA cash transfer delivery

81. The programme was well executed, as 97 percent of the households in the AA group received the cash transfer before or just after the flood peak. However, the timing of AA cash transfer delivery could be expedited to ensure households receive cash assistance before the flood peak. Administrative data showed that, in the AA group, only 50 percent of households received funds within six days of the flood peak (by 14 October 2022). While this is much faster than standard humanitarian responses, bigger impacts may be observed if cash assistance is delivered a few days prior to the actual shock (as intended), instead of during or after the shock.

82. It was also observed through qualitative data that, in some instances, beneficiaries had to travel long distances by foot to reach the remittance agent, highlighting the need to expand the remittance agent network or assess alternative methods for anticipatory cash delivery in hard-to-reach areas (or digital solutions once more broadly available). Additional data on market functionality in remote areas during or after a climate shock could also be useful to assess the effectiveness of the response in this context.

Consideration 2: Potential scope to improve targeting and prioritization

83. The findings from Nepal suggest there are at least two types of households that could benefit most from AA transfers. The first are those most vulnerable to a climatic event, in this case flooding, where the transfer increases the likelihood that they can maintain food security and avoid negative coping strategies, potentially saving lives during a shock. The second are those who have livelihoods that are most affected by a climatic event and where the timing of the transfers can make a significant difference in how they rebuild their livelihoods after flooding. For the second group, the optimal timing of transfers is more likely to depend on seasonality and access to functional markets, either before, during or after flooding.

84. Currently, communities themselves propose households to be included in the programme, which are then verified through spot checks. However, this method does not re-check households *not* nominated by communities. Thus, the absence of updated (census-type) data may limit the programme's ability to reach the most vulnerable.

85. To enhance targeting precision, future iterations could incorporate additional census-type exercises or utilize existing government census data from flood-exposed regions for a more complete assessment of household vulnerability. Accurately identifying households most in need could significantly enhance programme impacts, as those facing the greatest challenges often stand to make the most substantial gains from assistance.

86. Additionally, testing different targeting approaches to see what works best (e.g. community-based vs data-driven targeting) could also be an avenue to optimize AA through impact evaluations.[44]

Consideration 3: Adding programme components to enhance sustained recovery

87. While the impact evaluation detected positive impacts of the AA response, these effects dissipated in the medium and long term, and no effects were detected for key livelihood outcomes measured in the

[44] See an example of an impact evaluation testing targeting methods in the Democratic Republic of the Congo here: https://wfp-evaluation.medium.com/optimizing-targeting-of-humanitarian-food-assistance-in-the-drc-precision-and-coverage-29c6d39d2ee9.

subsequent agricultural season. If the objective is to support longer-term resilience, the AA intervention may benefit from testing additional components such as livelihood diversification, microinsurance, agricultural inputs (subsidies), or social and behaviour change communication around the optimal use of funds to ensure longer-term impacts. Future projects might pair cash transfers with other support (e.g., cash+) if impacting longer-term agricultural outcomes is considered a key outcome, especially for less flood-affected households.

Consideration 4: Further strengthen forecasting capacity to increase lead time and precision for AA responses

88. Enhancing forecasting capacity could potentially further extend AA response lead times (which are currently three days to three hours and can contribute to delays in payouts). Presently, the WFP Nepal country office collaborates with the Australian Department of Foreign Affairs and Trade to improve the state forecasting capacity for climatic shocks.

89. Transboundary data-sharing between neighbouring countries such as India, China and Bangladesh may further improve forecasts. By pooling and sharing meteorological and hydrological data across borders, countries can better understand weather patterns and anticipate climate-related disasters such as floods.

90. Recent advancements have also focused on developing localized or decentralized triggers using artificial intelligence and machine learning methods. This development is commendable because it may enable humanitarian actors to respond more quickly and accurately.

Consideration 5: Systematize collecting cost information to allow for cost-effectiveness analysis

91. Conducting cost-effectiveness analysis (CEA) in future impact evaluations is valuable, especially considering the pivotal role cost plays in scaling up interventions. As interventions mature, they should naturally become more cost-effective, benefiting from accrued experience in planning and executing AA frameworks. Moreover, as data collection methods advance and become more accessible, and forecasting techniques grow more precise, the potential for cost-effectiveness increases.

92. For CEA to be effective, meticulous collection of granular costing data is indispensable. This entails capturing all relevant elements associated with the AA programme, which may extend to encompass support from headquarters and the regional bureaux. This comprehensive approach ensures that the analysis accurately reflects the true costs involved and facilitates informed decision-making regarding the scalability and sustainability of interventions.

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Acronyms

AA	Anticipatory action
AIMS	Asset Impact Measurement System (WFP)
CBT	Cash-based transfers
CCT	Conditional cash transfer
CEA	Cost-effectiveness analysis
CERF	United Nations Central Emergency Response Fund
DFID	Department for International Development
DIME/DECDI	Development Impact Evaluation Department (World Bank)
DFAT	Department of Foreign Affairs and Trade, Australia
ECDPM	European Centre for Development Policy Management
EQ	Evaluation question
FbF	Forecast-based financing
FCS	Food Consumption Score
FFA	Food Assistance for Assets (WFP)
FGD	Focus group discussion
FIES	Food Insecurity Experience Scale
GFFO	German Federal Foreign Office
GloFAS	Global Flood Awareness System
GoN	Government of Nepal
HFC	High-frequency checks
HFDC	High-frequency data collection
HQ	Headquarters
IDS	Institute for Development Studies
MoU	Memorandum of understanding
MDMR	Ministry of Disaster Management and Relief
NGO	Non-governmental organization
NRCS	Nepal Red Cross Society
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
OEV	Office of Evaluation (WFP)
OSZIR	Climate and Disaster Risk Reduction Programme (WFP)
OSZPR	Asset Creation and Livelihoods Unit (WFP)
RBB	Regional Bureau Bangkok (WFP)
RCT	Randomized controlled trial
SBCC	Social and behaviour change communication
UCT	Unconditional cash transfer
UNEG	United Nations Evaluation Group
USD	United States dollars
WFP	World Food Programme

Appendix

A1. Limitations

1. The evaluation has several limitations.
2. The impact evaluation did not estimate the differential costs for the two groups, as they were delivered through the same mechanism. Future research and impact evaluations should conduct cost-effectiveness analysis for AA programming, especially once AA programmes have "matured" and have been implemented for a few years. As WFP gathers more experience with AA programmes, the costs of maintaining for example, a forecasting system, should reduce over time.
3. Household-level targeting primarily relied on community self-selection. While nominated households underwent verification, those not nominated did not, potentially leading to errors of exclusion. Omitting especially vulnerable households could skew the results downward, as significant improvements are typically expected from less affluent households.
4. Potential spillover effects across communities and differential attrition were monitored closely but not directly observed.
5. Furthermore, the post-shock transfers happened approximately six weeks after the action triggers were activated. A more "standard" response would probably be slower than this. In addition, the cash transfers were initiated a few days before the flood peak but received a few days after. Future impact evaluations should produce evidence for scenarios where the transfers are also received before the flood peak. Further, the water levels receded quickly following the flood, so detected impacts might have been larger if the transfers had been received even sooner.
6. The limited representation of beneficiaries with disabilities, estimated at around 13 percent of surveyed households, makes it challenging to gauge differential impacts on this subgroup.
7. Lastly, this impact evaluation does not evaluate the household targeting approach. There might be vulnerable households that the community-based targeting approach did not capture. Impacts might be larger for households that are less well off – in relative terms – which is why it is key to install a reliable targeting mechanism that ensures the inclusion of those most in need for subsequent years.

A2. Ethical considerations

8. WFP evaluations conform to the 2020 United Nations Evaluation Group ethical guidelines. Accordingly, the WFP Office of Evaluation and the World Bank's Development Impact (DIME) Department were responsible for safeguarding and ensuring ethics at all stages of the evaluation cycle. This included, but was not limited to, ensuring informed consent; protecting the privacy, confidentiality and anonymity of participants; ensuring cultural sensitivity; respecting the autonomy of participants; ensuring fair recruitment of participants (including women and socially excluded groups); and ensuring that the evaluation results did not pose harm to participants or their communities. During the inception phase, the following ethical issues, related risks, safeguards and measures were considered:

    - **Institutional review – ethical clearance:** The evaluation team obtained ethical clearance from the Government of Nepal's Health Research Council (NHRC) with reference number 1963 on 4 February 2022.
    - **Informed consent:** Every household enrolled in this impact evaluation consented first to being part of WFP's programme as per WFP guidelines and then provided informed consent to be surveyed. Refusal to respond to our survey did not preclude participation in WFP programming. Informed consent was collected for each survey round separately. The enumerators were trained to explain in detail and administer the informed consent form in the local language.
    - **Privacy during interviews:** Despite the minimal risks, several precautions were taken to ensure that the questions addressed to respondents respected their privacy and comfort. Interviews were conducted out of earshot of other participants (including those from the same household) and

enumerators. All enumerators underwent training that lasted for approximately five days and was followed by piloting in the field. The goal of the training was to ensure that enumerators followed survey best practices in terms of protocols and ethics, but also that questions were asked in a uniform and contextually appropriate manner. These issues were monitored and managed during the implementation of the evaluation. If any additional ethical issues arose during the implementation of the evaluation, they were recorded and managed in consultation with OEV.

- **Data management and confidentiality:** All personally identifiable information (PII) data were stored securely in encrypted folders to minimize any risk or harms to subjects. PII was only available to WFP principal investigators and coordinators working on this project, who followed strict data protection protocols such as those indicated in the WFP Guide for Personal Data Protection and Privacy. None of the direct identifiers were shared outside of the study, and all identifiers and codes were removed once the data collection exercise was complete. Only anonymized data were shared with the evaluation team at the World Bank's DIME for analysis purposes. Data collected during the impact evaluation may also be made publicly available for transparency purposes, after it is anonymized. If datasets are made available, the evaluation team will follow strict protocols such as obtaining informed consent from interviewed parties; properly preparing, cleaning and anonymizing data for sharing; and obtaining written authorization by the WFP country office.

9. The study prioritizes ethical conduct, covering informed consent, privacy, cultural sensitivity and vulnerable participant protection. Ethical integrity was consistently upheld and monitored to safeguard participants throughout the evaluation process.

A3. Stakeholder analysis

10. The stakeholder analysis for this evaluation identifies those who may influence or be influenced by the evaluation's outcomes. Stakeholders encompass internal and external parties, including programme beneficiaries. The primary user is the WFP country office in Nepal, but the evaluation aims for broader utilization of its findings.

11. Stakeholder categories include:

    1. internal Nepal-based stakeholders: key personnel within the country office;
    2. internal stakeholders outside of Nepal: involving the WFP Office of Evaluation (OEV), the WFP Regional Bureau for the Asia and Pacific (Regional Bureau Bangkok) and headquarters divisions;
    3. populations in need: both resident communities and migrants of various demographics;
    4. external stakeholders: comprising international non-governmental organizations (INGOs), donors, UN agencies and local forums (such as the Anticipatory Action Technical Working Group in Asia Pacific region (AA-TWG)); and
    5. national stakeholders: encompassing government entities at national and subnational levels, as well as local NGOs.

12. Stakeholder engagement methods differ by category but may involve reviewing and providing input on evaluation documents, actively monitoring the evaluation's design during programme implementation, participating in workshops, and offering feedback on evaluation reports.

13. The engagement aims to ensure diverse perspectives are considered and that the evaluation's results are effectively used by stakeholders.

A4. Programme targeting process

14. To identify the potential beneficiaries, WFP Nepal proceeded in three steps:

    I. **Regional:** Regional targeting was based on an overlay of flood risk (using Sentinel-1 satellite imagery for 2017, 2019 and 2020) and socio-economic vulnerability measures including poverty, food insecurity, housing and marginalization. Additionally, consultation with humanitarian organizations with extensive field-level experience on historical floods and flood response,

engagement with local governments, and seasonal monsoon forecast were taken into consideration for the final selection of municipalities.

II. **Municipal:** The list of municipalities was refined by focusing on those areas that could be covered under the Global Flood Awareness System (GloFAS)-based trigger mechanisms (considering feasibility). Combining all these factors, the priority list included nine municipalities covered by the trigger mechanism for the east basin and six municipalities covered by the trigger mechanism for the west basin.

III. **Household-level:** Communities self-nominated vulnerable households to be included in the programme. The community-level identification of households was followed by field-level verification (spot checks) and registration of beneficiaries. To do so, the WFP Nepal country office deployed its VAM (Vulnerability Assessment Mapping) enumerators in field to verify the households' vulnerability status. Vulnerability factors included:
    i. Hazard exposure in the past:
        1. Human casualties
        2. Flood depth
        3. Building damage experience
    ii. Housing condition types:
        1. Wood/mud bonded/unbacked bricks/heed huts
        2. Number of floors < 2
        3. Distance near to river
    iii. Physical vulnerability:
        1. Distance to safe shelter/community buildings
    iv. Socio-economic vulnerability:
        1. Family size 5+ OR headed by female, children or senior citizens
        2. Households with pregnant and lactating women
        3. Displaced or landless households
        4. Household head has no education or up to lower secondary level
        5. Household is highly dependent on agriculture and casual labour
        6. Household can survive on its land production for up to six months only (experienced food insecurity for up to six months in a year)

15. The OEV received the full list of eligible beneficiaries in September 2022, which included around 26,000 households across two river basins. This registration data served as a "baseline" and control variables were added to the regression.

A5. Registration data/baseline insights

16. WFP's registration data, which serves as the impact evaluation baseline, reveal farming as the predominant occupation among eligible households, with over 88 percent engaged in agricultural activities, either on their own land or as agricultural labourers. Conversely, skilled jobs are 6 percent more likely to be present in post-shock households compared with 15 percent reported in AA households, while a quarter of them rely on welfare subsidies. Housing patterns indicate a prevalent use of indigenous materials, with only one third of households reporting brick walls, while the majority have bamboo or wood structures. However, given the negligible magnitude of these variances and their proximity to the mean levels of the population, it is posited that these differences are likely attributable to random fluctuations rather than indicative of any significant structural imbalance between intervention households.

Table 5: Baseline/registration characteristics

	Post-shock	AA	Pairwise t-test – mean difference
Beneficiary is a woman	62%	65%	0.03
Has agricultural job	89%	88%	0.02

Has skilled job	21%	15%	0.06*
Receives welfare	28%	27%	0.01
Has mental disability	1%	3%	-0.01
Has physical disability	8%	8%	-0.01
House has brick wall	34%	33%	0.02
Household has pregnant woman	5%	4%	0.02
Woman has citizen card	96%	94%	0.02
Number of observations	1,203	1,205	2,408
Number of villages/clusters	70	68	138

This table includes data for the 2,408 households that responded in the third round.

A6. Forecast triggers

17. A flood trigger is based on a set of criteria to help answer the questions on when and where to act before a disaster. It gives an indication when a hazard becomes an out-of-the-ordinary (or severe) shock and impact crosses a certain threshold for the exposed vulnerable community.

18. Several global and national flood forecasts are available for Nepal. For this project, two forecast systems were selected by WFP in coordination with the Government of Nepal, based on a thorough study by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and the UN Resident Coordinator Office (RCO), as well as previous experience triggering AA for monsoon floods by WFP.[45]

19. The project relied on separate two-step trigger systems for each basin, described as follows (and presented in Table 6 below):

I. **Stage I:** A readiness trigger based on the GloFAS forecast, which provides approximately seven days' lead time. The readiness trigger would be met if there was at least a 70 percent prediction of reaching a one-in-two-year flood return period.
II. **Stage II:** The action trigger relies on two components – the DHM flood bulletin and the GloFAS forecast or government-based observational data, provides a lead time of anywhere between three hours and three days.

Table 6: Two-step flood trigger mechanism in Nepal

Readiness trigger	Action trigger		
GloFAS seven-day forecast predicts 70% + probability of reaching one-in-two-year return period	Flood warning bulletin issued by the Government of Nepal's Department of Hydrology and Meteorology (DHM)		
	+		
	GloFAS three-day forecast predicts 70% probability of reaching one-in-two-year return period	***OR***	Water level reaches government-defined danger level (*three-hour warning only*)

A7. Flood exposure and damage

20. This impact evaluation measured flood exposure and damage both by directly asking beneficiaries about the October 2022 flood impact, and by also verifying flood extent through satellite imagery. Some findings cannot be interpreted as *causal* impacts because damage occurred before any household received transfers

[45] The system was devised to reduce the risk of false alarms. However, there was a potential scenario where the action trigger could be directly activated due to high water levels, without the readiness trigger being activated first, thus diminishing the preparedness time. Additionally, it was conceivable that a readiness trigger could activate without subsequently triggering the action trigger if the water level receded.

(see previous section). This rules out the possibility that transfer funds could have been used, for example to facilitate evacuation of people or livestock.

21. To obtain measures of flood intensity from households, three separate strategies were employed:

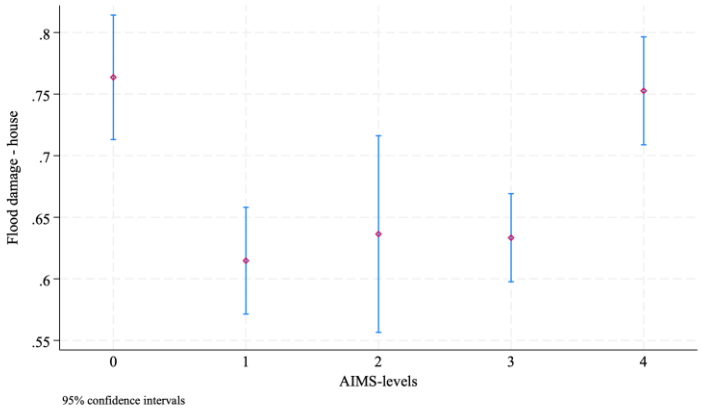
I. Enumerators held a measuring tape to the entrance of each respondents' home and compound and asked the household to indicate how high the water reached during the flood peak (during the second data collection round).
II. Satellite imagery was used to gain insights into flood extent – through WFP's AIMS.
III. Households were asked directly about flood damage.

22. The average flood measurement,[46] using the measurement tape, was 25 cm for both groups, and 48 cm for those that reported actual flooding, confirming that – when households experienced flooding – they were dealing with significant quantities of water.

23. The height of flooding was 6 cm higher on average in Kailali district. Kailali district also had more farmers report that their farm had been damaged by flooding; however, those households were more likely to cultivate land ex-ante before flooding took place.

24. Another measure of flood exposure is the predicted flood variable provided by AIMS (ranging from 0 to 4). AIMS analysis is based on Sentinel-1,2 imagery and historical flood and land cover maps, using the household dwelling's GPS coordinates with a 200-m buffer area as the anchor point. The results assign each household a value of flood probability ranging from 0 to 4. Figure 16 shows that households which scored a 4 were more likely to self-report as having their house flooded in October 2022. However, households that scored 0 in the AIMS index also were more likely than those scoring 1–3 to self-report house damage. Thus, the AIMS measure by itself was not very precise when trying to assess the flood damage to the house when compared with self-reported data.

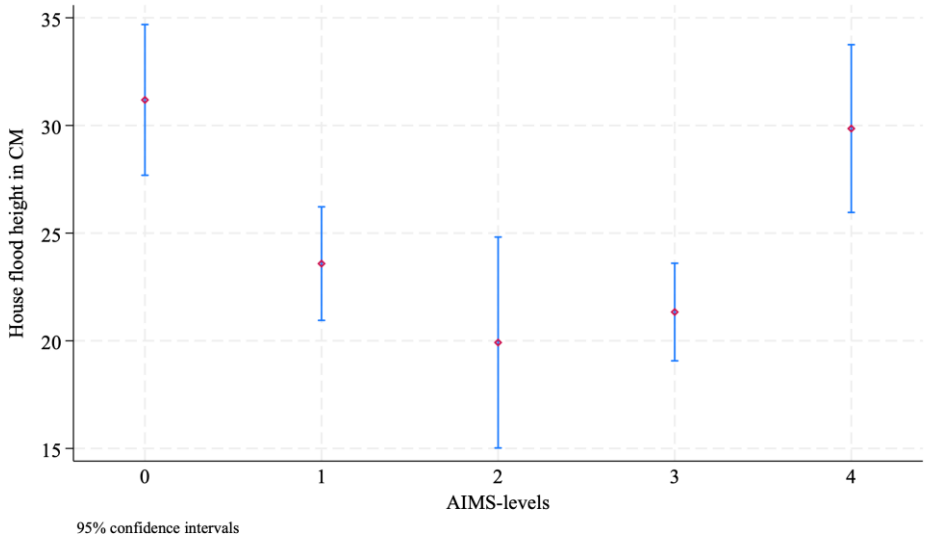
Figure 16: AIMS levels and self-reported house damage in the first round



25. Figure 17 shows that there is little correlation between the height of flood measured at the house and AIMS predicted flood score, using a 200-m buffer around the dwelling's GPS coordinates.

46 The question asked in the survey was *"Note for the enumerator: 1. You will now ask the respondent politely to show the maximum level of the floodwater. 2. Put the measuring tape on the wall/side of the house 3. Ask the respondent politely to point till how high the floodwater reached at its highest point in the house in Asoj-Kartik 2022"*

Figure 17: AIMS levels and self-reported house flood height (cm) in the first round

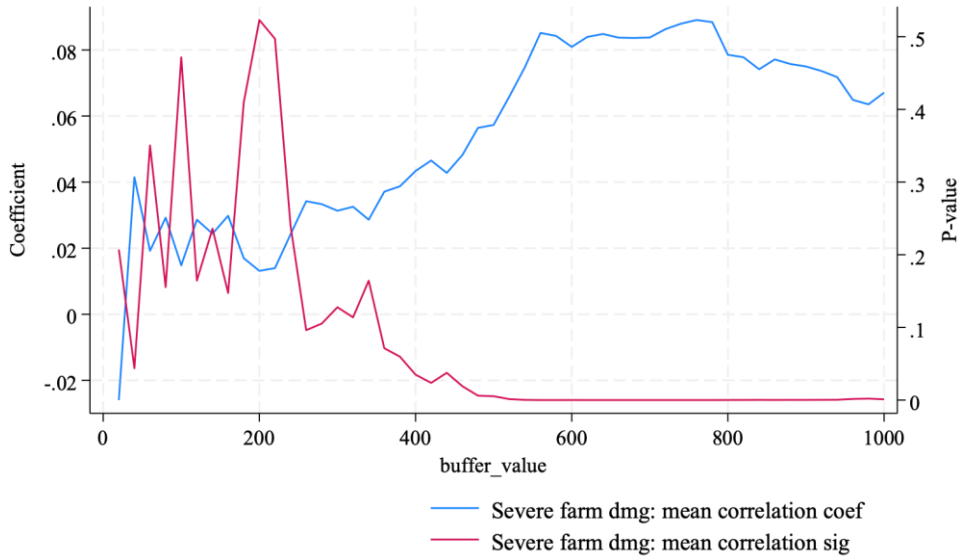


26. To illustrate what flooding was like, a beneficiary in the AA group described the flood as follows during qualitative data collection:

> *"The flood occurred at 3 am… in the night. When I got up early in the morning to go to the toilet, our yard was completely submerged in water. Every canal and waterways were fully filled with floodwater, few houses were inundated, others agriculture field were completely submerged under water or washed away. The agriculture field got completely destroyed. During the day, a lot of people were running here and there to identify the household unaffected by water to spend the night there. We spent the entire night without any sleep. Our muddy kitchen oven was also wet, we cooked the soaked rice and ate twice (in the morning and in the evening)."*

27. Given that most of the damage affected people's farms, the team expanded the buffer area for damage assessment provided by the AIMS team to test which buffer area correlates the most with self-reported damage. For severe farm damage, a buffer size of 771 m maximizes the correlation (illustrated by the blue line in Figure 18), indicating that, on average, households' farms are not located very near to their dwellings. Future studies should, if possible, collect more precise GPS data for farms, to more allow for more accurate remote sensing to assess damage.

Figure 18: Correlation – self-reported farm damage and satellite-predicted flood in the second round



A8. Data collection

A8.1 Quantitative data collection

28. The impact evaluation used WFP's registration data to serve as a (limited) baseline. Quantitative follow-up panel data for this impact evaluation were collected in three rounds from approximately 2,300 households in addition to one round of qualitative data collection.

8.1.1. Household-level sampling

29. The household sampling procedure relied on beneficiary selection data collected/verified by the WFP Nepal country office in July 2022. It identified households that were eligible for transfers based on their internal scoring cut-off. Each village had, on average, 30 transfer-eligible households. The evaluation team randomly selected the required number of villages from those ranked as most vulnerable in WFP's flood vulnerability ranking. For the impact evaluation, the evaluation team only included mid-sized villages: those with a minimum of 8 and a maximum of 70 transfer-eligible households. Within each sampled village, a maximum of 20 households were sampled for the impact evaluation surveys, with an additional 10 provided as replacements.

30. In the 140 villages included in the impact evaluation sample, 1,499 households were in the AA group and 1,484 households in the post-shock group. For the impact evaluation surveys, the sample consisted of 2,321 households in total, with 1,126 households in the AA group and 1,195 households in the post-shock group.

Table 7: List of impact evaluation locations in the West Basin, Karnali

	Number of targeted households for AA	Number of households in the impact evaluation villages
Bardiya District (Rajapur, Geruwa, Bansghadi)	8,231	1,735
Kailali District (Tikapur)	4,204	1,248
Total	**12,435**	**2,983**

31. Data were collected using computer-assisted personal interviews (CAPI) on SurveyCTO for all three rounds.

- **First round:** Conducted between 4 and 13 November, approximately four weeks after the transfers to the early group. (The first round was a shorter survey of approximately 20 minutes' duration.)

- **Second round:** Conducted between 10 and 27 January, approximately six weeks after transfers to the post-shock group. (The second round was a longer survey as more outcomes were measured, of approximately 40 minutes' duration.)
- **Third round:** The third and final round of data collection took place between 29 May and 14 June to capture the harvest from the winter and spring seasons of 2023. (The third round was a longer survey as more outcomes were measured, of approximately 40 minutes' duration.)

32. The first round was in the form of a shorter survey, which only focused on modules related to Food Consumption Score (FCS), coping strategies, psychosocial well-being, and loss and damage due to the floods, in addition to WFP assistance monitoring modules. For the second and third rounds, a longer survey questionnaire was administered. This included modules on food and non-food expenditure, agriculture, flood levels, costly borrowing and remittances, in addition to the modules already included in the first round.

33. Regular high-frequency checks and other data quality checks were conducted on the data collected, and outliers were communicated to the data collection team for corrections on a regular basis. WFP hired local enumerators directly and OEV consultants supervised the training of enumerators and accompanied the teams in the field throughout the data collection period. Backchecks were conducted for 10–12 percent of the sample for each round of quantitative data collection.

Table 8: Response rates by survey round

Survey round	No. of households assigned	No. of households surveyed	Percentage response rate
1	2,321	2,053	88%
2	2,321	2,291	99%
3	2,506	2,403	96%
Households that completed all three follow-up panel survey rounds		**1,983**	

34. A sample of 2,321 households was drawn for the impact evaluation surveys from the original list of 140 villages, in addition to approximately 10 replacement households per village. The survey response rates are given in Table 8.

35. As mentioned earlier, in the first data collection round, 12 villages could not be surveyed due to political conflicts in the communities and therefore an uncertain security situation for enumerators. Out of these, 10 villages were surveyed in the second and third rounds. The remaining three villages not surveyed in any of the rounds had been assigned to the AA arm.

36. In the third round of data collection, surveys were attempted for 2,506 households, which included the original survey sample and the replacement households surveyed in the first and second rounds.[47] Of the households surveyed in the three rounds of data collection, a panel consisting of 1,983 households was obtained.

37. The three primary outcomes for the evaluation are households' food security, coping with the flood shock, and psychological well-being, in line with the project's main objectives. These were captured across all three rounds of quantitative data collection.

38. Beginning in the second data collection round, after both groups had received transfers, a set of secondary outcomes were included to capture a broad range of possible impacts on households. The secondary outcomes were:

a. Financial outcomes/expenditures
b. Agriculture
c. Migration

[47] These additionally surveyed households were not used for the analysis.

A8.2 Qualitative data collection

39. In addition to conducting three rounds of quantitative impact evaluation data collection, qualitative focus-group discussions (FGDs) were conducted in a total of 15 settlements, covering both AA and post-shock settlements. Purposive sampling was employed to select these settlements based on various parameters, including accessibility, previous exposure to floods, rural–urban distribution, age of settlement, proportion of impoverished households and representation of the most vulnerable caste[48] groups. The key themes of FGDs included flood preparedness, early warning, programme implementation, cash transfer delivery, sharing of food resources, short-term and long-term changes due to the programme, community initiatives, and general well-being.

40. Following a two-and-a-half-day training session, field data collection took place from 4 to 8 August 2023. The team gathered data from six *palikas* (गाउँपालिका, romanized: Gāum̐pālikā, lit. "rural municipality") across two districts: Bardiya and Kailali. Three study teams, each with two members, conducted FGDs and documented the information in writing, with electronic recording available for reference as needed. The WFP Nepal country office conducted one and a half days of training in the local language, followed by one day of field testing. Before implementing the FGDs, the study team conducted a pilot test of the FGD tool among programme beneficiaries in Kailali district, with most participants being women. The transcripts were sequenced based on the key themes and cleaned. In between, thorough review of the transcripts and the associated translated notes were completed, by going through each audio file.

A8.2.1 Details on qualitative data collection

Qualitative quality assurance

41. Quality control was ensured during each stage of the study. The study team had a uniform understanding of the tools and protocols. Similarly, the questionnaires were well scrutinized to confirm that there were no ambiguities and that the respondents could clearly understand. Leading and bias questions were minimized as much as possible.

42. Personnel from the WFP Nepal country office MRE unit conducted spot checks and led the daily debriefing sessions. The contents transcripts were sequenced based on the 14 themes and cleaned.

Qualitative data organization, processing and reporting

43. The interviews and FGDs were conducted, and recordings from FGDs were compiled and a summary log of both interviews and FGDs was developed. The recordings, in most cases, were in Nepali with some Tharu language in few sections in selected FGDs: so, each FGD was transcribed in notebook first and then translated into English for analysis. The facilitator and notetakers who conducted the FGDs first transcribed the FGD note by going through the recordings, referring to the field notes, and then translated in English for analysis.

44. The FGD were conducted using a structured guideline. While transcribing, a template with various topics grouped into 14 themes with broader guidelines was used; however, for sub-themes, the transcriber and translator typed both questions and underlying answers, as discussion went on. Follow-up questions asked during the FGDs were transcribed and translated.

45. Reviewers went through the transcripts and worked on collating, moving the chunks of information, and performed the coding. Similarly, descriptors (demographic) files were prepared and linked with each FGD transcripts for comparing findings. Thematic analysis was done using *Atlas.ti* and case stories.

[48] The caste system in Nepal is a historical social hierarchy dividing people into four main categories: Brahmins (priests), Kshatriyas (warriors, rulers), Vaishyas (traders and merchants) and Shudras (labouring class) with various sub-castes. Though officially abolished since 1963, remnants of the system persist, influencing social dynamics. Vulnerable castes, including Dalits (formerly "untouchables"), indigenous Janajatis and Madhesis, face discrimination and marginalization, hindering their access to education, healthcare and economic opportunities.

Limitations of qualitative focus group discussions

46. Methodological limitations in this study are related to the use of qualitative data and potential bias. The sampling approach described above does not, and was not designed to, provide statistically representative data on AA programme participants or stakeholders.

47. Recall bias was unavoidable when respondents provided inaccurate or incomplete recollections of past experiences. (For example, not able to distinguish between experiences during the 2022 flood or floods before that, or not recalling the timing of receipt of cash). However, to counter recall bias, the study team did its best to "anchor" experience in a certain date or period (2022 activation) while conducting the FGDs.

48. Response bias, sometimes called "the halo effect", is the risk that interviewees may have been motivated to provide the study team with responses that would be considered socially desirable or influential in obtaining donor support. The standard informed consent shared at the beginning of the FGD made it clear that no benefits were expected from participation in this study. When data collection was carried out, the interviewers were oriented to maintain privacy during the interview and mention that the results would be confidential.

A8.3 Randomization balance test

Table 9: Balance test: AA vs post-shock

	(1)	(2)	(1)-(2)
Variable	Post-shock Mean/(Var)	FbAA Mean/(Var)	Pairwise t-test Mean difference
Has agriculture job	0.89	0.88	0.01
	(1.69)	(1.88)	
Has skilled job	0.21	0.15	0.06*
	(2.84)	(2.24)	
Receives welfare	0.28	0.27	0.01
	(3.51)	(3.54)	
Has mental disability	0.01	0.03	-0.01
	(0.26)	(0.49)	
Has physical disability	0.08	0.08	-0.01
	(1.23)	(1.37)	
House brick wall	0.34	0.33	0.02
	(3.94)	(3.96)	
Household has pregnant woman	0.05	0.04	0.02
	(0.89)	(0.67)	
Woman has citizen card	0.96	0.94	0.02
	(0.63)	(0.97)	

Number of observations	1,203	1,205	2,408
Number of clusters	70	68	138

Notes: This table presents descriptive statistics and balance tests across interventions using administrative data collected by WFP during registration before floods. Column 1 shows means of variables in the post-shock group with variance in parentheses. Column 2 shows means in the AA group. Column 3 shows the difference in means. Asterisks in Column 3 indicate statistical significance from a pairwise t-test on the difference in means at the 1 percent ***, 5 percent **, and 10 percent * levels.

A8.4 Lasso regression – main specification

Table 10: Main specification – food security and coping

	(1) FCS raw	(2) FCS poor	(3) FCS borderline	(4) FCS acceptable	(5) rCSI*
FbAA x Round 1	2.88**	-0.02***	-0.07***	0.09***	-0.96*
	(1.19)	(0.01)	(0.02)	(0.02)	(0.55)
FbAA x Round 2	-0.06	0.00	0.00	-0.01	0.22
	(1.34)	(0.00)	(0.03)	(0.03)	(0.34)
FbAA x Round 3	0.39	0.00	-0.02	0.02	
	(1.07)	(0.00)	(0.02)	(0.02)	
Post-shock group mean	47.92	0.02	0.23	0.73	6.48
Controls	Yes	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes	Yes
Observations	6,985	6,985	6,985	6,985	4,577

Notes: This table presents the impact of being in the AA group relative to the post-shock on food security. Data include all three survey rounds. Round 1 corresponds to the time when the FbAA group received their transfer, but the post-shock group had not. Round 2 corresponds to when both groups received their transfer. Round 3 corresponds to six months after both groups received their transfers. Controls selected by LASSO. Standard errors are clustered at the village level. Asterisks indicate statistical significance at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 11: Main specification – mental health

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	PHQ-4 score std	PHQ-4 score raw	Anxiety score	Depression score	Respondent is anxious	Respondent is depressed	Cantril Ladder
FbAA x Round 1	-0.10	-0.35	-0.18	-0.17	-0.02	-0.03	0.29*
	(0.07)	(0.25)	(0.13)	(0.13)	(0.03)	(0.03)	(0.15)
FbAA x Round 2	-0.06	-0.18	-0.11	-0.07	-0.02	-0.01	0.18
	(0.07)	(0.20)	(0.11)	(0.11)	(0.02)	(0.02)	(0.17)
FbAA x Round 3	0.02	0.06	0.02	0.04	0.01	0.02	0.02
	(0.06)	(0.17)	(0.10)	(0.09)	(0.02)	(0.02)	(0.11)
Post-shock group mean	0.05	3.73	1.93	1.80	0.27	0.26	3.98
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,985	6,985	6,985	6,985	6,985	6,985	6,985

Notes: This table presents the impact of being in the AA group relative to the post-shock group on mental health indicators. PHQ-4 score was standardized within each round (column 1). Data include all three survey rounds. Round 1 corresponds to the time when the FbAA group received their transfer, but the post-shock group had not. Round 2 corresponds to when both groups received their transfer. Round 3 corresponds to six months after both groups received their transfers. Controls selected by LASSO. Standard errors are clustered at the village level. Asterisks indicate statistical significance at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 12: Main specification – winter crop cultivation

	(1) Planted	(2) No. of crops	(3) Area	(4) Wheat yield	(5) Costs	(6) Crop value	(7) Sales revenue
FbAA x Round 3	-0.03	0.01	0.01	0.00	-0.01	12.87	7.98
	(0.03)	(0.08)	(0.03)	(0.08)	(0.03)	(20.98)	(9.76)
Post-shock group mean	0.76	1.89	0.33	1.93	0.32	161.68	42.94
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,408	1,789	2,408	900	2,408	2,408	2,408

Notes: This table presents the impact of being in the AA group relative to the post-shock group on winter crop cultivation: whether the household planted a winter crop (column 1), number of crops cultivated (column 2), number of crops cultivated with area more than 200m^2 (column 3), the area they cultivated in hectares (column 4), yield of wheat as measured in tons per hectare (column 5), planting costs which include expenditures on seeds, fertilizer and labor (column 6), the value of crops harvested which is the summation of USD revenue earned from crops sold and the imputed value of crops harvested but not sold (column 7), and USD revenue from crops sold (column 8). Revenue and crop value are winsorized at 99 percent. Data include the last survey round. Round 1 (not collected) corresponds to the time when the FbAA group received their transfer, but the post-shock group had not. Round 2 (not collected) corresponds to when both groups received their transfer. Round 3 corresponds to six months after both groups received their transfers. Controls selected by LASSO. Standard errors are clustered at the village level. Asterisks indicate statistical significance at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 13: Main specification – assets, income, migration

	(1) Wage income: last month	(2) Business profit	(3) Asset index	(4) Any migrants	(5) No. of migrants
FbAA x Round 1	-1.91	0.98			
	(3.33)	(1.44)			
FbAA x Round 2	3.73	-2.01	-0.09		
	(3.69)	(1.40)	(0.12)		
FbAA x Round 3	-7.03	0.01	-0.09	0.01	0.04
	(7.34)	(1.07)	(0.12)	(0.02)	(0.05)
Post-shock group mean	44.41	5.30	-0.07	0.55	0.77
Controls	Yes	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes	Yes
Observations	6,985	6,985	4,773	2,408	2,408

Notes: This table presents impacts of transfer timing on measures asset ownership, income and migration: the amount of wage income earned in the last month (column 1), business profits (column 2), an asset index (column 3), whether the household had any migrants in a given recall period (the last 12 months in round 3) (column 4) and the number of household members who migrated (column 5). Data include all rounds for wage income and business profits, the last two rounds for the asset index, and the last round for the measures of migration. Controls selected by LASSO. Asterisks indicate statistical significance from a pairwise t-test on the difference in means at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 14: Main specification – costly borrowing

	(1)	(2)	(3)	(4)
	Borrowed since Dashain	Amount borrowed USD	Amount borrowed USD*	Highest annual interest rate
FbAA x Round 2	0.04	-7.76	11.10	6.63
	(0.03)	(49.86)	(30.69)	(5.79)
FbAA x Round 3	0.02	-55.84	-22.56	-8.90
	(0.03)	(57.72)	(41.86)	(6.27)
Post-shock group mean	0.55	435.50	240.76	50.68
Controls	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes
Observations	4,773	2,853	4,773	2,850

Notes: This table presents impacts of transfer timing on measures of costly borrowing: the amount households borrowed since Dashain festival (26 September – 9 October) in column 1; the amount borrowed in column 2 in a given recall period (4 months in round 2, 10 months in round 3); and the highest annual interest rate they faced in column 3. Data include the last two survey rounds. Controls selected by LASSO. Asterisks indicate statistical significance from a pairwise t-test on the difference in means at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 15: Main specification – number of times foodstuffs consumed in last week

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Cereal	Meat	Fruit	Milk	Oil	Pulses	Sugar	Vegetables
FbAA x Round 1	0.08**	0.32***	0.03	0.03	0.17*	0.32	0.18	0.17
	(0.04)	(0.07)	(0.10)	(0.16)	(0.10)	(0.20)	(0.21)	(0.17)
FbAA x Round 2	-0.03	0.18*	0.05	-0.12	-0.03	-0.06	-0.31*	0.06
	(0.02)	(0.10)	(0.08)	(0.18)	(0.03)	(0.22)	(0.18)	(0.09)
FbAA x Round 3	-0.00	0.17**	0.10	-0.05	0.04	0.00	-0.36*	-0.02
	(0.00)	(0.09)	(0.10)	(0.15)	(0.03)	(0.16)	(0.21)	(0.10)
Post-shock group mean	6.81	1.31	0.95	1.38	6.34	4.21	3.59	4.93
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,985	6,985	6,985	6,985	6,985	6,985	6,985	6,985

Notes: This table presents impacts of transfer timing on the components of the FCS, disaggregated by food type. Data include all three survey rounds. In column 1, cereal indicates the number of days the household consumes cereal in the previous seven days. Remaining columns indicate the number of times foodstuffs out of the previous seven other food groups were consumed. Controls selected by LASSO. Asterisks indicate statistical significance from a pairwise t-test on the difference in means at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 16: Main specification – expenditures in the last month

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Electricity	Education	Fuel	House repair	Medical	House rent
FbAA x Round 2	-14.19	0.19	-0.80	0.28	-11.62	-1.95	-0.37**
	(8.67)	(0.15)	(1.08)	(0.50)	(8.14)	(1.96)	(0.17)
FbAA x Round 3	-4.24	-0.03	-3.16**	0.26	-1.76	-0.42	0.80
	(7.76)	(0.17)	(1.53)	(0.49)	(6.51)	(2.07)	(0.77)
Post-shock group mean	58.88	1.34	10.38	4.03	25.84	16.64	0.63
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,773	4,773	4,773	4,773	4,773	4,773	4,773

Notes: This table presents the impact of being in the AA group relative to the post-shock group on expenditures (USD): total non-food spending (column 1), electricity (column 2), education (column 3), fuel (column 4), house repairs (column 5), medical expenditures (column 6) and house rent (column 7). Zero values imputed if the household did not occur any expenditure in this category. Data include the last two survey rounds. Round 1 (not collected) corresponds to the time when the FbAA group received their transfer, but the post-shock group had not. Round 2 corresponds to when both groups received their transfer. Round 3 corresponds to six months after both groups received their transfers. Controls selected by LASSO. Standard errors are clustered at the village level. Asterisks indicate statistical significance at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 17: Main specification – reduced Coping Strategies Index

	(1)	(2)	(3)	(4)	(5)
	Q1	Q2	Q3	Q4	Q5
FbAA x Round 1	-0.15**	-0.15**	-0.15	-0.11	-0.08
	(0.07)	(0.07)	(0.09)	(0.15)	(0.08)
FbAA x Round 2	-0.00	0.03	-0.01	0.06	0.04
	(0.05)	(0.04)	(0.06)	(0.11)	(0.05)
Post-shock group mean	0.77	0.60	0.77	1.53	0.72
Controls	Yes	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes	Yes
Observations	4,577	4,577	4,577	4,577	4,577

Notes: This table presents impacts of transfer timing on the reduced Coping Strategies Index (rCSI). Data include the first two survey rounds. The rCSI module asks: During the last 7 days, were there days (and, if so, how many) when your household had to employ one of the following strategies (to cope with a lack of food or money to buy it)? Q1: Relied on less preferred, less expensive food? Q2: Borrowed food or relied on help from friends or relatives? Q3: Reduced the number of meals eaten per day? Q4: Reduced portion size of meals? Q5: Restricted consumption by adults in order for small children to eat? Controls selected by LASSO. Asterisks indicate statistical significance from a pairwise t-test on the difference in means at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 18: Main specification – summer 2022 crop cultivation

	(1) Planted	(2) No. of crops	(3) Area	(4) Yield paddy – actual	(5) Crop value	(6) Sales revenue
FbAA x Round 3	0.01	0.05	0.02	0.08	15.10	7.05
	(0.05)	(0.05)	(0.04)	(0.08)	(14.77)	(5.85)
Post-shock group mean	0.92	1.16	0.38	2.20	123.96	22.04
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1983	1544	1983	1419	1983	1983

Notes: This table presents the pre-intervention differences of the AA group relative to the post-shock group on summer crop cultivation: whether the household planted a summer 2022 crop (column 1), number of crops cultivated (column 2), the area they cultivated in hectares (column 3), yield of paddy as measured in tons per hectare (column 4), the value of crops harvested which is the summation of USD revenue earned from crops sold and the imputed value of crops harvested but not sold (column 5), and USD revenue from crops sold (column 6). Revenue and crop value are winsorized at 99 percent. Data include the last survey round. Round 3 corresponds to six months after both groups received their transfers. Controls selected by LASSO. Standard errors are clustered at the village level. Asterisks indicate statistical significance at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 19: Main specification – summer 2022 crop losses

	(1)	(2)	(3)	(4)
	Paddy flooded	Share flooded	Amount harvested (kg)	Lost crop (kg)
FbAA x Round 3	-0.03	-0.03	63.77	-458.33
	(0.03)	(0.03)	(82.25)	(431.54)
Post-shock group mean	0.80	0.80	688.64	970.75
Controls	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes
Observations	1,699	1,699	2,408	1,857

Notes: This table presents impacts of transfer timing on summer 2022 monsoon crop production. Data include the last survey round. Column 1 is the probability that a household has planted paddy in summer 2022 and it was affected by flooding. Column 2 represents share of 2022 paddy that was flooded. Column 3 shows amount in kilograms of paddy crop harvested from monsoon 2022 paddy. Column 4 represents the farmers' estimated loss in kilograms in the monsoon 2022 paddy. Controls selected by LASSO. Asterisks indicate statistical significance from a pairwise t-test on the difference in means at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 20: Main specification – vitamin A-rich foods

	(1) Vit. A	(2) Vit. A: never	(3) Vit. A: sometimes	(4) Vit. A: 7 or more times
FbAA x Round 1	0.58*	-0.02**	-0.02	0.04
	(0.30)	(0.01)	(0.03)	(0.03)
FbAA x Round 2	0.20	0.00	-0.02	0.02
	(0.27)	(0.00)	(0.02)	(0.02)
FbAA x Round 3	0.22	0.00	-0.01	0.01
	(0.24)	(0.00)	(0.02)	(0.02)
Post-shock group mean	8.57	0.04	0.23	0.72
Controls	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes
Observations	6,985	6,985	6,985	6,985

Notes: This table presents impacts of transfer timing on vitamin A consumption. Column 1 is the FCS for vitamin A-rich foods, including milk, meat, vegetable and fruit consumption frequency. Columns 2–4 represent probability that household never, sometimes and frequency consumes these food groups as defined by WFP. Controls selected by LASSO. Asterisks indicate statistical significance from a pairwise t-test on the difference in means at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 21: Main specification – protein consumption

	(1) Protein	(2) Ate protein: never	(3) Ate protein: sometimes	(4) Ate protein: 7 or more times
FbAA x Round 1	0.64***	-0.02*	-0.04	0.06*
	(0.22)	(0.01)	(0.03)	(0.03)
FbAA x Round 2	0.12	0.01	-0.01	0.01
	(0.24)	(0.01)	(0.03)	(0.03)
FbAA x Round 3	0.17	-0.01	-0.00	0.01
	(0.19)	(0.01)	(0.03)	(0.03)
Post-shock group mean	5.53	0.06	0.47	0.46
Controls	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes
Observations	6,985	6,985	6,985	6,985

Notes: This table presents impacts of transfer timing on protein consumption. Column 1 is the FCS for protein consumption, including frequency of meat and pulse consumption. Columns 2–4 represent the probability that a household never, sometimes and frequently consumes these food groups as defined by WFP. Controls selected by LASSO. Asterisks indicate statistical significance from a pairwise t-test on the difference in means at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 22: Main specification – kitchen garden

	(1) No. of crops in kitchen garden
FbAA x Round 3	-0.22
	(0.18)
Delayed group mean	3.07
Controls	Yes
District x Round FE	Yes
Observations	2408

Notes: This table presents impacts of transfer timing on kitchen garden cultivation. Controls selected by LASSO. Asterisks indicate statistical significance from a pairwise t-test on the difference in means at the 1 percent ***, 5 percent **, and 10 percent * levels.

Table 23: Main specification – PHQ-4 categories

	(1) None	(2) Mild	(3) Moderate	(4) Severe
FbAA x Round 1	0.09**	-0.05**	-0.05**	0.02
	(0.03)	(0.03)	(0.02)	(0.02)
FbAA x Round 2	0.04	-0.03	-0.00	-0.00
	(0.03)	(0.02)	(0.02)	(0.01)
FbAA x Round 3	0.01	-0.01	-0.00	0.01
	(0.03)	(0.02)	(0.02)	(0.01)
Post-shock group mean	0.41	0.32	0.16	0.09
Controls	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes
Observations	6,985	6,985	6,985	6,985

Notes: This table presents impacts of transfer timing on PHQ-4 outcome categories, which are defined as follows: none 0–2, mild 3–5, moderate 6–8 and severe 9–12. Controls selected by LASSO. Asterisks indicate statistical significance from a pairwise t-test on the difference in means at the 1 percent ***, 5 percent **, and 10 percent * levels.

A8.5 Lasso regression: flood interaction

Table 24: Flood interaction – winter crop cultivation

	(1) Planted	(2) No. of crops	(3) Area (ha)	(4) Wheat yield	(5) Planting costs	(6) Crop value	(7) Sales revenue
FbAA x R3	-0.06*	-0.01	-0.01	-0.06	-0.02	-6.66	-0.65
	(0.03)	(0.09)	(0.03)	(0.10)	(0.03)	(21.54)	(9.53)
FbAA x Flood x R3	0.11**	0.09	0.14*	0.18	0.14**	103.38**	47.99**
	(0.06)	(0.20)	(0.07)	(0.17)	(0.06)	(47.42)	(22.26)
Flood x R3	-0.02	0.00	0.05	0.09	0.13***	35.92	17.09
	(0.05)	(0.13)	(0.04)	(0.12)	(0.05)	(26.94)	(12.83)
Post-shock group mean	0.76	1.89	0.33	1.93	0.32	162.00	42.94
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District x Round FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,360	1,756	2,360	885	2,360	2,360	2,360

Notes: This table presents the interaction of being in the AA group and satellite-detected flood relative to the post-shock group on winter crop cultivation: whether the household planted a winter crop (column 1), number of crops cultivated (column 2), the area cultivated in hectares (column 3), yield of wheat as measured in tons per hectare (column 4), planting costs which include expenditure on seeds, fertilizer and labor (column 5), the value of crops harvested which is the summation of USD revenue earned from crops sold and the imputed value of crops harvested but not sold (column 6), and USD revenue from crops sold (column 7). Revenue and crop value are winsorized at 99 percent. Data include the last survey round. Round 1 (not collected) corresponds to the time when the FbAA group received their transfer, but the post-shock group had not. Round 2 (not collected) corresponds to when both groups received their transfer. Round 3 corresponds to six months after both groups received their transfers. Controls selected by LASSO. Standard errors are clustered at the village level. Asterisks indicate statistical significance at the 1 percent ***, 5 percent **, and 10 percent * levels.

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