# Concern's Graduation Programme in Malawi (2017-2021)

## Report on the Effects of Cyclone Idai

Tara Bedi and Michael King

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## Executive Summary

Following a year of drought in 2018, the southern and central regions of Malawi experienced a tropical cyclone, Cyclone Idai, in March of 2019. The Malawian Government estimated that the cyclone, and associated floods, affected over 975,600 people (5.4% of the population), displaced 86,976 people (0.5% of the population) and killed 60 people. 288,371 houses were damaged or destroyed and the effects from this disaster cost an estimated USD$ 220 million (Government of Malawi 2019).

Malawi has a history of extreme weather events, often experiencing severe flooding and droughts (Nicholson and Chigwenembe 2019). According to the needs assessment report by the Malawi Government post Cyclone Idai, Malawi has experienced 19 majors floods and 7 droughts in the last 50 years. Much of flooding in Malawi is caused due to seasonal monsoonal rains, from weather systems like the ITCZ (intertropical convergence zone) or the Congo air mass. The worst flood to hit Malawi happened in 2015, where the total cost of the damage and recovery was USD$ 335 million, around 5% of it's GDP (Government of Malawi 2015). A key unknown is to what extent recent weather patterns, including Cyclone Idai, have been caused or made worse by climate change. It remains possible that climate change has played a role as Malawi has been identified by the Intergovernmental Panel for Climate Change's (IPCC) as a high risk country for climate change (Government of Malawi 2019).[1]

The March 2019 flooding happened during year one of the implementation of Concern's Graduation model. Data collection was planned for mid 2019 and following the floods, it was decided to collect additional flooding and food security data.[2] The data collection compromised of two surveys, the first was a short 30 minutes survey fielded at the household level to the female spouse of Research Cohort 1 (started receiving graduation benefits in November 2018). The second survey was called Baseline 2, which consisted of a 2 hour long survey fielded to both spouses in eligible households that were part of Research Cohort 2 (started receiving graduation benefits in November 2019).

Our sample is not representative of the population who live in these areas as the Graduation program and the research is focused on households who are classified as very poor or poor by a community wealth ranking or a proxy means test. As we work with couples, it is reasonable to say that the data in this report is representative of poor households with couples.

[1] Chapter 3 of the IPCC report identified Malawi's mountain and wetland ecosystems to be at high risk due to warming temperatures (Hoegh-Guldberg et al. 2018).

[2] As part of Concern's Graduation program in Malawi, there was also a programme year where the implementation protocols in Malawi were finalised. This pilot programme had 200 households on the Graduation programme, though these pilot households are not part of the research.

The following are the main findings of this report:

1. Almost all households in our Nsanje households were affected by the floods (94%) and seven out of ten households in Mangochi were affected. Poor harvest due to flooding became the most common shock households experienced in 2019.

2. Casual labour (90%) and agricultural plots (83%) were negatively affected for the majority of households in each region, while 51% of households had durable assets, and 40% had household buildings, negatively affected (see table 1). Business and livestock were least likely to be affected, though those who did get affected experienced a high value of losses .

3. For households affected the reported loss (specifically the estimated cost to repair the damage caused by Cyclone Idai) was largest for livestock (MWK 48,934), agricultural plots (MWK 36,532) and house structures (MWK 36,532). Reported losses for daily labour (MWK 27,536), damage to other building structures (MWK 26,929) and businesses (MWK 25,127) were lower but still substantial. To put these figures in perspective, households on the Graduation program receive consumption support of MWK 15,000 per month to cover their basic needs for the household for a total of 12 months. An alternative comparison is with monthly GNI per capita in Malawi which was MWK 22,125 at the end of 2018.

**Table 1:** Proportion of Households Affected and Extent of Damage, by Category

| | Proportion Affected | Mean Cost MWK |
|---|---|---|
| Lost daily work | 0.90 | 27536.10 |
| Damage to agriculture plots | 0.83 | 36969.12 |
| Damage to durable goods | 0.51 | 11492.67 |
| Damage to house structure | 0.40 | 36531.60 |
| Damage to building structures | 0.40 | 26920.04 |
| Livestock loss | 0.16 | 48934.44 |
| Business loss | 0.05 | 25127.01 |

This table includes all households, including both Graduation and Non-Graduation households

4. Evidence is found at both the household and village level that Cyclone Idai led to disimprovements in food security, irrespective of how food insecurity is measured.

5. Less than half of households across the two regions received some form of warning and the proportion was lower in Mangochi where floods are less frequent and took place in early March. Radio announcements were the most common source of warning. The second most common channel was warning through friends and family.

6. The vast majority of households affected by the flood across both regions did not receive any kind of relief. Only 29% and 16% received some form of relief in Nsanje and Mangochi respectively. Of those who received relief, fifty nine percent received it from an international NGO, while 18% received it from a government source, 17% from a local NGO and 16% from UN agencies.

7. Considering all types of relief, we find some preliminary evidence of targeting. First, the proportion of households receiving relief in a village is positively correlated with the proportion of households affected by the flood and at the household level there is a positive correlation between the likelihood of receiving relief and the amount of damage endured.

8. Non-graduation households were 9.3 percentage points more likely to have responded that they were affected by the flood generally (extensive margin), however graduation households experienced damage that was MWK 16,000 more than non-graduation households in housing structure damage, and around MWK 20,000 more in other building structure damage (intensive margin).

9. We find that only 7.2 percent of non-graduation households reported that someone in the household got sick after the flood. Predominantly households experienced some form of injury post flood, only a small percent experienced malaria (3%), dysentery (2%) or a cold (1%). Of those that did get sick, 95 percent received treatment, mainly in a public clinic or a hospital.

10. After events, like the March 2019 flooding, individuals can experience increased stress that may led to poorer long term decisions. We include four simple tests on reaction time, inhibitory control, memory, and fluid intelligence to capture what is termed as bandwidth. Graduation households affected by the flooding had a statistically quicker reaction time than non-graduation households who were also affected by the flooding. We found no other statistically different results.

11. Graduation households also report high losses for livestock (MWK 52,673) crops (MWK 49,834) and business losses (MWK 39,748), and these losses were higher than non-Graduation households by MWK 4,749, MWK 17,071 and MWK 21,253 respectively (see figure 2.12c). While Graduation households had not yet received their capital transfer to start income generating activities at the time of Cyclone Idai, household visits suggests households used part of the consumption support to buy poultry and livestock, invest in agricultural plots, to start businesses and buy household assets. The implication of this could be greater financial loss due to crop damage, loss of livestock and business for these households. This suggests that hard fought gains were lost in an environment of pervasive risk and regular shocks, Cyclone Idai in this case, suggesting the potential existence of an environmental poverty trap.

12. Despite these losses non-graduation households still had greater food insecurity than graduation households, providing preliminary evidence of a positive affect of the Graduation programme.

13. A greater percent of non treated households received relief compared to households who were part of the Graduation program; across both regions 23.3% of non-graduation households received relief, this is compared to 16.1% of graduation households.

14. While this report explores some of the direct impacts of the flooding, some of the next steps planned include looking at the gender dimensions of the impact of the flood and the impact of disasters on mental wellbeing.

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# Section 1

# Introduction

## 1.1 Overview of Cyclone Idai

Following a year of drought in 2018, the southern and central regions of Malawi experienced a tropical cyclone, Cyclone Idai, in March of 2019. The Malawian Government estimated that the cyclone, and associated floods, affected over 975,600 people (5.4% of the population), displaced 86,976 people (0.5% of the population) and killed 60 people. 288,371 houses were damaged or destroyed and the effects from this disaster cost an estimated USD$ 220 million (Government of Malawi 2019).

Cyclone Idai passed between southern Mangochi and northern Nsanje between the 6th and 8th of March 2019 (see figure 1.1), and subsequently on March 8th, a State of Disaster was declared by the Government for the Southern and Central Region (Government of Malawi 2019). In the first 10 days of March 2019, Nsanje received over 200 mm of rainfall, while Mangochi received over 150 mm (see figure 1.2b). This compares with 40 - 75 mm of rainfall for Nsanje and Mangochi respectively during the first 10 days in March 2018.[1] Cyclone Idai was immediately preceded in February 2019 by a period of no rainfall in Nsanje and less than 30mm in Mangochi (see figure 1.2a).

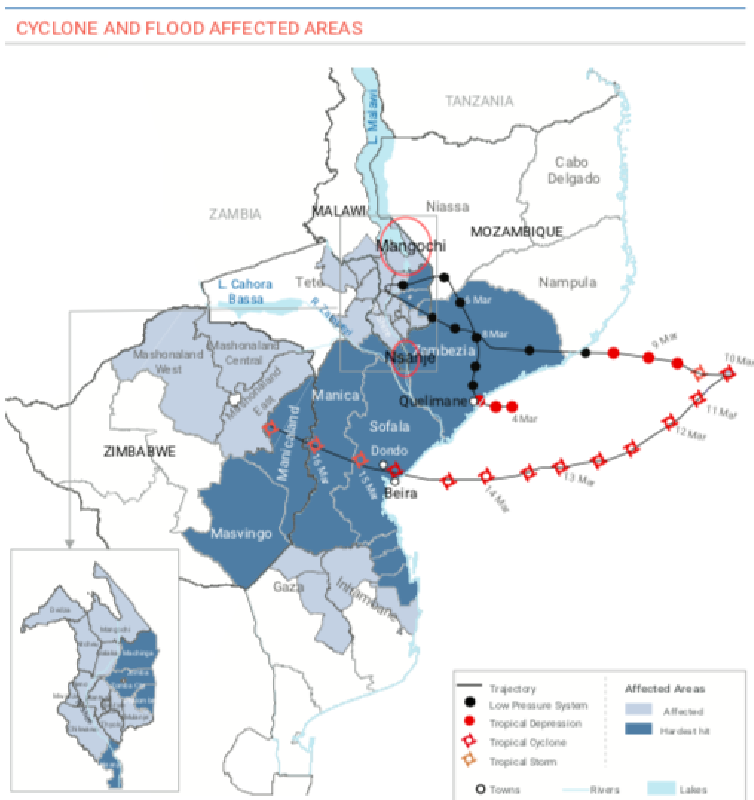
A particular feature of Cyclone Idai was the fact that after returning to the Indian Ocean it gathered strength and returned to the Mozambican coast with devastating effects.[2] While the centre of the cyclone did not cross Malawian territory a second time, heavy rains continued particularly in Southern Malawi. During the period March 11 - 20, Nsanje continued to receive significant levels of rainfall and over this time period received between 40 -100 mm of rainfall (see figure 1.2c).

Malawi has a history of extreme weather events, often experiencing severe flooding and droughts (Nicholson and Chigwenembe 2019). According to the needs assessment report by the Malawi Government post Cyclone Idai, Malawi has experienced 19 majors floods and 7 droughts in the

[1] http://www.fao.org/giews/earthobservation/country/index.jsp?lang=en&code=MWI

[2] The double hitting nature of Cyclone Idai, with the weather system first hitting land as a low pressure weather system before returning to sea, forming into a cyclone and hitting land again is according to the Malawian Government potentially a new trend which also happening recently to cause the 2015 flooding.

**Figure 1.1:** The path of Cyclone Idai, March 26th 2019




Source: `https://reliefweb.int/sites/reliefweb.int/files/resources/SA_Cyclone_and_Flooding_Snapshot_26032019.pdf` last 50 years. Much of flooding in Malawi is caused due to seasonal monsoonal rains, from weather systems like the ITCZ (intertropical convergence zone) or the Congo air mass. The worst flood to hit Malawi happened in 2015, where the total cost of the damage and recovery was USD$ 335 million, around 5% of it's GDP (Government of Malawi 2015). A key unknown is to what extent recent weather patterns, including Cyclone Idai, have been caused or made worse by climate change. It remains possible that climate change has played a role as Malawi has been identified by the Intergovernmental Panel for Climate Change's (IPCC) as high risk country for climate change (Government of Malawi 2019).[3]

## 1.2 Graduation Research and Cyclone Idai

The March 2019 flooding happened during year one of the implementation of Concern's Graduation programme in Malawi. The Graduation programme is a 'big push' intervention designed to move people out of poverty by addressing the many challenges of extreme poverty by simultaneously boosting livelihoods and income, and providing access to financial services. Concern's implementation of the graduation programme is informed by evidence of its effectiveness. A six-country study showed that recipients had more assets and savings, spent more time working, went hungry fewer days, experienced lower levels of stress and enjoyed improved physical health as a result of the program.[4]

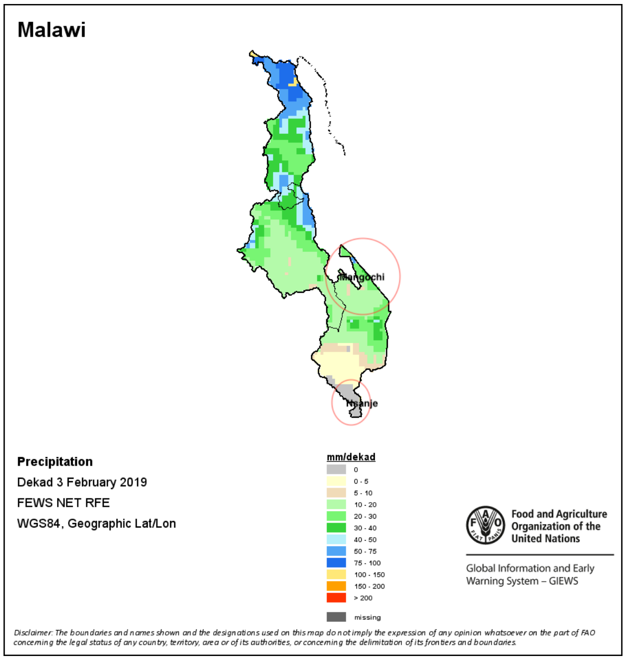
The gender dimension of the graduation model has largely remained unexplored in the literature, and this gap in understanding is the focus of Concern's graduation programme in Malawi. Concern partners TIME (Trinity Impact Evaluation Unit) at Trinity College, the University of Dublin and the Gender Innovation Lab (GIL) at the World Bank are undertaking a Randomised Control Trial (RCT) to better understand how gender, intra-household dynamics and spousal cohesion affect and are affected by the programme. Focusing specifically on couples, three separate treatment arms that vary key gender components of the programme will be compared relative to a control group. In the first treatment arm, all the benefits of the graduation programme are targeted to the female. In the second treatment arm, all benefits are targeted at the male in the couple. In the final treatment arm, while all the benefits are targeted at the female, the couple is exposed to a twelve month couples training called Umodzi. Umodzi is designed to transform gender and power relations' within the household through monthly modules that cover the role of gender, not just female empowerment but also the role of men and boys, time management, budgeting, communication tools and issues of violence.

This study covers 200 villages, stratified across Mangochi and Nsanje districts and a total of

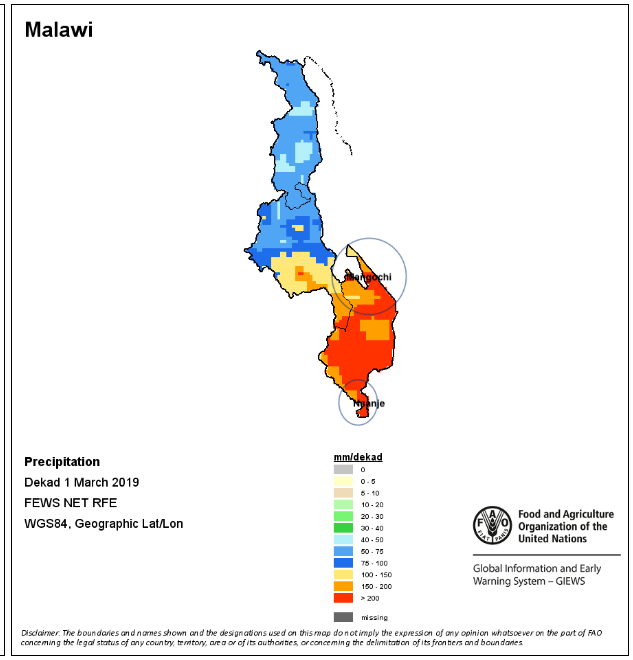
[3] Chapter 3 of the IPCC report identified Malawi's mountain and wetland ecosystems to be at high risk due to warming temperatures (Hoegh-Guldberg et al. 2018).

[4] Further information on the Graduation model can be found at the following links: https://www.concern.net/sites/default/files/media/resource/concern_worldwides_graduation_programme_in_-burundi.pdf; https://www.cgap.org/sites/default/files/CGAP-Focus-Note-Reaching-the-Poorest-Lessons-from-the-Graduation-Model-Mar-2011.pdf; and http://www.econ.yale.edu/ cru2/pdf/Science-2015-TUP.pdf.

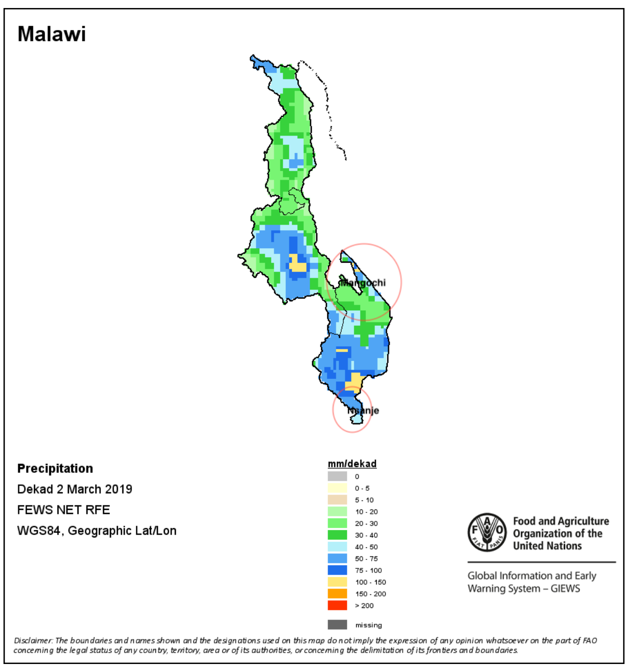
**Figure 1.2:** Rainfall by Dekad, end February to end March, 2019



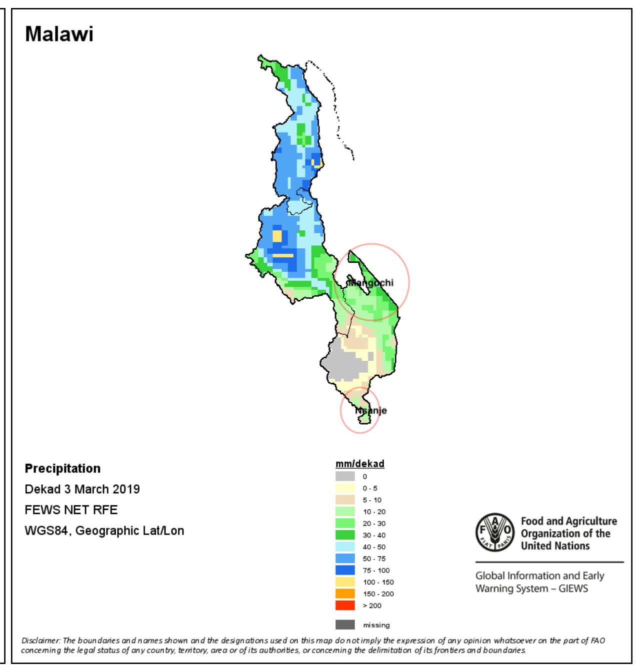

**(a)** Dekad 3 February 2019




**(b)** Dekad 1 March 2019




**(c)** Dekad 2 March 2019




**(d)** Dekad 3 March 2019

Source: `http://www.fao.org/giews/earthobservation/country/index.jsp?lang=en&code=MWI`

3,300 households. Villages were randomly allocated to two cohorts - Research Cohort 1 and Research Cohort 2. The first set of villages began the Graduation intervention in November 2018, with villages allocated to Research Cohort 2 starting in November 2019. As the flooding happened a few months prior a scheduled second baseline survey for Research Cohort 2 (July 2019), the survey tool was adjusted to include a set of questions on the impact of Cyclone Idai and households experience of warnings and relief. Concern and its research partners felt this was important to help understand both the impact of the floods and the performance of the graduation intervention.

## 1.3 Overview of the Post Cyclone Idai Data

Field work took place between early June to mid August, 2019 including team training and initial piloting, with a total of 4,932 surveys completed during this time. The field work compromised of two surveys, the first was a short 30 minutes survey fielded at the household level to the female spouse of Research Cohort 1 (1,628 households).[5] The second survey was called Baseline 2 and consisted of a 2 hour long survey fielded to both spouses in eligible households that were part of Research Cohort 2 (1,652 households). Questions related to Cyclone Idai were administered to the complete sample of female spouses (both cohorts). Table 1.1 provides an overview of each type of survey conducted.

The short survey to Research Cohort 1 included the following sections: locality, lineage, shocks, food security, bandwidth and flooding. Treatment households in Research Cohort were 9 months into the Graduation program and had not yet received their capital transfer. This is an important caveat when considering the impact of the Graduation programme on mitigating the impacts of Cyclone Idai. Research Cohort 2 received baseline 2, which was the same survey as baseline 1, with the additional locality, lineage, bandwidth and flooding sections. Of these households, a total of 256 (15.5%) were replacement households.[6] In addition, a total of 183 village surveys were also fielded.[7]

It is important to note that our sample is not representative of the population who live in these areas as the Graduation program and the research is focused on households who are classified as very poor or poor by a community wealth ranking or a proxy means test. As we work with couples, it is reasonable to say that we are representative of poor households with couples. In the treatment villages a total of 18 households were surveyed, where 12 were randomly assigned to treatment and

[5] If the female spouse was not available, the survey was fielded to the male spouse. This occurred in 63 households. We also have 47 households who migrated and therefore will need to be tracked for the next survey

[6] Replacement households were required because households from baseline 1 were divorced, migrated, or one member of the couple had passed away. The justification for these replacements comes from the need to start with a fresh up-to-date list of couples for enrolment in Research Cohort 2 of implementation. Replacement households had to meet the same inclusion criteria as the proxy means test for households who were part of baseline 1, which included not having a formal job, doing gaynu or having no cattle/less than 5 goats/not having a good house (iron sheet roof, cemented walls, and burnt bricks), as well as being in a relationship where both partners lived together for at least 60% of the time.

[7] As a number of villages were split into 2, only one survey was fielded in these villages. As a result, how we define villages for the research is not exactly the same as villages as locals would define them.

**Table 1.1:** Description of Surveys

| Research Cohort 1 - Follow Up Survey (30 mins) | Cohort 2 - Baseline 2 |
|---|---|
| 30 Minutes to female spouse | Two hours to each spouse |
| Household Register | Full baseline survey with household register (male) |
| Lineage Module | Lineage Module (both) |
| Flooding Module | Flooding Module (female) |
| Bandwidth Questions | Bandwidth Questions (both) |
| Food Security | Food Security (female) |

the remaining households were allocated to be controls within the village. For control villages, a total of 12 control households were surveyed.

The data in this report focuses on female spouses. This gives us an overall sample of 3,280 household observations. For the analysis for this report, we rely on different samples of our data. To provide clean estimates of the impact of the floods, we first examine the experience of non-treatment households at the time of Cyclone Idai. This sample of 2,404 households consists of all control households and all Research Cohort 2 intervention households. The reason we do this is because participation in the Graduation program may have affected what types of damage households experience and the extent of these damages. For example, Graduation households may have bought more assets due to their consumption support, or the program may have affected whether they did Ganyu, whether they were doing more business activities and so forth. Second, we analyse these households by district, as there are heterogeneous impacts by the two districts. Third, where appropriate, we analyse by treatment status comparing treatment (Research Cohort 1 only) and control households using the full sample.[8]

Table 1.2 provides an overview on the basic socio-economic household characteristics average in our full sample. The average age of the male spouse in our households is 42.9 years of age and has 4.3 years of education and 58% can read and write. The female spouse is younger, with the average age of 35.9 years. She has a lower level of education and only 29% of the female spouses can read and write. The average household has 5.8 members, with 1.54 of the members in school. Around 31% of households report having a business. Differences exist between our Mangochi and Nsanje samples. Our respondents are younger, more educated and more literate in Nsanje.

[8]Special efforts were made to ensure quality data collection. During surveying several quality control procedures were implemented, including: 1) Daily high frequency check reports, spot-checks and accompaniments by project management staff. The goal of these checks was to observe and provide feedback to Field Officers regarding their interviewing, including creating a confidential environment, phrasing of questions, prompting and probing, confidence, patience and respect. 2) A total of 616 surveys (12.5%) underwent a short back-check/audit survey. These back-checks were conducted by two back-checkers. Back-checks contained a range of questions with the goal of confirming that the interview took place, confirming the questions were asked correctly, and testing the accuracy of responses.

**Table 1.2:** Household composition

| | Mangochi | | | | | Nsanje | | | | | Total | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | ST. Dev | Min | Max | N | Mean | ST. Dev | Min | Max | N | Mean | ST. Dev | Min | Max | N |
| HH_Male spouse: age | 44.93 | 13.97 | 18.00 | 98.00 | 1474 | 40.97 | 14.01 | 19.00 | 97.00 | 1510 | 42.92 | 14.13 | 18.00 | 98.00 | 2984 |
| HH_Male spouse: highest edu level | 2.83 | 3.03 | 0.00 | 16.00 | 1278 | 5.60 | 3.82 | 0.00 | 16.00 | 1460 | 4.31 | 3.74 | 0.00 | 16.00 | 2738 |
| HH_Male spouse: can read/write 1-yes | 0.48 | 0.50 | 0.00 | 1.00 | 1606 | 0.68 | 0.47 | 0.00 | 1.00 | 1621 | 0.58 | 0.49 | 0.00 | 1.00 | 3227 |
| HH_Female spouse: age | 37.34 | 16.23 | 0.00 | 444.00 | 1482 | 34.50 | 12.53 | 0.00 | 80.00 | 1494 | 35.91 | 14.56 | 0.00 | 444.00 | 2976 |
| HH_Female spouse: highest edu level | 2.06 | 2.65 | 0.00 | 12.00 | 1132 | 3.12 | 3.24 | 0.00 | 12.00 | 1243 | 2.62 | 3.02 | 0.00 | 12.00 | 2375 |
| HH_Female spouse: can read/write 1-yes | 0.25 | 0.43 | 0.00 | 1.00 | 1629 | 0.33 | 0.47 | 0.00 | 1.00 | 1611 | 0.29 | 0.46 | 0.00 | 1.00 | 3240 |
| HH: Total number of members living in the hh | 5.88 | 2.05 | 0.00 | 16.00 | 1641 | 5.77 | 2.00 | 0.00 | 15.00 | 1639 | 5.82 | 2.02 | 0.00 | 16.00 | 3280 |
| HH: Total No of members in school 2017-2018 | 1.67 | 1.52 | 0.00 | 8.00 | 1618 | 1.69 | 1.57 | 0.00 | 9.00 | 1625 | 1.68 | 1.54 | 0.00 | 9.00 | 3243 |
| HH: Dummy-Business activities 1+: 1-yes | 0.22 | 0.41 | 0.00 | 1.00 | 834 | 0.40 | 0.49 | 0.00 | 1.00 | 818 | 0.31 | 0.46 | 0.00 | 1.00 | 1652 |
| Observations | 3280 | | | | | | | | | | | | | | |

Note: Included in this are the new households selected in the Baseline 2. N=3,262. The highest educational level of the household head is show as following: 0 indicates no education; 1 - 12 refers to each year of schooling through primary and secondary school.

Table 1.3 provides the summary statistics on all variables discussed in this report for our full sample of households (female respondents). The table includes variables on the affects of Cyclone Idai (such as monetary damage to assets, illnesses and lost daily labour), warnings received and levels of relief. Table 6.1, which is in the appendix, provides a description of interviewed households used in this report by district.

**Table 1.3:** Summary Variables

| | Mean | ST. Dev | Min | Max | N |
|---|---|---|---|---|---|
| Affected by Cyclone Idai | 0.83 | 0.38 | 0.00 | 1.00 | 3256 |
| Frequency of flooding | 3.06 | 1.72 | 1.00 | 5.00 | 3280 |
| Received flood warning | 0.47 | 0.50 | 0.00 | 1.00 | 2694 |
| Damage to house structure | 0.40 | 0.49 | 0.00 | 1.00 | 2694 |
| Damage to agriculture plots | 0.83 | 0.37 | 0.00 | 1.00 | 2694 |
| Livestock loss | 0.16 | 0.36 | 0.00 | 1.00 | 2694 |
| Business loss | 0.05 | 0.22 | 0.00 | 1.00 | 2694 |
| Do you engage in Ganu? | 0.80 | 0.40 | 0.00 | 1.00 | 2694 |
| Lost daily work | 0.90 | 0.30 | 0.00 | 1.00 | 2142 |
| Damage to durable goods | 0.51 | 0.50 | 0.00 | 1.00 | 2694 |
| Informed by Mobile | 0.01 | 0.09 | 0.00 | 1.00 | 1361 |
| Informed by Radio | 0.64 | 0.48 | 0.00 | 1.00 | 1361 |
| Informed by TV | 0.00 | 0.03 | 0.00 | 1.00 | 1361 |
| Informed by VillageLeader | 0.22 | 0.42 | 0.00 | 1.00 | 1361 |
| Informed by FamilyNeighbor | 0.35 | 0.48 | 0.00 | 1.00 | 1361 |
| Informed by RedCross | 0.01 | 0.12 | 0.00 | 1.00 | 2691 |
| Informed by PublicServiceAnnouncement | 0.00 | 0.06 | 0.00 | 1.00 | 2691 |
| Informed by None | 0.50 | 0.50 | 0.00 | 1.00 | 2691 |
| Damage to building structures | 0.40 | 0.49 | 0.00 | 1.00 | 653 |
| Damage to drinking water | 0.07 | 0.25 | 0.00 | 1.00 | 2694 |
| Damage to toilet structure | 0.52 | 0.50 | 0.00 | 1.00 | 2399 |
| Estimated cost of house repairs | 36531.60 | 47249.34 | 0.00 | 500000.00 | 1076 |
| Estimated cost of building repairs | 26920.04 | 34780.79 | 0.00 | 300000.00 | 262 |
| Estimated livestock loss cost | 48934.44 | 59379.98 | 0.00 | 404000.00 | 442 |
| Estimated business loss cost | 25127.01 | 37646.15 | 0.00 | 210000.00 | 141 |
| Estimated wage loss cost | 27536.10 | 404271.78 | 0.00 | 15000000.00 | 2142 |
| Estimated durable loss cost | 11492.67 | 22961.29 | 0.00 | 259500.00 | 1374 |
| Food insecurity index: 0-secure,10-insecure | 5.06 | 2.18 | 0.00 | 10.00 | 3217 |
| Concern hunger gap | 3.74 | 3.18 | 0.00 | 12.00 | 3266 |
| Food Gap March | 0.45 | 0.50 | 0.00 | 1.00 | 2816 |
| Food Gap April | 0.25 | 0.44 | 0.00 | 1.00 | 2816 |
| Food Gap May | 0.23 | 0.42 | 0.00 | 1.00 | 2816 |
| Food scarcity March-May | 0.93 | 1.11 | 0.00 | 3.00 | 2816 |
| Received relief: 1-Yes | 0.18 | 0.38 | 0.00 | 1.00 | 3280 |
| Total cash relief | 2024.28 | 8443.46 | 0.00 | 120000.00 | 2694 |
| Total estimated loss cost | 90508.82 | 372137.49 | 0.00 | 15060000.00 | 2694 |
| Relief source: Government | 0.04 | 0.19 | 0.00 | 1.00 | 2694 |
| Relief source: Local NGO | 0.04 | 0.19 | 0.00 | 1.00 | 2694 |
| Relief source: International NGO | 0.13 | 0.34 | 0.00 | 1.00 | 2694 |
| Relief source: UN (such as WFP) | 0.03 | 0.18 | 0.00 | 1.00 | 2694 |
| Relief source: Churches | 0.00 | 0.06 | 0.00 | 1.00 | 2694 |
| Relief source: Friends and family | 0.00 | 0.04 | 0.00 | 1.00 | 2694 |
| HH experienced malaria post flood | 0.03 | 0.17 | 0.00 | 1.00 | 2694 |
| HH experienced dysentery post flood | 0.02 | 0.14 | 0.00 | 1.00 | 2694 |
| HH experienced fever post flood | 0.00 | 0.06 | 0.00 | 1.00 | 2694 |
| HH experienced cold post flood | 0.01 | 0.08 | 0.00 | 1.00 | 2694 |
| HH experienced cholera post flood | 0.00 | 0.05 | 0.00 | 1.00 | 2694 |
| HH experienced typhoid post flood | 0.00 | 0.05 | 0.00 | 1.00 | 2694 |
| HH experienced injury post flood | 0.07 | 0.25 | 0.00 | 1.00 | 2694 |
| HH experienced chickenPox post flood | 0.00 | 0.03 | 0.00 | 1.00 | 2694 |
| HH experienced skindiseases post flood | 0.00 | 0.03 | 0.00 | 1.00 | 2694 |
| HH got care post flood | 0.95 | 0.21 | 0.00 | 1.00 | 176 |
| HH got care in hospital | 0.31 | 0.46 | 0.00 | 1.00 | 176 |
| HH got care in health centre/public clinic | 0.61 | 0.49 | 0.00 | 1.00 | 176 |
| HH got care in private clinic | 0.00 | 0.00 | 0.00 | 0.00 | 176 |
| HH got care in private clinic | 0.01 | 0.08 | 0.00 | 1.00 | 176 |
| HH got care in shelter | 0.01 | 0.08 | 0.00 | 1.00 | 176 |
| Observations | 3280 | | | | |

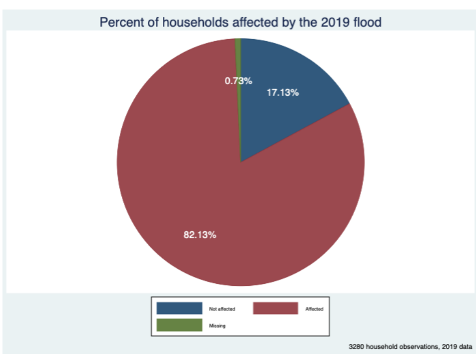
Note:N=3280.

# Section 2

# Effects

## 2.1 Experience of Flooding and Household Shocks

**Figure 2.1:** Household negatively affected by Cyclone Idai, March 2019




Note: 24 households, less than 1% , did not answer whether they were affected by Cyclone Idai

Our starting point is the widely used self-declared metric, whether a household was affected by Cyclone Idai, and the widespread impact of the flood is immediately apparent. In total, 82% of the 3280 households interviewed were affected by the flood (see figure 2.1). [1] Only 17.1% of the survey respondents stated that they were not affected.

Disaggregating by district, we see that almost all households in our Nsanje households were affected by the floods (93.7%) (see figure 2.2). In terms of absolute numbers, only 102 households from the 1,639 households interviewed in Nsanje stated that they were not affected by the flood. In Mangochi, over 70% of households, were affected. From the 1,641 households interviewed in Mangochi, 460 responded that they were not affected.[2]

To help contextualise the extent and the impact of the flooding, we consider the main types of shocks households experienced in the the prior 12 months for 2018 and 2019 ( see figure 2.3). This data was collected in both baseline 1, 2 and the short survey. In 2018, the main types of shocks households faced were bad harvest due to drought, followed by pest attacks. Conversely in 2019, in line with the majority of households being impacted by Cyclone Idai, the main type of shock households faced in 2019 was a bad harvest due to flooding. In contrast, in 2018, only 10 percent stated that they experienced a bad harvest due to flooding.

[1] In the prior table the summary statistic did not include the 24 households that did not respond, therefore this figure is slightly lower than the 83% of households affected from the 3,256 households that did respond.

[2] In figure 3.5a we see that over 40 % of households have no memory of having a flood. Yet, even households that do not recall flooding, were affected by Cyclone Idai. Over 71% of households who had no memory of prior flooding were affected by Cyclone Idai.

**Figure 2.2:** Households negatively affected by Cyclone Idai: District level

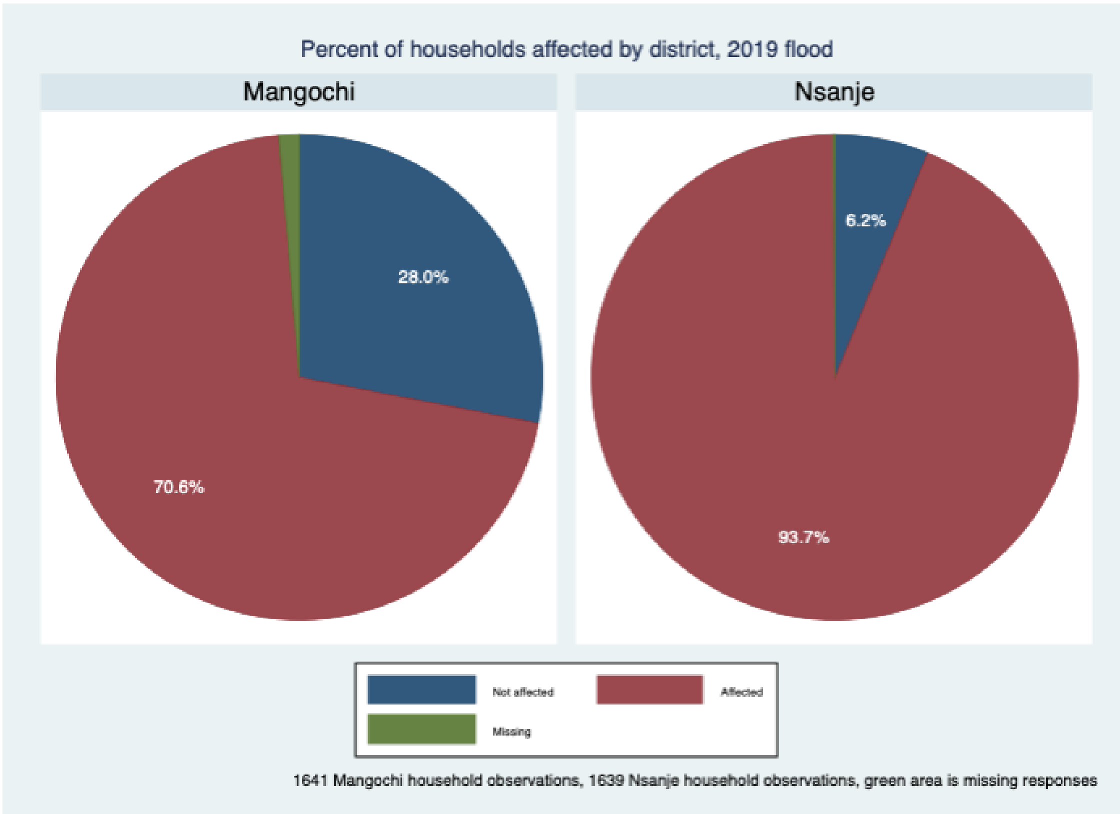
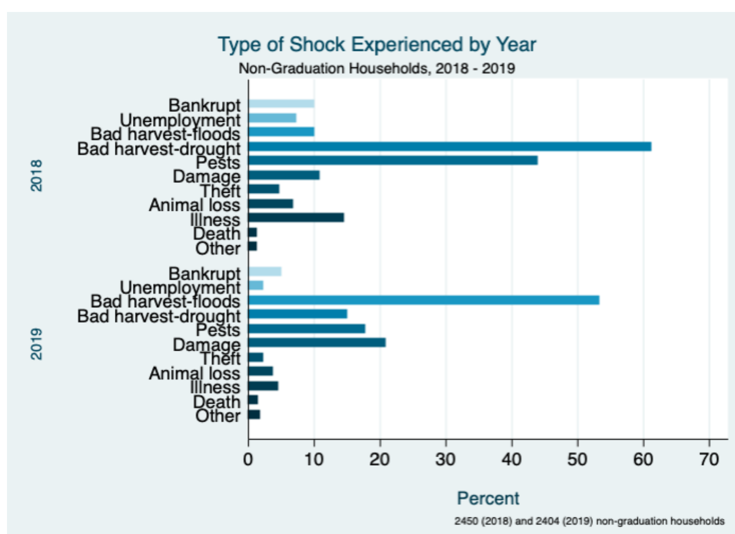


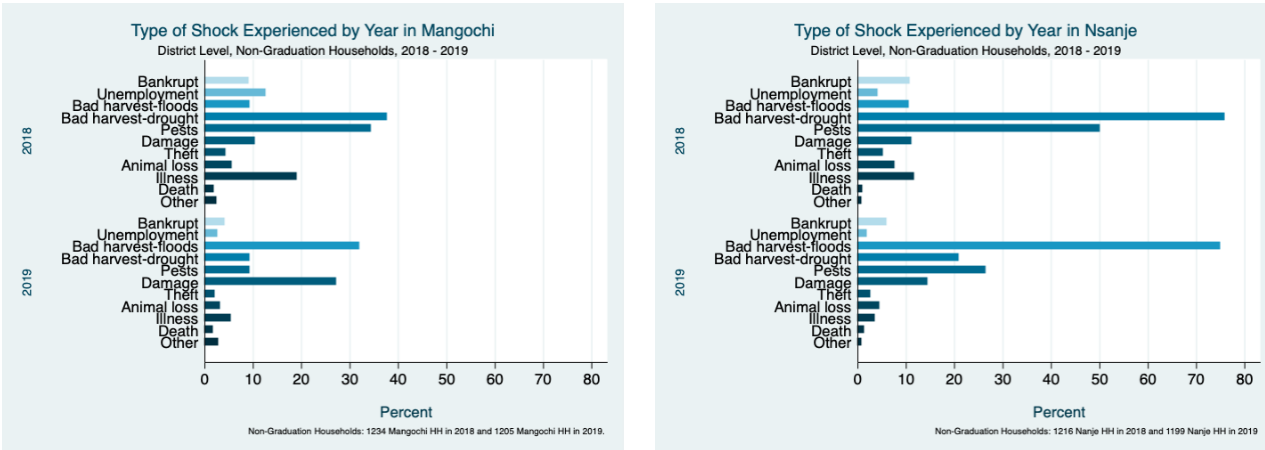

**Figure 2.3:** Types of shocks in 2018 and 2019




N=2,986. Households in the Baseline 1 and 2.

While there is a difference by district in the extent to which the flooding affected the harvest, for both districts the percent of households citing bad harvest due to flooding more than tripled. In 2018, only 8.6% of household in Mangochi and 11.4% of households cited a bad harvest due to flooding as a major shock. By 2019, over 33% of households in Mangochi and 78% of households in Nsanje reported a bad harvest due to flooding. There was also a doubling of households reporting household and equipment damage between 2018 and 2019. This is consistent with the types of damage reported by households in the following section. Overall, what these figures clearly show is that in 2019, Cyclone Idai was the main shock households

**Figure 2.4:** Types of Shocks: By Year and District



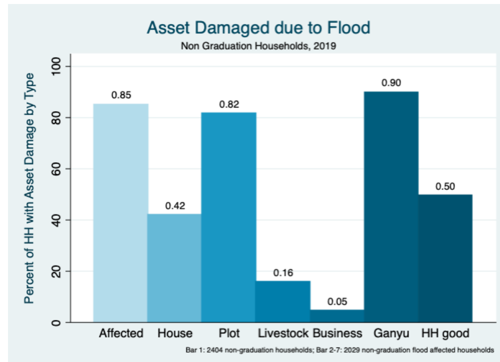

**(a)** **(b)**

faced. In the next sections, we will look at what the impact of this shock was on households and the majority of households were negatively affected.

## 2.2 Types of Damage Experienced by the Household

The impact of the March 2019 flood on households durable goods and livelihoods is summarised in figure 2.5. Our sample for this graph is restricted to all households who were not part of the Graduation program at the time of the survey.[3] The first column, *affected*, reports all households who stated that they were affected by the flood. Of the 85% of non-graduation households who were affected by the flood, 82% reported agriculture plot damage, while over 90% of households affected reported loss of daily labour, Ganyu.[4] These are the two categories where the majority of households reported being affected.

**Figure 2.5:** Whether and how households were affected by Cyclone Idai:

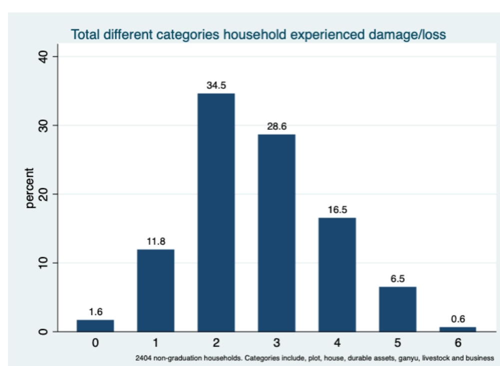



Of the 2404 non-graduation households, 2029 households were affected by the flood. All reported means of different types of damage are based on the 2029 flood affected households

Buildings and other household durable goods were the next most frequently affected; 42% of households had their house or other buildings damaged and 42% had other household durable goods damaged or destroyed by the flooding. In contrast only 16% of households reported loss of livestock, while 5% reported their businesses being affected. One reason for these two being lower is that fewer households own livestock and run businesses. For instance, in research cohort 2, where post flood business data was collected, only 30% of households owned a business, while just over 50% of households owned livestock, whereas almost all households have agriculture plots, houses and a drinking water source.

If we aggregate across total categories (of impact) households experienced damage or loss in, we find that most households were likely to face damage in more than one area (see figure 2.6. Over 62% of households were affected in 2 - 3 different ways. For example, over 22% of households affected by the flooding had both their plots affected and their ability to get daily labour, while 6% experienced damage to their plots and assets and another 12.7% experienced damage to their plots, assets and daily labour income.

**Figure 2.6:** Total different categories households experienced damage in: Non-Graduation households




Differences emerge when we consider Mangochi and

[3]As mentioned in the prior section we restrict this sample to households who were not on the Graduation program because participation in the Graduation program may have affected what they report being damage. For example Graduation households may have bought more assets due to their consumption support, or the program may have affected whether they did Ganyu, whether they were doing more business activities and so forth.

[4]Of the 2404 non-graduation households, 2029 households were affected by the flood. For the percentages on damage reported, the percent is based on the figure of those who reported being affected by the flood, not on the full sample of non-graduation households.

**Table 2.1:** T-test for differences on Damage Categories: by District and Treatment Status

| | Difference between Mangochi and Nsanje |
|---|---|
| Affected by Cyclone Idai | -0.213*** |
| | (-15.33) |
| Damage to house structure | 0.0989*** |
| | (4.49) |
| Damage to agriculture plots | -0.308*** |
| | (-19.41) |
| Livestock loss | -0.128*** |
| | (-7.92) |
| Business loss | -0.0565*** |
| | (-5.96) |
| Lost daily work | -0.00569 |
| | (-0.38) |
| Damage to durable goods | 0.122*** |
| | (5.50) |
| Observations | 2380 |

$t$ statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**(a)**

| | Difference between Non-Treated and Treated |
|---|---|
| Affected by Cyclone Idai | 0.0934*** |
| | (6.29) |
| Damage to house structure | 0.0906*** |
| | (4.15) |
| Damage to agriculture plots | -0.0601*** |
| | (-3.61) |
| Livestock loss | 0.0183 |
| | (1.13) |
| Business loss | -0.0184 |
| | (-1.85) |
| Lost daily work | 0.0126 |
| | (0.80) |
| Damage to durable goods | -0.0496* |
| | (-2.22) |
| Observations | 3256 |

$t$ statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

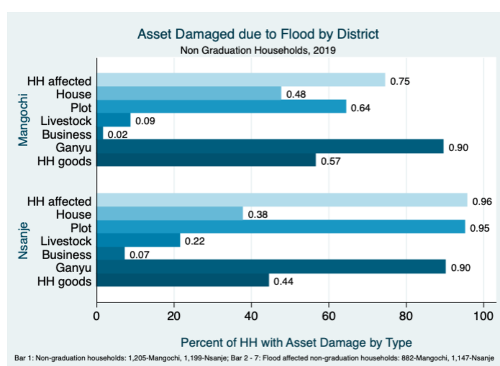
**(b)**

Note: District: Only includes non-Graduation households at the time of survey. Treatment: All Graduation households from Research Cohort 1 make up the treated, and all other households are assumed to be control.

Nsanje separately. Aside from household buildings and asset damage, across all other categories, a greater percent of households in Nsanje reported experiencing damage or loss (see figure 2.7). Almost all agricultural plots were affected in Nsanje (95%), as well as casual labour for households (90%). While the proportion affected is lower in Mangochi, the majority of households (64%) also reported agriculture damage and loss of daily labour, ganyu at 73%. The one area that stands out for Mangochi is housing, 48% of households reported damage to their house, while only 38% of households in Nsanje reported similar damage.

For the next part of our analysis we look at whether the differences between the two districts are statistically significant through the use of a t-test. In line with the discussion of figure 2.7, we see in table 2.1a that households in Mangochi were 21 percentage points less affected by the flood and this difference is significant.[5] Similarly, households in Mangochi experienced lower loss of livestock, damage to their agriculture plots, their business and loss of Ganyu work. Yet, these households in Mangochi suffered more damage to their housing structures than what was reported by households in Nsanje. All these differences are significant.

**Figure 2.7:** Whether and how households were affected by Cyclone Idai: District Level




Aside from the mean of all affected, remaining averages are based on flood affected non-graduation households in Mangochi (882) and Nsanje (1,147)

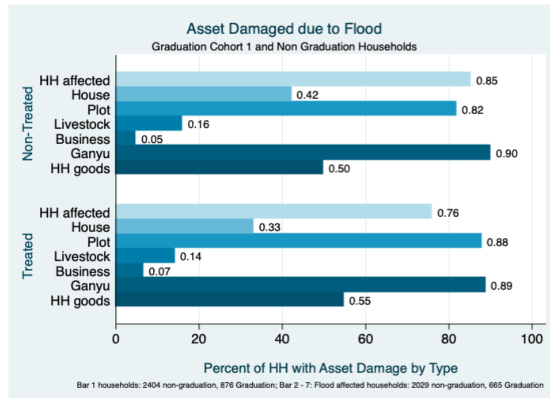
While our main analysis focuses on households who

[5] These differences do not tell us why the differences exist, just that the averages of these two groups are different and this difference is not due to chance.

have not yet started the Graduation program or who are control households, in figure 2.8 and table 2.1b we look at the differences between Graduation and Non-Graduation households. From the summary statistics in figure 2.8 we see that there are some differences between these two groups. In particular, a greater percent of non graduation households reported being affected by the flood in March 2019 and that their housing structure has been damaged. On the other hand, a greater percent of graduation households reported damage to their agriculture plots.

In table 2.1b we assess whether any of these differences between non-graduation and graduation households are statistically significant.[6] Consistent with the summary statistics, we find that non-graduation households were 9.3 percentage points more likely to be affected by the flood. They also had a similar percentage point difference in reporting damage to their housing structure. Both these differences are significant. Again, as discussed in the summary statistics above, agriculture plots of non-graduation households were less affected than graduation households and this difference is significant.

**Figure 2.8:** Whether and how households were affected by Cyclone Idai: by Treatment Status




Aside from the mean of all affected, remaining averages are based on 2029 flood affected non-graduation households and 665 flood affected graduation households

### 2.2.1 Infrastructure Damage and Related Costs

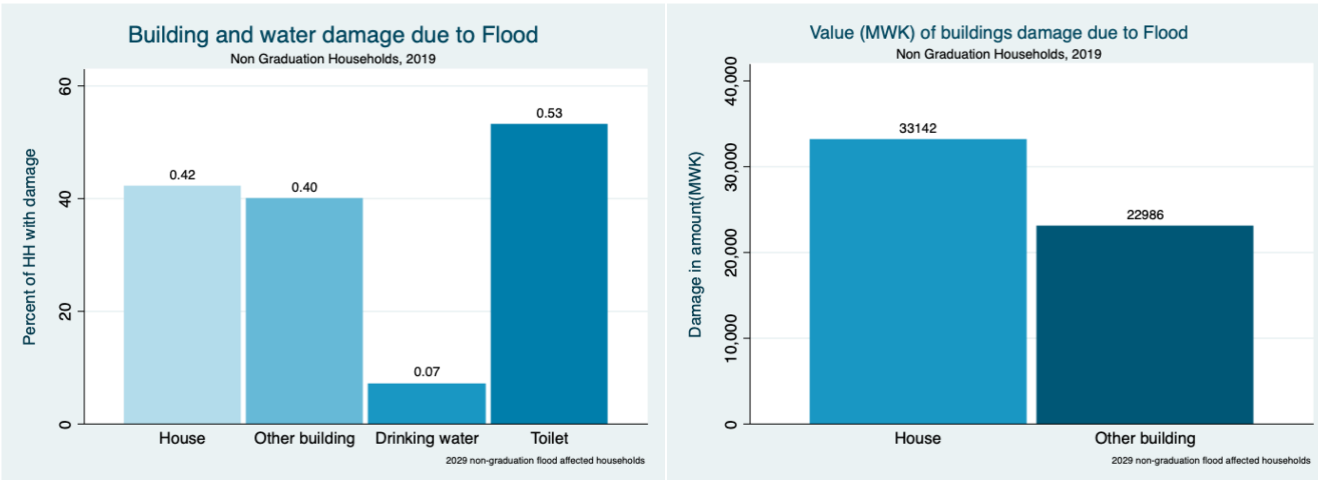
We present the proportions of non-graduation households with the household infrastructure damage, including to the house, other buildings owned by the household (such as a kitchen), toilet, and the source of drinking water in figure 2.9. For most households (regardless of district) the toilet was the most affected building structure, followed by the house where they lived (figure 2.9a). Households estimate that on average it will cost MWK 33,142 to repair the damage caused by Cyclone Idai to their housing structure and MWK 22,986 to repair damages from their other buildings (figure 2.9b). To put this amount in perspective, households on the Graduation program receive consumption support of MWK 15,000 per month to cover their basic needs for the household for a total of 12 months.[7] It would take two months of their consumption support to fix the level of damage reported on their housing structure and around 1.5 months to repair damages to their other buildings. The drinking water sources were the least affected at 7 percent.

By district, as discussed earlier, Mangochi had a higher reported average for housing structure damage. In figure 2.10a and 2.10b, we see that not only do households in Mangochi have a higher reported level of damage to their housing structures but also require a greater amount of finances

[6] Remember that these differences do not tell us why the differences exist, just that the averages of these two groups are different and this difference is not due to chance.

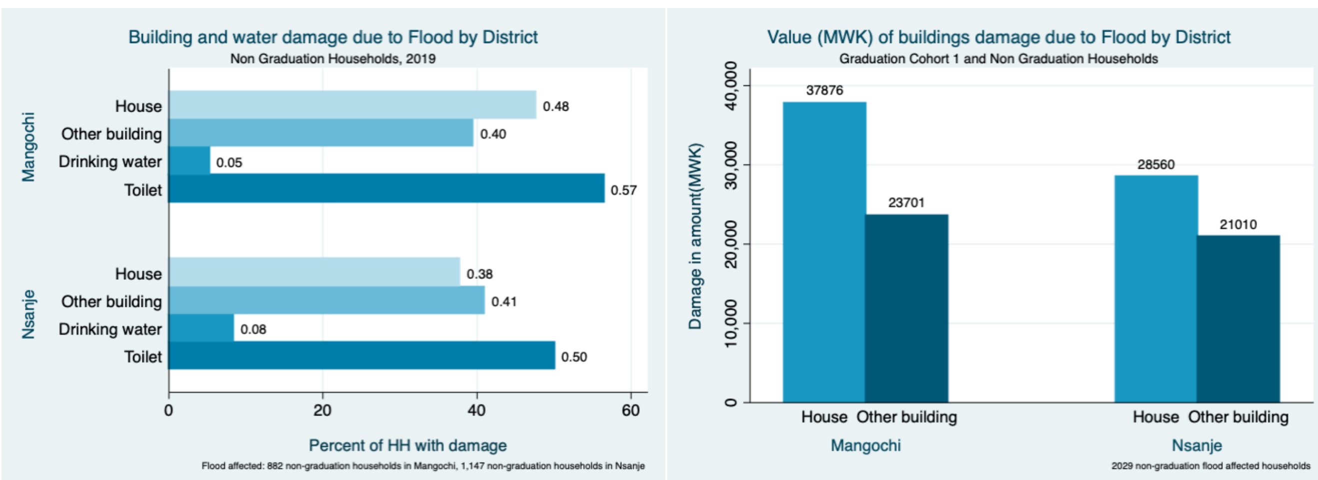
[7] An alternative comparison is with monthly GNI per capita in Malawi which was MWK 22,125 at the end of 2018.

**Figure 2.9:** Infrastructure damage caused by Cyclone Idai




**(a)** **(b)**

**Figure 2.10:** Infrastructure damage caused by Cyclone Idai: District Level




**(a)** **(b)**

to repair their housing structure than those in Nsanje. From table 2.2 we see that these differences on housing damage and required resources to fix the house are significant. While both districts have a similar level of damage to other buildings, the amount of finances required to repair these in Mangochi is slightly higher. Though from table 2.2 we see that neither of these two differences between the districts are significant.

We examine whether these affects vary by treatment status (figure 2.11). What we see is while there are some differences in the percent reporting damages to their housing, building, water and toilet structures by treatment status (see figure 2.11a), the big significant difference is in the estimation of the damage costs (figure 2.11b). Overall households who were part of the 2018 graduation

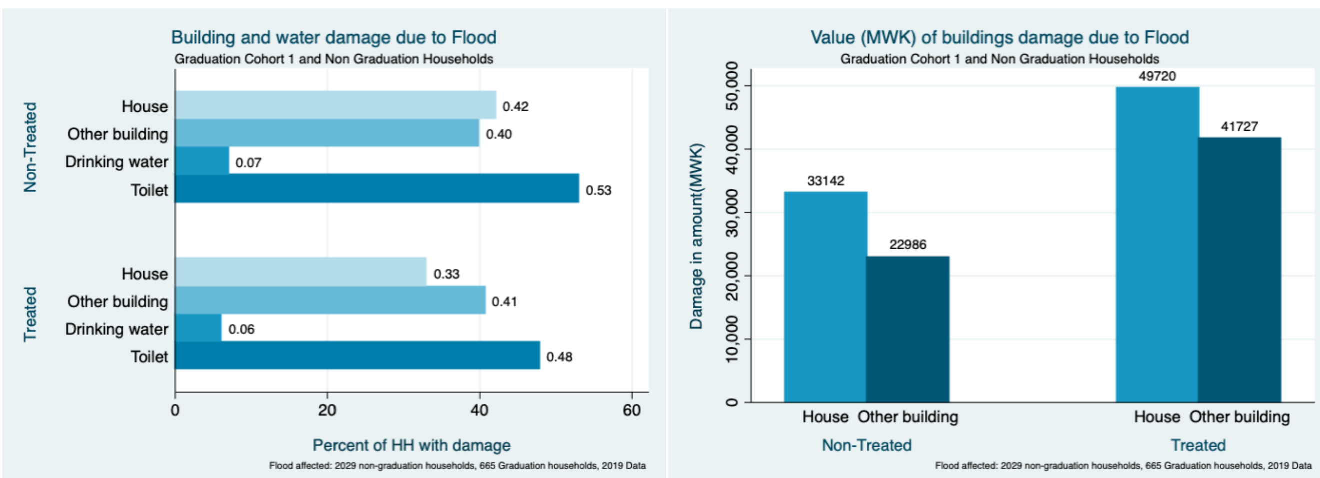
**Table 2.2:** T-test for differences between Districts: Infrastructure damage

| | Difference between Mangochi and Nsanje |
|---|---|
| Damage to house structure | 0.0989*** |
| | (4.49) |
| Damage to building structures | -0.0146 |
| | (-0.30) |
| Damage to drinking water | -0.0313** |
| | (-2.72) |
| Damage to toilet structure | 0.0644** |
| | (2.73) |
| Estimated cost of house repairs | 9316.7** |
| | (3.25) |
| Estimated cost of building repairs | 2690.7 |
| | (0.77) |
| Observations | 2029 |

$t$ statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Note: All Graduation households from Research Cohort 1 make up the treated, and all other households are assumed to be control.

**Figure 2.11:** Infrastructure damage caused by Cyclone Idai: Treatment Status



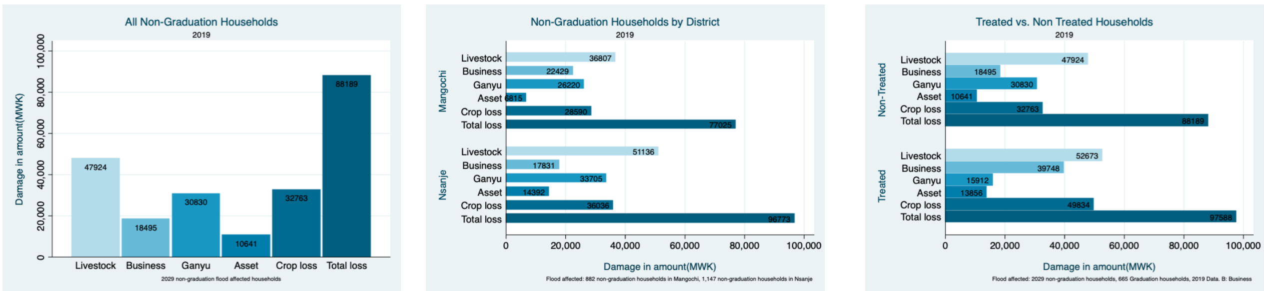

**(a)** **(b)**

cohort (research cohort 1) estimated damage that was MWK 16,000 more than non-graduation households in housing structure damage, and around MWK 20,000 more in other building structure damage. From table 2.4a we see that this difference in damage costs is statistically significant.

### 2.2.2 Other Damage Costs

In table 2.3, we look at the types of damage non-graduation households experience and the average cost of damage they incurred. In this table we look at all households, both graduation and non-graduation. While fewer households reported loss of livestock, for those who did, the level of

**Figure 2.12:** Estimate cost (MWK) of damage caused by Cyclone Idai




(a) (b) (c)

financial losses was higher than any other types of flood related damages households experienced. The second main financial loss was due to loss of crops, with an average MWK 36,969 reported, followed closely by damage costs related to the housing structures. Households also experienced loss of MWK 27,536, due to loss of daily wages. Finally, while 51% of households reported damage to durable goods, the average cost of losses were the lowest from all the included categories.

**Table 2.3:** Proportion of Households Affected and Extent of Damage, by Category

| | Proportion Affected | Mean Cost MWK |
|---|---|---|
| Lost daily work | 0.90 | 27536.10 |
| Damage to agriculture plots | 0.83 | 36969.12 |
| Damage to durable goods | 0.51 | 11492.67 |
| Damage to house structure | 0.40 | 36531.60 |
| Damage to building structures | 0.40 | 26920.04 |
| Livestock loss | 0.16 | 48934.44 |
| Business loss | 0.05 | 25127.01 |

This table includes all households, including both Graduation and Non-Graduation households

We complement this analysis in figure 2.12, which summarises the average financial loss due to the 2019 flood by damage type for non-graduation households, and by district and treatment status. In figure 2.12a we focus on non-graduation households. Non-graduation households followed a similar pattern of damage costs to the sample of all households. Similar to the table above, these households experienced the largest loss in livestock. Unlike the full sample, non-graduation households experienced slightly more losses due to loss of daily wages, as seen in figure 2.12a at MWK 30,830. In addition, while these households faced business losses, at MWK 18,495, these losses were lower than what was experienced by the full sample.

Regionally, households in Nsanje reported a higher estimated financial loss across most categories (figure 2.12b). The difference between reported looses due to livestock loss was particular big between households in Nsanje and Mangochi (50% higher in Nsanje). The one exception to this regional pattern is crop loss, where households in Mangochi experienced higher estimated crop losses.

There are some interesting differences in estimated losses by treatment status (see figure 2.12c). In particular, due to the consumption support, Graduation households may be less likely to engage

**Table 2.4:** T-test for differences between Treatment Status: Infrastructure damage and resulting financial losses

| | Difference between Non-Treated and Treated |
|---|---|
| Damage to house structure | 0.0906*** |
| | (4.15) |
| Damage to building structures | -0.00779 |
| | (-0.16) |
| Damage to drinking water | 0.00932 |
| | (0.82) |
| Damage to toilet structure | 0.0515* |
| | (2.18) |
| Estimated cost of house repairs | -16578.5*** |
| | (-4.69) |
| Estimated cost of building repairs | -18741.5*** |
| | (-3.63) |
| Observations | 2694 |

$t$ statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**(a)**

| | Difference between Non-Treated and Treated |
|---|---|
| Estimated livestock loss cost | -4748.9 |
| | (-0.69) |
| Estimated business loss cost | -21252.8** |
| | (-3.21) |
| Estimated wage loss cost | 14918.0 |
| | (0.71) |
| Estimated durable loss cost | -3215.5* |
| | (-2.29) |
| Estimated crop loss | -17071.0*** |
| | (-7.06) |
| Total estimated loss cost | -9399.2 |
| | (-0.57) |
| Observations | 2694 |

$t$ statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**(b)**

Note: All Graduation households from Research Cohort 1 make up the treated, and all other households are assumed to be control.

in Ganyu work, which would result in lower losses of daily wages due to the flooding. Summary statistics from figure 2.12c supports this interpretation, with Graduation households reporting lower losses due to not being able to engage in daily labour. In fact, this is the only area where non-Graduation households report greater financial loss. While this loss is bigger for non-Graduation households, from table 2.4b we see that this difference is not statistically significant.

Graduation households report high losses for livestock (MWK 52,673) crops (MWK 49,834) and business losses (MWK 39,748), and these losses were higher than non-Graduation households by MWK 4,749, MWK 17,071 and MWK 21,253 respectively (see figure 2.12c). While Graduation households had not yet received their capital transfer to start income generating activities at the time of Cyclone Idai, household visits suggests households used part of the consumption support to buy poultry and livestock, invest in agricultural plots, to start businesses and buy household assets. The implication of this could be greater financial loss due to crop damage, loss of livestock and business for these households. This suggests that hard fought gains risk being lost in an environment of pervasive risk and regular shocks. This suggests the potential existence of an environmental poverty trap, where weather events, like flooding, prevent households from escaping poverty or push household back below poverty levels. In table 2.4b we see that the differences between Graduation and non-Graduation households in business, asset and crop loss are all statistically significant, though the difference in monetary loss due to livestock is not significant.

## 2.3 Food Insecurity

We define food security in three alternative ways - the Food Insecurity Index, the Hunger Gap measure used in other Concern studies and self-reported food scarcity in the three months post flood. For this section we first analyse the results at the household level, and similar to the prior section we look first at all non-graduation households, then by district and finally by treatment status.

In summary, we find the following:

- Cyclone Idai caused significant impacts on food security and we find this result regardless of how we define food security.

- Regionally, we find that households in Nsanje faced higher food insecurity than those in Mangochi, regardless of whether they were affected by the flood.

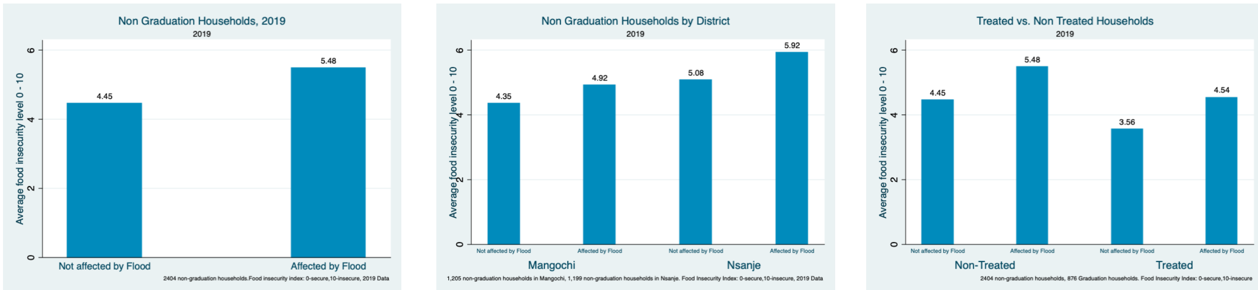
- Non-graduation households had greater food insecurity than graduation households, aside from April 2019, which was a month after the flood.

### 2.3.1 Food Insecurity Index

In the first instance we look at the average food insecurity score versus whether a household was affected by the Cyclone Idai (see figure 2.13). The Food Insecurity Index draws on a food insecurity measure outlined in the Bossuroy et al. (2019) pre-analysis plan for a multi-country RCT of the Sahel Adaptive Social Protection. This index is constructed using 10 questions answered by female respondents, which includes whether the household ever experienced any difficulty in having enough food to fulfil the needs of the family, the number of meals and days that the household did not have enough food to eat, the number of days that the household ate meat over the past week, whether any household member skipped any meal or reduced consumption due to the shortage of food and the number of days and meals skipped, whether the household borrowed food or received any help from friends or relatives, and the order in which household members are served food when food is in short supply. The index is calculated by the standardised weighted average score of each question and the total score ranges from 0 (food secure) to 10 (severely food insecure).

What these summary statistics on the food Insecurity Index tell us is that regardless of how one groups the data, households who were affected by the flood had a higher food insecurity score than households who were not affected by the flood. If we look at figure 2.13a, we see that non-graduation households affected by the flood had a higher food insecurity score of 5.48 compared to non-graduation households who did not get affected at 4.45. If we look at these same households by district, this pattern is consistent across region. The one thing to note though in figure 2.13b is that households in Nsanje, regardless of whether they were affected by the flood or not, had a higher level of food insecurity than households in Mangochi. Finally, in figure 2.13c it is noticeable

**Figure 2.13:** Average Food Insecurity Index Score versus Impacted by Cyclone Idai




(a) (b) (c)

**Table 2.5:** T-test for differences on Food Insecurity Index for those affected by Cyclone Idai: by District and Treatment Status

| | Difference between Mangochi and Nsanje |
|---|---|
| Food insecurity index: 0-secure,10-insecure | -1.005*** |
| | (-11.06) |
| Observations | 2005 |

$t$ statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**(a)**

| | Difference between Non-Treated and Treated |
|---|---|
| Food insecurity index: 0-secure,10-insecure | 0.945*** |
| | (9.92) |
| Observations | 2647 |

$t$ statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**(b)**

Note: We only include households who are affected by Cyclone Idai. District: Only includes non-Graduation households at the time of survey. Treatment: All Graduation households from Research Cohort 1 make up the treated, and all other households are assumed to be control.

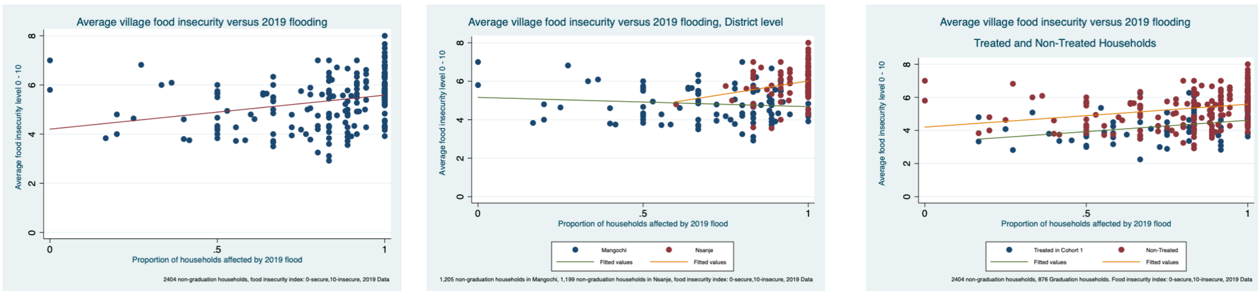
that non-graduation households had a higher food insecurity score than those who were part of the first cohort of treated households.

Formally, we statistically test for these differences in table 2.7; explicitly testing whether the difference between the average food insecurity score by district and treatment status is significant for households affected by Cyclone Idai. When we look at the district score, we see from table 2.5a that the average mean food insecurity score in Mangochi is lower than Nsanje and that this difference is statistically significant. Households in Mangochi report being more food secure. When we look at this difference by treatment status in table 2.5b, consistent with the summary statistics, non-graduation households who were affected by the flood had a higher food insecurity score than Graduation households affected by the flood. This difference is also statistically significant.

Aggregating the household responses to the village level, we compare the proportion of households affected by the flood at the village level to their food insecurity index. Figure 2.20 describes the impact of the 2019 flood on the prevalence of food insecurity using the Food Insecurity Index. At the village level for non-graduation households in figure 2.14a, we see that food security is negatively correlated to the proportion of households in a village affected by the 2019 flood. The correlation suggests that villages affected by the flood are more likely to struggle with a shortage of food (therefore seeing an increase in their food insecurity index score).

If we disaggregate by district, we see that while Nsanje still has this negative relationship, in Mangochi there is actually a declining trend (see figure 2.14b). As the proportion of households

**Figure 2.14:** Village Food Insecurity Index Score versus Proportion Impacted by Cyclone Idai




(a) (b) (c)

Note: Summarised at the village level and excluded households who provided no information about whether they were negatively affected by the flood, Cyclone Idai, in March 2019. The data of food insecurity was collected in the Baseline 2 survey in June/July 2019. Food Insecurity Index is constructed using the standardised weighted average of 10 questions about food security in the last 12 months (the list of questions is shown in Appendix). The index score ranges from 0 (secure) to 10 (insecure).

who are affected by the flood increase in a village in Mangochi the food insecurity index decreases, suggesting greater food security. It would be important to look further into why this may be the case (possibly due to relief), especially as both districts reported plot damage and loss of crops due to the flood. Though it is also important to remember when we look at the simple bar graph comparison at the household level, households affected by the flooding reported a higher food insecurity score.

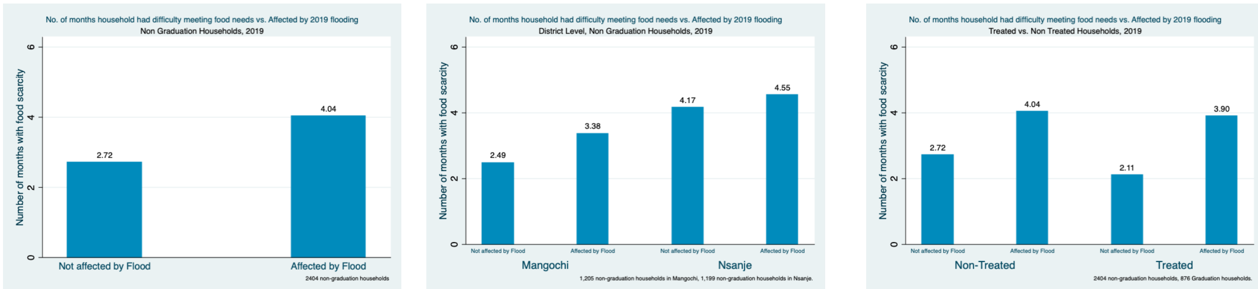
Finally, in figure 2.14c, we look at this relationship by treatment status. Regardless of treatment status, the proportion of households affected by the flood in a village is positively correlated with an increase in food insecurity. Though consistent with the summary statistics from figure 2.13c, the correlation for non-graduation households is higher.

### 2.3.2 The Concern Hunger Gap

The second measure we use is the Concern Hunger Gap. This measure is calculated using two questions: whether the household ever experienced any difficulty in having enough food to fulfil the needs of the family and the number of months that the household struggled to feed the family from any source of food. If the household responds that they did not face any food insecurity, they get a score of 0. If they say yes, then the total number of months they faced food scarcity are added to give them a score out of 12. Therefore for the Concern Hunger Gap, the total score ranges from 0 (food secure) to 12 (severely food insecure).

Figure 2.15 describes the impact Cyclone Idai on the prevalence of food insecurity using the Concern Hunger Gap at the household level. A similar pattern to the households results from the food insecurity index discussed already can be seen here. In figure 2.15a we observe that non-graduation households who were affected by Cyclone Idai faced over 4 months of food scarcity, while those who were not affected faced 2.7 months of food scarcity. When we look at this figure by district, this pattern remains. Though similar to prior results, on average all Nsanje households reported

**Figure 2.15:** Average Concern Food Gap Index versus Impacted by Cyclone Idai, Household Level




(a) (b) (c)

**Table 2.6:** T-test for differences on Concern Food Gap Index for those affected by Cyclone Idai: by District and Treatment Status

| | Difference between Mangochi and Nsanje |
|---|---|
| Concern hunger gap | -1.169*** |
| | (-8.00) |
| Observations | 2017 |

*t* statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**(a)**

| | Difference between Non-Treated and Treated |
|---|---|
| Concern hunger gap | 0.136 |
| | (0.94) |
| Observations | 2682 |

*t* statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**(b)**

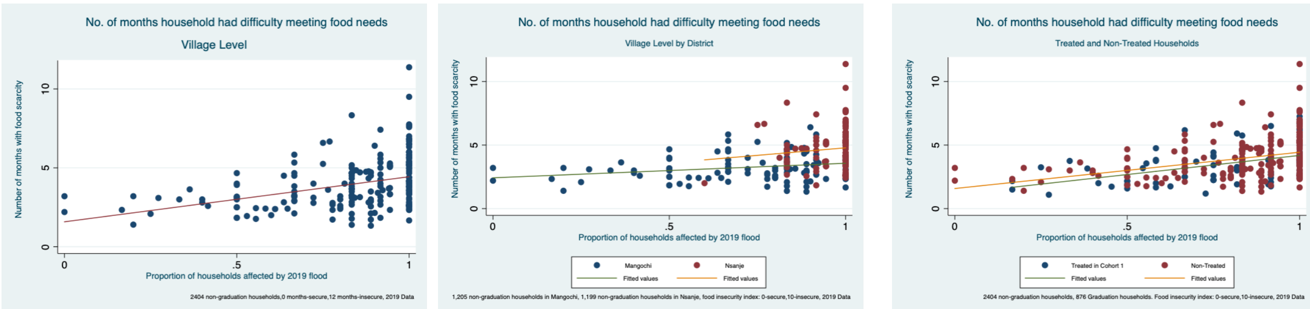
Note: We only include households who are affected by Cyclone Idai. District: Only includes non-Graduation households at the time of survey. Treatment: All Graduation households from Research Cohort 1 make up the treated, and all other households are assumed to be control.

a greater number of food scarcity months than households in Mangochi, regardless of whether they were affected by the flood or not. Finally, non-graduation and treated households affected by the flooding both reported greater number of food scarcity months than non-graduation and treated households that were not affected. Though within each category, non-graduation households reported a higher number of food scarcity months than treated households.

As for the previous measure of food insecurity, we statistically test for these differences discussed using t-tests and the results are displayed in table 2.6. Consistent with the figures above we find a negative and statistically significant difference between Mangochi and Nsanje in the number of months flood affected households were food insecure (table 2.6a). On the other hand, in table 2.6b, we see that the positive difference in the number of food scarcity months between treated and non-graduation households that were affected by the flood is not statistically significant. We suspect this non-finding is related to the 12 month nature of this variable diluting our ability to pick up a statistically difference for the final 3 months (months since the Cyclone) of this period.

In figure 2.16 we can see that for the Concern Food Gap Score, the village level trends are similar to the households summary statistics discussed above. In figure 2.16a we see that the proportion of non-graduation households affected by the flood is negatively related to the level of food security in the village (or positively related to food insecurity as shown in the graph). This relationship is similar in figure 2.16b when we analyse by district. This relationship also holds in figure 2.16c, when we compare non-graduation households and households who were treated in cohort 1.

**Figure 2.16:** Village Level: Concern Food Gap Score versus Proportion Impacted by Cyclone Idai




**(a)** **(b)** **(c)**

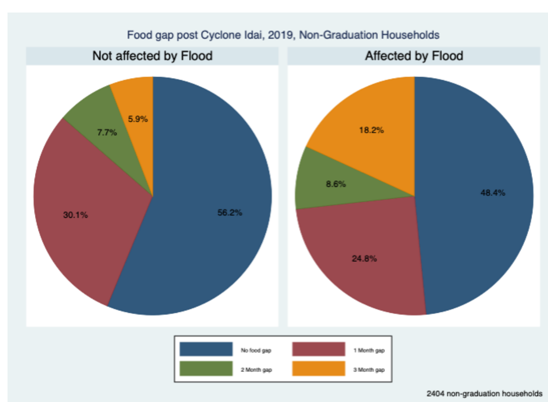
Note: Concern Hunger gap is calculated by the number of months the household struggled to feed the family from any source of food, which equals to 0 if there's no such an experience. The total score ranges from 0 (secure) to 12 (insecure). Red circle represents villages in the treatment group in Cohort 1 while blue circle represents other villages, i.e. villages in the control group in Cohort 1 and in both control and treatment groups in Cohort 2. The graph is summarised at the village level and excluded households who provided no information about whether they were negatively affected by the flood, Cyclone Idai, in March 2019.

### 2.3.3 Food Scarcity Post Cyclone Idai

An augmented index that only considers the period between surveying and the flood would likely show even stronger relationships. While we do not have these questions for the period directly after the flood, we do ask households during which months they didn't have enough food to fulfil the needs of their family. We use this information in two ways, first we look at at the total number of months from March to May that households said they faced food scarcity, second, we look by month. In figure 2.17 we look at this for non-graduation households. A bigger portion of households who are affected by the flood are likely have had one to three months of food scarcity post flooding.

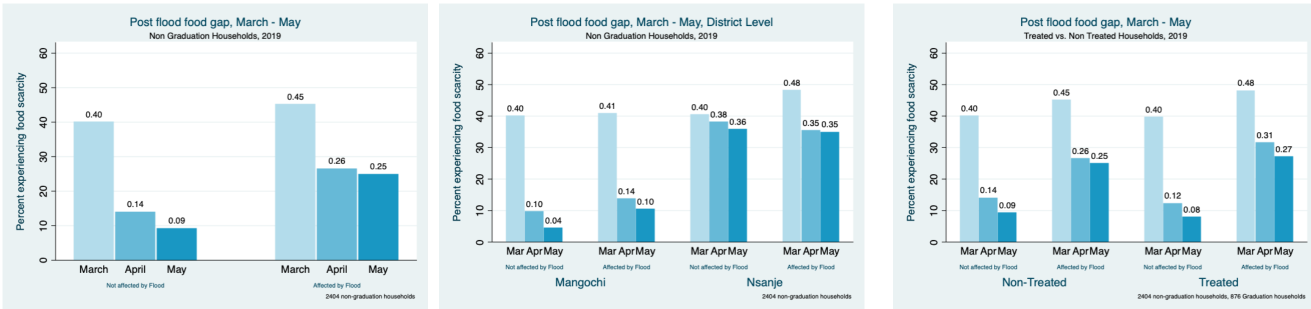
In figure 2.18, we look at the month by month reported average of food scarcity. What we see is that regardless of whether a household was affected by Cyclone Idai, the highest percent of households reported food scarcity in March, which then decreased for April and May. This holds whether we analyse by district or treatment status. If we look at it by being impacted by the flood, flood impacted households reported a higher incidence of food scarcity for all three months compared to non flood impacted households.

**Figure 2.17:** Total Months Food Gap March-May vs. Impacted by Cyclone Idai




By district, in figure 2.18b we see that the average likelihood for households in Mangochi facing food scarcity in March, April and May was lower than the average for Nsanje households. From table 2.7a we find that this difference was significant for all three months. This is consistent with all the prior analysis, with Mangochi having lower food inse-

**Figure 2.18:** Food Gap Post Cyclone Idai: March - May, 2019




**(a)** **(b)** **(c)**

**Table 2.7:** T-test for differences on Food Gap for those affected by Cyclone Idai: by District and Treatment Status

| | Difference between Mangochi and Nsanje |
|---|---|
| Food Gap March | -0.0735** |
| | (-3.11) |
| Food Gap April | -0.217*** |
| | (-10.63) |
| Food Gap May | -0.245*** |
| | (-12.35) |
| Food scarcity March-May | -0.535*** |
| | (-10.14) |
| Observations | 1823 |

$t$ statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**(a)**

| | Difference between Non-Treated and Treated |
|---|---|
| Food Gap March | -0.0295 |
| | (-1.23) |
| Food Gap April | -0.0500* |
| | (-2.32) |
| Food Gap May | -0.0214 |
| | (-1.02) |
| Food scarcity March-May | -0.101 |
| | (-1.83) |
| Observations | 2385 |

$t$ statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**(b)**

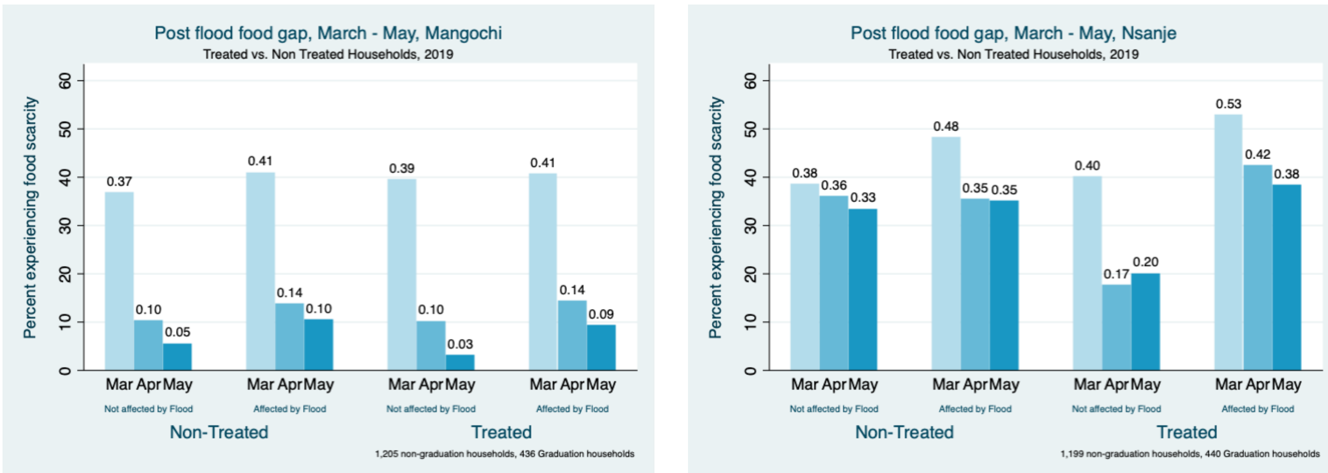
Note: We only include households who are affected by Cyclone Idai. District: Only includes non-Graduation households at the time of survey. Treatment: All Graduation households from Research Cohort 1 make up the treated, and all other households are assumed to be control.

curity scores. In addition, Mangochi has a lower average of total number of months of food scarcity post flood than Nsanje. This difference is also statistically significant.

Treated households that were affected by the flood report a slightly higher incidence of food insecurity from March to May than non-graduation households (see table 2.18c). When we look at whether these differences are statistically significant in table 2.7b, we find that they are not, aside from April. This result is in slight contrast to the other two food security indices discussed above (the food insecurity index and the Concern Hunger Gap) where treated households overall had a lower level of food insecurity, and were more food secure than non-graduation households. One reason for this difference could be related to flood relief, where a lower percent of graduation households received relief post flood, compared to non-graduation households (This section on relief comes later in the report). The gap in access to relief could be why we see greater food insecurity for these households. The other reason for this could be that while Graduation households were less likely to report being affected by the flood, those that did, experienced more extensive losses, including food scarcity. Though this difference in food scarcity disappeared by May, two months post flooding.

We investigate this difference between treated and non-treated households a little further by

**Figure 2.19:** Food Gap March - May, Treatment Status by District, post Cyclone Idai



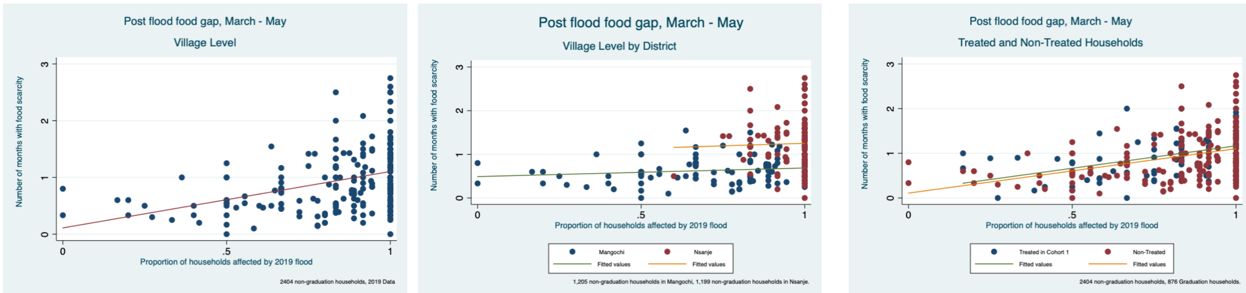

**(a)** **(b)**

disaggregating by district. For households in Mangochi there is little difference in the percent reporting a food gap for March, April and May by treatment status (see figure 2.19a). A similar percent of treated and non-treated households report a hunger gap during these three months. Contrastingly, this difference between treated and non-treated households reporting a food gap is be driven by households in Nsanje (see figure 2.19b). In March, 53% of treated households in Nsanje said they had a food gap, compared to 48% of non-treated households, resulting in a gap of 13 percentage points between the two groups. In April this gap in Nsanje increased to 21 percentage points, where only 17% of non-treated households had a food gap compared to 38% of treated households. By May, the average for both groups was similar, with a small gap of 3 percentages points between non-graduation and graduation households. was still evident but decreasing.

In Figure 2.20 we look at this same question but aggregating to the village level and compare districts and treated villages in Research Cohort 1 to all other villages. What we see in figure 2.20a is that as the proportion of households affected by Cyclone Idai increase, so does the number of months they face food insecurity post flooding. When we look at this by districts, we see that the Nsanje villages have a higher proportion of households affected by the flood and a higher incidence of food insecurity post flooding. For treated and non-graduation households the linear trend line is almost the same.

Finally, we conduct simple correlations between being the binary variable affected by Cyclone Idai and the three food insecurity variables discussed in this section, the food index, the Concern Hunger Gap and the food gap in the three months post flooding. In table 2.8 we see that being affected by the flood in 2019 has a positive and significant impact on increasing food insecurity. This relationship holds regardless of what measure is used. These relationships remain the same when we limit it to non-graduation households or including graduation households, or when we run

**Figure 2.20:** Food Gap March - May versus Proportion Impacted by Cyclone Idai




**(a)** **(b)** **(c)**

Note: Summarised at the village level and excluded households who provided no information about whether they were negatively affected by the flood, Cyclone Idai, in March 2019. The data of food insecurity was collected in the Baseline 2 survey in June/July 2019. The Food Gap is calculated by summing if a household faced food insecurity in March, April and May. If they faced for none, they got a score of 0, if they faced scarcity in all three months, they got a score of 3.

it by district (please see table 6.2, 6.3, 6.4 and 6.5 in the appendix). It is important to remember that we do not control for any other factors in this simple correlation test. In addition, it does not necessarily imply causation. At the same time these findings are robust to a high degree of confidence and have been found despite the fact that part of the food insecurity and the Concern index is constructed with reference to the last twelve months.

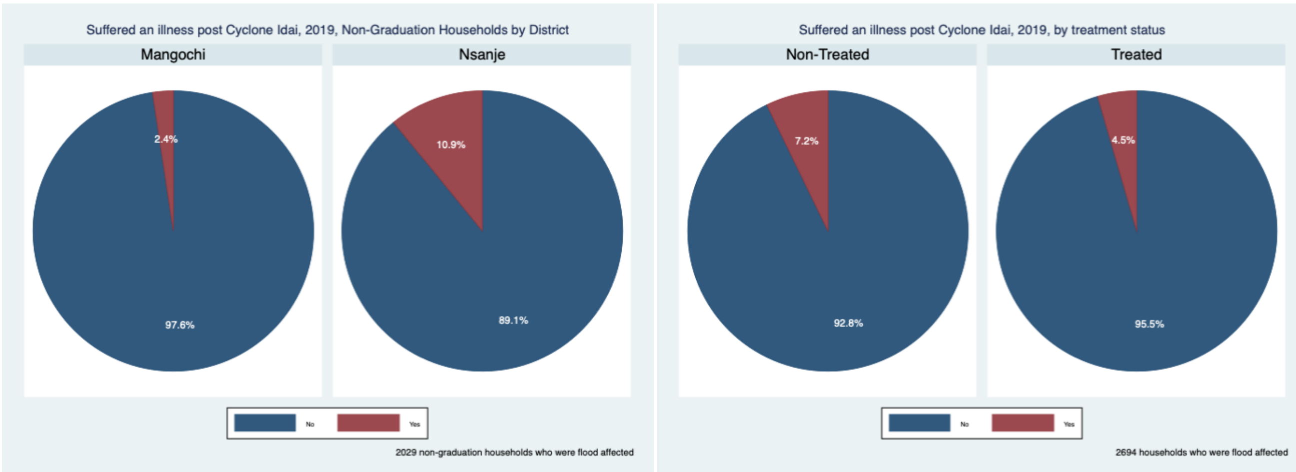
**Table 2.8:** Univariate Regression: Relationship between Cyclone Idai and Food Security

| VARIABLES | (1)<br>count_hunger | (2)<br>foodins_s | (3)<br>foodgap_postflood |
|---|---|---|---|
| flood2019 | 1.516*** | 1.137*** | 0.368*** |
| | (0.14) | (0.12) | (0.05) |
| Constant | 2.489*** | 4.117*** | 0.620*** |
| | (0.11) | (0.11) | (0.04) |
| Observations | 3,242 | 3,193 | 2,796 |
| R-squared | 0.032 | 0.038 | 0.014 |
| t-stat | 11.22 | 9.37 | 6.98 |
| p-val | 0.00 | 0.00 | 0.00 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: All 3280 households are included, regardless of treatment status.

**Figure 2.22:** Experience of Illness: Post Cyclone Idai

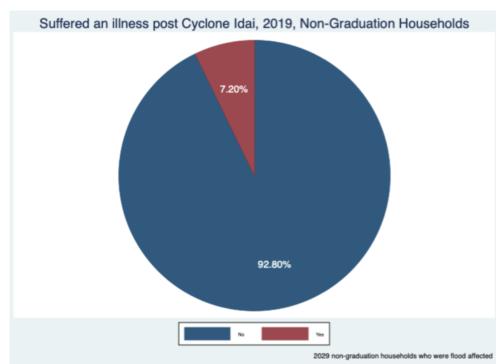



**(a)** **(b)**

## 2.4 Household Illness

Another effect of the flood was to cause illnesses within households. Though when we look at figure 2.21, we see that just 7.2% of non-graduation households reported that someone in the household got sick after the flood. Overall, 92.8% of households experienced no illnesses post flooding.

**Figure 2.21:** Experience of Illness post Cyclone Idai




District wise only 2.4% of households in Mangochi reported an illness post flooding, while 10.9% of households in Nsanje reported being ill. From table 2.9a, we see that this different in incidence of reported illness between the two districts is significant.

Next, we look at this by treatment status in figure 2.22b. We find that 7.2% of non-graduation households reported an illness post flooding, compared to 4.5% of treated households. Again we test whether this difference is statistically significant. In table 2.9b, we find that non-graduation households are more likely to report being ill post flooding and this difference is significant. This is an important finding.

For the next part of our analysis on illness, we look at the types of sickness experienced by non-graduation households post cyclone. In figure 2.23a, we see that predominantly households experienced some form of injury post flood, only a small percent experienced malaria (3%), dysentery (2%) or a cold (1%).

In tables 2.9a and 2.9b, we estimate the differences between the incidence of this illnesses by district and treatment status, and check whether any of these differences are statistically significant.

**Table 2.9:** T-test for differences on Illness: by District and Treatment Status

| | Difference between Mangochi and Nsanje |
|---|---|
| Did you or your family members experience any illness/diseases since the floods? | -0.0852*** |
| | (-7.46) |
| HH experienced malaria post flood | -0.0450*** |
| | (-5.54) |
| HH experienced dysentery post flood | -0.0350*** |
| | (-5.22) |
| HH experienced fever post flood | -0.00323 |
| | (-1.33) |
| HH experienced cold post flood | -0.00793* |
| | (-2.00) |
| HH experienced cholera post flood | -0.00209 |
| | (-0.80) |
| HH experienced typhoid post flood | -0.00523* |
| | (-2.15) |
| HH experienced injury post flood | -0.0852*** |
| | (-7.46) |
| HH experienced chickenPox post flood | 0.00227 |
| | (1.61) |
| HH experienced skindiseases post flood | 0.000262 |
| | (0.19) |
| Observations | 2029 |

*t* statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**(a)**

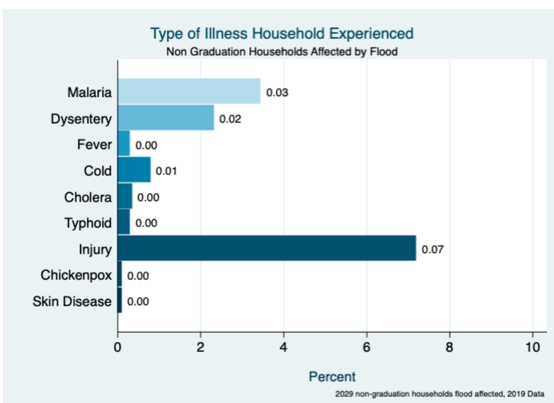
| | Difference between Non-Treated and Treated |
|---|---|
| Did you or your family members experience any illness/diseases since the floods? | 0.0268* |
| | (2.43) |
| HH experienced malaria post flood | 0.0119 |
| | (1.53) |
| HH experienced dysentery post flood | 0.0141* |
| | (2.28) |
| HH experienced fever post flood | -0.00155 |
| | (-0.60) |
| HH experienced cold post flood | 0.00638 |
| | (1.80) |
| HH experienced cholera post flood | 0.00195 |
| | (0.80) |
| HH experienced typhoid post flood | 0.00145 |
| | (0.64) |
| HH experienced injury post flood | 0.0268* |
| | (2.43) |
| HH experienced chickenPox post flood | 0.000986 |
| | (0.81) |
| HH experienced skindiseases post flood | 0.000986 |
| | (0.81) |
| Observations | 2694 |

*t* statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

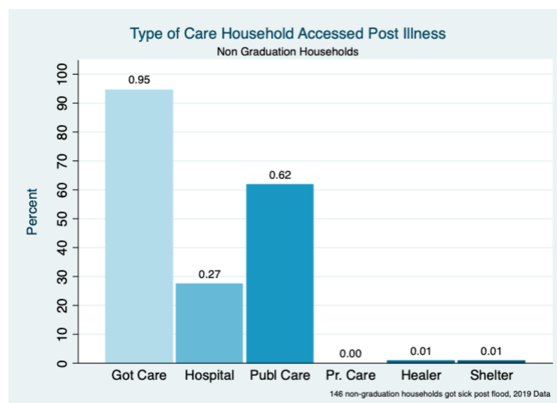
**(b)**

Note: District: Only includes non-Graduation households at the time of survey. Treatment: All Graduation households from Research Cohort 1 make up the treated, and all other households are assumed to be control.

**Figure 2.23:** Types of Illness Experienced and Type of Care: Post Cyclone Idai




**(a)**




**(b)**

What we see in table 2.9a is that households in Nsanje were more likely to experience an injury, malaria, dysentery, a cold and typhoid compared to households in Mangochi, and these differences are significant. Non-graduation households were more likely to experience an injury and dysentery post flooding compared to treated households and both of these differences are significant. These results are suggestive of a positive impact of the graduation intervention.

Of the 146 non-graduation households that fell sick, in figure 2.23b we see that 95% of them received treatment. Of those that got sick, 62% received treatment in a public clinic, while 27% received treatment in a hospital. None of the households went to a private clinic and only 1 percent received treatment from a healer or in the shelter they went to post flooding.

## 2.5 Psychological Impact: Bandwidth

After events, like the March 2019 flooding, individuals can experience increased stress that may led to poorer long term decisions. Mani et al. (2013) suggests that scarcity begets scarcity and that the channel through which this occurs is low bandwidth to make strategic longer term decisions. Their finding that Indian farmers make better longer term decisions after harvest, compared to before harvest, provides evidence of this phenomenon (Mani et al. (2013)).

One of the modules fielded to all households in the July 2019 was designed to measure bandwidth. The questions were designed to measure internal psychological constraints can play a role in perpetuating poverty traps, or be a contributing factor to why households fall into poverty after a shock. We specifically measured memory, attention, inhibitory control and fluid intelligence, which is the ability to solve problem, retain information and engage in logical reasoning - collectively known as bandwidth. The four measures are defined as follows:

- BW1 measures reaction time as captured through the individuals best and average (over 10 tries) reaction time to touching a figure on a tablet.
- BW2 focuses on inhibitory control, which we measure through a hearts and flowers test. In this test the individual sees either a heart or a flower, and their action depends on what they see. If they see a heart, they have to touch the heart, if they see a flower, they have to touch the opposite side.
- BW3 tests their memory, through reading them a number they have to recipe back after 10 seconds. If they get it correct, they get the next number which is one digit longer.
- BW4 measures fluid intelligence through a raven's test, where individuals have to complete a pattern puzzle from one of six provided options.

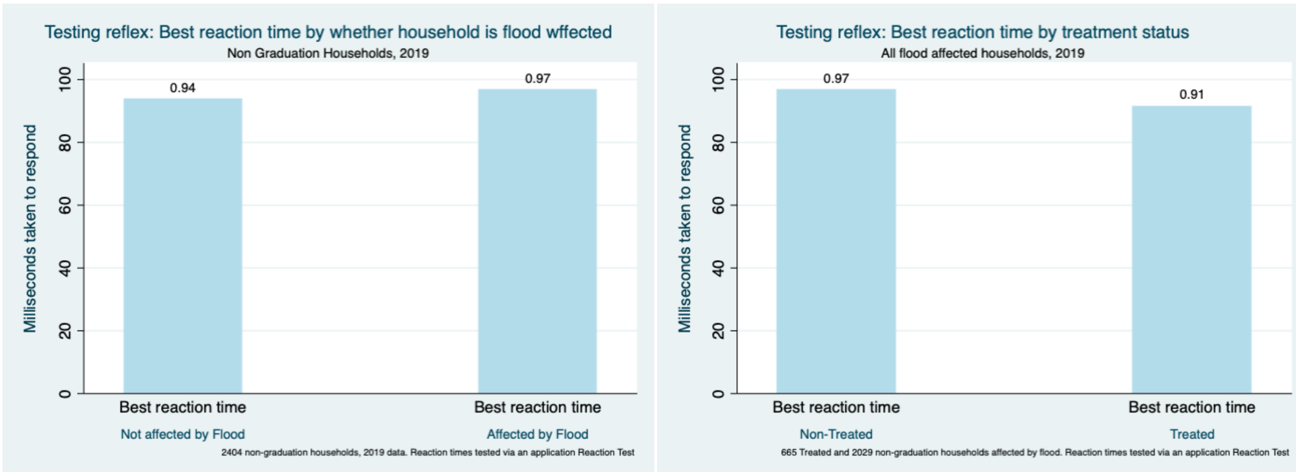
  In our analysis, We assess household outcomes from BW 2, 3, and 4 based on the total number of correct responses from the total questions asked for all three measures.

First, we examine (respondent's best) reaction time and whether households were affected by flood (2.24). In figure 2.24a, we look at all non-graduation households who were affected by the flood and see that households who were not affected by Cyclone Idai actually had a slightly quicker response than those who were. The difference in reaction time is small but consistent with what we would expect. In table 2.10a we find that this difference is not statistically significant.[8]

Next, we focus on households who were affected by the flood and analyse by treatment status. In figure 2.24b, we find that non-graduation households who are affected by the flood had a slightly slower response than graduation households who were affected by the flood. Treated households had a slightly quicker response in reacting to the target stimulus those non-treated households. In

[8] Multivariate regressions which control for other variables are required to decide whether there is a robust relationship between BWI and the floods. We would also need to look at the level of damages and bandwidth.

**Figure 2.24:** Average Reaction Response Time and Flooding Effects




(a) (b)

Note: BW 1 captures the best reaction time

**Table 2.10:** T-test for differences on BandWidth: by Flooding and Treatment Status

| | Difference between Flood Affected vs Non-Flood Affected, Non-Graduation |
|---|---|
| Best Reaction Time: | -0.0302 |
| | (-1.46) |
| Bandwidth-heart/flower: correct | (-1.43) |
| Bandwidth-memory: correct | (-1.37) |
| Bandwidth-logic thinking: correct | (-1.91) |
| Observations | 2380 |

*t* statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(a)

| | Difference between Non-Treated vs Treated, All Flood Affected Households |
|---|---|
| Best Reaction Time: | 0.0528*** |
| | (3.42) |
| Bandwidth-heart/flower: correct | (-0.75) |
| Bandwidth-memory: correct | (-0.56) |
| Bandwidth-logic thinking: correct | (-2.57) |
| Observations | 2694 |

*t* statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

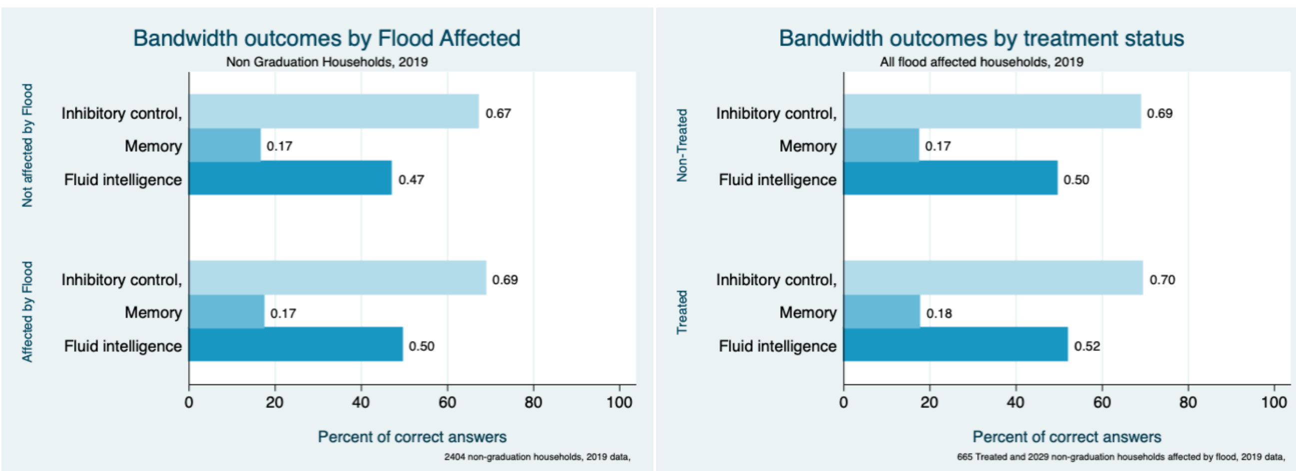
(b)

table 2.10b we confirm that this difference is statistically significant. This is a promising preliminary conclusion.

Figure 2.25 captures the relationship between the other three bandwidth measures and whether a household was affected by the flood. Interestingly, we find that non-graduation households not affected by the flood had a slightly lower percent of correct answers in inhibitory control and fluid intelligence, compared to non-graduation households affected by the flood (see figure 2.25a). Though neither of these differences between the two groups are statistically significant. Both groups had the same percent of correct answers related to memory. Further multivariable analysis is required to conclude fully.

When we analyse this by treatment status we find that for households affected by the flood, treated households had a slightly higher percent of correct answers across all three areas compared to non-treated households. Though again when we test where these differences between the two groups is significant, we find that in advance of doing multivariate analysis, none of them are statistically signifiant in univariate comparisons (see table 2.10b).

**Figure 2.25:** Average Inhibitory control, Memory and Fluid intelligence Scores and Flooding Effects




**(a)** **(b)**

Note: BW 2 captures inhibitory control through a hearts and flowers game, BW 3 captures memory and BW 4 captures fluid intelligence through a Raven's test.

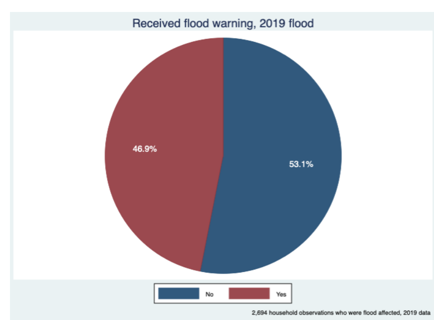
# Section 3

# Warnings

## 3.1 Warnings

Our survey asked households whether they received a warning about Cyclone Idai and whom they received it from. Responses to these questions reflect a range of local and regional institutional systems, access to and strength of national communication systems and the level of community engagement of households. We find that for all households affected by Cyclone Idai, only 46.9% of households received a warning (see figure 3.1), meaning the majority of households received no warning.

**Figure 3.1:** Received Flood Warning about Cyclone Idai

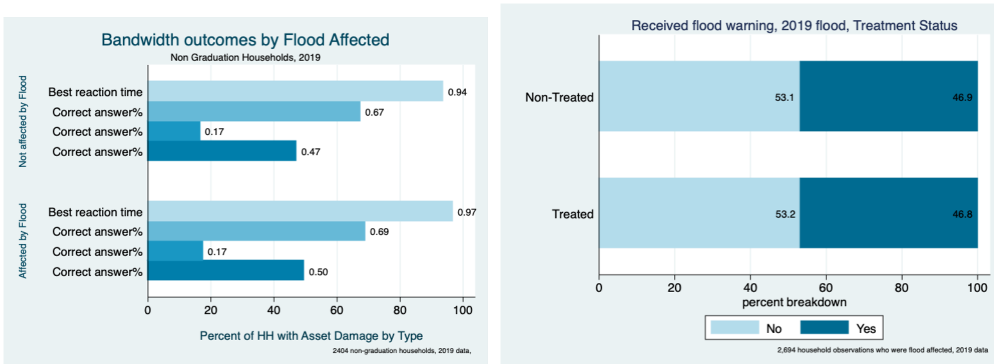



Regionally, we find clear differences for the proportion of households warned (figure 3.2a). In Nsanje, perhaps because of what is by now in some places an annual flooding, a much higher proportion of households received a warning about the flood. Of all households affected in Mangochi, only 24.4% of received a warning (figure 3.2a). In comparison, in Nsanje 63.8% of households were warned about the flooding. Our statistical test shows that this difference is statistically significant. One can think of two interpretations. It may be that the differences reflect that the warning systems are working in alerting households in Nsanje, a region of more frequent flooding. Alternatively, this difference may reflect the fact that the rains began closer to Mangochi (as illustrated in Figure 1.1) and by the time Southern Malawi was affected a second time, the cyclone system had drawn the attention of local leaders, national politicians and media.

While there were regional differences in whether households received a warning or not, we see no similar differences when we look at treatment status. In figure 3.2b, we see that regardless of treatment status, a similar proportion of households received a warning about the flooding.

In table 3.1, we statistically compare the differences between warnings received at the district

**Figure 3.2:** Received Flood Warning about Cyclone Idai




**(a)** **(b)**

**Table 3.1:** T-test for differences on Flood Warning: by District and Treatment Status

| | Difference between Mangochi and Nsanje |
|---|---|
| Received flood warning | -0.394*** |
| | (-22.05) |
| Observations | 2694 |

$t$ statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**(a)**

| | Difference between Non-Treated and Treated |
|---|---|
| Received flood warning | 0.00153 |
| | (0.07) |
| Observations | 2694 |

$t$ statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**(b)**

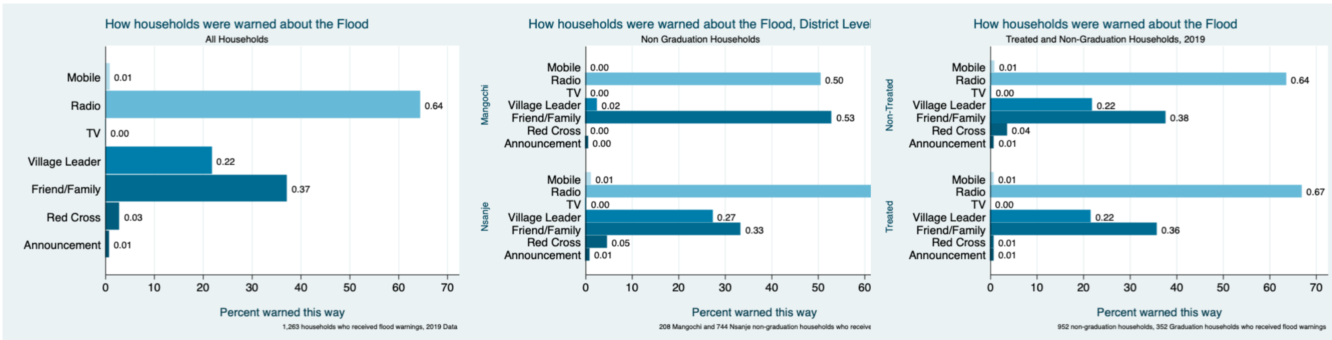
Note: District: Only includes non-Graduation households at the time of survey. Treatment: All Graduation households from Research Cohort 1 make up the treated, and all other households are assumed to be control.

level and by treatment status to see whether these differences are significant. Consistent with the summary statistics discussed above, table 3.1a confirms that households in Mangochi were less likely to receive a warning about the flooding and this difference is significant. Table 3.1b confirms that there is no significant difference between non-graduation and graduation households in the likelihood of receiving a flood warning.

Our data allows us to understand how households received warnings (figure 4.5). Radio announcements was the most common source of warning. The second most common channel was warning through friends and family; this was followed by village leaders. If we look at this by district, we find interesting differences in the source of warnings. In particular, the main source of warnings for households in Nsanje follows the overall patterns discussed above (see figure 3.3b). While over 67% of Nsanje households received warnings from the radio, only 53% of households in Mangochi received warnings from this source. Households in Mangochi were much more likely to receive warnings from family and friends than those in Nsanje. While over 27% of Nsanje households received warnings from village leaders, less than 0.02% of households in Mangochi received it via this channel. When we look at treated versus non-treated households in figure 3.3c, we see little difference between households in how they received a warning.

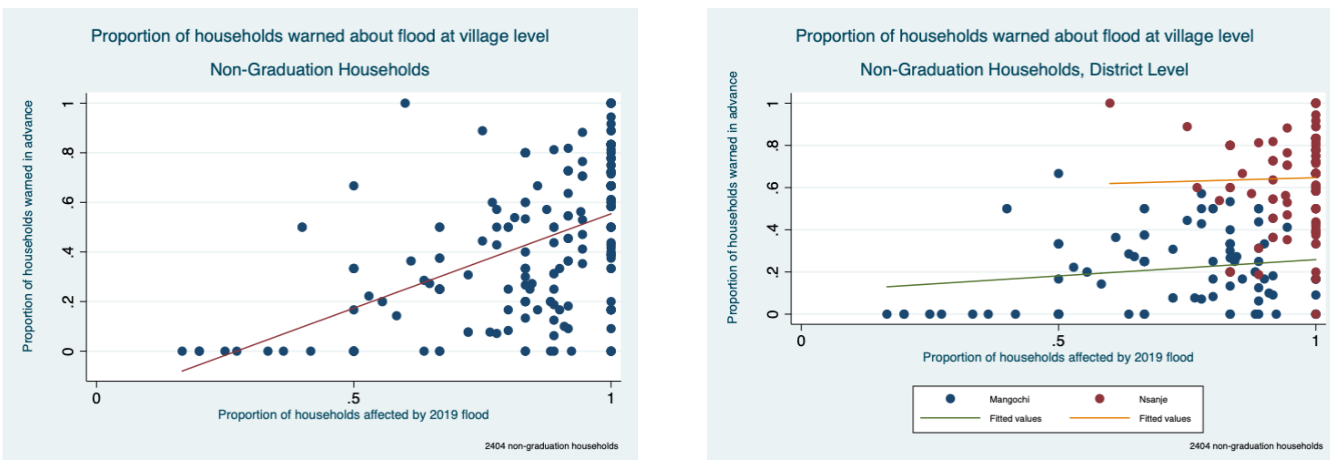
For the next part of the analysis, we look at the proportion of households affected at the village level by whether the household received warning, and how they were warned. Given that we found

**Figure 3.3:** Source through which household received warning on Cyclone Idai




(a) (b) (c)

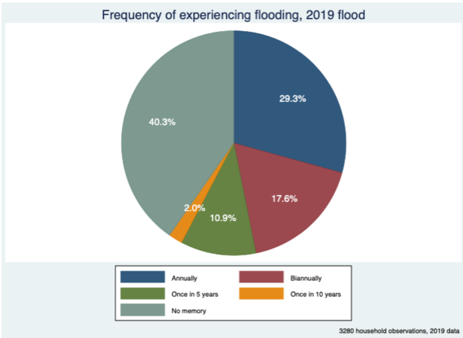
**Figure 3.4:** Proportion of households warned about Cyclone Idai at the Village Level



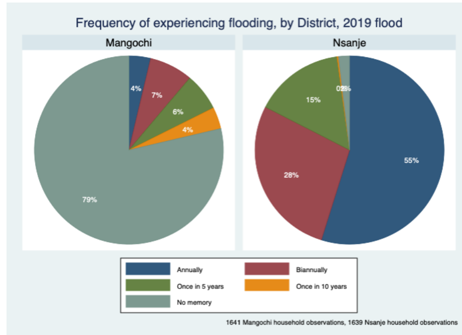

(a) (b)

a significant difference between regions on the likelihood of receiving a warning, we also conduct analysis at district level. We find suggestive evidence that the number of households in a village that received a warning is positively related to the number affected by the flood (figure 3.4a). This maybe be unsurprising for two reasons. First, the degree to which household preparedness is influenced by a warning, may reduce the level of monetary losses and not whether or not you are affected. Second, warnings are more likely to happen in villages more prone to flooding due to local topographical characteristics. When we look at this by district in figure 3.4b, we see a similar relationship, where the number of households in a village that received a warning increased with the proportion affected by the flood.

**Figure 3.5:** Frequency of Flooding




**(a)**




**(b)**

## 3.2 Previous Experiences of Flooding

Some parts of Malawi experience annual floods, while others less so. This is evident from figure 3.5b, where district differences exist in household flood recall. We found that 79 percent of our households in Mangochi have no memory of previously experiencing a flood (see Figure 3.5b) In contrast, 80 percent of our households in Nsanje recall experiencing a flood annually (55%) or every second year (25%). The contrast in previous experience of flooding should, one would imagine, manifest itself in different levels of preparedness, even in this weak institutional setting.

Exploring the data further, we investigated the relationship between frequency of flooding (specifically household recall of) and the level of damage households experienced. First, we graph the frequency of flooding by household damage incurred. If we look at figure 3.6a, we see that the average amount of financial damage decreases when households do not report experiencing a more frequent pattern of flooding. Those who have no memory of a flooding pattern for their area report a lower level of financial loss from the damage caused. We test whether this difference is significant in table 3.2, comparing households with irregular versus regular flooding. Households that only recall flooding every 5 years or have no memory of flooding have a lower level of financial loss recorded (-26852 MWK), compared to households who recall experiencing flooding annually or biannually. Though this difference is not statistically significant. The average mean financial loss households experience are similar regardless of how often they recall flooding happening in their area.

**Figure 3.6:** Total loss due to the flood and the frequency of affected by the flood in the past

**(a)** Non-Graduation households

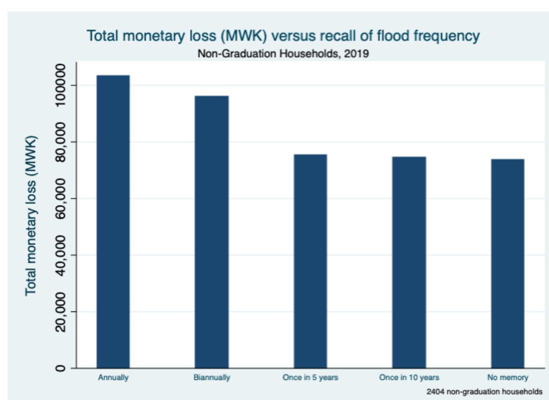


**Table 3.2:** T-test for differences between Flooding Frequency: Total damage amount

| | Difference between Regular vs Irregular Flooding |
|---|---|
| Total estimated loss cost | -26852.3 |
| | (-1.42) |
| Observations | 2029 |

$t$ statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Note: All non-graduation households

## Section 4

# Relief

### 4.1 Relief sources

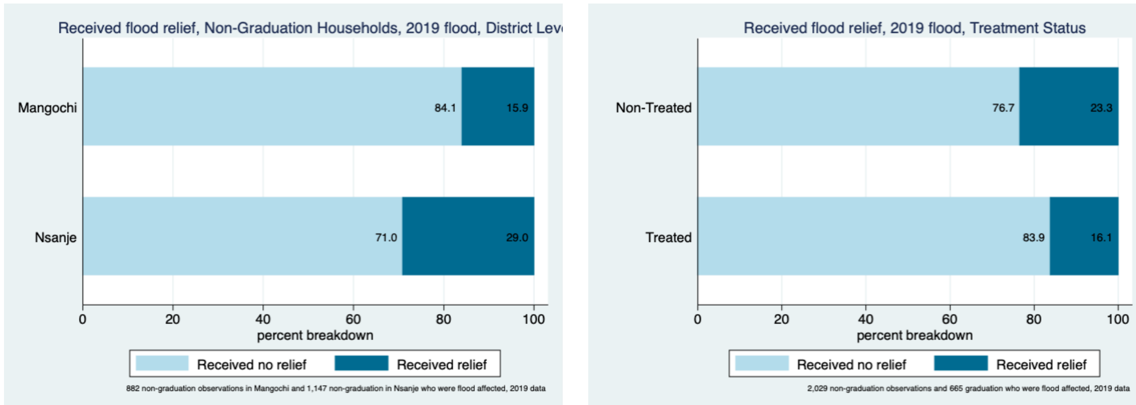
Relief efforts in the poorest countries in the world can be hampered by weak monitoring mechanisms and institutional structures. However, the advent of mobile communication and the spread of cash transfer programmes is making in easier to respond to the needs of affected communities. We asked a range of questions on what relief households received following Cyclone Idai. It is worth pointing out that the vast majority of households affected by the flood across both regions did not receive any kind of relief. Of all flood effected non-graduation households, just 23.3% of households received relief of some form, while 76.7% of affected households received no relief at all (see the non-treated bar in figure 4.1b).

Disaggregating by district, we see that non-graduation households in Mangochi were even less likely to receive relief. Twenty-nine percent of non-graduation households in Nsanje who were affected by Cyclone Idai received some form of relief as a result of the flood (see 4.1a). This means that even in a region regularly affected by flooding, just a quarter of households received relief. For Mangochi, where a large portion of the households do not recall any flood, the percent drops even further. Only 15.9% of non-graduation households in Mangochi received relief in any form. The vast majority of households that were affected had to find their own ways to cope with the flood.

We find that a greater percent of non treated households received relief compared to households who were part of the Graduation program (4.1b); across both regions 23.3% of non-graduation households received relief, this is compared to 16.1% of graduation households. However for Mangochi, there was little different in levels of relief by treatment status in Mangochi (15.88% of non-graduation households receiving relief compared to 15.87% of graduation households). Contrastingly, in Nsanje 29% of non-graduation households received relief post Cyclone Idai, compared to only 16.2% off graduation households.

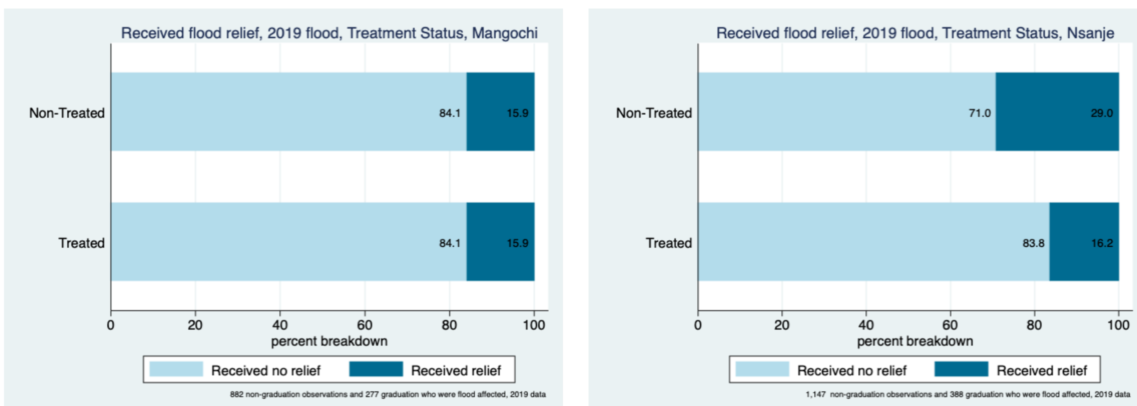
We check in table 4.1a whether this difference between those who received relief by treatment status for the two districts is significant or not. Employing an appropriate statistical test, we find

**Figure 4.1:** Received Relief as a Result of Cyclone Idai




**(a)** **(b)**

**Figure 4.2:** Received Relief as a Result of Cyclone Idai, Treatment Status by District




**(a)** **(b)**

**Table 4.1:** T-test for differences on Relief: Treatment Status by District

| | Difference between Non-Treated and Treated, Mangochi |
|---|---|
| Received relief: 1-Yes | -0.000115 |
| | (-0.00) |
| Observations | 1159 |

*t* statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**(a)**

| | Difference between Non-Treated and Treated, Nsanje |
|---|---|
| Received relief: 1-Yes | 0.128*** |
| | (5.02) |
| Observations | 1535 |

*t* statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

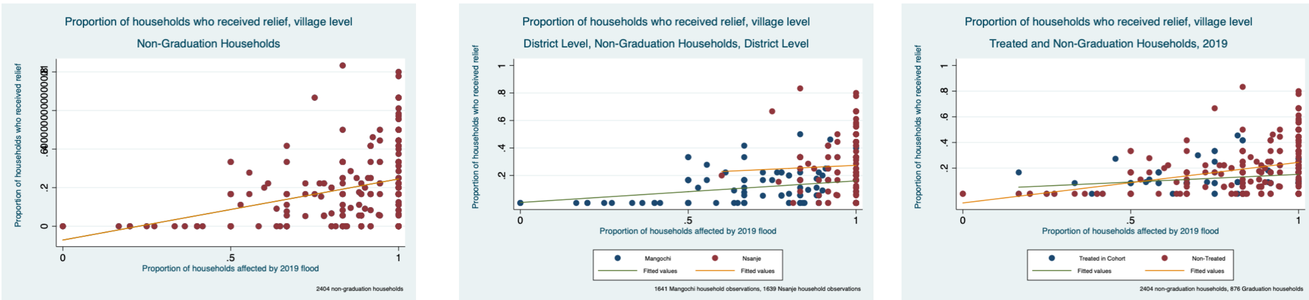
**(b)**

Note: District: Only includes non-Graduation households at the time of survey. Treatment: All Graduation households from Research Cohort 1 make up the treated, and all other households are assumed to be control.

for Nsanje there is a statistically significant difference in the relief received by non-graduation and graduation households.

The success of relief targeting can be assessed to some degree by village level analysis. Specifically, is there a relationship between the number of households affected and the number of households that receive relief? Figure 4.3 illustrates the relationship between the proportion of households

**Figure 4.3:** Proportion of households who received relief post Cyclone Idai, Village Level




(a) (b) (c)

negatively affected by the flood in each village with the proportion of who received some kind of relief. Figure 4.3a looks only at non-graduation households and illustrates that relief provided was correlated to the proportion of households affected in the villages. There are no villages where the proportion of households receiving relief was higher than those affected, which suggests there was no mis-targeting from this particular perspective. Of course, this targeting performance, occurs within the context of the fact that in many villages only 10% to 30% of households received relief when all or more than 90% of households were negatively affected. Figure 4.3b, illustrates the more extensive relief operation in Nsanje given that more households were affected in Nsanje. In figure 4.3c we review this relationship by treatment status. What we can see is that for villages with a higher proportion of treated households who were affected by the flood, the likelihood of receiving relief did not change. On the other hand, as already discussed above, for non-graduation households, as the proportion of affected households in a village increased, so did the proportion receiving relief.

Households received relief from different sources and in different forms. The 586 households who received relief were asked who they received the relief from. The options included both local and international channels, such as government, local NGOs, international NGOs, UN (such as WFP), churches, friends and families, and, other sources mentioned by the respondents. Of the 479 non-graduation households who received relief, in figure 4.4 we see that 59% received it from an international NGO, while 18% received it from a government source, 17% from a local NGO and 16% from UN agencies. This makes clear the weak capacity of local government to react to

**Figure 4.4:** Flood Relief Source, Non-Graduation Households

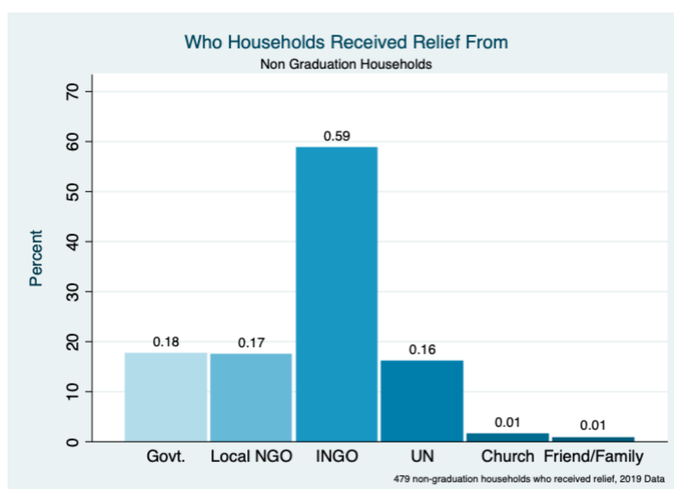
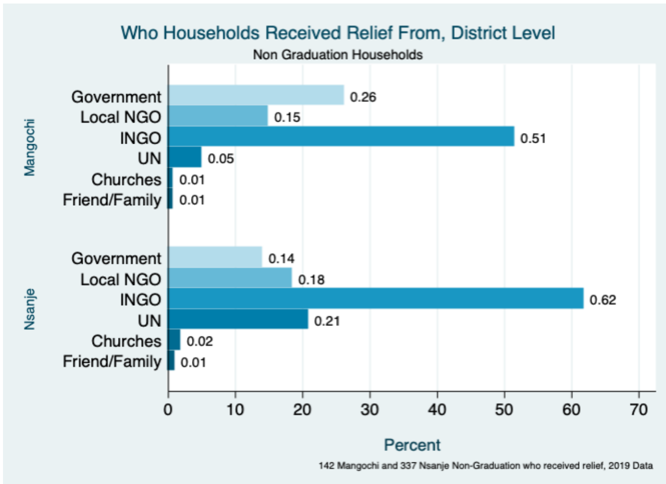
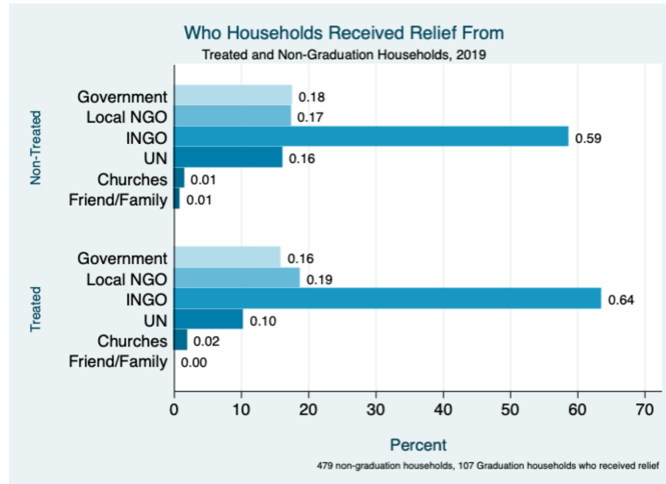


**Figure 4.5:** Source of Flood Relief: by District and Treatment Status




**(a)**




**(b)**

disasters of this kind.

Variation across the two districts is captured in figure 4.5a. While relief from INGOs were still the most common relief source across both districts, 51% of households in Mangochi who received relief received it from INGOs compared to 62% of households in Nsanje. Similarly, 21% of households in Nsanje who received relief identified the UN as the source of their relief, compared to only 5% of households in Mangochi. The only source of relief that was higher in Mangochi was government relief. A total of 26% of households in Mangochi reported receiving government support, compared to 14% of households in Nsanje.

When we look at this by treatment status in figure 4.5b, there are some differences. A slightly higher percent of non-graduation households received relief from government and UN sources compared to graduation households. On the other hand, a slightly higher percent of graduation households received relief from local and international NGOS, compared to non-graduation households.

We examine whether differences between districts and treatment status households are statistically different, even though the sample we are analysing is limited to the 586 households who received relief. From table 4.2a we see that when we compare by district, the difference in government relief between districts is significant, with the average Mangochi household more likely to receive relief from the government compared to Nsanje households. On the other hand, Mangochi households were less likely to receive relief from INGOs and the UN bodies than households in Nsanje, both these differences are significant. When we look at table 4.2b, we see that none of the differences in the source of relief for treated versus non-treated households is significant.

We asked the 586 households what form of relief the received. The main type of relief provided to households was in the form at food. In figure 4.6 we see that 53% of households got relief in the form of food. The next main type is relief is in the form of grain, at 49%, followed by cash at 36%.

**Table 4.2:** T-test for differences on Relief Source: District and Treatment Status

| | Difference between Mangochi and Nsanje |
|---|---|
| Relief source: Government | 0.121** |
| | (3.21) |
| Relief source: Local NGO | -0.0361 |
| | (-0.95) |
| Relief source: International NGO | -0.103* |
| | (-2.10) |
| Relief source: UN (such as WFP) | -0.158*** |
| | (-4.39) |
| Relief source: Churches | -0.0108 |
| | (-0.90) |
| Relief source: Friends and family | -0.00186 |
| | (-0.20) |
| Observations | 479 |

$t$ statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**(a)**

| | Difference between Non-Treated and Treated |
|---|---|
| Relief source: Government | 0.0165 |
| | (0.41) |
| Relief source: Local NGO | -0.0136 |
| | (-0.33) |
| Relief source: International NGO | -0.0489 |
| | (-0.93) |
| Relief source: UN (such as WFP) | 0.0579 |
| | (1.52) |
| Relief source: Churches | -0.00408 |
| | (-0.31) |
| Relief source: Friends and family | 0.00835 |
| | (0.95) |
| Observations | 586 |

$t$ statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

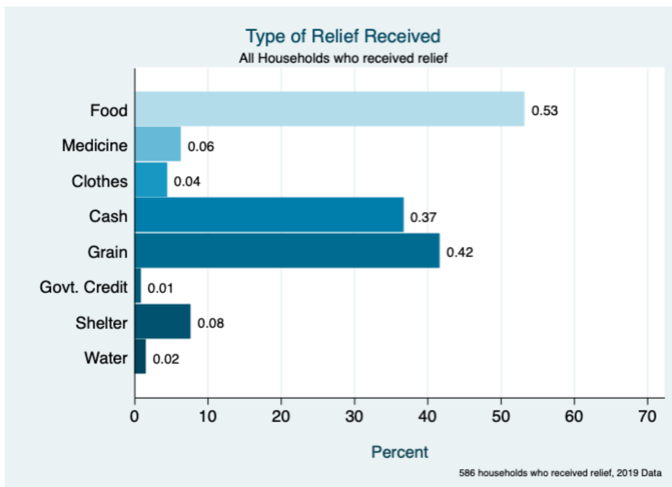
**(b)**

Note: District: Only includes non-Graduation households at the time of survey. Treatment: All Graduation households from Research Cohort 1 make up the treated, and all other households are assumed to be control.

For the 215 households who received cash, the average amount received was MWK 25,516. Very few households received relief in the form of medicine, clothes or government credit.

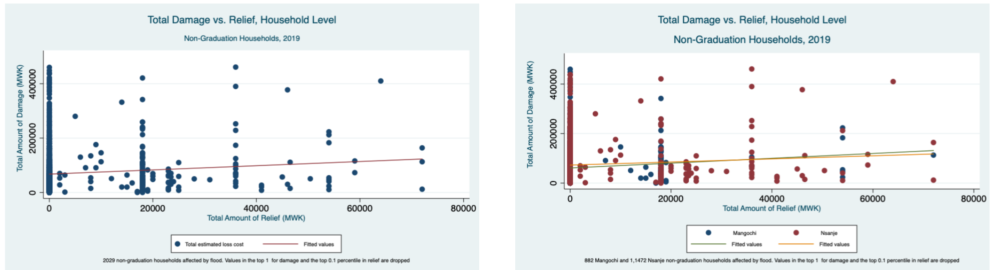
We also examined the relationship between the level of monetary losses a household experienced with the cash relief they received (see figure 4.7a). The predominance of responses at 18,000 MKW is illustrative of existing cash transfer programmes. It is noteworthy from figure 4.7a, that looks at all non-graduation households, that there is a slight positive relationship between household losses and the amount of cash relief they received. As the amount of damage households report increases, there is a corresponding small increase in the amount of relief they report receiving. This amount of relief is not on par though with the reported damage. This suggests that the approach to cash relief may only be slightly sensitive to actual household losses. From figure 4.7b we see that this relationship is similar across the two districts. It is important to remember though that cash was only the third most common form of relief and only 215 households received relief in the form of cash. On the other hand, of the 2029 non-graduation households that were flood affected, only 39 reported no associated financial cost to the flooding, while a total of 1,985 households reported losses of MWK 18,000 or greater.

**Figure 4.6:** Type of Relief Received Post Cyclone Idai



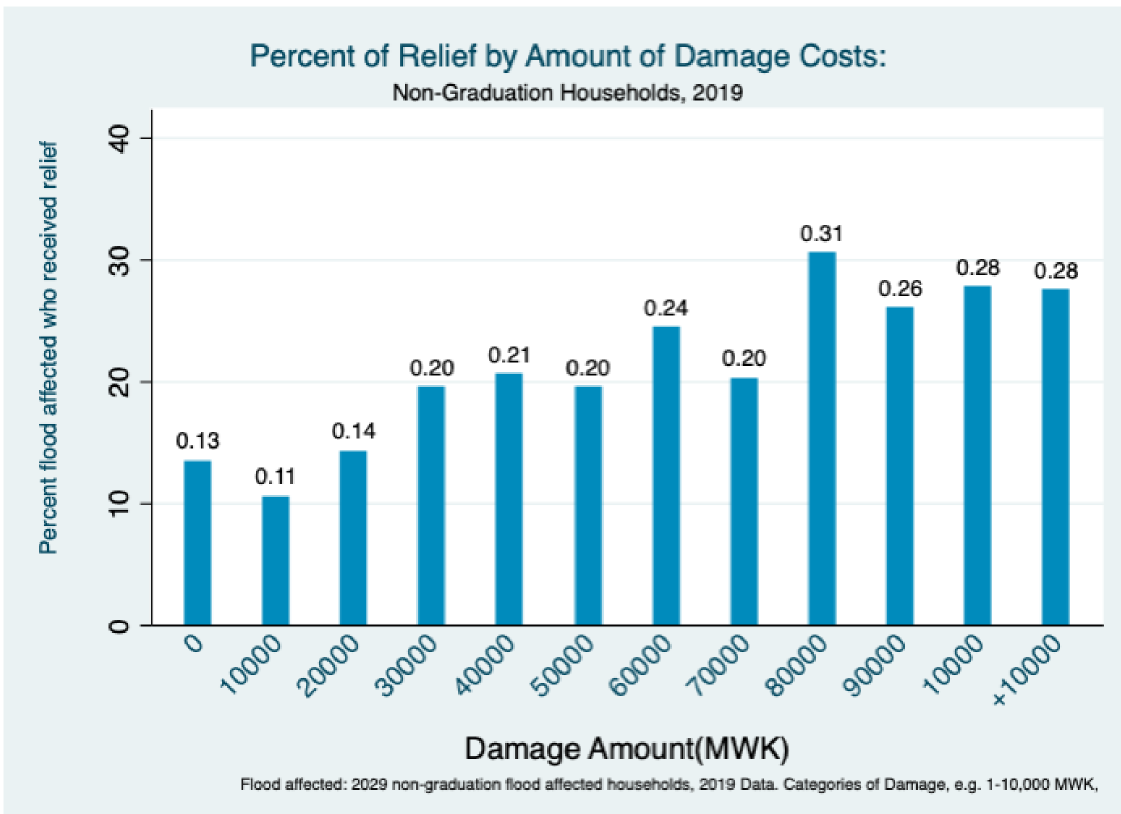

To complement the above analysis, we also look at whether a household received relief by the amount of damage they incurred in table 4.8. The likelihood of receiving relief increases with the

**Figure 4.7:** Total cash relief and total damage loss: at the household level




**(a)** **(b)**

**Figure 4.8:** Relief versus Cost of Damage




level of damage the household experiences. We do find that over 13 percent of households who incurred no damage costs received relief, while those who incurred between MWK 70,000- 80,000 of damage had the highest proportion of households who received relief at 31 percent.

# Section 5

# Conclusion

The decision to include Cyclone Idai related questions in the planned 2019 data collection has provided a wealth of information about the impacts of the floods, and the interaction between the shock and the graduation programme intervention. There are a number of next steps for our Cyclone Idai research and these are as follows:

- This report for Concern Worldwide uses summary statistics and univariate analysis to describe the impacts of Cyclone Idai. The next step is employ multivariate analysis (or multivariable regression analysis) to move beyond these preliminary findings and comprehensively examine the economic impacts of the flooding. For Research Cohort 2 we may be able to find an impact on consumption and we have an opportunity to move beyond the binary measure of being affected by the flood to a monetary measure. In addition, the impacts of the floods are likely to stretch beyond economic outcomes. We will also explore the impact of the floods on community engagement, migration, attitudes and other social dimensions.

- Examine the gender dimensions of the impact of the flood. For Research Cohort 2, we are in a position to compare the impacts between spouses within the same household and consider aspects such as labour supply, gender roles, mental health, community relationships effects on their own relationship. While there is a growing literature on the impact of disasters on households in low income settings, there is much less understanding on the differentiated impact by gender.

- There is very little research on the impact of disasters on mental wellbeing. We will further explore the mental wellbeing impacts of the flood by examining the impact on the bandwidth measures, and wider wellbeing measures that we have for Research Cohort 2. This is potentially a unique contribution to the literature.

- In line with the preliminary findings in this report, it seems reasonable to think that the graduation programme helped protect households from the worst effects of the flooding (such as food insecurity). Further research will estimate the benefit Research Cohort 1 received from being on the programme when Cyclone Idai hit Malawi.

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# Section 6

# Appendix

## 6.1 Appendix

**Table 6.1:** Summary Variables by District

| | Mangochi | | | | | Nsanje | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | ST. Dev | Min | Max | N | Mean | ST. Dev | Min | Max | N |
| Affected by Cyclone Idai | 0.72 | 0.45 | 0.00 | 1.00 | 1619 | 0.94 | 0.24 | 0.00 | 1.00 | 1637 |
| Frequency of flooding | 4.46 | 1.13 | 1.00 | 5.00 | 1641 | 1.67 | 0.88 | 1.00 | 5.00 | 1639 |
| Received flood warning | 0.24 | 0.43 | 0.00 | 1.00 | 1159 | 0.64 | 0.48 | 0.00 | 1.00 | 1535 |
| Damage to house structure | 0.47 | 0.50 | 0.00 | 1.00 | 1159 | 0.35 | 0.48 | 0.00 | 1.00 | 1535 |
| Damage to agriculture plots | 0.68 | 0.47 | 0.00 | 1.00 | 1159 | 0.95 | 0.22 | 0.00 | 1.00 | 1535 |
| Livestock loss | 0.10 | 0.29 | 0.00 | 1.00 | 1159 | 0.20 | 0.40 | 0.00 | 1.00 | 1535 |
| Business loss | 0.03 | 0.16 | 0.00 | 1.00 | 1159 | 0.07 | 0.26 | 0.00 | 1.00 | 1535 |
| Do you engage in Ganu? | 0.70 | 0.46 | 0.00 | 1.00 | 1159 | 0.87 | 0.34 | 0.00 | 1.00 | 1535 |
| Lost daily work | 0.90 | 0.30 | 0.00 | 1.00 | 813 | 0.90 | 0.30 | 0.00 | 1.00 | 1329 |
| Damage to durable goods | 0.60 | 0.49 | 0.00 | 1.00 | 1159 | 0.44 | 0.50 | 0.00 | 1.00 | 1535 |
| Informed by Mobile | 0.00 | 0.06 | 0.00 | 1.00 | 290 | 0.01 | 0.10 | 0.00 | 1.00 | 1071 |
| Informed by Radio | 0.54 | 0.50 | 0.00 | 1.00 | 290 | 0.67 | 0.47 | 0.00 | 1.00 | 1071 |
| Informed by TV | 0.00 | 0.00 | 0.00 | 0.00 | 290 | 0.00 | 0.03 | 0.00 | 1.00 | 1071 |
| Informed by VillageLeader | 0.04 | 0.19 | 0.00 | 1.00 | 290 | 0.28 | 0.45 | 0.00 | 1.00 | 1071 |
| Informed by FamilyNeighbor | 0.47 | 0.50 | 0.00 | 1.00 | 290 | 0.32 | 0.47 | 0.00 | 1.00 | 1071 |
| Informed by RedCross | 0.00 | 0.00 | 0.00 | 0.00 | 1159 | 0.02 | 0.16 | 0.00 | 1.00 | 1532 |
| Informed by PublicServiceAnnouncement | 0.00 | 0.03 | 0.00 | 1.00 | 1159 | 0.01 | 0.07 | 0.00 | 1.00 | 1532 |
| Informed by None | 0.75 | 0.43 | 0.00 | 1.00 | 1159 | 0.30 | 0.46 | 0.00 | 1.00 | 1532 |
| Damage to building structures | 0.39 | 0.49 | 0.00 | 1.00 | 469 | 0.43 | 0.50 | 0.00 | 1.00 | 184 |
| Damage to drinking water | 0.06 | 0.23 | 0.00 | 1.00 | 1159 | 0.08 | 0.27 | 0.00 | 1.00 | 1535 |
| Damage to toilet structure | 0.56 | 0.50 | 0.00 | 1.00 | 1075 | 0.49 | 0.50 | 0.00 | 1.00 | 1324 |
| Estimated cost of house repairs | 41129.63 | 48068.91 | 0.00 | 500000.00 | 540 | 31899.25 | 45990.56 | 0.00 | 300000.00 | 536 |
| Estimated cost of building repairs | 26456.28 | 25901.30 | 0.00 | 150000.00 | 183 | 27994.30 | 49807.64 | 0.00 | 300000.00 | 79 |
| Estimated livestock loss cost | 42207.46 | 43092.64 | 0.00 | 200000.00 | 112 | 51217.54 | 63868.35 | 2000.00 | 404000.00 | 330 |
| Estimated business loss cost | 27896.55 | 27333.06 | 0.00 | 110000.00 | 29 | 24409.90 | 39956.49 | 0.00 | 210000.00 | 112 |
| Estimated wage loss cost | 23794.99 | 350653.44 | 0.00 | 10000000.00 | 813 | 29824.68 | 433929.64 | 0.00 | 15000000.00 | 1329 |
| Estimated durable loss cost | 7518.15 | 13990.52 | 0.00 | 140500.00 | 697 | 15584.60 | 28917.78 | 0.00 | 259500.00 | 677 |
| Food insecurity index: 0-secure,10-insecure | 4.53 | 2.22 | 0.00 | 9.00 | 1601 | 5.59 | 2.01 | 0.00 | 10.00 | 1616 |
| Concern hunger gap | 3.07 | 2.77 | 0.00 | 12.00 | 1633 | 4.40 | 3.42 | 0.00 | 12.00 | 1633 |
| Food Gap March | 0.40 | 0.49 | 0.00 | 1.00 | 1310 | 0.49 | 0.50 | 0.00 | 1.00 | 1506 |
| Food Gap April | 0.13 | 0.33 | 0.00 | 1.00 | 1310 | 0.37 | 0.48 | 0.00 | 1.00 | 1506 |
| Food Gap May | 0.09 | 0.28 | 0.00 | 1.00 | 1310 | 0.35 | 0.48 | 0.00 | 1.00 | 1506 |
| Food scarcity March-May | 0.62 | 0.86 | 0.00 | 3.00 | 1310 | 1.20 | 1.23 | 0.00 | 3.00 | 1506 |
| Received relief: 1-Yes | 0.11 | 0.32 | 0.00 | 1.00 | 1641 | 0.24 | 0.43 | 0.00 | 1.00 | 1639 |
| Total cash relief | 1616.05 | 7425.87 | 0.00 | 120000.00 | 1159 | 2332.51 | 9127.32 | 0.00 | 96000.00 | 1535 |
| Total estimated loss cost | 81759.53 | 308816.62 | 0.00 | 10182000.00 | 1159 | 97114.96 | 413551.51 | 0.00 | 15060000.00 | 1535 |
| Relief source: Government | 0.04 | 0.20 | 0.00 | 1.00 | 1159 | 0.04 | 0.18 | 0.00 | 1.00 | 1535 |
| Relief source: Local NGO | 0.03 | 0.16 | 0.00 | 1.00 | 1159 | 0.05 | 0.21 | 0.00 | 1.00 | 1535 |
| Relief source: International NGO | 0.08 | 0.27 | 0.00 | 1.00 | 1159 | 0.17 | 0.37 | 0.00 | 1.00 | 1535 |
| Relief source: UN (such as WFP) | 0.01 | 0.09 | 0.00 | 1.00 | 1159 | 0.05 | 0.22 | 0.00 | 1.00 | 1535 |
| Relief source: Churches | 0.00 | 0.03 | 0.00 | 1.00 | 1159 | 0.01 | 0.07 | 0.00 | 1.00 | 1535 |
| Relief source: Friends and family | 0.00 | 0.03 | 0.00 | 1.00 | 1159 | 0.00 | 0.04 | 0.00 | 1.00 | 1535 |
| HH experienced malaria post flood | 0.01 | 0.11 | 0.00 | 1.00 | 1159 | 0.05 | 0.21 | 0.00 | 1.00 | 1535 |
| HH experienced dysentery post flood | 0.00 | 0.05 | 0.00 | 1.00 | 1159 | 0.03 | 0.18 | 0.00 | 1.00 | 1535 |
| HH experienced fever post flood | 0.00 | 0.04 | 0.00 | 1.00 | 1159 | 0.00 | 0.07 | 0.00 | 1.00 | 1535 |
| HH experienced cold post flood | 0.00 | 0.05 | 0.00 | 1.00 | 1159 | 0.01 | 0.10 | 0.00 | 1.00 | 1535 |
| HH experienced cholera post flood | 0.00 | 0.04 | 0.00 | 1.00 | 1159 | 0.00 | 0.06 | 0.00 | 1.00 | 1535 |
| HH experienced typhoid post flood | 0.00 | 0.00 | 0.00 | 0.00 | 1159 | 0.00 | 0.07 | 0.00 | 1.00 | 1535 |
| HH experienced injury post flood | 0.03 | 0.17 | 0.00 | 1.00 | 1159 | 0.09 | 0.29 | 0.00 | 1.00 | 1535 |
| HH experienced chickenPox post flood | 0.00 | 0.04 | 0.00 | 1.00 | 1159 | 0.00 | 0.00 | 0.00 | 0.00 | 1535 |
| HH experienced skindiseases post flood | 0.00 | 0.03 | 0.00 | 1.00 | 1159 | 0.00 | 0.03 | 0.00 | 1.00 | 1535 |
| HH got care post flood | 0.85 | 0.36 | 0.00 | 1.00 | 33 | 0.98 | 0.14 | 0.00 | 1.00 | 143 |
| HH got care in hospital | 0.39 | 0.50 | 0.00 | 1.00 | 33 | 0.29 | 0.45 | 0.00 | 1.00 | 143 |
| HH got care in health centre/public clinic | 0.45 | 0.51 | 0.00 | 1.00 | 33 | 0.64 | 0.48 | 0.00 | 1.00 | 143 |
| HH got care in private clinic | 0.00 | 0.00 | 0.00 | 0.00 | 33 | 0.00 | 0.00 | 0.00 | 0.00 | 143 |
| HH got care in private clinic | 0.00 | 0.00 | 0.00 | 0.00 | 33 | 0.01 | 0.08 | 0.00 | 1.00 | 143 |
| HH got care in shelter | 0.00 | 0.00 | 0.00 | 0.00 | 33 | 0.01 | 0.08 | 0.00 | 1.00 | 143 |
| Observations | 3280 | | | | | | | | | |

**Table 6.2:** Univariate Regression: Relationship between Cyclone Idai and Food Security, Non-Graduation Households

| VARIABLES | (1)<br>count_hunger | (2)<br>foodins_s | (3)<br>foodgap_postflood |
|---|---|---|---|
| flood2019 | 1.319*** | 1.029*** | 0.333*** |
| | (0.16) | (0.15) | (0.06) |
| Constant | 2.719*** | 4.455*** | 0.632*** |
| | (0.13) | (0.14) | (0.05) |
| Observations | 2,366 | 2,346 | 2,095 |
| R-squared | 0.021 | 0.029 | 0.010 |
| t-stat | 8.20 | 7.08 | 5.39 |
| p-val | 0.00 | 0.00 | 0.00 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: All non-graduation households are included.

**Table 6.3:** Univariate Regression: Relationship between Cyclone Idai and Food Security, Graduation Households

| VARIABLES | (1)<br>count_hunger | (2)<br>foodins_s | (3)<br>foodgap_postflood |
|---|---|---|---|
| flood2019 | 1.793*** | 0.983*** | 0.469*** |
| | (0.22) | (0.18) | (0.09) |
| Constant | 2.109*** | 3.556*** | 0.597*** |
| | (0.17) | (0.16) | (0.08) |
| Observations | 876 | 847 | 701 |
| R-squared | 0.064 | 0.038 | 0.028 |
| t-stat | 8.20 | 5.56 | 5.18 |
| p-val | 0.00 | 0.00 | 0.00 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: All graduation households are included, regardless of treatment status.

**Table 6.4:** Univariate Regression: Relationship between Cyclone Idai and Food Security, Nsanje

| VARIABLES | (1)<br>count_hunger | (2)<br>foodins_s | (3)<br>foodgap_postflood |
|---|---|---|---|
| flood2019 | 1.045*** | 1.122*** | 0.257** |
| | (0.33) | (0.23) | (0.12) |
| Constant | 3.420*** | 4.535*** | 0.963*** |
| | (0.32) | (0.24) | (0.11) |
| Observations | 1,631 | 1,614 | 1,504 |
| R-squared | 0.005 | 0.018 | 0.002 |
| t-stat | 3.22 | 4.84 | 2.13 |
| p-val | 0.00 | 0.00 | 0.04 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: All non-graduation households are included.

**Table 6.5:** Univariate Regression: Relationship between Cyclone Idai and Food Security, Mangochi

| | (1) | (2) | (3) |
|---|---|---|---|
| VARIABLES | count_hunger | foodins_s | foodgap_postflood |
| flood2019 | 1.106*** | 0.695*** | 0.112** |
| | (0.15) | (0.15) | (0.05) |
| Constant | 2.287*** | 4.022*** | 0.535*** |
| | (0.11) | (0.13) | (0.05) |
| Observations | 1,611 | 1,579 | 1,292 |
| R-squared | 0.032 | 0.020 | 0.003 |
| t-stat | 7.22 | 4.70 | 2.04 |
| p-val | 0.00 | 0.00 | 0.04 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: All graduation households are included, regardless of treatment status.