Ultra-Poor Graduation and Environmental Shocks: Evidence from the 2019 Malawian Floods

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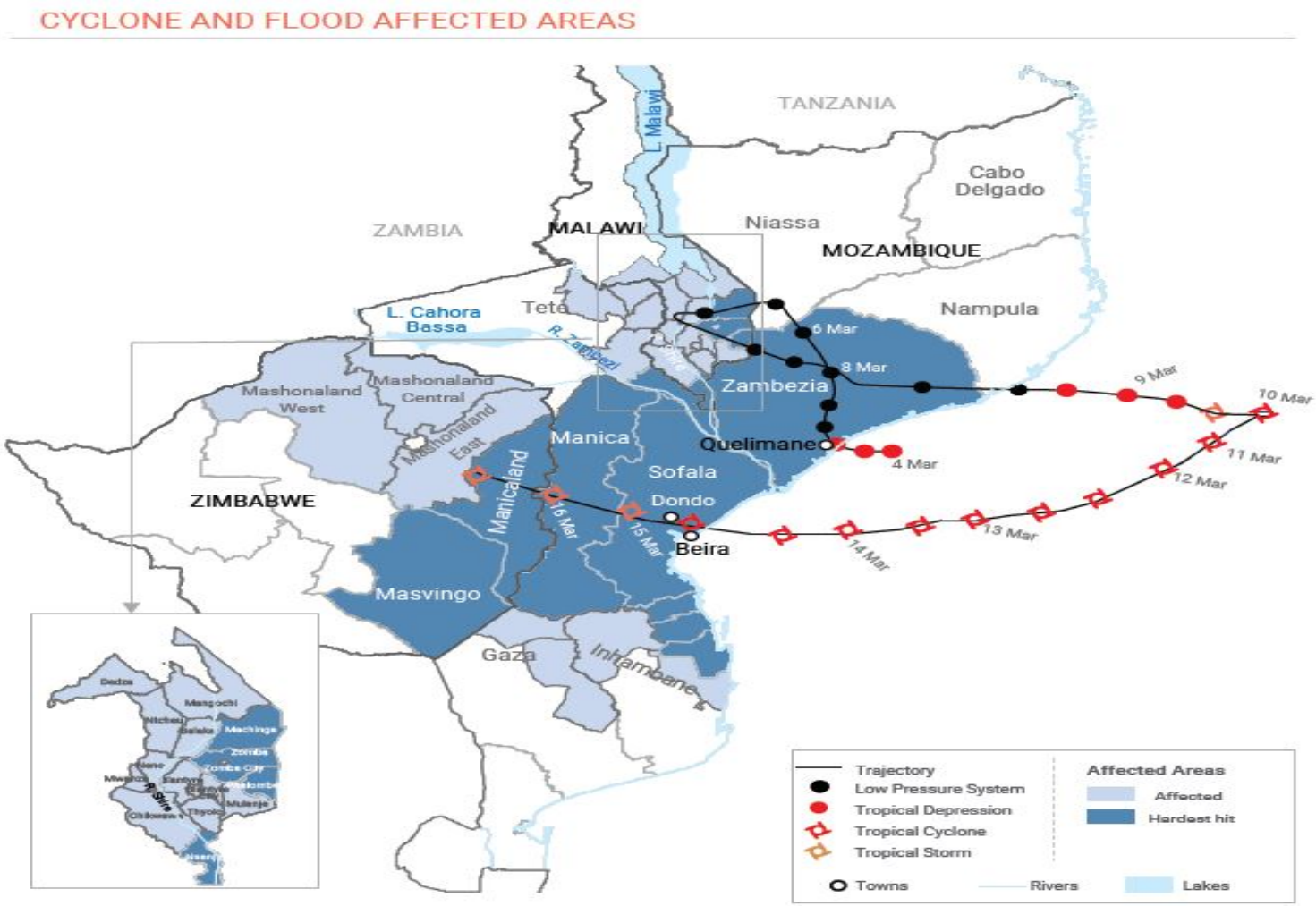
1. Cyclone Idai

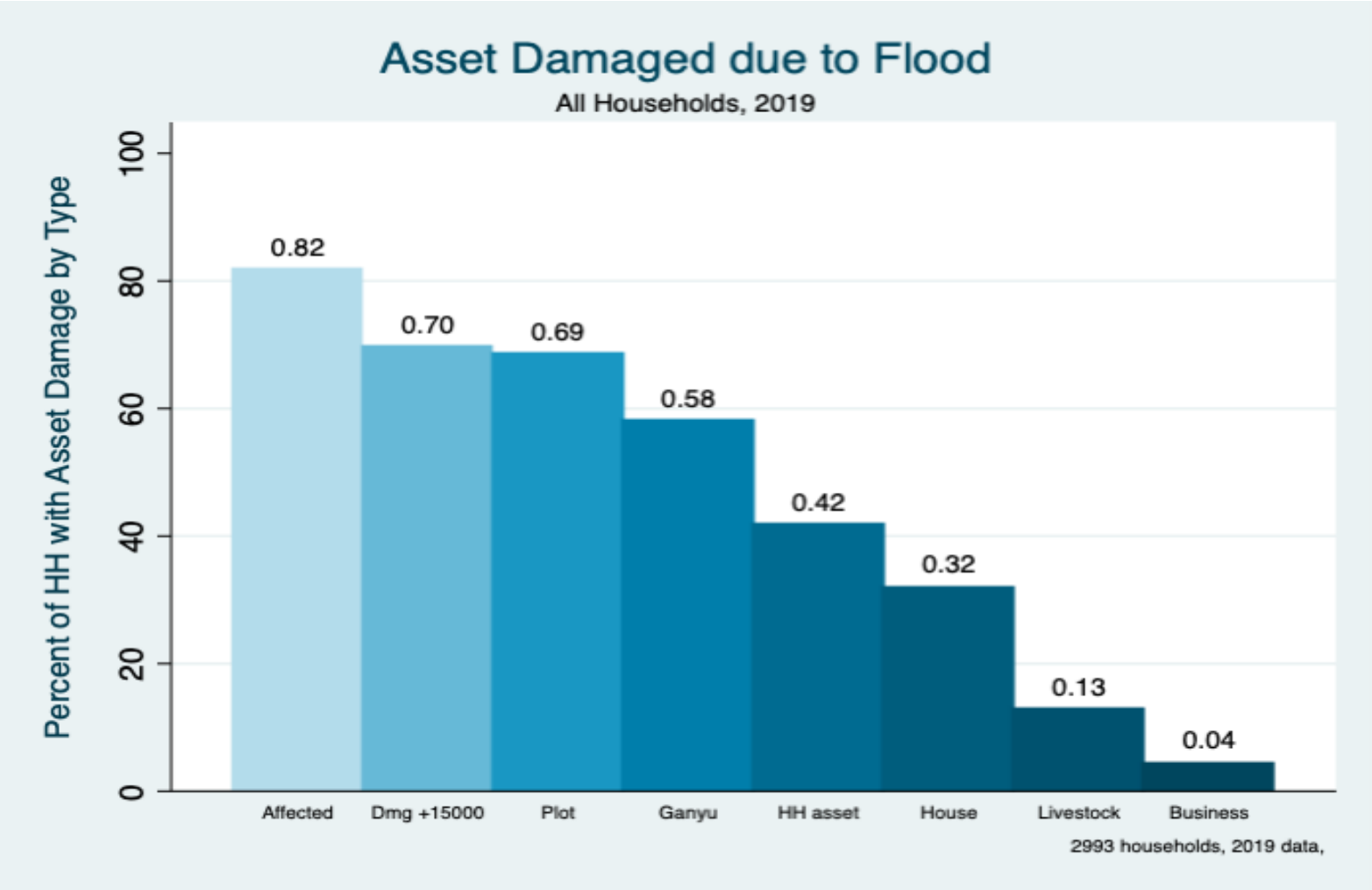
Figure: The March 2019 Malawi Floods

Cyclone Idai

Figure: The Path of Cyclone Idai



Cyclone Idai Effects



Context - Cyclone Idai Effects

	Mean	ST. Dev	N
Total cost/income loss from flood damage	65,393	86,073	2,993
Total income loss	39,635	63,033	2,993
Total building/asset damage cost	21,572	47,523	2,993
Estimated crop loss	29,760	49,313	2,993
Estimated livestock loss cost	6,307	27,140	2,993
Estimated business loss cost	1,058	9,142	2,993
total wage income loss from flood damage	9,088	16,858	2,993
Observations	2,993		

2. Research Questions

1. Do multifaceted anti-poverty programmes protect households from post natural disaster food insecurity?
2. What mechanisms play a role in the food security trajectory of HHs post flood? Examine role played by:
   - Asset damage
   - Income loss
   - Psychological bandwidth
   - Relief

Hypotheses

Environmental poverty traps undermine the ability of HHs to graduate out of poverty and may be reinforced through impacts on mental health, aspirations or bandwidth.

Summary of Results

Intervention:

- Improvements in FS prior to flood, 4 months post but not immediately afterwards.
- Recipients not more likely to experience significant damage but higher value of damage driven by crop/business losses (hinting at a natural disaster poverty trap).
- Find lasting negative impacts of flooding on treated, not untreated.

Relief:

- Distribution of relief deliberately disadvantaged programme participants possibly explaining non result for FS post flood.

Bandwidth (4m post flood):

- Graduation improved bandwidth.
- Modest evidence change in FS post flood negatively affected bandwidth.

3. Literature: Micro Impact of Natural Disasters

- Economic:
  - Substantial negative effects on HH consumption, income, and durable assets, with greater effects for poorer HHs.
  - Studies find poorer HH dis-invest in health/education to smooth food consumption; long term damage. (Carter et al. (2007), Antilla-Hughes and Hsiang (2012) and Baez et al. (2016)).
- Psychological:
  - Typhoon Xangsane survivors: Significant prevalence of PTSD, depression, panic disorder and generalized anxiety disorder (Amstadter et al. (2009)).
  - Hurricane Katrina: Elevated psychological distress among low-income, female survivors. (Lowe and Rhodes (2013)).

Literature: Cash Transfer Programmes and Protection Against Shocks/Disasters

- Strand of cash transfers literature focuses on risk/shock mitigation (not environmental risks and natural disasters).
- Mexico's Progresa programme reduced likelihood children withdrawn from school following negative shock (de Janvry et al. (2006)).
- Adverse rainfall in year of birth leads to a 17% reduction in the probability of employment at age 18, **but** each additional year of cash transfer exposure following adverse rainfall increases the probability of employment at age 18 by 8 per-cent (Adhvaryu et al. (2018)).

4. Intervention Gender Focused Graduation

- The three treatment arms as as follows:
  1. All benefits are targeted to **female**.
  2. All benefits are targeted to **male**.
  3. All benefits are targeted to **female**, and the couple is exposed to a **monthly couples training course** called Umodzi for 12 months.
- 200 villages, stratified across Mangochi and Nsanje; total of 3,000 couples.
- Treatment villages: 18 households were surveyed, 12 treatment, 6 control. 12 in control villages.
- Experimental arm villages were randomly allocated to be part of Research Cohorts 1 (start Nov 2018) or 2 (start Nov 2019).

Flood Timing

Flood occurred after 4 months of consumption support and HH visits (topics included improved consumption, savings, HH vision and improved crop farming) for cohort 1.

5. Data Survey - Survey Four Months Post Cyclone

Cohort 1 - Follow Up Survey	Cohort 2 - Baseline 2
30 Minutes to female spouse	Two hours to each spouse
Household Register	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)

Pre-Flood Balance: July 2018 Data

	Full Sample Mean	No Damage Mean	Flood Damage Mean	p-value
HH size	5.73	5.60	5.78	0.00
Dependency Ratio	0.48	0.48	0.48	0.30
Total educ exp last year	7,583.80	6,328.40	8,128.78	0.28
Total exp on illness last 30 days	600.43	674.08	568.45	0.51
Total household assets	12.82	13.46	12.54	0.48
Total agriculture plots	1.55	1.61	1.53	0.18
Female spouse age	35.45	34.66	35.80	0.00
Female spouse edu level	1.91	1.76	1.97	0.14
Total months with sufficient food in prior year	4.00	4.27	3.89	0.17
Food security index: 0-insecure,9-secure	8.97	9.38	8.79	0.18
D:Food secure jan/feb 2018	0.49	0.54	0.47	0.07
D:Food secure april/may 2018	0.88	0.92	0.86	0.98
Recent food security index: 0-insecure,3-secure	0.95	1.03	0.92	0.31
Observations	2,993	906	2,087	

Key Outcome Variable - Food Security

We define Food Security in three alternative ways.

- Food Security Index (Year)
  - 9 components, ranges from 0 (severely food insecure) to 9 (food secure).
  - Similar to Sahel study food security index and reference period is last year.
- Food Security Index (Past Week)
  - 3 components, turned into a binary measure.
  - Skip meal in prior week, less than 3 meals eaten yesterday and failed to eat meat in last week.
- Monthly Food Security
  - Recall of whether there were days when you did not fulfill the foods needs of family, by month.
  - Precision of recall is likely improved by recency, anchoring around large event and importance of food for family.

6. Methodology

Estimation Equation

$$Y_{(i)hvt} = \beta_1 + \beta_2 T_{hv} + \beta_3 T_{hv} * F_{hv} + \beta_4 F_{hv} + \beta_6 X(i)hvt + \beta_6 Z(i)hv + \epsilon_{hvt}$$

- β_2 captures the impact of our treatment indicator T_{hvt}, which takes the value of 1 if household h in village v received the Graduation program, and 0 if it did not.
- β_3 captures the interaction term between being flood affected and being on the Graduation program.
- β_4 captures the impact of being affected by the flood in 2019.
- We also include time variant $(X(i)hvt)$ and time invariant $(Z(i)hv)$ household and individual controls from baseline.
- ϵ_{hvt} is our statistical error term.

7. Results: Food Security

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Food Sec Index	food_secure_yr	d_food_sec_jf	d_food_sec_am	food_sec_feb	food_sec_march	food_sec_april
trt_cohort_1	1.233***	0.652***	0.144***	0.028	0.162***	0.063*	0.011
	(0.16)	(0.20)	(0.04)	(0.02)	(0.04)	(0.04)	(0.02)
household experienced more MWK15000 damage	-0.350***	-0.708***	-0.054**	-0.056***	-0.030	-0.051**	-0.054***
	(0.11)	(0.16)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
15000 dam threshold*graduation	-0.294*	-0.526**	-0.067	-0.028	-0.092*	-0.067	-0.025
	(0.17)	(0.26)	(0.04)	(0.03)	(0.05)	(0.04)	(0.03)
Constant	3.662***	8.250***	0.411***	0.904***	0.276***	0.641***	0.864***
	(0.15)	(0.26)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
Observations	2,993	2,982	2,993	2,993	2,993	2,993	2,993
District Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ANCOVA baseline control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Baseline Controls	No	No	No	No	No	No	No
Treatment+Flood dam_threshold+Interaction	0.589	-0.582	0.0227	-0.0567	0.0403	-0.0553	-0.0680
P value	2.66e-05	3.31e-08	0.00115	0.987	0.0124	0.864	0.540
Treatment+Interaction	0.939	0.127	0.0771	-0.000359	0.0706	-0.00410	-0.0144
P value	0	0.540	0.00700	0.000641	0.00370	0.0568	0.00946
Flood dam_threshold+Interaction	-0.643	-1.234	-0.121	-0.0846	-0.122	-0.118	-0.0788
P value	1.39e-05	0.00456	0.468	0.0133	0.187	0.00126	0.00520
Mean Control	4.206	8.969	0.428	0.924	0.301	0.669	0.874
SD Control	2.118	2.685	0.495	0.265	0.459	0.471	0.333
Adjusted R-squared	0.149	0.0704	0.0205	0.0914	0.0159	0.0258	0.0857

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

Differential Pattern of Damage - Summary

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Damage:yn	dam_threshold	dam_threshold2	ttl_dmg_cost	ttl_income_loss	ttl_stock_dam
trt_cohort_1	-0.078***	-0.035	0.042	12,890.311***	21,294.649***	2,886.809
	(0.02)	(0.02)	(0.03)	(4,603.01)	(4,843.67)	(2,369.36)
Constant	0.656***	0.439***	0.214***	6,531.912	-545.721	3,108.524
	(0.04)	(0.04)	(0.05)	(8,645.97)	(7,372.89)	(4,820.38)
Observations	2,947	2,947	2,947	2,947	1,914	2,947
R-squared	0.124	0.104	0.0714	0.0461	0.0570	0.0125
District Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household and respondent controls	Yes	Yes	Yes	Yes	Yes	Yes
Household and respondent baseline controls	No	No	No	No	No	No
Mean Control	0.832	0.709	0.517	61462	55520	20895
SD Control	0.374	0.454	0.500	80151	64779	42265

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
46 respondents have missing age

Disaggregated Damage - Productive Asset and Wage Labour

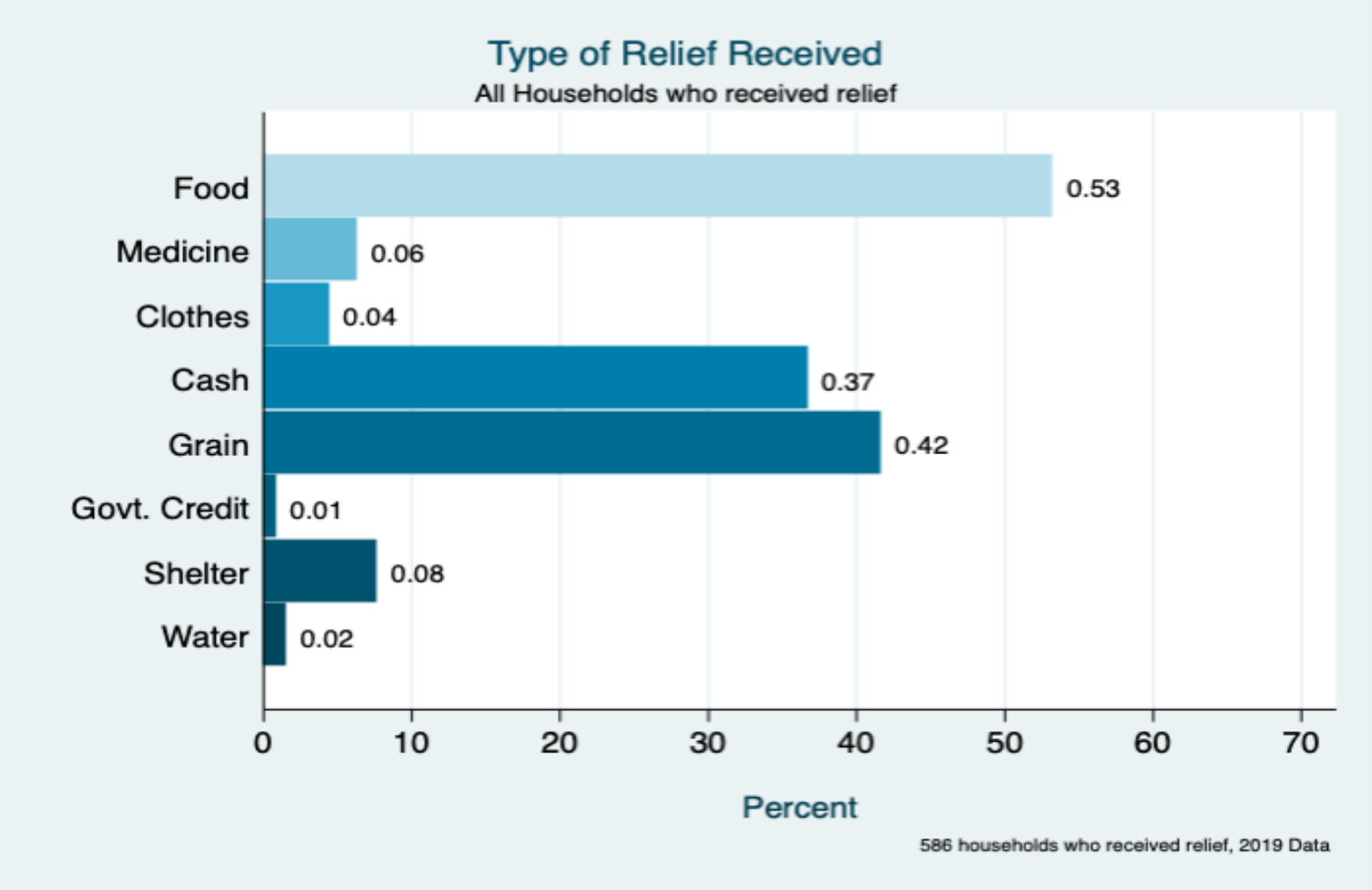
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	Plot damage	crop_loss	lost_stock_yn	livestock_loss	bus_dmg_yn	bus_income_loss	ganu_yn	lost_ganyu	wage_inc_loss
trt_cohort_1	-0.024	10,075.430***	-0.027*	-798.059	0.008	1,334.739***	-0.152***	-0.141***	-126.084
	(0.02)	(2,574.52)	(0.02)	(1,102.35)	(0.01)	(488.96)	(0.02)	(0.02)	(709.15)
Constant	0.421***	227.980	-0.027	-5,066.894***	-0.007	-502.401	0.612***	0.561***	7,092.559***
	(0.04)	(4,546.05)	(0.02)	(1,897.60)	(0.01)	(526.06)	(0.04)	(0.04)	(1,453.13)
Observations	2,947	2,947	2,947	2,947	2,947	2,947	2,947	2,947	2,947
R-squared	0.210	0.0428	0.0385	0.0219	0.0197	0.0107	0.142	0.108	0.0281
District Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household and respondent controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household and respondent baseline controls	No	No	No	No	No	No	No	No	No
Mean Control	0.695	26446	0.138	6661	0.0427	663.5	0.695	0.623	9083
SD Control	0.461	44613	0.345	28209	0.202	7489	0.461	0.485	16743

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
46 households did not report value of crop loss, so are missing

Introducing the Relief Efforts

- Relief efforts began in March, with considerable international attention.
- 17.6% of HHs got relief, 21.5% of those affected.
- NGOs (international/local), the Government and the UN all engaged in relief efforts. International NGOs playing the biggest role.
- Relief efforts often went through village head/council to decipher who in village would receive aid; sometimes using updated wealth rankings.
- Efforts made to give aid to HHs not already in anti-poverty programmes.

Types of Relief Received



Treatment HHs less Likely to Get Relief

VARIABLES	(1) Recipient Relief:yn	(2) Relief Type Cash	(3) relief_grain	(4) relief_food	(5) relief_foodrelated	(6) Relief Source ttl relief sources	(7) r_govt	(8) r_local_ngo	(9) r_int_ngo	(10) r_un
trt_cohort_1	-0.074***	-0.042***	-0.048***	-0.051***	-0.069***	-0.087***	-0.014**	-0.011	-0.037***	-0.021***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	0.072**	0.040*	0.007	0.042*	0.057**	0.067*	0.031**	0.007	0.026	-0.000
	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.01)	(0.01)	(0.02)	(0.01)
Observations	2,947	2,947	2,947	2,947	2,947	2,947	2,947	2,947	2,947	2,947
R-squared	0.0374	0.00973	0.0361	0.0390	0.0450	0.0421	0.00187	0.00717	0.0279	0.0202
District Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household and respondent controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household and respondent baseline controls	No	No	No	No	No	No	No	No	No	No
Mean Control	0.198	0.0772	0.0877	0.109	0.153	0.223	0.0340	0.0345	0.116	0.0340
SD Control	0.398	0.267	0.283	0.311	0.360	0.493	0.181	0.183	0.320	0.181

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

Food Security - 4m Post Flood

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Food Sec Index	food_secure_yr	d_food_sec_jf	d_food_sec_am	food_sec_feb	food_sec_march	food_sec_april	foodsec_recent
trt_cohort_1	1.233***	0.652***	0.144***	0.028	0.162***	0.063*	0.011	0.554***
	(0.16)	(0.20)	(0.04)	(0.02)	(0.04)	(0.04)	(0.02)	(0.06)
household experienced more MWK15000 damage	-0.350***	-0.708***	-0.054**	-0.056***	-0.030	-0.051**	-0.054***	-0.065
	(0.11)	(0.16)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.04)
15000 dam threshold*graduation	-0.294*	-0.526**	-0.067	-0.028	-0.092*	-0.067	-0.025	-0.177**
	(0.17)	(0.26)	(0.04)	(0.03)	(0.05)	(0.04)	(0.03)	(0.07)
Constant	3.662***	8.250***	0.411***	0.904***	0.276***	0.641***	0.864***	0.938***
	(0.15)	(0.26)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.05)
Observations	2,993	2,982	2,993	2,993	2,993	2,993	2,993	2,993
District Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ANCOVA baseline control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Baseline Controls	No	No	No	No	No	No	No	No
Treatment+Flood dam_threshold+Interaction	0.589	-0.582	0.0227	-0.0567	0.0403	-0.0553	-0.0680	0.311
P value	2.66e-05	0.00456	0.00115	0.987	0.00370	0.00126	0.00946	5.19e-05
Treatment+Interaction	0.939	0.127	0.0771	-0.000359	0.0706	-0.00410	-0.0144	0.377
P value	0	0.540	0.468	0.000641	0.187	0.864	0.00520	0
Flood dam_threshold+Interaction	-0.643	-1.234	-0.121	-0.0846	-0.122	-0.118	-0.0788	-0.243
P value	1.39e-05	3.31e-08	0.00700	0.0133	0.0124	0.0568	0.540	1.13e-07
Mean Control	4.206	8.969	0.428	0.924	0.301	0.669	0.874	1.110
SD Control	2.118	2.685	0.495	0.265	0.459	0.471	0.333	0.808
Adjusted R-squared	0.149	0.0704	0.0205	0.0914	0.0159	0.0258	0.0857	0.110

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

Bandwidth Index - 4m Post Flood

Low bandwidth, perhaps due to poverty, leads to poorer strategic longer term decisions (Mani et al. (2013)).

- BW1: Average (over 10 tries) reaction time touching a randomly appearing circle on tablet.
- BW2: Inhibitory control measured by hearts and flowers test.
- BW3: Recite number back after 10 seconds. If correct given increasingly longer numbers.
- BW4: Fluid intelligence through a raven's test.
- BW Index: mean of the four standardized variables.

Bandwidth Results - 4m Post Flood

VARIABLES	(1) Dmg loss+15000: Bandwidth Index	(2) Food insec A-F incr: Bandwidth Index	(3) food insec incr AM-JF: Bandwidth Index	(4) Food insec recent: Bandwidth Index
trt_cohort_1	0.149**	0.105**	0.103**	0.094
	(0.07)	(0.04)	(0.04)	(0.06)
household experienced more MWK15000 damage	0.066			
	(0.04)			
15000 dam threshold*graduation	-0.055			
	(0.07)			
Increased food insecurity: 1-yn		-0.191*		
		(0.11)		
Increased food insecurity*graduation		0.179		
		(0.18)		
Increased food insec 2 mon-post flood vs. 2 mon pre			-0.090	
			(0.08)	
Increased food insec 2mon*graduation			0.117	
			(0.13)	
Recent food sec: 1-foodsec_recent score 0				-0.002
				(0.05)
Food insecure*graduation				0.027
				(0.08)
Constant	-0.109	-0.076	-0.072	-0.074
	(0.11)	(0.10)	(0.11)	(0.11)
Observations	2,945	2,945	2,945	2,945
District Dummies	Yes	Yes	Yes	Yes
Household and respondent controls	Yes	Yes	Yes	Yes
Household and respondent baseline controls	No	No	No	No
Treatment+Flood dam_threshold+Interaction	0.160			
P value	0.00481	0.107	0.802	0.673
Treatment+Interaction	0.0938	0.284	0.220	0.121
P value	0.0476	0.935	0.0890	0.0303
Flood dam_threshold+Interaction	0.0111			
P value	0.853	0.537	0.224	0.0943
Mean Control	1.450	1.443	1.444	1.467
SD Control	0.260	0.265	0.265	0.252
Adjusted R-squared	0.148	0.148	0.148	0.148
Treatment+Flood d_food_sec_change+Interaction		0.0929		
Flood d_food_sec_change+Interaction		-0.0122		
Treatment+Flood food_insec_recent+Interaction				0.119
Flood food_insec_recent+Interaction				0.0251
Treatment+Flood food_insec_am+Interaction			0.130	
Flood food_insec_am+Interaction			0.0269	

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

8. Big Takeaways

- Graduation HHs lost more from the flood and flooding damage negatively affected their FS 4 months post flood.
- However, Graduation HHs still higher FS and Bandwidth 4 months post flood, despite:
  - Lack of relief received.
- Suggests that more support needed to graduate HHs in areas of frequent environmental risk.

Thank you