A Real-time Monitoring of Poverty in an Age of Climate Change

Innovations in Rural South Malawi

Nobuo Yoshida

Lead Economist, SWIFT Project lead
Poverty and Equity Global Practice
World Bank

Kazusa Yoshimura

Consultant for RFMS
Poverty and Equity Global Practice
World Bank

Lina Cardona

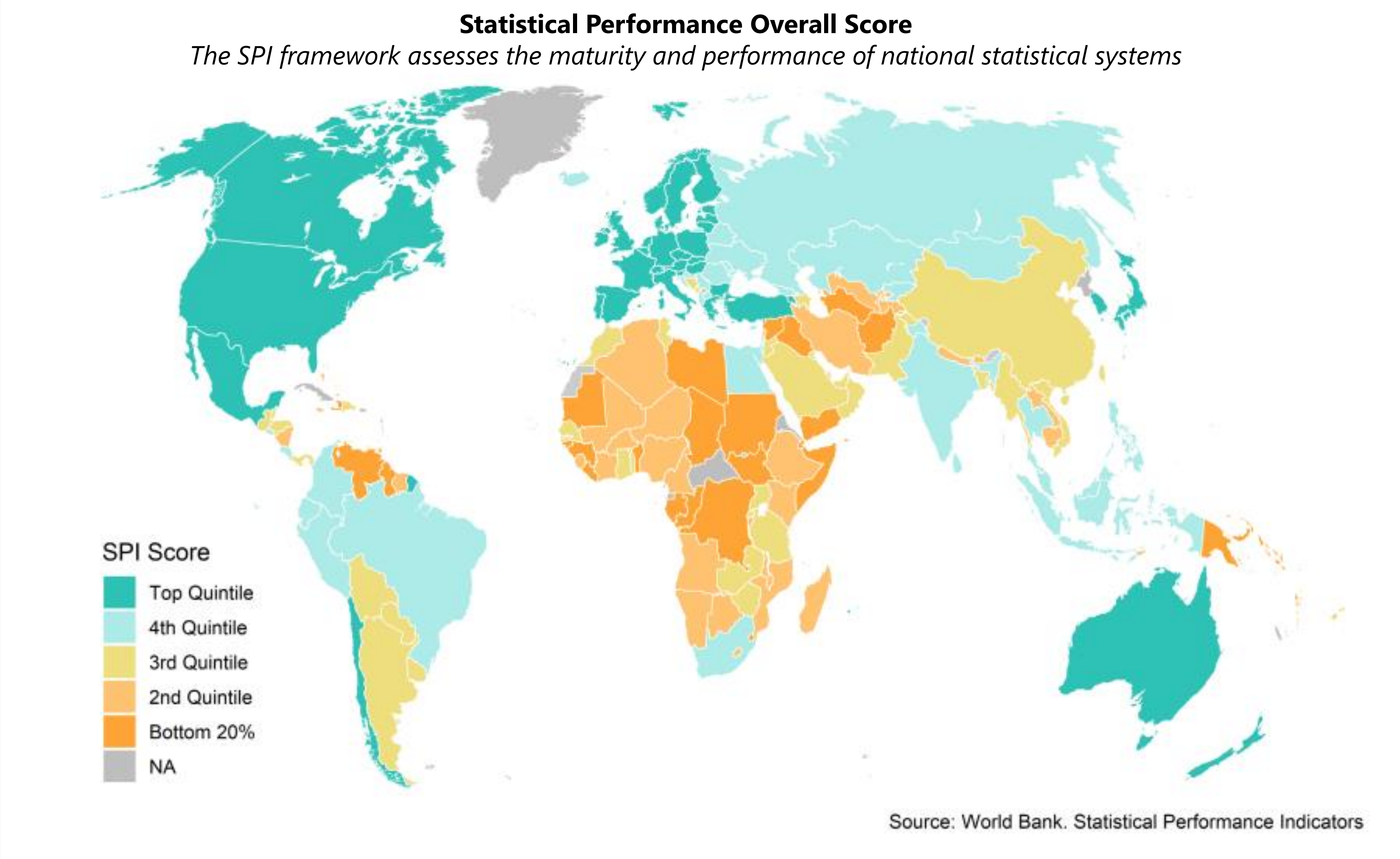
Malawi Country Poverty Economist
Poverty and Equity Global Practice
World Bank

In an increasingly uncertain world, there is growing need to monitor welfare and poverty **frequently and in a granular manner** for just-in-time decision-making

Climate change	Pandemics	Fragility and conflict	Inflation

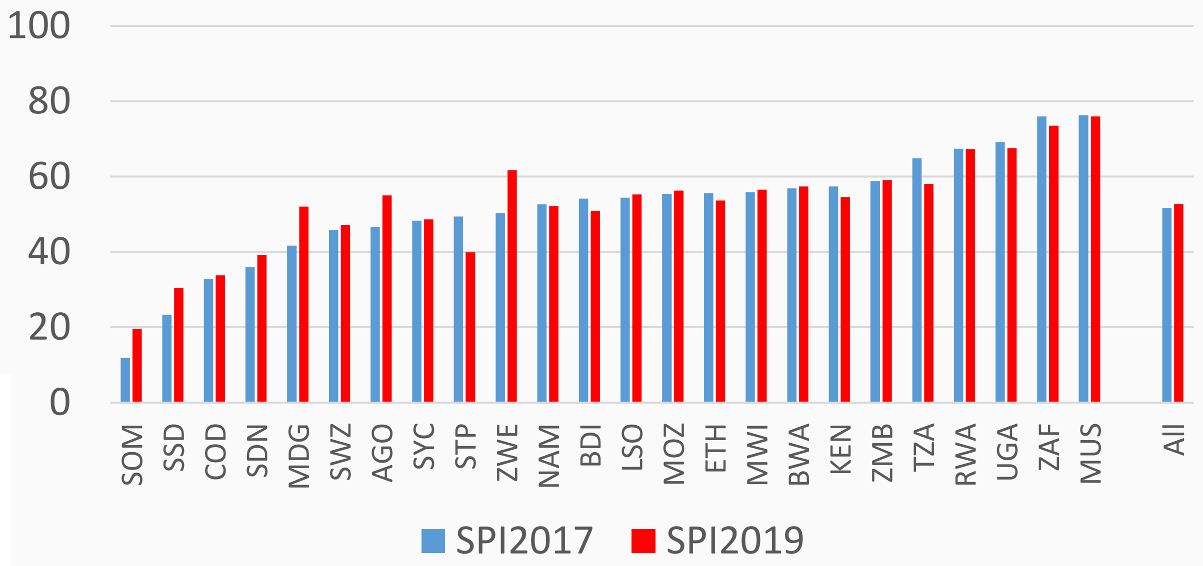
However, this is not easy because collecting consumption or income data to estimate poverty rates is **time-consuming (2 – 3 years)**, **costly (multimillion dollars)**, **complex (needing highly educated enumerators and analysts),** and **vulnerable to climate shocks, conflicts, and natural disasters**.

The quality of official statistics measured by Statistical Performance Indicator remains low in Africa

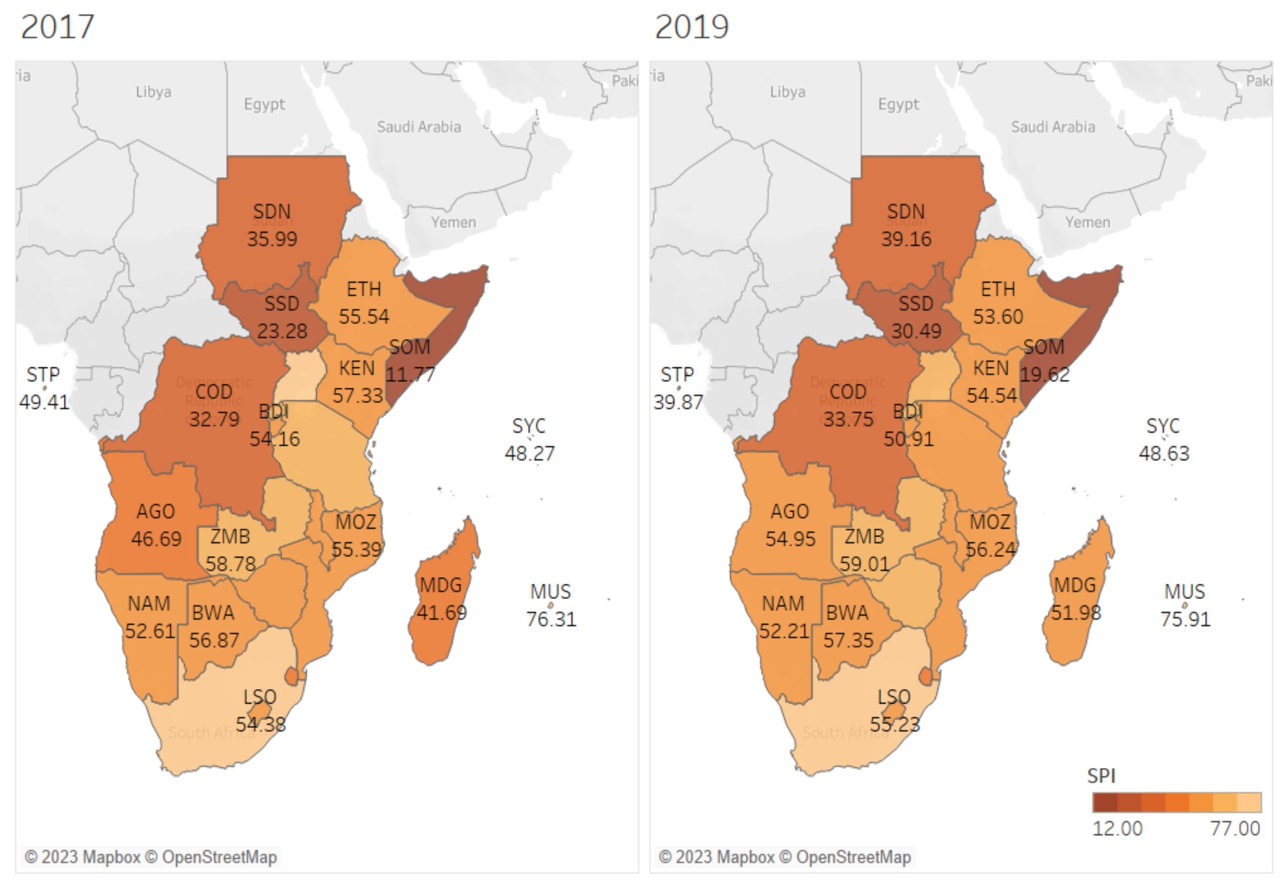


Access and quality of data has improved gradually in AFE

Comparison of SPIs between 2017 and 2019



Mapping improvements in SPIs between 2017 and 2019



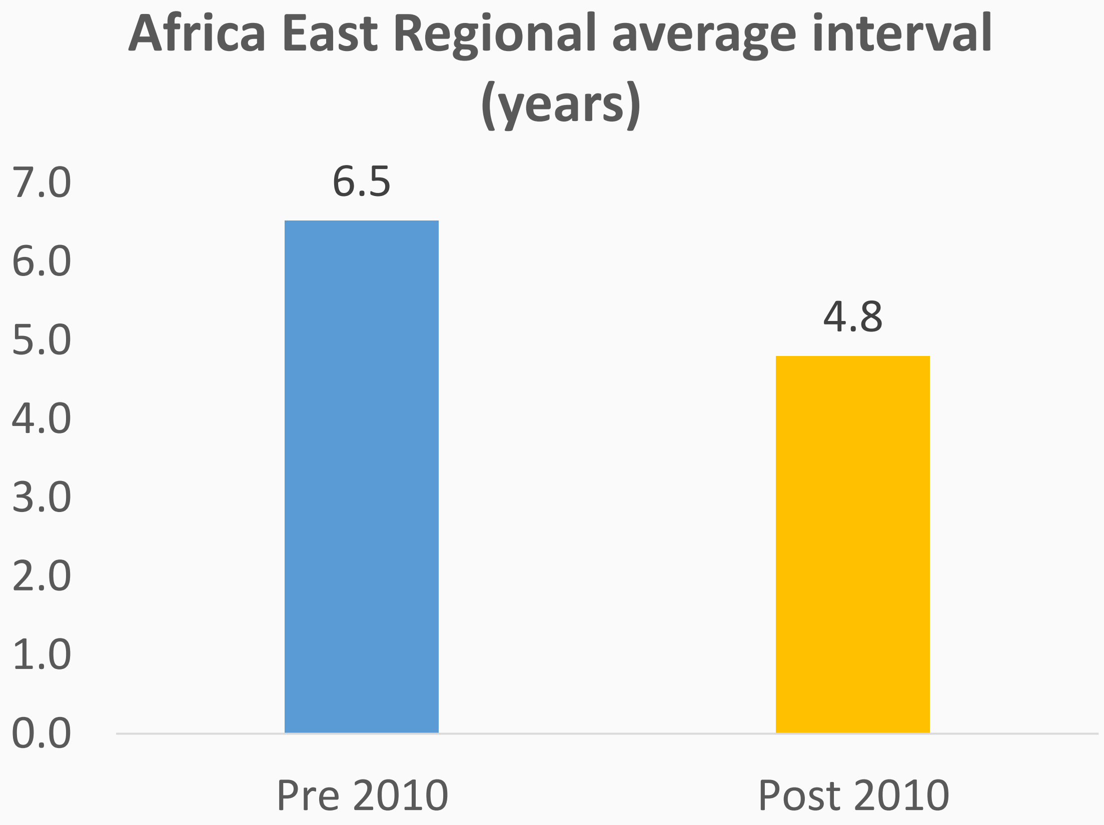
Source: World Development Indicators (IQ.SPI.OVRL)

Statistical Performance Indicators (SPIs) are improving gradually in the region as a whole.

Large improvements have occurred in Madagascar, Angola, Zimbabwe, Somalia, and South Sudan.

The frequency of household surveys has recently increased but still not enough

- Both the country coverage and the frequency of household surveys is increased since 2010,
- **25** countries have had household surveys since 2010 compared to **23** before 2010, with the addition of Zimbabwe and Somalia).
- In the region, on average, household surveys are conducted every **4.8** years compared to **6.5** years before 2010.
- But this is **far from sufficient** especially given increase volatility and new developments with data.



Toward more frequent and disaggregated poverty rates

A traditional approach is too expensive and slow. A model-based approach is used to produce frequent poverty statisticsA

Data

High Frequency and Geospatial Data Collection

Model

Poverty projection/simulation models

Statistics

Highly Frequent Poverty Measures

Sources of high frequency and geospatial data

- High Frequency Phone Surveys
- Use of macro projections such as GDP, inflation
- Community data collection

Using proxies to estimate poverty

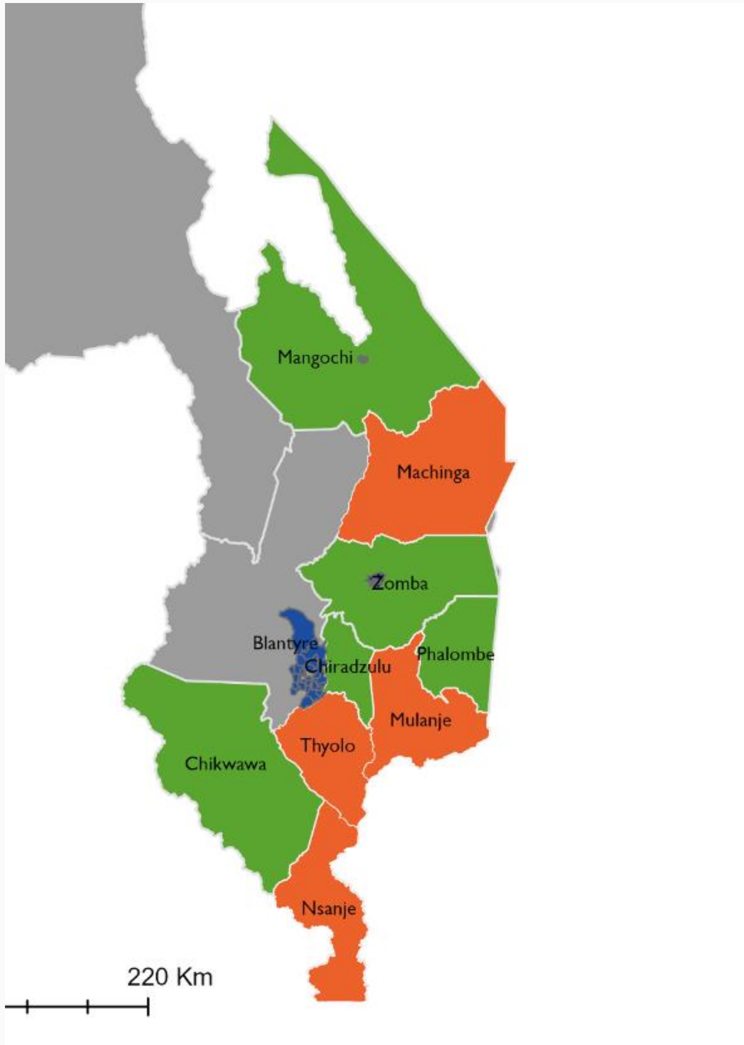
- MPO poverty projection method
- Survey of Well-being via Instant and Frequent Tracking (SWIFT)

Examples

- MPO annual updates of poverty
- Monthly and quarterly poverty monitoring (ongoing)

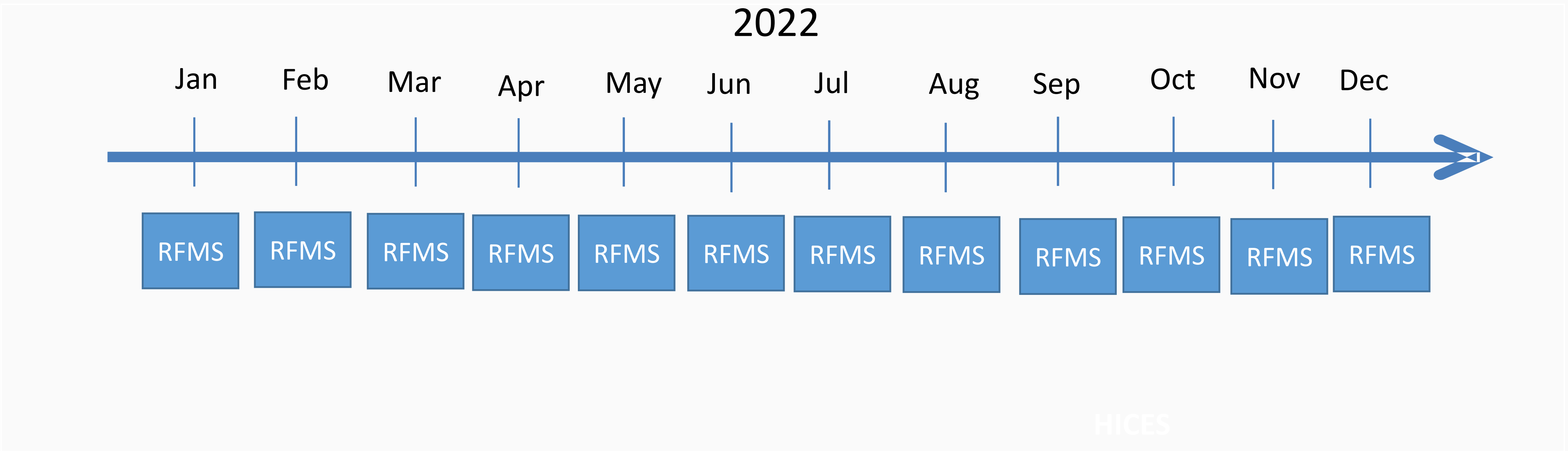
Rapid Feedback Monitoring System (RFMS) is a community-based data collection in rural southern Malawi

- RFMS collects data **every month** since August 2020 in rural southern Malawi
- RFMS includes a wide variety of topics, such as poverty, food security, livelihoods, shocks, and coping mechanisms
- RFMS is a **real-time, frequent, climate-resilient, and cheap** monitoring system
- **Locally hired enumerators**: The enumerators can collect data to reduce the cost of data collection ($2 – 3 per household) and collect data even immediately after a cyclone hit the country



WORLD BANK GROUP

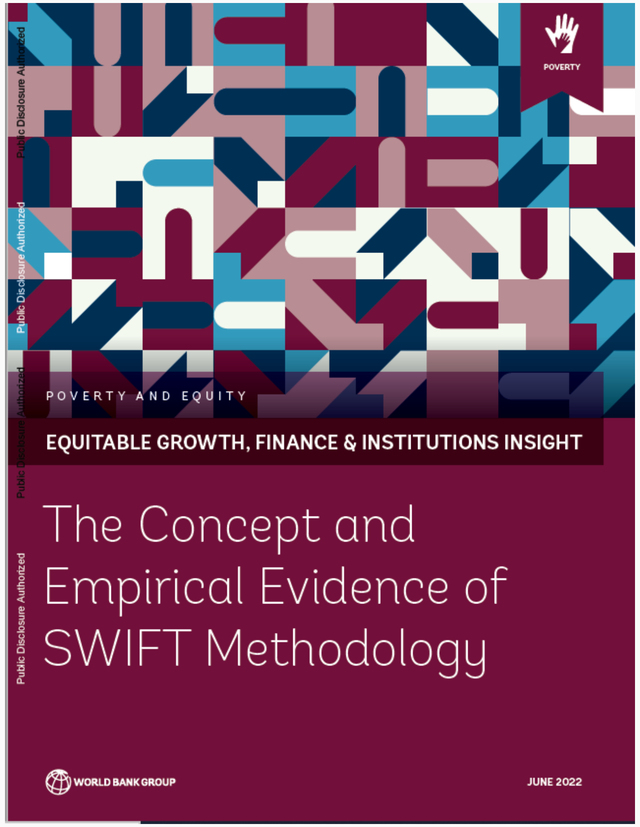
RFMS monthly data collection, poverty monitoring, and cyclones



Poverty measurement with SWIFT

SWIFT: Rapid Poverty Monitoring Tool

- Poverty data are limited because a traditional way of collecting and producing poverty data is costly, time-consuming, and complex
- SWIFT is an innovative poverty monitoring tool engineered by machine learning technique and can estimate poverty, inequality, and poverty profiles cheaply, quickly, and easily
- SWIFT needs only 10 – 15 simple questions to estimate poverty and inequality statistics and profile the poor and vulnerable
- RFMS includes the SWIFT questions biannually or whenever needed
- The SWIFT methodology has been reviewed and improved and now can estimate poverty annually or even monthly (Yoshida et al. 2022)



RFMS SWIFT model

20 variables
(19 questions)

Note that this model was trained in IHS2019-20

RFMS SWIFT model	
Variables	**coefficient**
Household demographics	
household size	-0.31
household size^2/100	1.46
Housing Conditions	
Floor 's material is SMOOTHED MUD	-0.1
Roof's material is GRASS	-0.07
Source of lighting is BATTERY/DRY CELL(TORCH)	-0.09
Source of cooking fuel is COLLECTED FIREWOOD	-0.14
NONE for rubbish disposal facility	-0.09
Asset ownership	
Bed	0.1
Mortar/pestle (mtondo)	0.06
Radio (wireless)	0.09
Iron (for pressing clothes)	0.14
Bicycle	0.08
The number of rooms	0.05
Consumption dummies - purchased in last 7 days	
meat fish animal product	0.2
Fruits	0.11
milk or milk product	0.28
Fat Oil	0.14
Sugar sugar product	0.19
Food security	
preferred less expensive food in 7 days	-0.06
borrowed food in 7 days	-0.04

WORLD BANK GROUP

How does SWIFT work?

Household Budget/Expenditure Survey

C

X

Frequent household surveys

Ĉ=F(X')

X'

Machine Learning

C=F(X')

Identify only the most relevant variables X'

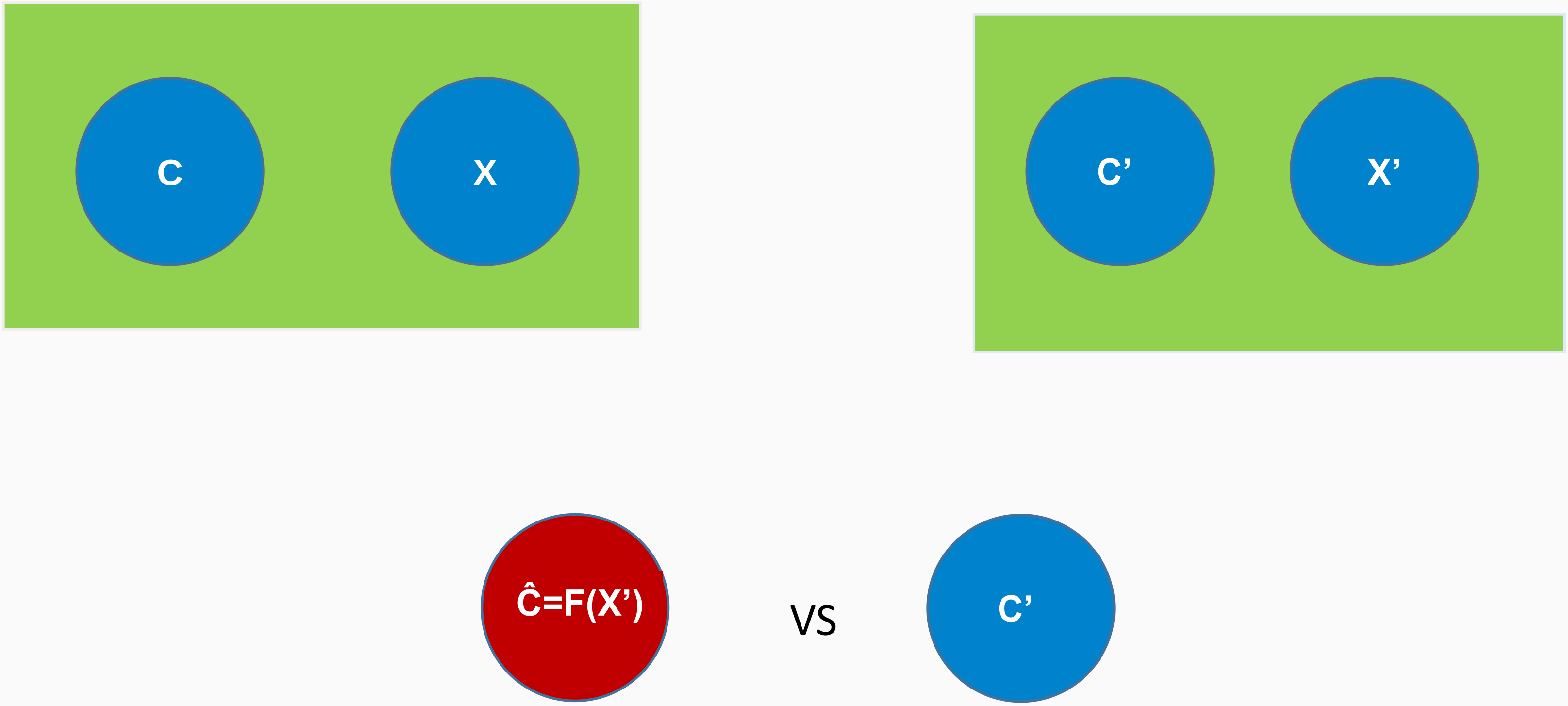
Collecting data X' using smartphones/tablets = CAPI (Computer Assisted personal interview)

C: Log of Consumption
X: Variables collected by HBS
X': Among X, variables correlates the most with consumption; variables collected by HFPS
Ĉ=F(X'): Predicted consumption

Christiaensen test

Household Budge Survey (First year)

Household Budget Survey (Second year)



WORLD BANK GROUP

SWIFT Survey of Well-being via Instant and Frequent Tracking

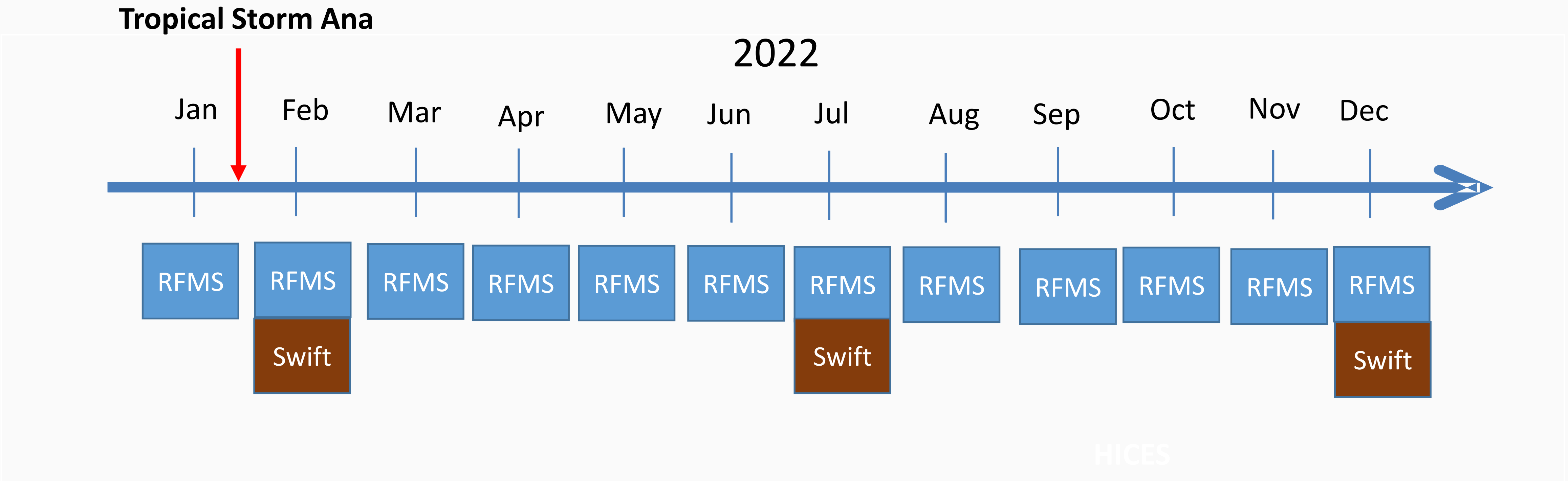
Reliability of SWIFT

Table 1. Comparisons of poverty rates between actual consumption and SWIFT imputed expenditures (%)

Countries & years	Actual consumption		SWIFT Imputation (second year)
	First-year	Second year	
Vietnam (1992/93 - 97/98)*	60.6	37.4	36.7
Inner Mongolia (2000 - 2004)*	19.0	6.2	7.8
Kenya (1997 - 2005/6)*	50.8	46.6	45.5
Russia (1994 - 2003)*	11.4	11.1	9.2
Morocco (2001-2007)**	15.3	8.9	8.4
Afghanistan (2011 - 2016)	38.3	54.5	53.5
Albania (2005-2008)	17.7	12.1	13.0
Malawi(2005-2011)	51.6	50.2	49.7
Romania (2011-2012)	22.6	21.7	22.3
Rwanda (2005-2008)	56.7	44.9	43.3
Sri Lanka(2009-2012)	8.7	6.5	7.0
Uganda(2009-2012)	24.5	19.5	23.3

Source. * Christiaensen et al. (2012); ** Douidich et al. (2013); all others from Yoshida et al. (2022).

RFMS includes SWIFT for monitoring poverty frequently and real-time



RFMS is flexible enough to include SWIFT questionnaire whenever we need. Before Ana, SWIFT module was included biannually. After Ana, SWIFT module was included frequently to monitor the abnormally high poverty incidence

For example, RFMS did not plan to include SWIFT in February 2022, but because of Ana, RFMS team decided to include SWIFT module for RFMS February 2022.

Use RFMS to monitor the impact of cyclones in rural southern Malawi

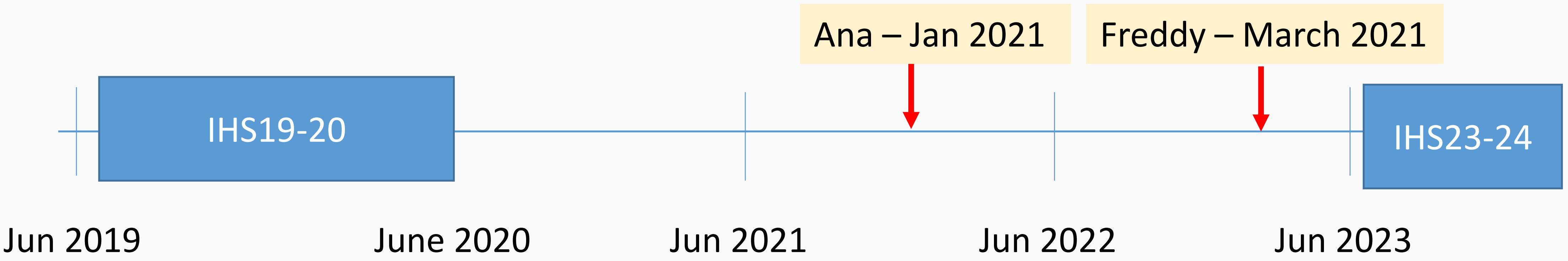
1. RFMS is used to monitor the impact of recent cyclones in rural southern Malawi
2. RFMS is also used for evaluating the performance of Smallholder Horticulture Empowerment & Promotion (SHEP)

- This presentation focuses on monitoring of the cyclone impact on poverty

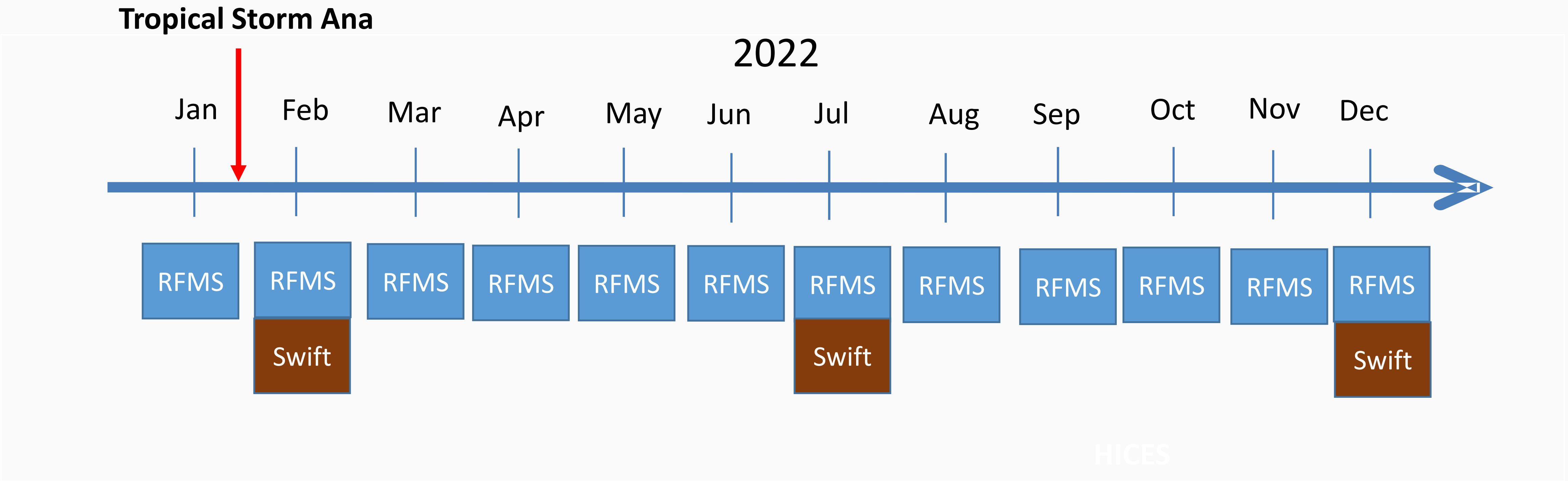
Monitoring the impact of climate changes and actions on poverty using official surveys is not easy because…

The household survey data collection does not always coincide with a climate shock

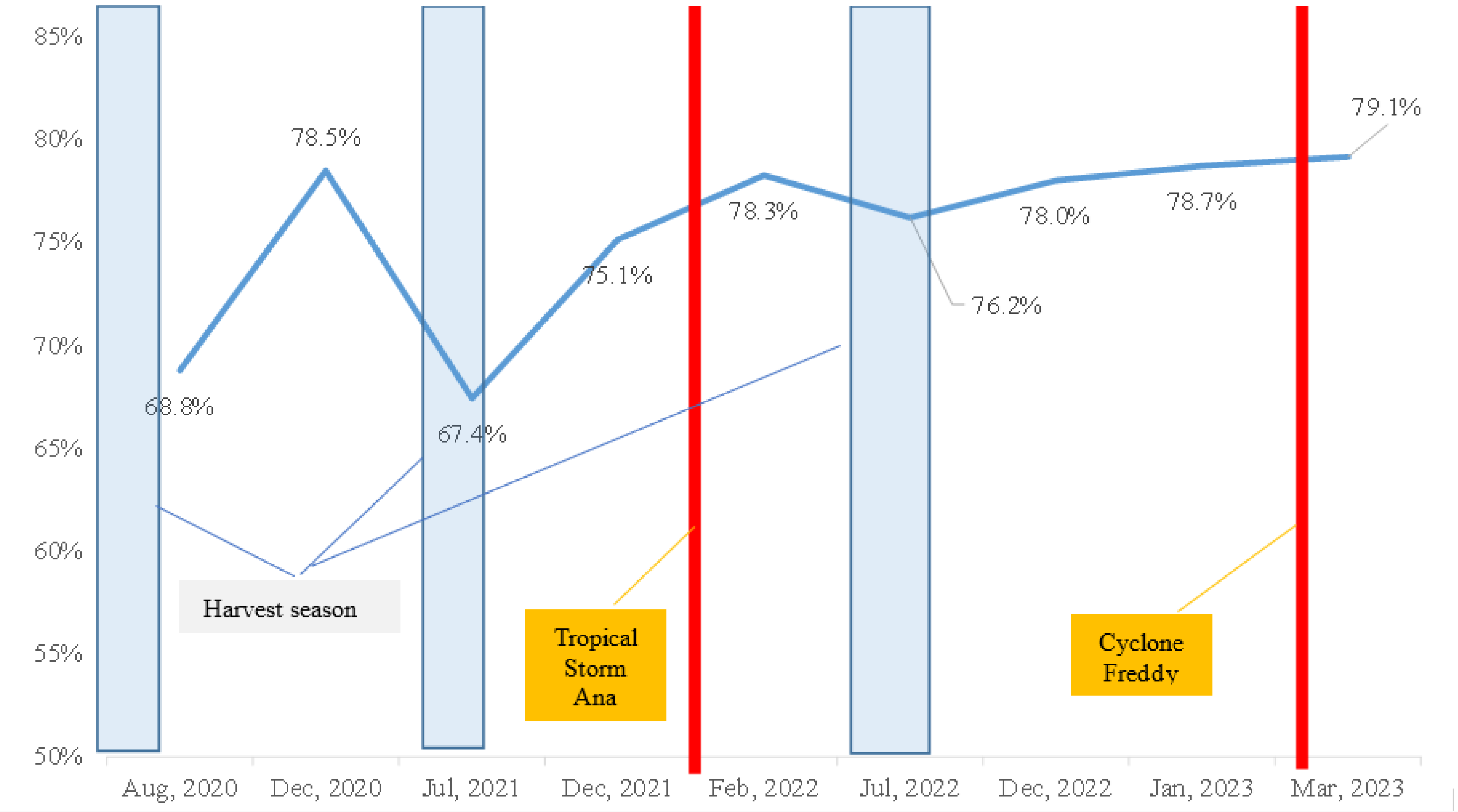
- Malawi National Statistics Office collects official household survey (IHS) every three to four years
- But it did not coincide with recent two cyclones



But RFMS could capture the immediate and lagged impact of Tropical Storm Ana



Frequent and real-time monitoring of poverty in rural southern Malawi



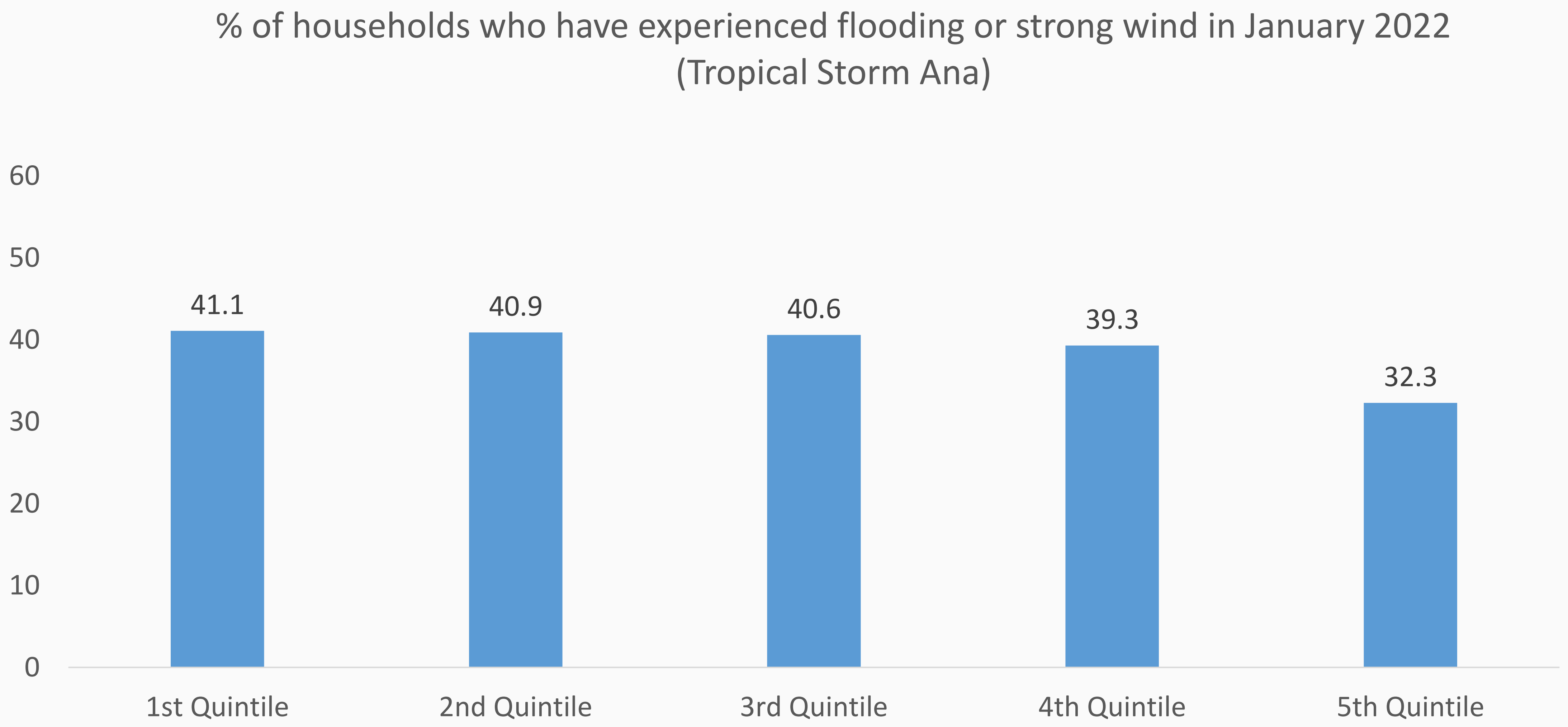
Tropical Storm Ana hit the country in January 2023

Cyclone Freddy hit the country in March 2023

RFMS collected poverty data more frequently since July 2022

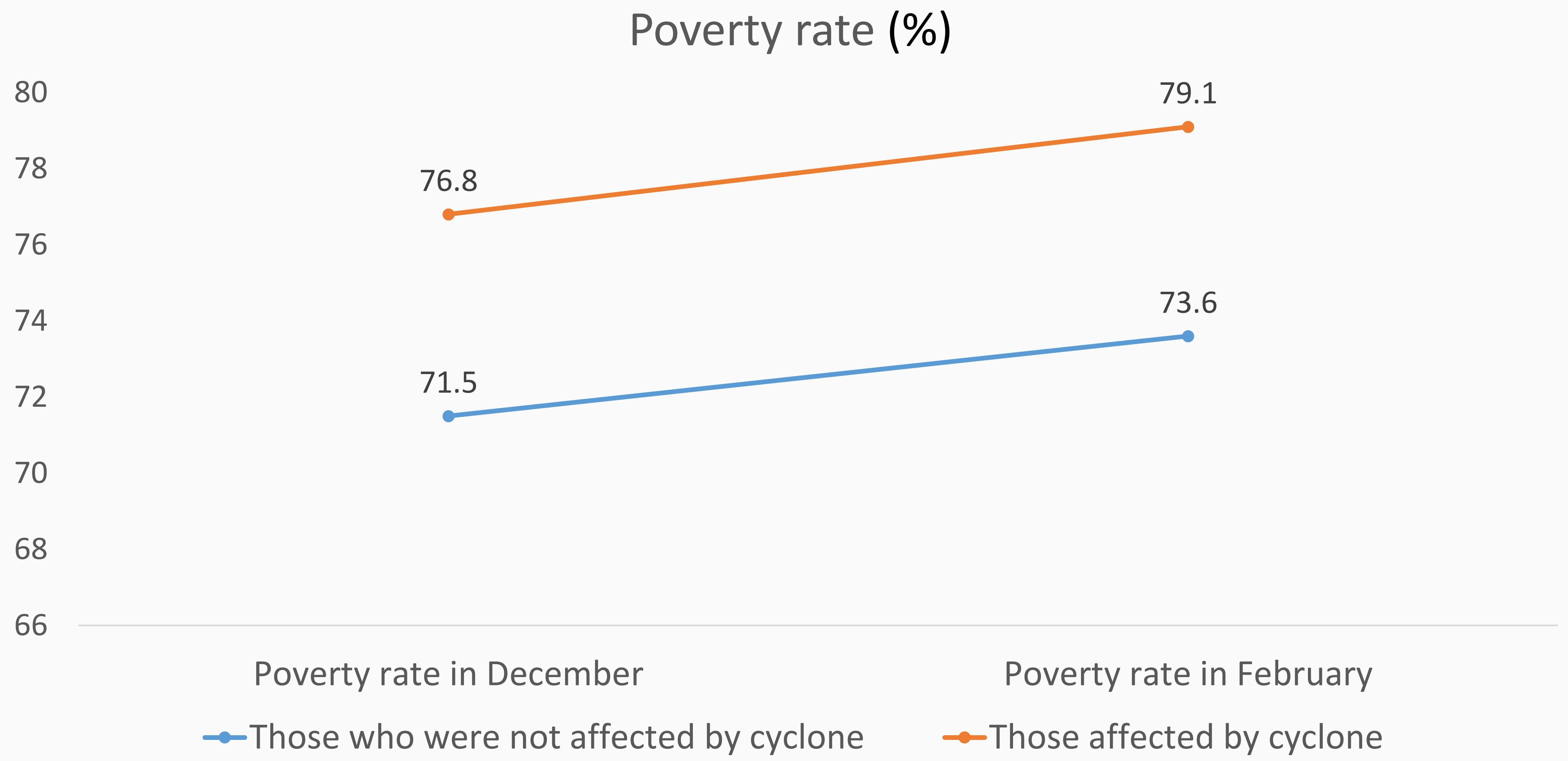
The poverty rate in rural southern Malawi continued to be higher than 75 percent since December 2021

The poor suffered more from tropical storm Ana



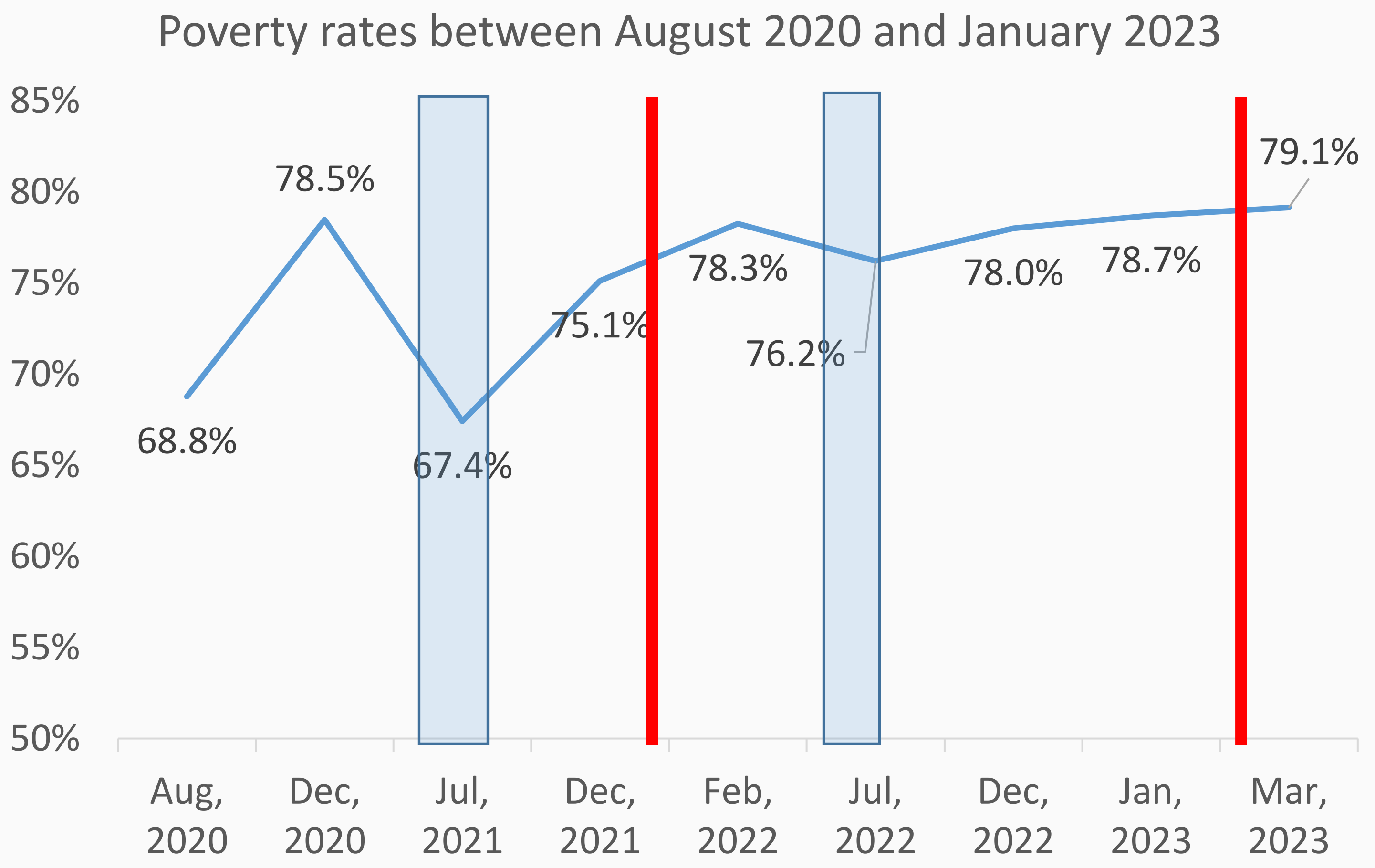
WORLD BANK GROUP

Immediate impact of tropical storm Ana on poverty



WORLD BANK GROUP

The medium-term impact of Ana and the immediate impact of Freddy

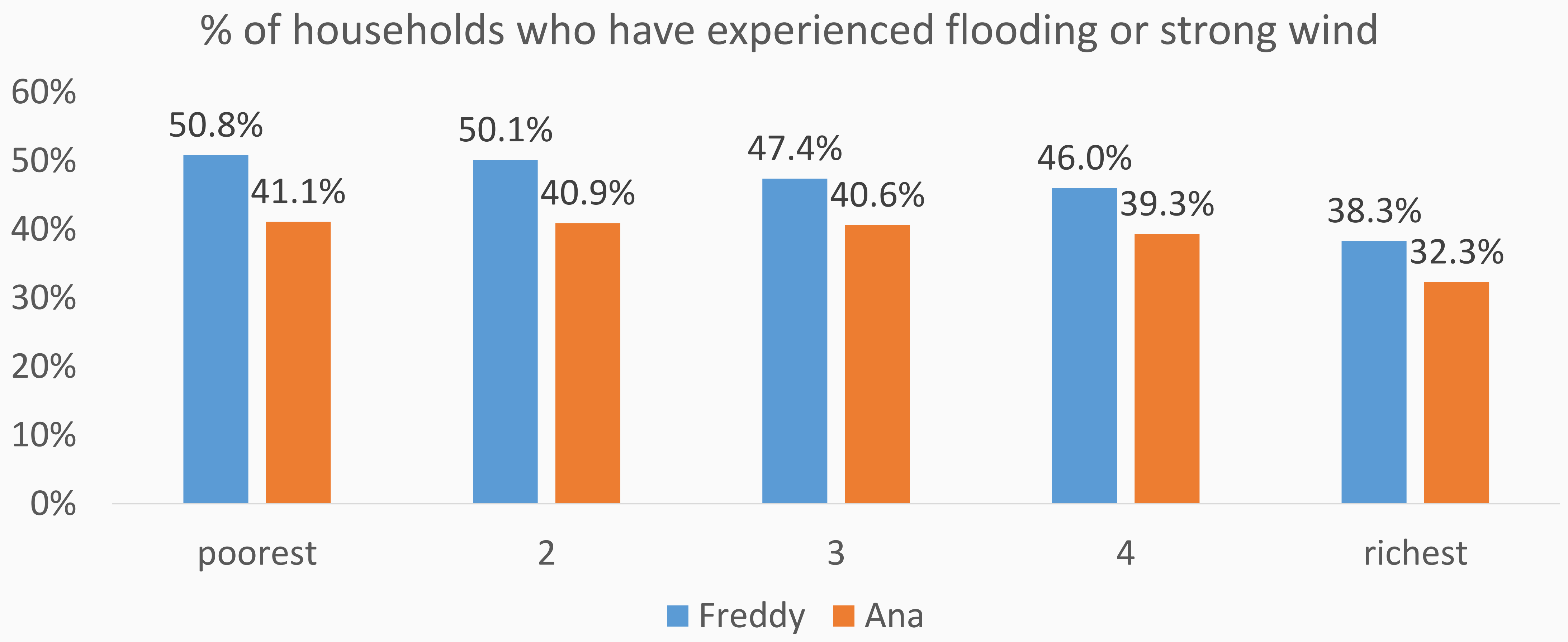


Poverty remained very high in the harvest season (July 2022) unlike other years, suggesting a lagged impact of Ana

Since farmers do not cash harvests until the harvest season and live with the last year's harvests in the lean season, the poverty rate did not change immediately after a cyclone

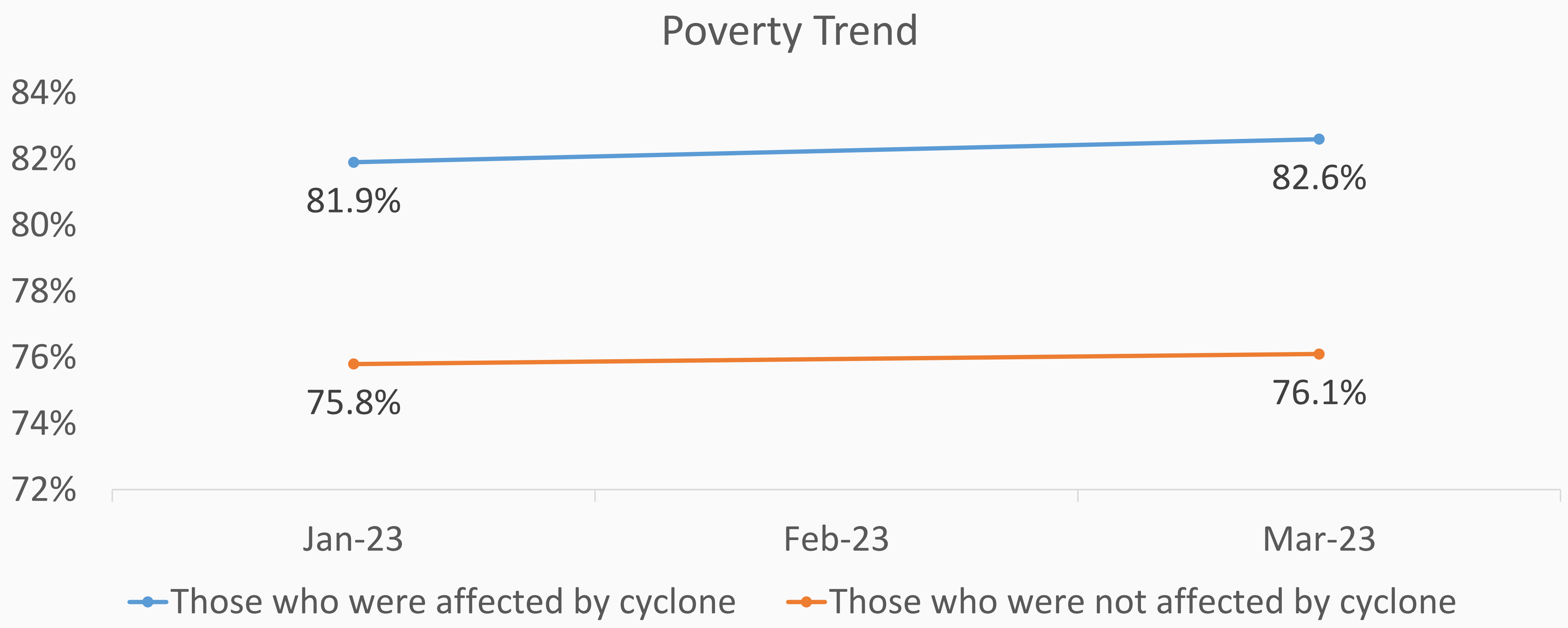
Like tropical storm Ana, poverty did not increase much after Cyclone Freddy

The poor suffered more from Cyclone Freddy as well, and the damages due to Cyclone Freddy are bigger than those of Storm Ana

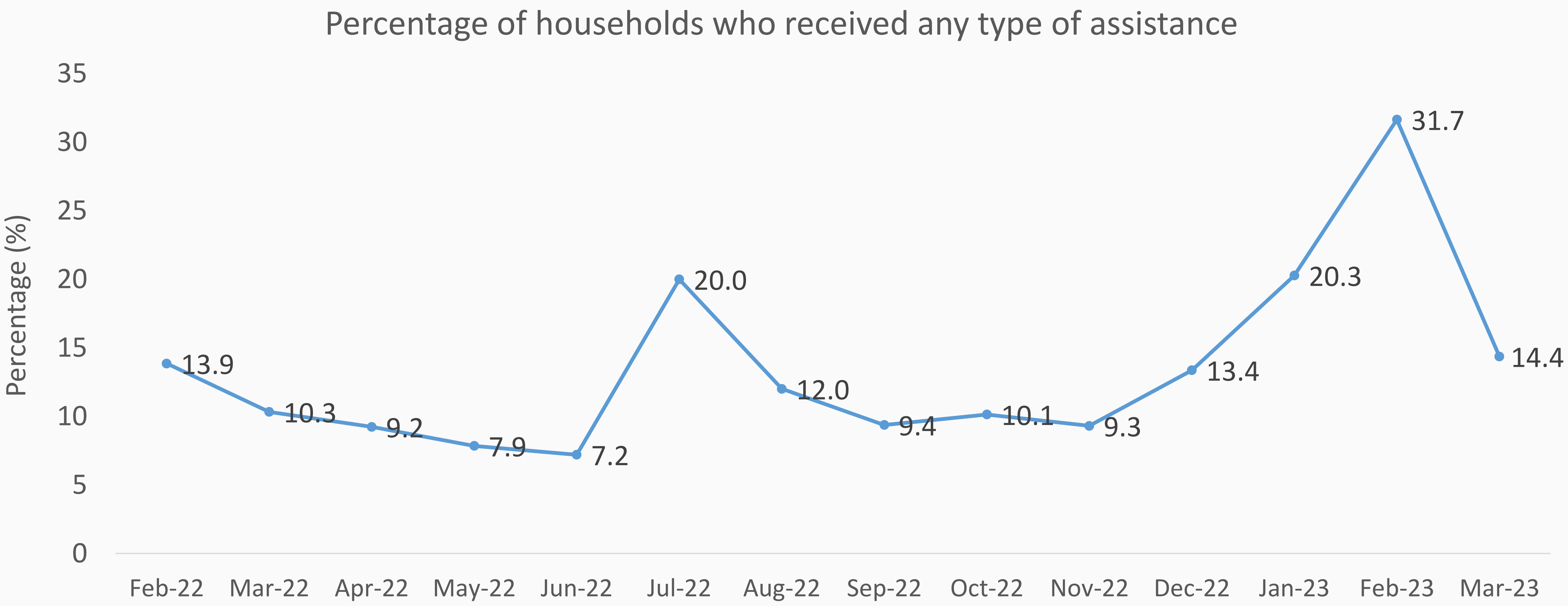


WORLD BANK GROUP

Poverty rates did not increase largely after Cyclone Freddy, but they were already very high

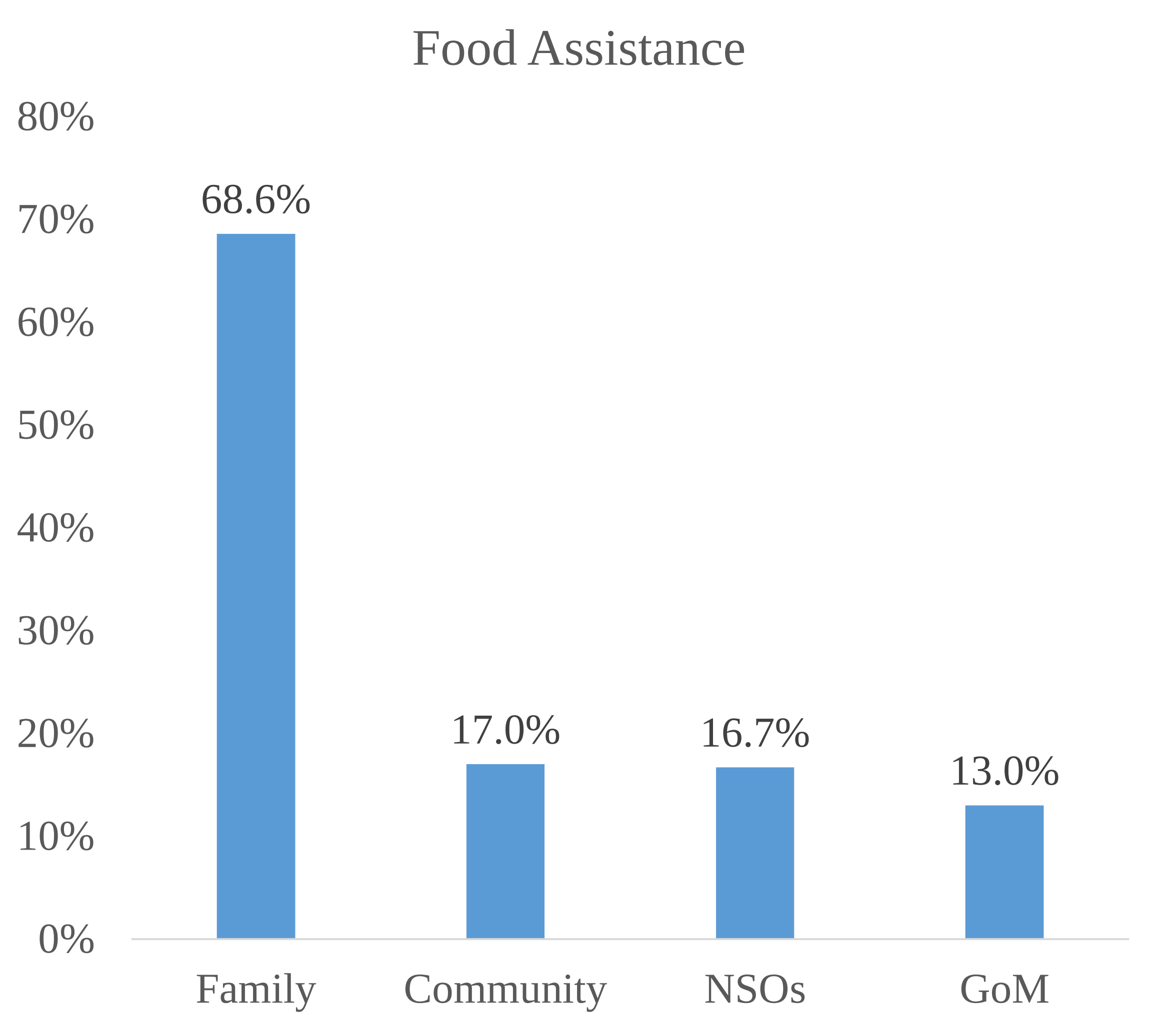


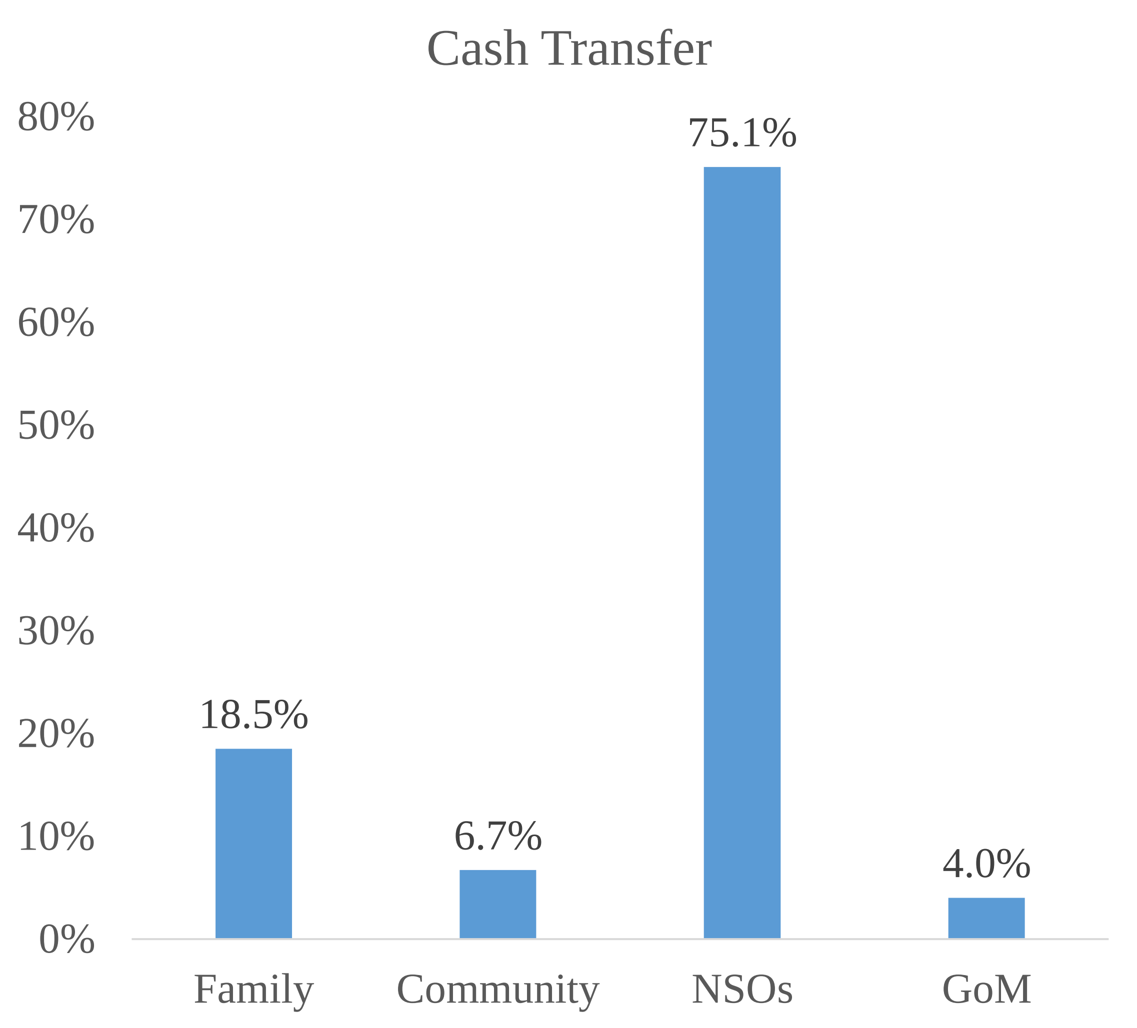
Assistance from the government, NGOs, and families



WORLD BANK GROUP

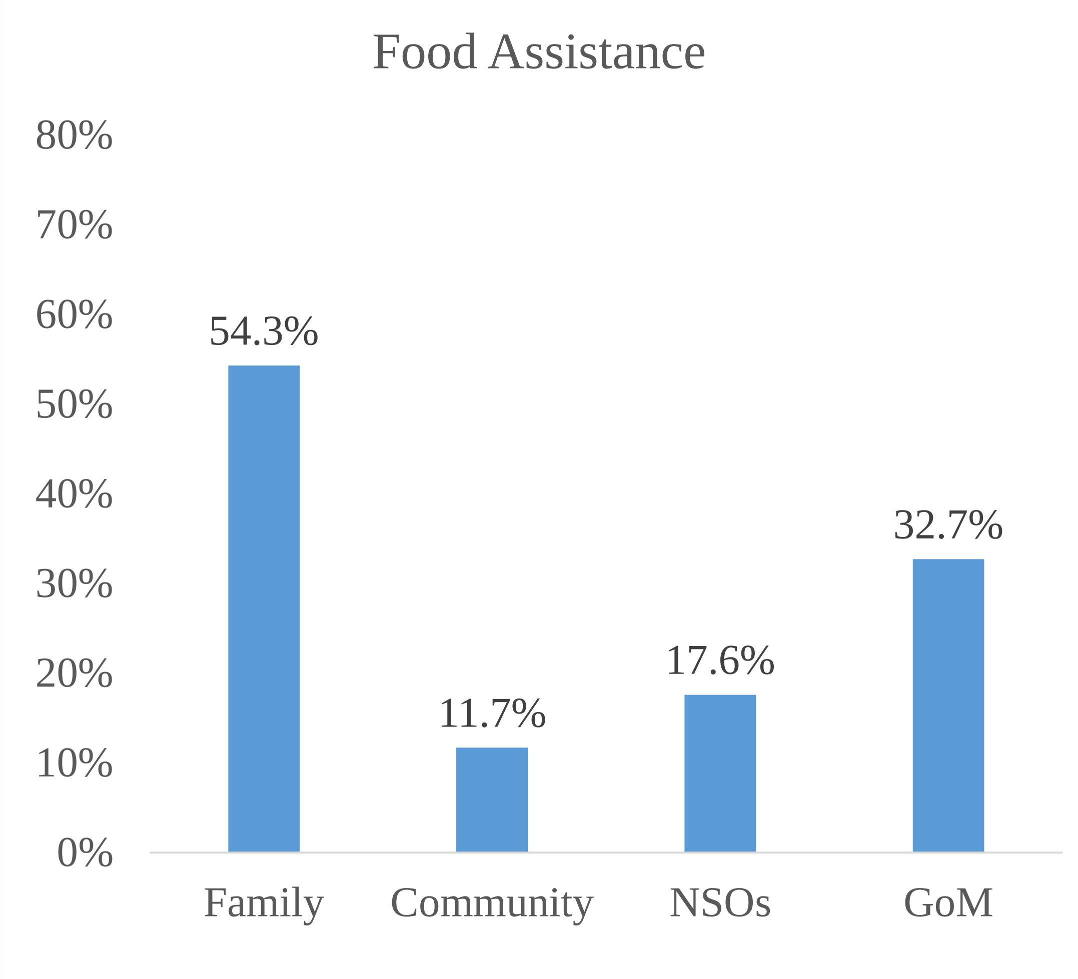
Sources of assistance in Jan-March 2022 (Tropical Storm Ana)

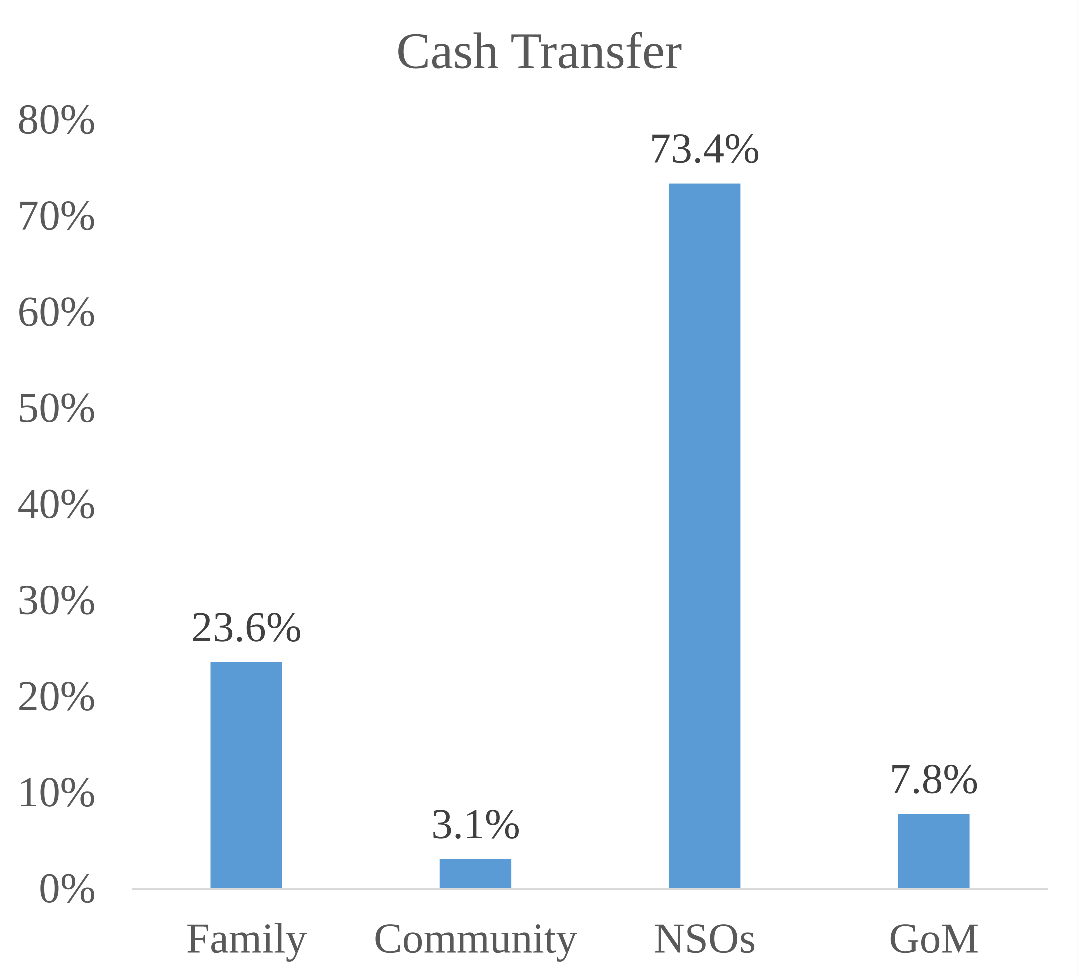




WORLD BANK GROUP

Sources of assistance in Sources of assistance in Jan-March 2023 (Cyclone Freddy)





Concluding remarks

- RFMS (with SWIFT) is a frequent, real-time, climate-resilient, and cost-effective monitoring of poverty
- RFMS also provides other information like food security, livelihoods, coping mechanisms, and social assistance
- It is difficult to monitor the immediate and medium- and long-term impacts of climate changes on poverty using the traditional methodology
- RFMS (with SWIFT) could show the immediate impact of Tropical Storm Ana on poverty was small, but the medium-term impact was large
- Using RFMS, we can study the drivers of the poverty trend and identify possible solutions
- A combination of a traditional household survey with SWIFT allows us to establish frequent and real-time poverty monitoring at a low cost

Thank you!

If you have any further questions, please contact us

Nobuo Yoshida nyoshida@worldbank.org
Kazusa Yoshimura kyoshimura1@worldbank.org
Lina Cardona-Sosa lcardonasosa@worldbank.org

WORLD BANK GROUP