Impact Evaluation of the MCC-Funded Rural Water Supply Program in Nampula, Mozambique

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Making Impact Evaluation Matter

Asian Development Bank, Manila

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Research Team

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Impact Evaluation of the Mozambique Rural Water Supply Activity

August 2014

VirginiaTech

STANFORD UNIVERSITY

Rural Water Supply Activity (RWSA)

- Installation of 600 handpumps in rural communities across the provinces of Nampula (358) and Cabo Delgado (242)

- Installation of 10 small scale solar systems in Cabo Delgado

The objectives of the RWSA, as stated in the Compact, are to **increase beneficiary productivity and income** through:

- Time savings
- Reducing water-related illnesses (diarrhea, dysentery, etc.)


Demand Response Approach
Communities submitted an application +
Contributed 2,500 MZN ($86 USD)

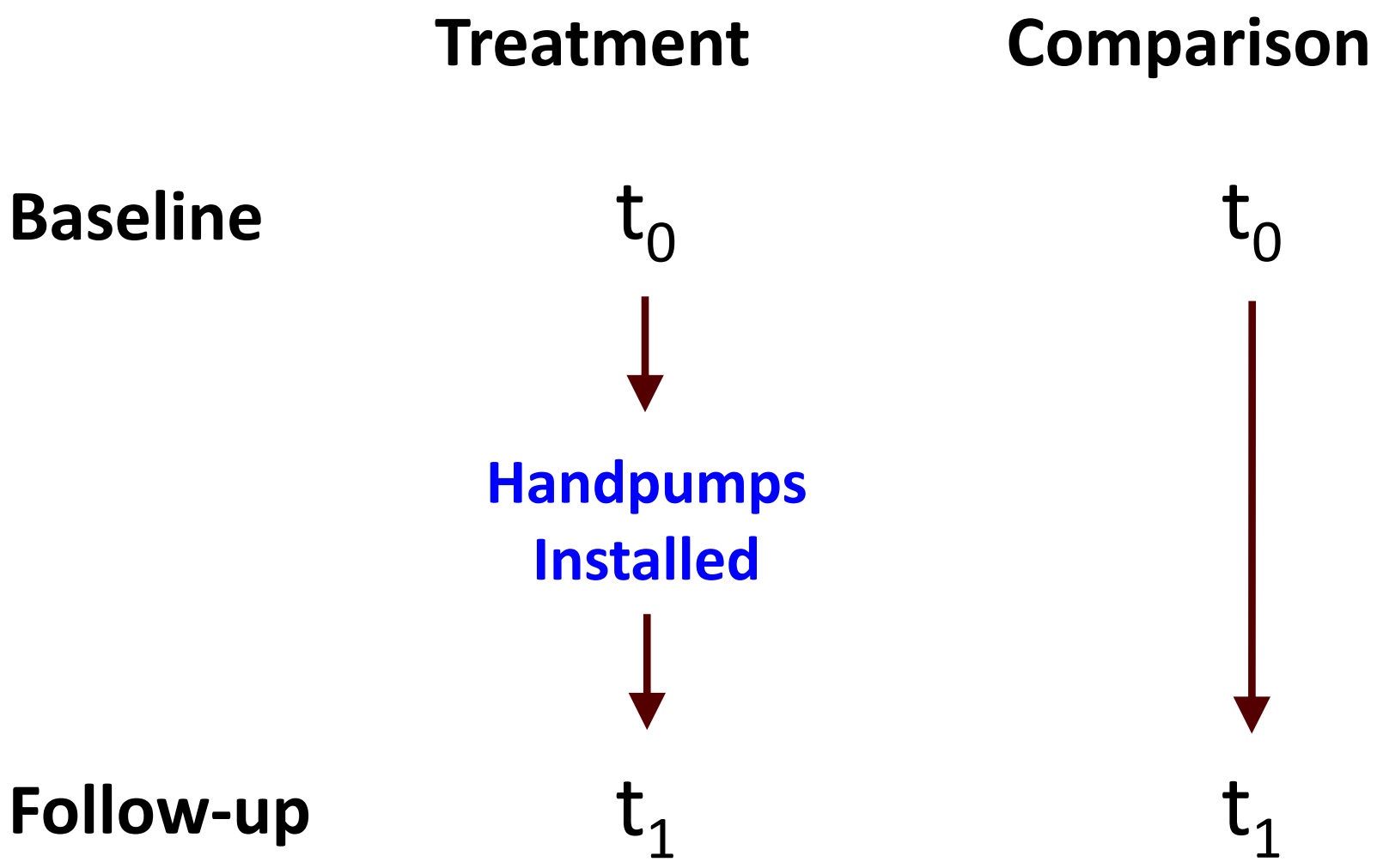
The **water committee** received training on:

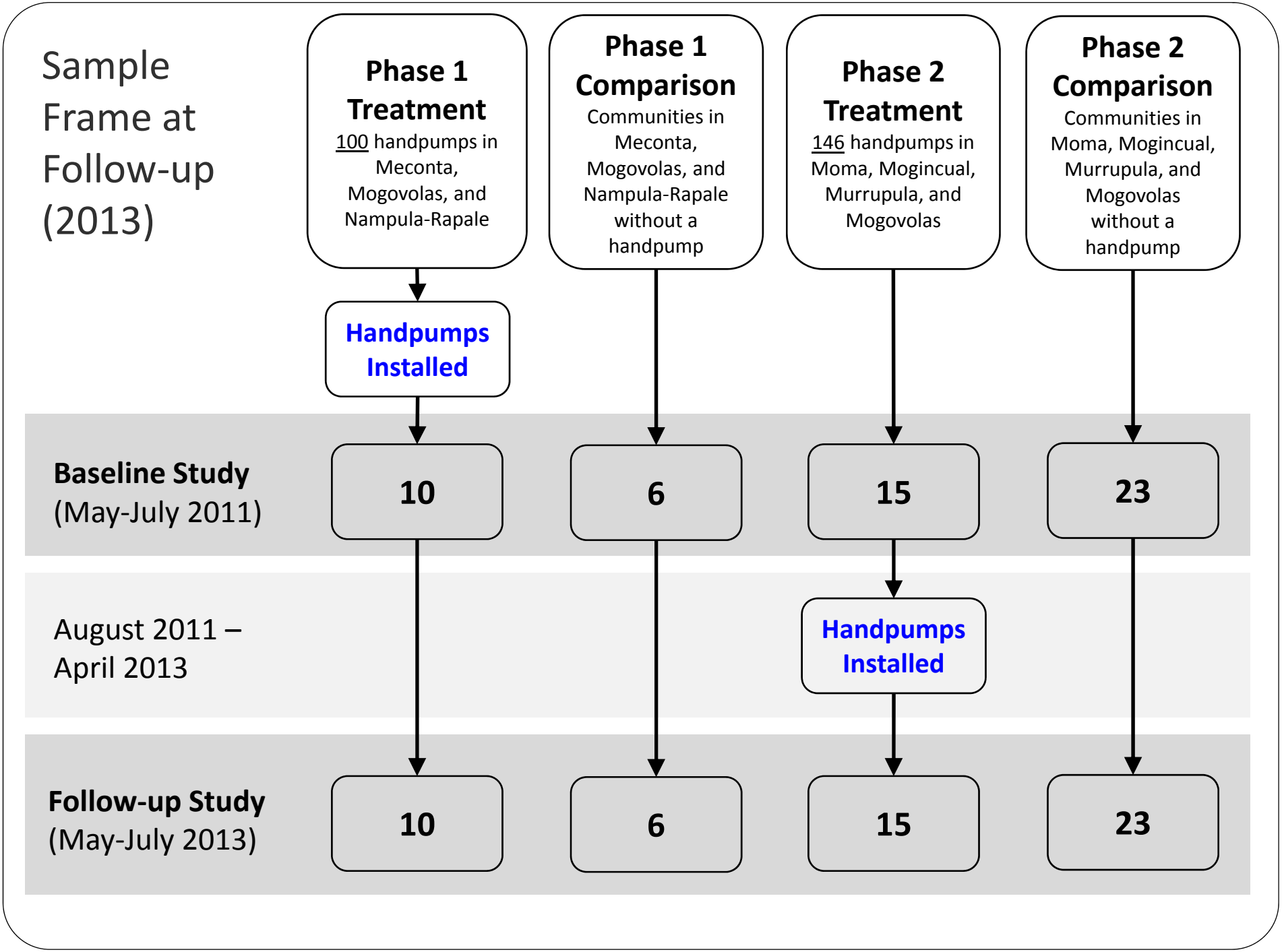
- Handpump operation and maintenance
- Hygiene and sanitation (PHAST or CLTS)

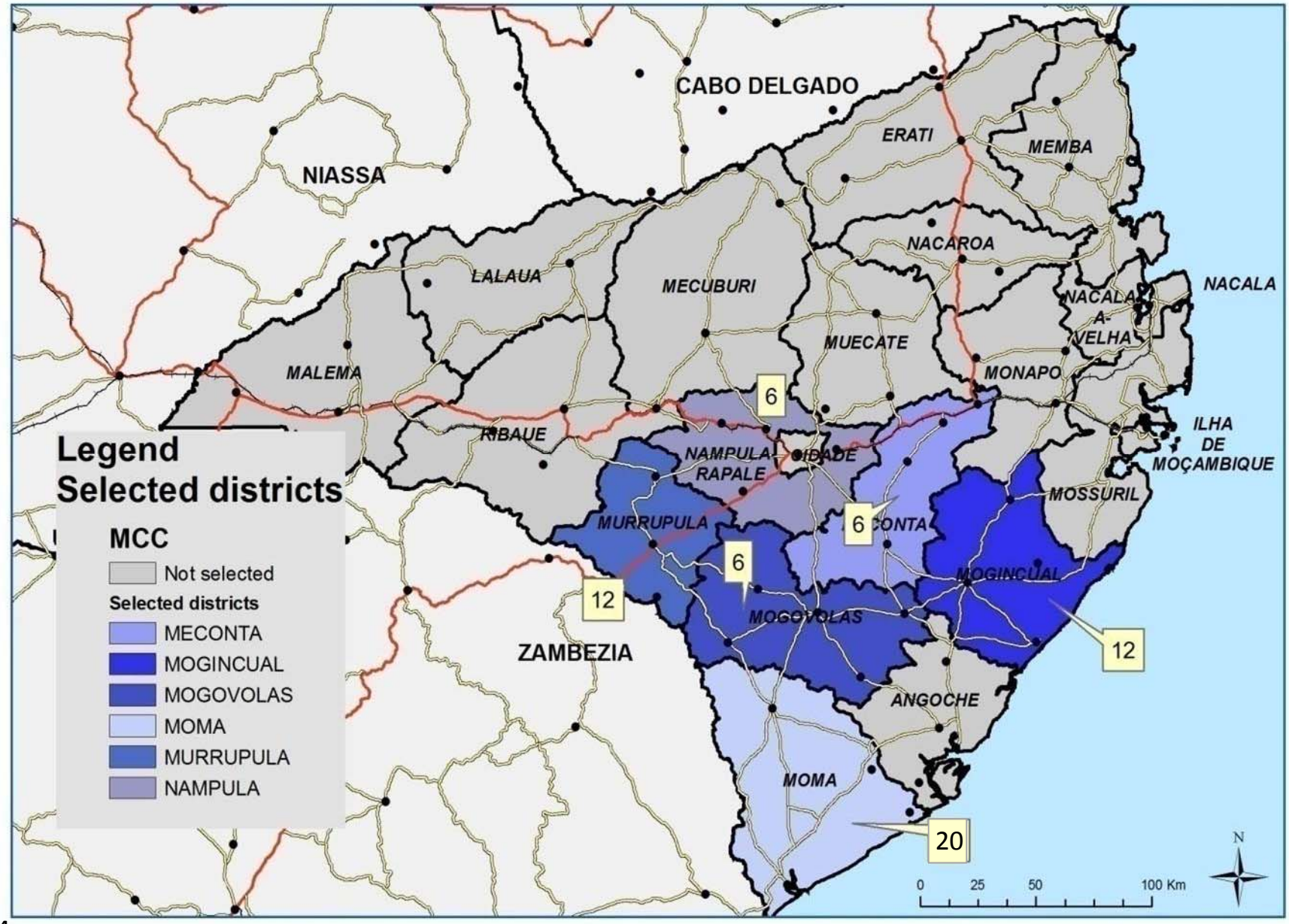
PHAST = Participatory Hygiene And Sanitation Transformation

CLTS = Community Led Total Sanitation

Research Design




Sample Frame at Follow-up (2013)
Phase 1 Treatment
100 handpumps in Meconta, Mogovolas, and Nampula-Rapale
Phase 1 Comparison
Communities in Meconta, Mogovolas, and Nampula-Rapale without a handpump
Phase 2 Treatment
146 handpumps in Moma, Mogincual, Murrupula, and Mogovolas
Phase 2 Comparison
Communities in Moma, Mogincual, Murrupula, and Mogovolas without a handpump
Handpumps Installed
Baseline Study (May-July 2011)
10
6
15
23
August 2011 – April 2013
Handpumps Installed
Follow-up Study (May-July 2013)
10
6
15
23


CABO DELGADO
NIASSA
ERATI
MEMBA
NACAROA
LALAUA
MECUBURI
NACALA
NACALA-A-VELHA
MUECATE
MALEMA
MONAPO
6
RIBAUE
ILHA DE MOÇAMBIQUE
NAMPULA
RAPALE
IDADE
MOSSURIL
MURRUPULA
6
CONTA
6
MOGINCUAL
12
MOGOVOLAS
12
ZAMBEZIA
ANGOCHE
MOMA
20
Legend
Selected districts
MCC
Not selected
Selected districts
MECONTA
MOGINCUAL
MOGOVOLAS
MOMA
MURRUPULA
NAMPULA
N
0
25
50
100 Km

Final Sample Frame

	Community Classification	Number of Communities in Group	Number of Communities by District
Phase 1	Treatment	10	4 Meconta 3 Mogovolas 3 Rapale
	Comparison	6	2 Meconta 1 Mogovolas 3 Rapale
Phase 2	Treatment	15	8 Mogincual 3 Murrupula 2 Mogovolas 2 Moma
	Comparison	23	4 Mogincual 8 Murrupula 1 Mogovolas 10 Moma

Data Collection Activities (RWSA)

Activity	2011 Baseline Study	2013 Follow-up Study
Household Surveys	**1,579** (54 communities: 27 treatment; 27 comparison)	**1,826** (62 communities: 32 treatment; 30 comparison)
Water Committee/ Leader Interviews	**54**	**31**
Water Sampling	**11 communities** (39 community water sources and 259 household containers)	**11 communities** (32 community water sources and 873 household containers; water source variability tested in 4 communities)
Handpump Observations	NA	**17** (17 communities)

73% (1,147) of the households (HHs) interviewed during the baseline study were surveyed again in the follow-up study

73% (832) of the *resurveyed* HHs were from Phase 2 communities

Panel data used in subsequent analysis

Analysis Approach

- A mixed-effects model was used to account for correlations within households, communities, and enumerators
- Fixed effects were introduced to correct for within-district trends and trends over time (i.e., from baseline to follow-up)

$$y = \beta_{Handpump} + \beta_{District} + \beta_{Trend} + \alpha_{Enumerator} + \alpha_{Community} + \alpha_{Household} + \epsilon$$

Fixed effects: β

Random effects: α

Error: ε

Mixed-Effects Model – Results

Variable	Estimated Impact of MCA HP	Standard Error
Liters Per Capita per Day (LPCD) (All Sources)	+2.4	1.0 *
LPCD from *Improved Sources*	+16.8	0.7 ***
Minutes Per Capita per Day (MPCD) Spent Fetching Water	-38.3	9.0 ***
Total Time (minutes) Spent Collecting 20 Liters of Water (All Sources)	-52.4	9.0 ***
Number of Times Per Day Respondent Reported Washing Hands	-3.3	1.6 *
Number of Children Exhibiting Symptoms of Diarrheal Illness in the Past Week	-0.078	0.039 .
Log-odds of Household (HH) Stating that Water Fetching Affects School Attendance	-1.6	0.3 ***
Log-odds of HH Indicating Satisfaction with their Water Supply Situation	+4.9	0.4 ***
Log-odds of HH Indicating Satisfaction with their Sanitation Situation	+0.7	0.3 **
Log-odds of HH Using Latrines	+0.8	0.3 **
Monthly HH Expenditures (in MZN)	+114.36	87.9
Monthly HH Income (in MZN)	-866.9	794.4

Significance codes: '***' p<0.001; '**' p<0.01; '*' p<0.05; '.' p<0.1

Water Consumption

All Sources and Improved Sources

Panel Data

The installation of the MCA handpumps are associated with an insignificant **1.8 LPCD** increase in **median water consumption** (from all sources)

Phase 2 Median Total Liters per Capita per Day (LPCD) (All Sources)

	Number of Communities	Baseline	Follow-Up	Difference
		Mean of Median LPCD	Mean of Median LPCD	LPCD
Treatment	15	17.5	19.6	2.1 .
Comparison	23	18.2	18.5	0.3
			Difference in Differences	1.8

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

The installation of the MCA handpumps are associated with an **15.9 LPCD** increase in **median water consumption** (from **improved sources**) (p<0.001)

Phase 2 Median Total Liters per Capita per Day (LPCD) from *Improved Sources*

	Number of Communities	Baseline	Follow-Up	Difference
		Mean of Median LPCD	Mean of Median LPCD	LPCD
Treatment	15	0.0	14.7	14.7***
Comparison	23	1.5	0.3	-1.2
			Difference in Differences	15.9***

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

Households in Phase 2 treatment communities significantly increased their total median water consumption (from all sources) by 12.8 LPD

Phase 2 Median Total Liters per Households per Day (LPD)

		Baseline	Follow-Up	Difference
Phase/ Community	Number of Communities	Mean of Median LPD	Mean of Median LPD	LPD
Treatment (all sources)	15	65.4	78.2	12.8**
Treatment (improved)	15	0.0	60.6	60.6***
Comparison (all sources)	23	74.8	72.4	-2.3
Comparison (improved)	23	7.3	1.4	-5.9

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

Time Spent Collecting Water

Panel Data

Following the installation of the MCA handpumps there was an **93-minute decline** in the time households spent collecting water from all sources, but this decline was **statistically insignificant**

But…

The installation of the MCA handpumps can be associated with a **67-minute reduction** in the median **roundtrip time to the 'primary' source** (p<0.05)

Phase 2 Median Roundtrip Time to *Primary Source*

	Number of Communities	Baseline	Follow-Up	Difference
		Mean of Median Time (Minutes)	Mean of Median Time (Minutes)	Minutes
Treatment	15	141	64	-77**
Comparison	23	116	105	-11
			Difference in Differences	-67*

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

The installation of the MCA handpumps can be associated with a 53-minute reduction in the median **time to collect 20 liters of water** (p<0.05)

Phase 2 Median Time to Collect 20 Liters of Water

	Number of Communities	Baseline	Follow-Up	Difference
		Mean of Median Time (Minutes)	Mean of Median Time (Minutes)	Minutes
Treatment	15	101	63	-39*
Comparison	23	85	99	14
			Difference in Differences	-53*

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

Impact on Schooling

Panel Data

MCA handpumps are associated with a **18.4% reduction** in the mean percentage of households stating that water fetching negatively affects the school attendance of their children (p<0.01)

Phase 2 Mean Percentage of Households (HHs) Stating that Water Fetching Affects School Attendance

	Number of Communities	Baseline	Follow-Up	Difference
		Mean % HHs Stating that Water Fetching Affects School Attendance	Mean % HHs Stating that Water Fetching Affects School Attendance	Change in Percentage
Treatment	15	28.0%	5.5%	-22.5%***
Comparison	23	19.4%	15.3%	-4.1%
			Difference in Differences	-18.4%**

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

Satisfaction with Water Supply and Sanitation Situation

Panel Data

MCA handpumps are associated with a **65% increase** in respondent **satisfaction with their water supply** relative to comparison communities ($p<0.001$)

Phase 2 Percentage of HH Indicating Satisfaction with Water Supply Situation

	Number of Communities	Baseline	Follow-Up	Difference
		Mean Percent of HH Satisfied	Mean Percent of HH Satisfied	Change in Percentage
Treatment	15	22%	79%	56%***
Comparison	23	32%	23%	-9%
			Difference in Differences	65%***

Significance codes: *** $p<0.001$ ** $0.001>p<0.01$ * $0.01>p<0.05$. $0.05>p<0.10$

In contrast, there was **no significant increase** in **respondent satisfaction with their sanitation situation** relative to comparison communities

Phase 2 Percentage of HH Indicating Satisfaction with their Sanitation Situation

	Number of Communities	Baseline	Follow-Up	Difference
		Mean Percent of HH Satisfied	Mean Percent of HH Satisfied	Change in Percentage
Treatment	15	44%	64%	20%*
Comparison	23	48%	62%	14%*
			Difference in Differences	6%

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

Health, Hygiene, and Wealth

Panel Data

The Installation of the MCA Handpump was *not* associated with significant changes in:

Health

- Percentage of children with reported symptoms of gastrointestinal or respiratory illness in week prior to interview

Sanitation and Hygiene

- Self-reported handwashing practices or latrine use

Wealth

- Household income and expenditure

However, the percentage of households using a **latrine** did increase by 10% in the treatment communities (p<0.05)

Phase 2 Percentage of Households Using Latrines

	Number of Communities	Baseline	Follow-Up	Difference
		% HHs Using Latrine	% HHs Using Latrine	Change in Percentage
Treatment	15	22%	32%	10%*
Comparison	23	17%	19%	1%
			Difference in Differences	9%.

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

Incomes and expenditures increased in both treatment and comparison communities along with household engagement in agriculture and consumption of meat and fish, pointing to a **general trend of economic development in Nampula** (or a productive farming season)

Conclusions

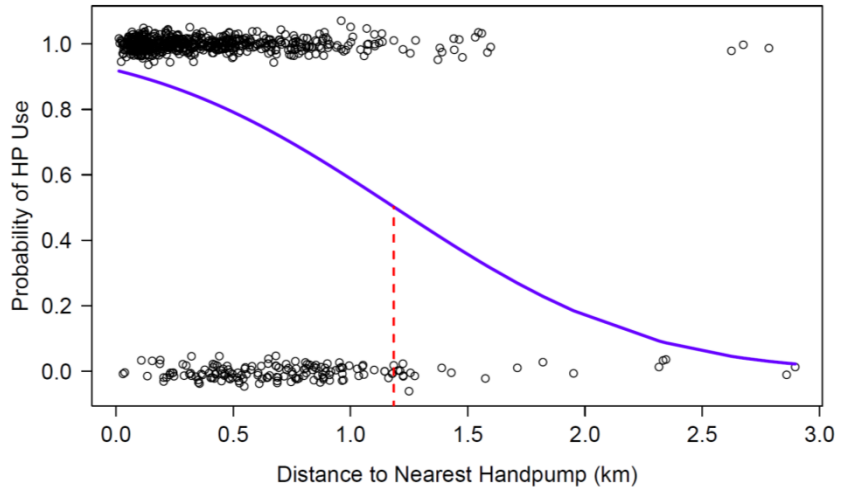
- One of the two primary objectives of the RWSA has been realized
  - The installation of the MCA handpump reduced the time HHs spend collecting water from their primary source by ~1 hour
  - No significant water-related health improvements

Conclusions

- Attention should be given to enhancing or rehabilitating traditional sources, since they continue to be important to households even after the installation of the handpumps

Conclusions

- Given dispersed nature of housing in Nampula, it may be necessary to construct multiple handpumps per community or small piped water systems to provide adequate service levels
  - "Distance" was the number one reason households did not use the handpumps



Conclusions

- Consider alternative approaches to sanitation and hygiene promotion that result in broader reach and better uptake of key messages

Questions?