



# 20<sup>th</sup> AfWA International Congress and Exhibition 2020

## Breaking new grounds to accelerate access to water and sanitation for all in Africa

# WHERE DOES CLTS WORK BEST?

## EVIDENCE FROM FOUR COUNTRIES

23<sup>rd</sup> – 24<sup>th</sup> February 2020, Kampala, Uganda

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# MOTIVATION



Kar and Chambers (2008):  
Community response to CLTS is governed in part by the “**challenge**” or “**favorability**” of local operating conditions:

- *community size*
- *remoteness*
- *flood frequency*
- *disease prevalence*
- *water supply conditions*
- *social cohesion (among others)*

The **size (and direction) of influence** of these variables was informed by extensive practice, but nonetheless is **largely anecdotal**.

# OBJECTIVE



More than a decade and dozens of large CLTS programs later, **is it possible to quantitatively estimate the importance of these variables** by combining public geo-referenced datasets with implementation M&E data on CLTS performance?



- M&E data from Cambodia, Ghana, Liberia, and Zambia
  - *Provided by Akros/Govt of Zambia, Global Communities, CRSHP, and UNICEF*
- Explanatory variable data derived from multiple public GIS datasets

# RESEARCH QUESTION & APPROACH



What explanatory variables influence CLTS program performance, and how?



Statistical analysis of CLTS performance in 7 programs across 4 countries.

- Multivariate regression models with covariate adjustment performed in R (v.3.5.2)
- OLS or logit depending whether the response variable is binary or continuous

# CLTS PERFORMANCE METRICS

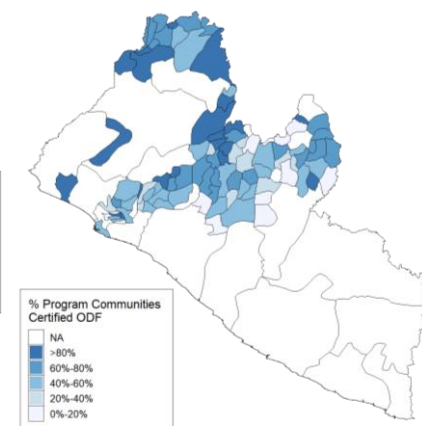
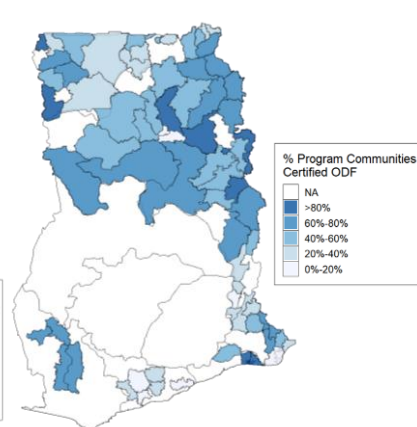
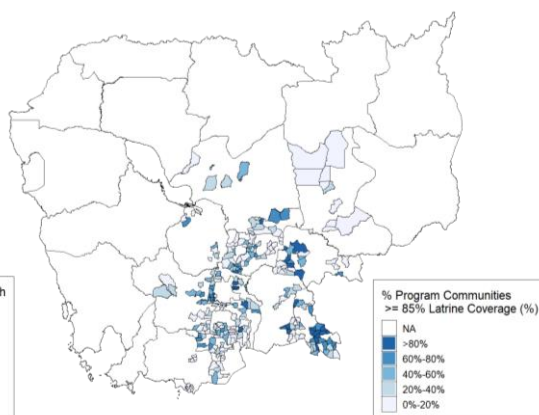
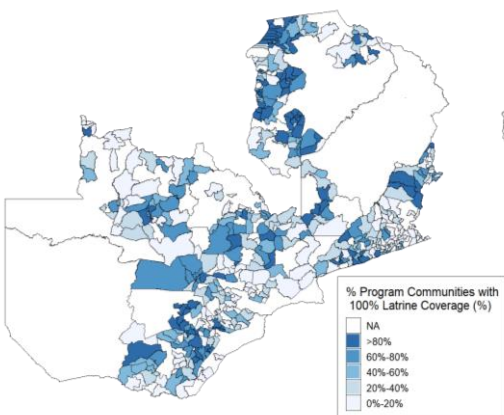


	Response Variable	Definition	Type	Resolution	Country
1.	<b>ODF Achievement</b>	<ul style="list-style-type: none"> <li>• <b>Zambia:</b> Has the community ever reported <math>\geq 100\%</math> latrine coverage?</li> <li>• <b>Cambodia:</b> Has the community ever reported <math>\geq 85\%</math> latrine coverage?</li> <li>• <b>Ghana:</b> Has the community been certified ODF?</li> <li>• <b>Liberia:</b> Has the community been certified ODF?</li> </ul>	Binary (yes/no)	Community	All
2.	<b>Increase in Latrine Coverage</b>	Percentage point change in latrine coverage from baseline to follow-up reporting.	Continuous (%)	Community	Cambodia
3.	<b>ODF Sustainability</b>	Has a community which achieved 100% latrine coverage subsequently remained above 90% latrine coverage?	Binary (yes/no)	Community	Zambia
4.	<b>Area-level ODF Achievement</b>	Percent of triggered communities in a district/ward that have become ODF	Continuous (%)	District / ward	Ghana, Zambia

# CLTS M&E DATA SUMMARY



	Zambia	Cambodia	Ghana	Liberia
Initial # communities	30,343	2,301	6,959	2,905
# Communities after cleaning	20,398	2,273	5,059	2,026
% Achieving ODF	38%	34%	49%	56%

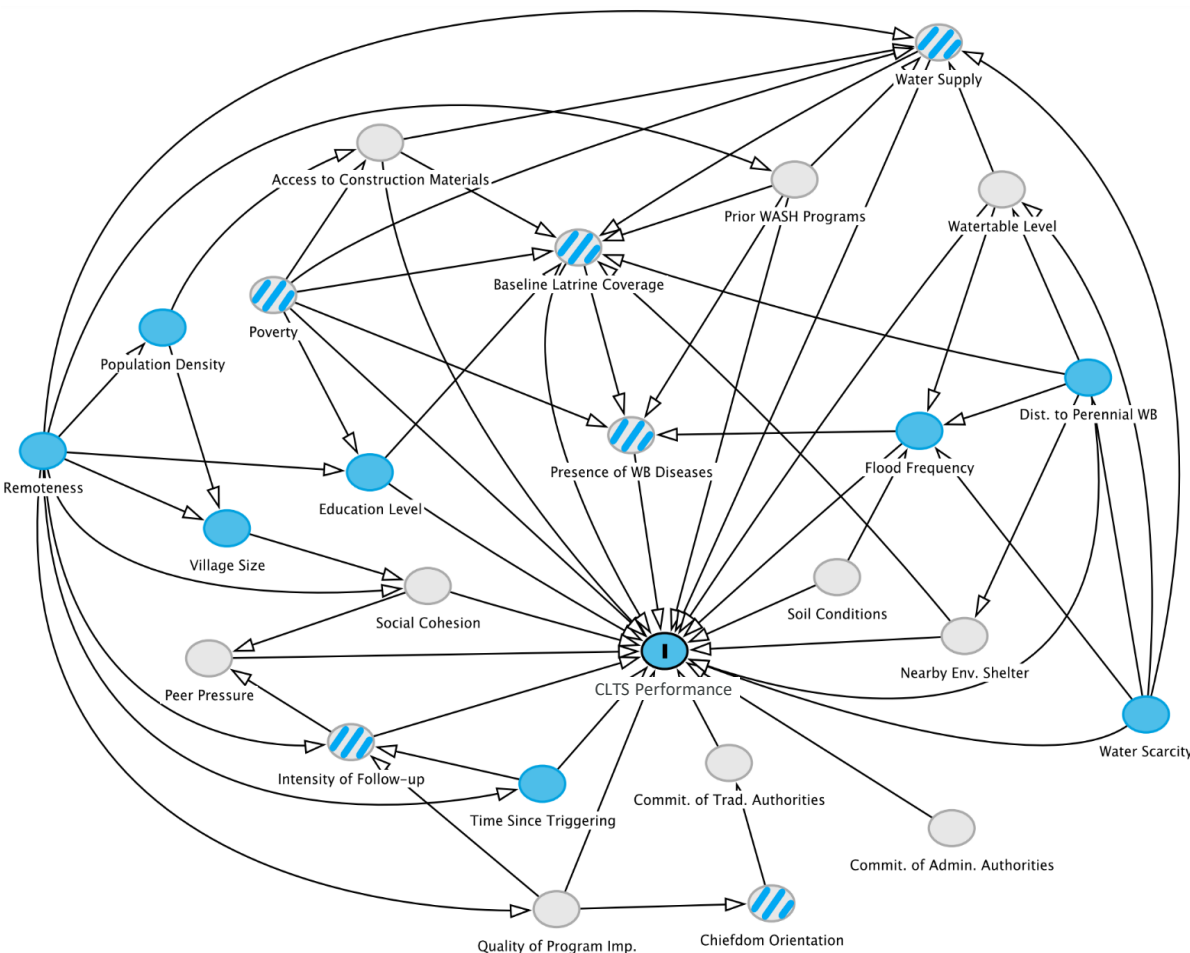


# CONTEXTUAL VARIABLES



Variable	Proxy
Baseline latrine coverage	<ul style="list-style-type: none"> <li>• % households with latrines at baseline</li> </ul>
Population size	<ul style="list-style-type: none"> <li>• # of households</li> </ul>
Female / male Literacy	<ul style="list-style-type: none"> <li>• % men/women literate</li> </ul>
Distance to waterbodies	<ul style="list-style-type: none"> <li>• Km to inland waterways (lakes, rivers)</li> </ul>
Flooding frequency	<ul style="list-style-type: none"> <li>• Average # flood days per year</li> </ul>
Population density	<ul style="list-style-type: none"> <li>• # people per km<sup>2</sup></li> </ul>
Remoteness of community	<ul style="list-style-type: none"> <li>• Time to cities</li> <li>• Distance to main roads (categories 1-2)</li> </ul>
Water scarcity	<ul style="list-style-type: none"> <li>• Water use/water availability</li> </ul>
Water supply	<ul style="list-style-type: none"> <li>• # of improved water sources</li> <li>• % access to improved water</li> <li>• Rural water system coverage</li> </ul>
Waterborne disease burden	<ul style="list-style-type: none"> <li>• Cholera predicted incidence</li> <li>• Children's diarrhea prevalence</li> </ul>

# DIRECTED ACYCLIC GRAPH



- Visual representation of possible links between variables.
- Used to define adequate statistical models.

-  Variable with data available for all 4 countries
-  Variable with data available for only some countries
-  Variable with no data or unmeasurable
-  Outcome variable



# KEY ODF ACHIEVEMENT FINDINGS



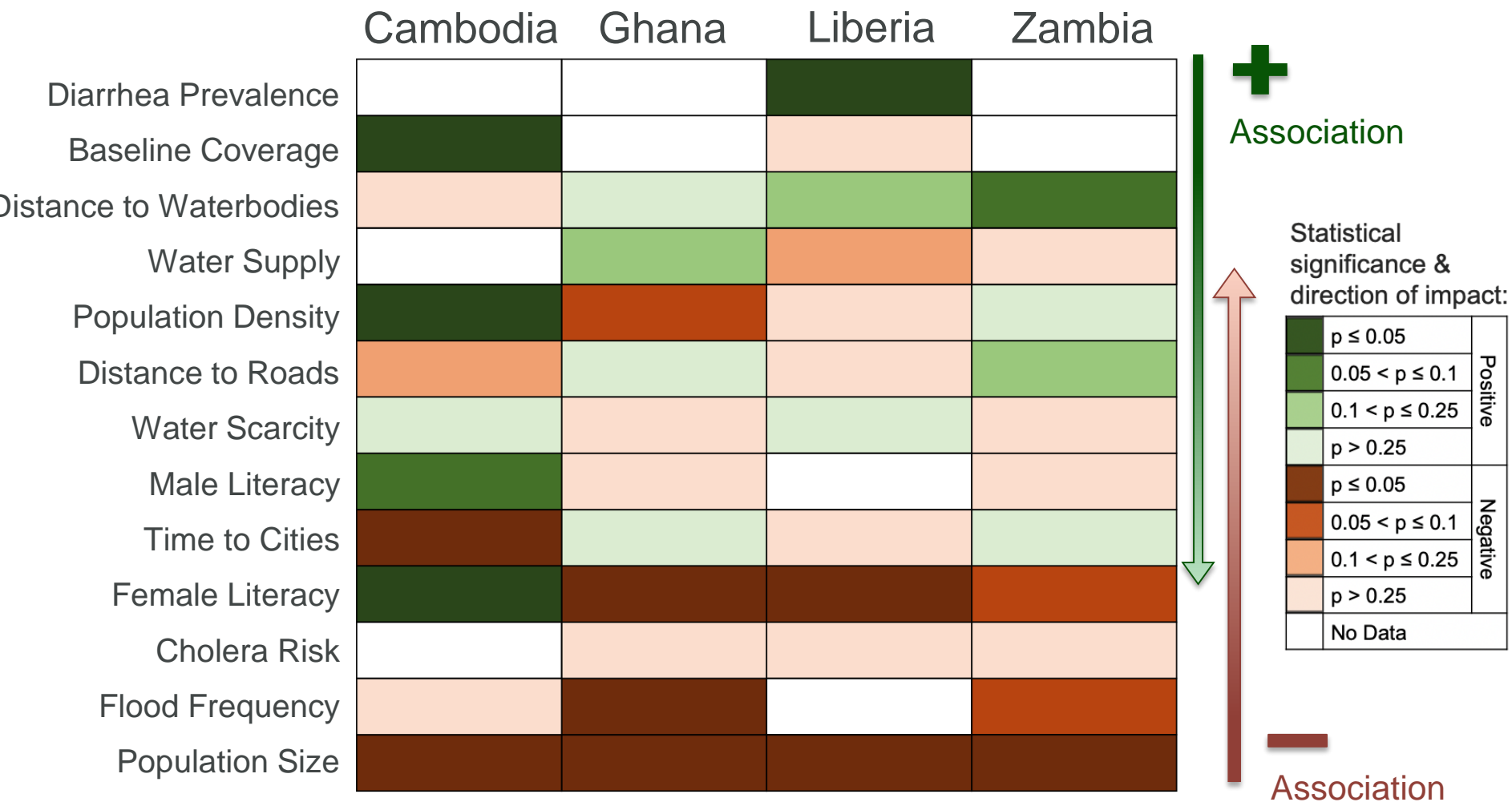
## Consistently favorable across all countries

- Small population size
- Low frequency of flooding (not available in Liberia)

## Inconsistent influence across countries

- Female literacy (Cambodia vs. Ghana, Liberia, Zambia)
- Remoteness (Cambodia vs. Ghana)
- Population density (Cambodia vs. Ghana)

# ALL ODF ACHIEVEMENT FINDINGS



# SOME FINDINGS ARE CONSISTENT...



Community size is consistently inversely associated with ODF achievement.

**Zambia**

$P < 0.05$

**Cambodia**

$P < 0.05$

**Ghana**

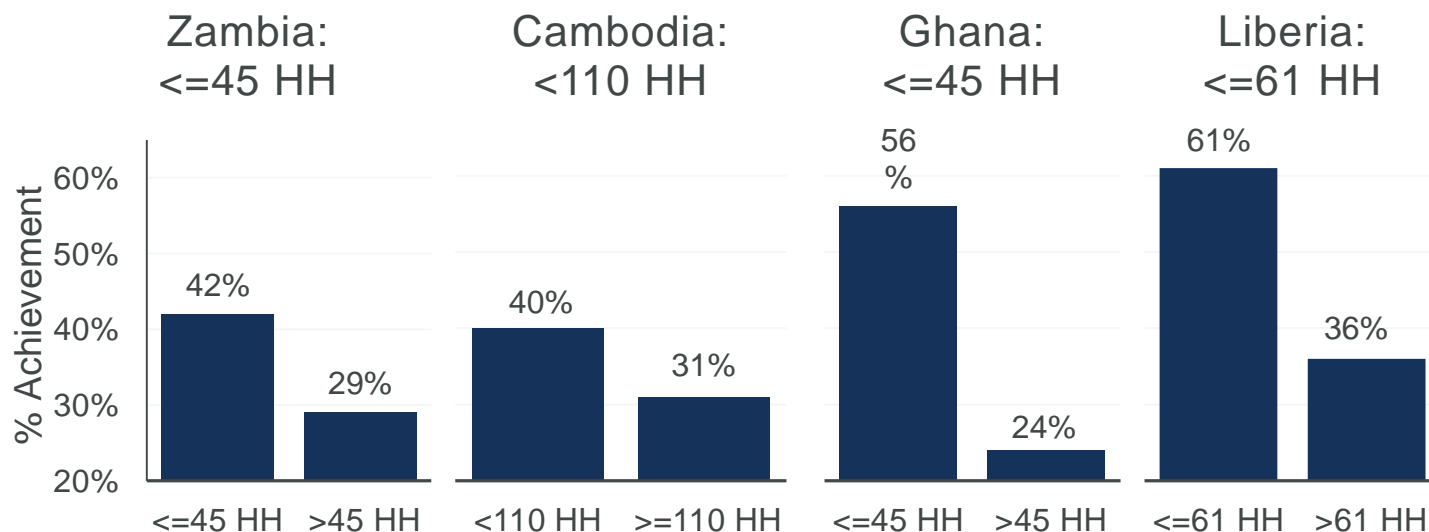
$P < 0.05$

**Liberia**

$P < 0.05$

- 1 Easier implementation
- 2 Higher social cohesion
- 3 Favorable arithmetic

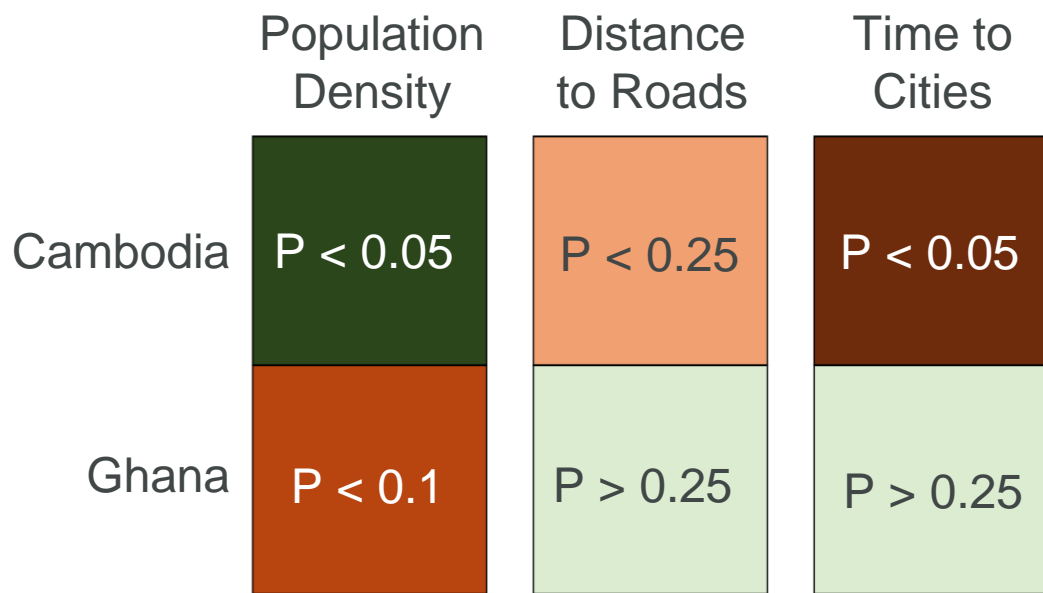
## Optimal Cut-points



# MANY ARE COUNTRY-SPECIFIC...



## Population Density & Remoteness



Cambodia: Urban settings are more **favorable**

- Increased access to materials
- Typically, lower poverty & higher education

Ghana: Urban settings more **challenging**

- Fewer traditional materials
- Desire for “modern” latrines
- Space and land ownership issues
- Rural areas → higher social cohesion

Population density and remoteness are typically inversely related



Less remote  
More dense

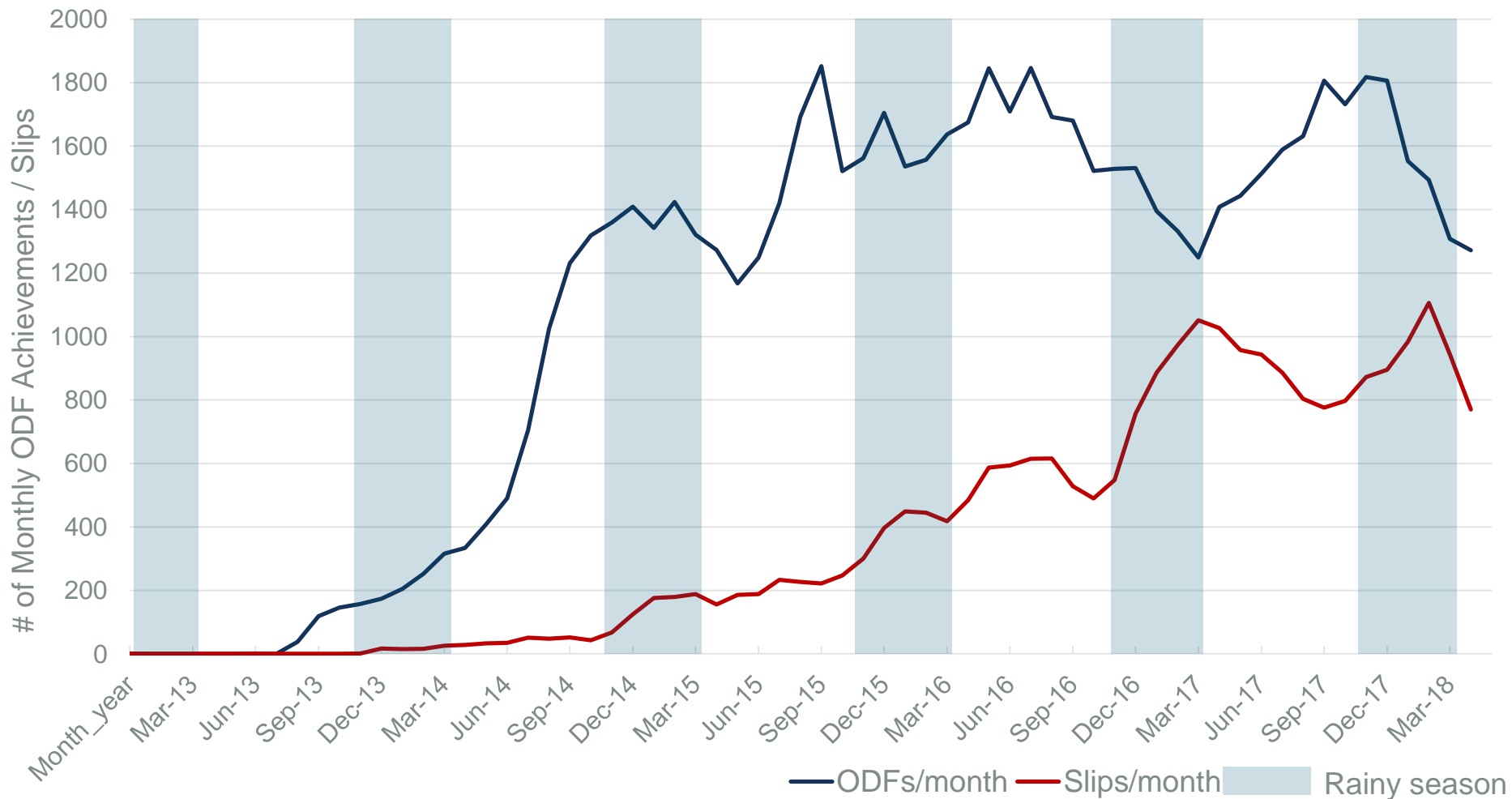


More remote  
Less dense

# ODF ACHIEVEMENT & SUSTAINABILITY



## Zambia case study



# ODF ACHIEVEMENT & SUSTAINABILITY



## Zambia case study

Statistical significance & direction of impact:

Dark Green	$p \leq 0.05$	Positive
Medium Green	$0.05 < p \leq 0.1$	
Light Green	$0.1 < p \leq 0.25$	
Very Light Green	$p > 0.25$	Negative
Dark Brown	$p \leq 0.05$	
Medium Brown	$0.05 < p \leq 0.1$	
Light Brown	$0.1 < p \leq 0.25$	
Very Light Brown	$p > 0.25$	
White	No Data	

	ODF Achieve.	ODF Sustain.
<b>CONTEXTUAL VARIABLES</b>		
# Drinking water sources	Dark Green	Very Light Green
Village size	Dark Brown	Light Green
Distance to roads	Light Green	Dark Brown
Time to cities	Very Light Green	Light Brown
Population density	Very Light Green	Medium Green
Female literacy	Medium Brown	Dark Green
Distance to waterbodies	Medium Green	Very Light Brown
Flood frequency	Medium Brown	Dark Brown
Cholera risk	Very Light Brown	Light Brown
% Access to drinking water	Very Light Brown	Very Light Brown
Male literacy	Very Light Brown	Very Light Brown
Water scarcity	Very Light Brown	Very Light Brown

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**Areas that with higher accessibility, population density, and literacy are favorable for ODF sustainability, though not for ODF achievement:**

- Wealthier, more educated areas
- Access to construction materials
- More durable latrines
- Easier for post-ODF follow-up

# PROGRAMMING RECOMMENDATIONS



Our results suggest **there are a number of variables that explain CLTS performance, but many are country/context-specific.**

- Systematically map the variables of highest significance to:
  - Aid in location prioritization
  - Identify challenging contexts → adaptive programming

To mitigate challenging contexts:

- **Employ explanatory variable thresholds**
  - Divide the community into sub-units
  - Trigger more favorable communities first, to create an ODF environment around challenging ones.



# DATA RECOMMENDATIONS



- **Baseline** latrine coverage and population size (#HHs) data
- **Post-ODF** data is needed to examine slippage, increase in coverage
  - Longitudinal data allows the greatest flexibility
- **Record dates** associated with all data, particularly:
  - Triggering, baseline data collection, ODF certification, all follow-up data collection visits
- Make sure **community locations** are accurate and reliable
- **Ongoing quality assurance** and quality control
- **Collect explanatory variable data** (where suitable) for program communities to circumvent existing data limitations



# 20<sup>th</sup> AfWA CONGRESS

— YOU ARE WELCOME —