PRELIMINARY: DO NOT CITE

Evaluating WSP's Rural Sanitation and Hygiene Campaign Programs

Measuring health outcomes: Early lessons

Global Impact Evaluation Team

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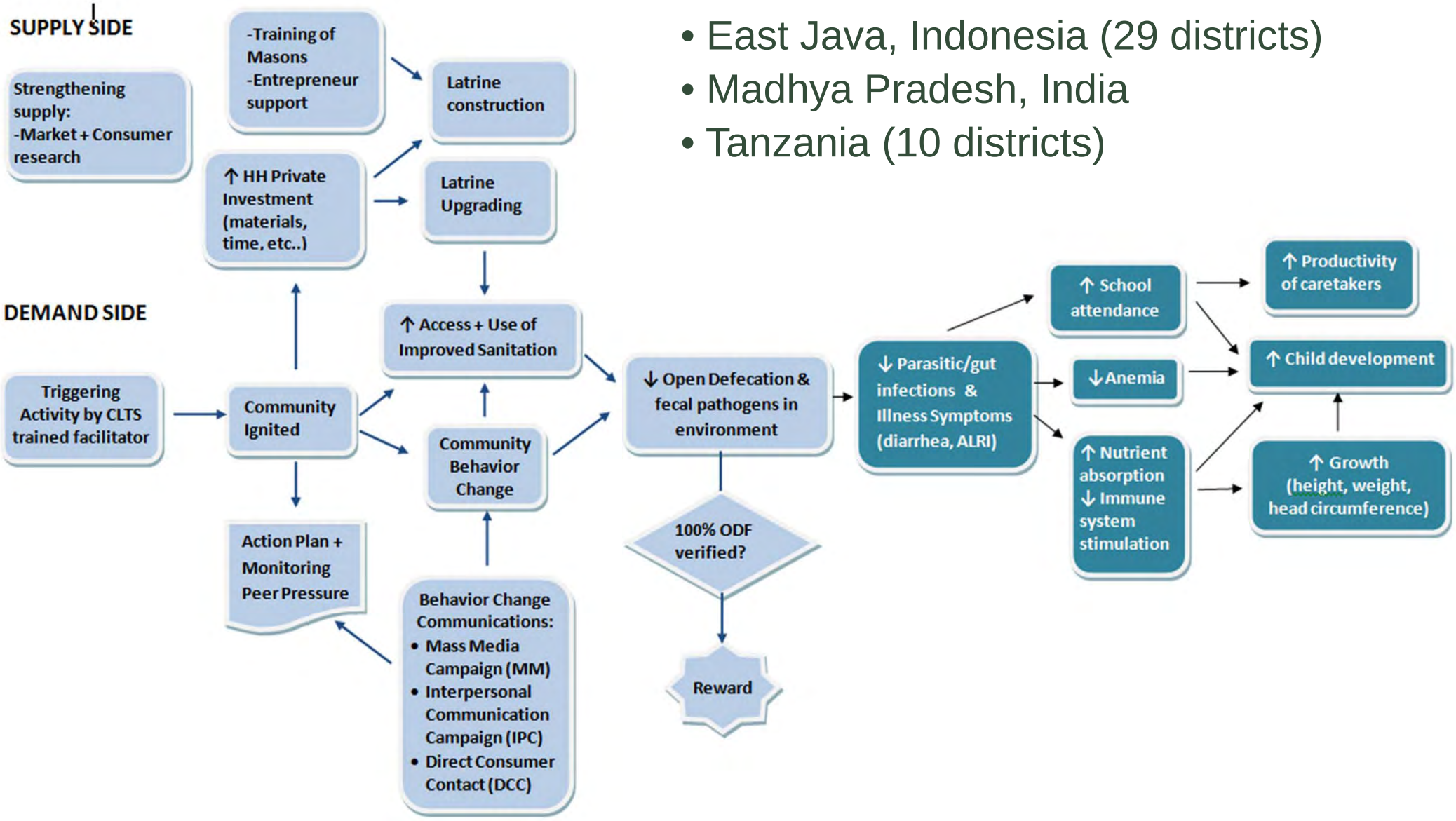
wsp
water and sanitation program

Agenda

- WSP's Rural Sanitation and Handwashing programs
- Outcome Measures
- Challenges (1): underreporting of symptoms
- Challenges (2): attrition
- In-focus: Appropriate recall periods for diarrhea and other caregiver-reported symptoms

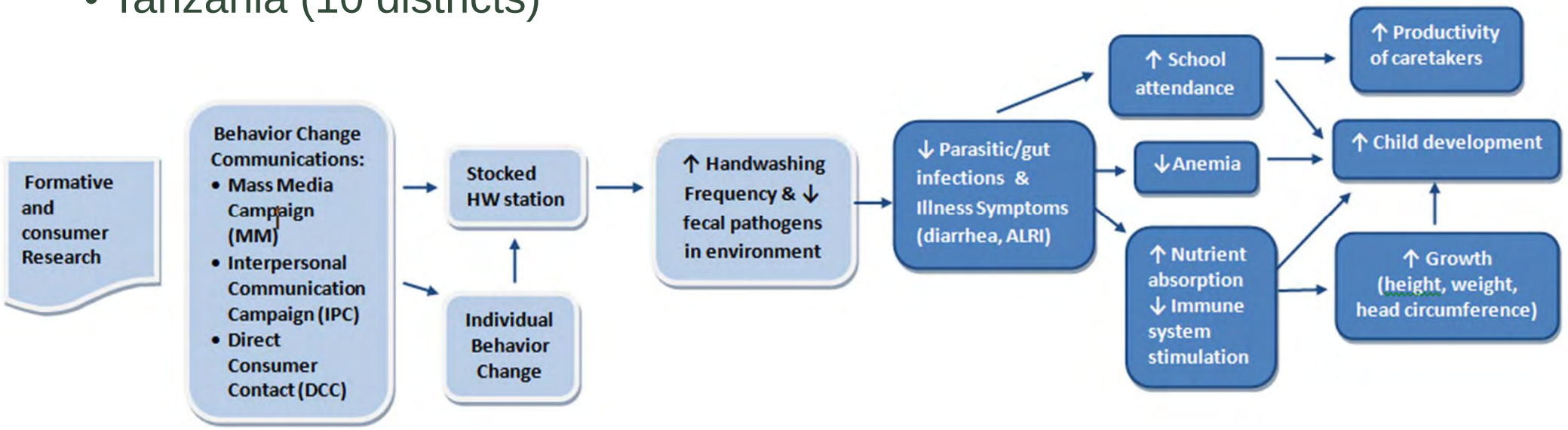
WSP's Rural Sanitation Program

- East Java, Indonesia (29 districts)
- Madhya Pradesh, India
- Tanzania (10 districts)



WSP's Hand Washing Program

- Perú
- Senegal (4 regions)
- Vietnam (3 provinces)
- Tanzania (10 districts)



Outcome Measures (I)

Health and Welfare Impacts		
What Does the Evaluation Measure?	**How Is It Being Measured?**	**Measuring Instrument**
Diarrhea prevalence	Caregiver reported symptoms collected in a 14-day health calendar	Household questionnaire
Child growth	Anthropometric measures: - Weight - Height - Arm and head circumference	In-household collection of anthropometric measures
Child developmental and social-emotional screening	Composite measures	Ages and stages questionnaires adapted
Anemia	Hemoglobin concentration (< 110g/L per international standards)	In household collection and analysis of capillary blood using the HemoCue photometer

Outcome Measures (II)

Health and Welfare Impacts		
What Does the Evaluation Measure?	**How Is It Being Measured?**	**Measuring Instrument**
Parasite prevalence	Egg counting of stool preserved samples with modified Kato Katz method; ELISA for protozoan	In-house collection of stool from children (0-24 mo) at baseline
Environmental contamination (selected countries & measures) • sentinel objects • drinking water (hh level) • hand-rinse • water source contamination	• Membrane filtration for prevalence of E.coli; total coliforms	In-house collection of water samples, rinse of sentinel objects and hands, water source samples
Economic	• productivity and time savings– caretakers • facilities and implements (e.g. soap) costing - capital cost and maintenance • opportunity costs	Household questionnaire
Education	School enrollment and attendance	Household questionnaire

Intermediate Outcome Measures

Handwashing Behavior and Determinants		
What Does the Evaluation Measure?	**How Is It Being Measured?**	**Measuring Instrument**
Handwashing with soap behavior	Direct observation of place for handwashing stocked with soap and water	Household questionnaire
	Self-reported handwashing with soap behavior	Household questionnaire
	By event: time, juncture, by who, handwashing materials, both hands	Structured Observations
Determinants of handwashing with soap behavior	Opportunity, ability, and motivation determinants	Household questionnaire
Determinants of sanitation behavior	Opportunity, ability, and motivation determinants	Household questionnaire

Issues in Outcome Measurement

- Behavior change
  - Hand washing (structured observations)
  - latrine/toilet use
- Measures of “intangibles”: privacy, security, prestige
- CLTS and *collective* responses: reputation, shame (trust games?)
- Open-defecation free communities: 100%? (transect walks?)
- Self-report: not truth but socially acceptable answers? i.e. knowledge vs action effects (list randomization, non-verbal response methods?) social desirability bias
- Subjective appreciation: different answers for same type of facilities? (vignettes?)

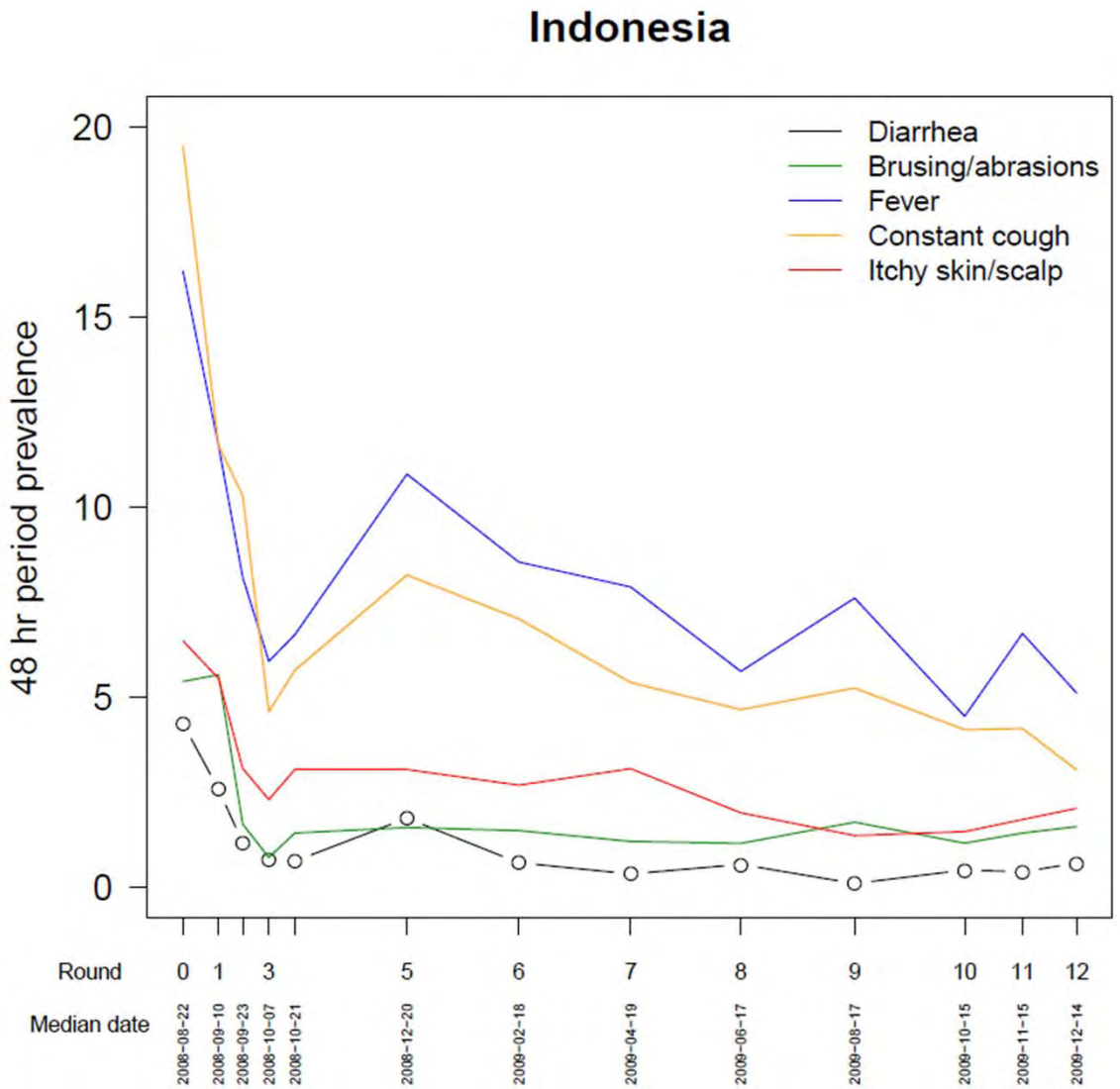
WSP's Impact Evaluations – Sample Summary

	ARMS (T,C)	clusters/ arm	HH sample size		Stool sample size		Water (hh)		Community Survey		HW structural obs.	
			BL	EL	BL	EL	BL	EL	BL	EL	BL	EL
INDONESIA	2	80	2,090	2,500	0	1,120	0	800	160	160	NA	NA
MP, INDIA	2	40	2,000	3,000	260	1,200	1,000	800	80	80	NA	NA
PERU*	3 (T), 2 (C)	40	3,500	3,500	160	1000	160	1000	120	120	160	600
VIETNAM	2	140 (T), 70	3,150	3,150	0	0	0	0	210	210	0	600
SENEGAL	2	54, 56	1,550	1,550	110	0	0	0	110	110	110	250
TANZANIA*	3 (T), 1 (C)	47(3), 48	1,700	4,500	NA	2,000	0	0	NA	181	0	375

TANZANIA* : T1 = handwashing
T2 = handwashing and rural sanitation
T3 = rural sanitation

PERU* : T1 = mass media treatment at the provincial level
T2 = social mobilization treatment at the district level
T2-schools = promotion of handwashing behavior in primary schools
C-schools= children who attend similar primary school where HW promotion not offered

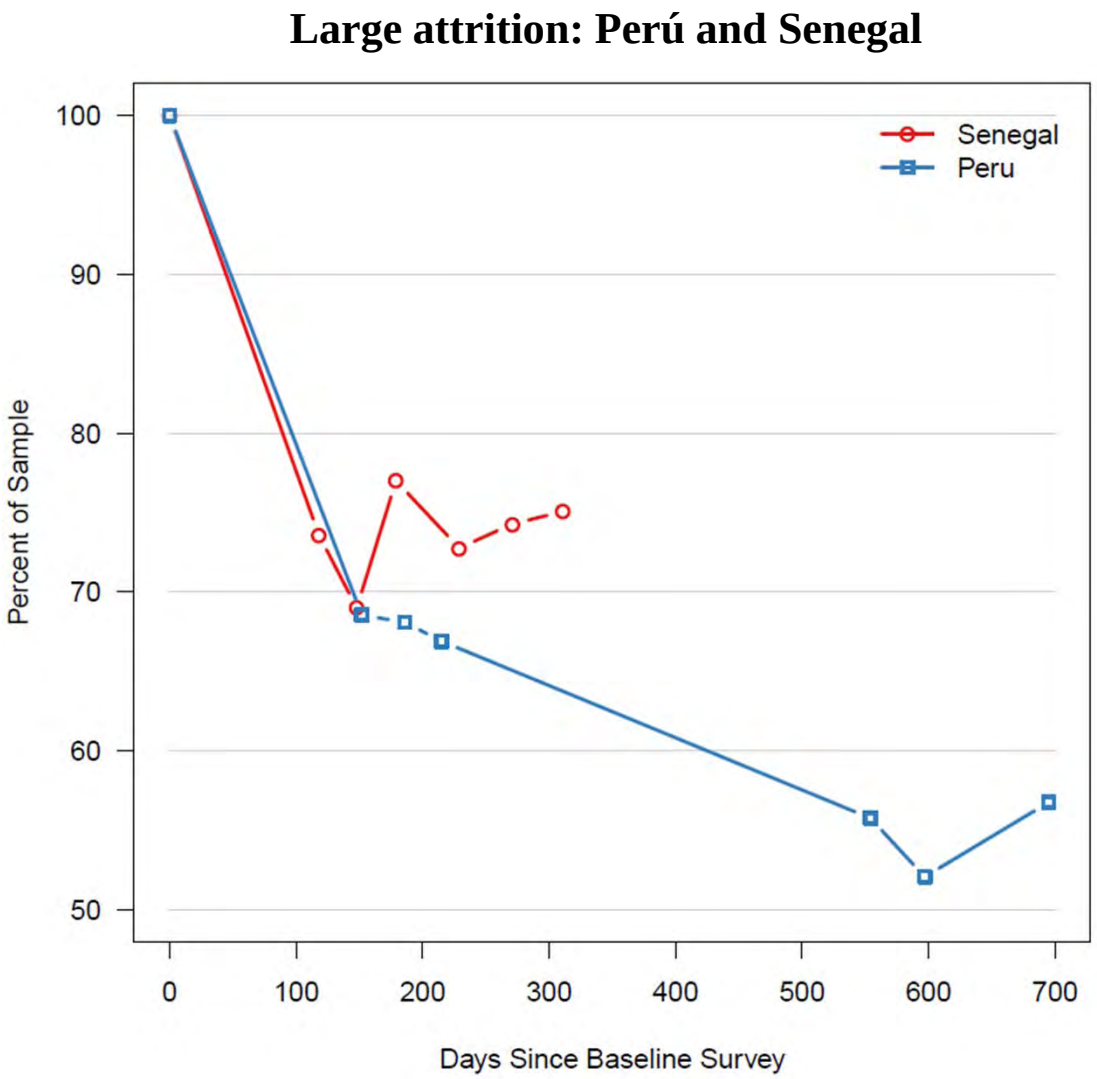
Challenges (1): Symptom underreporting



- Large declines in both diarrhea and non intervention or season related symptoms :
- Underreporting due to health cadres collection effect?

Halted repeated rounds

Challenges (2): Attrition



- Some countries showed a decline in sample size in first and subsequent rounds
- Long questionnaires effect ? (country-particular)
- Child not present
- Supervision problems?

Some strategies: Repeated measurements and attrition

- Supplement samples (original replacement rules)

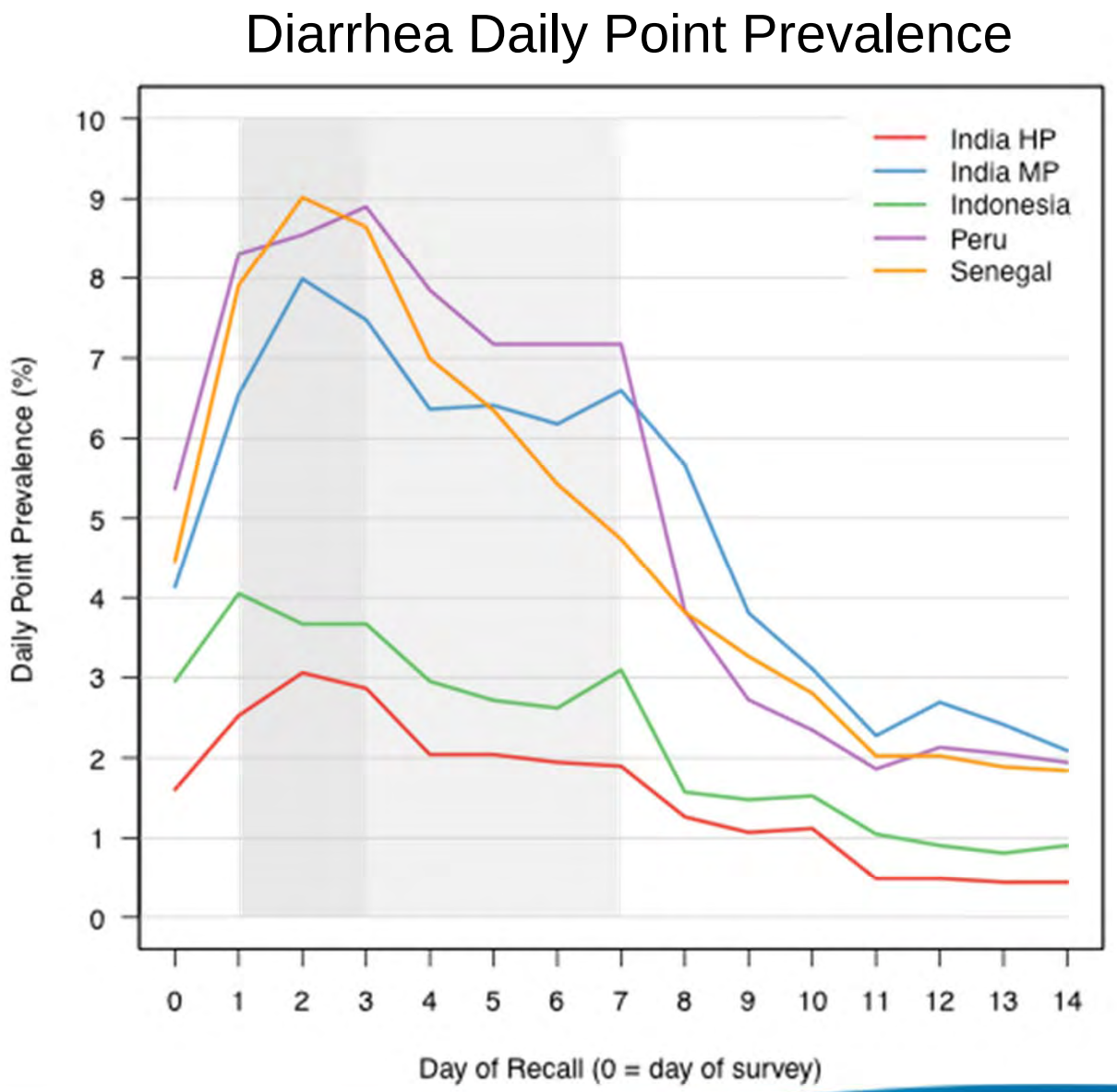
  Eligible households:

  - Living in the cluster at time of baseline (not moved in)
  - Age eligibility projected forward
- Supervision problems?
  - Cash prize for enumerator team with lowest rate of attrition
  - Adherence to replacement rules- if hh not found, workload is not reduced

In Focus:
What is the appropriate recall period to ask about diarrhea symptoms?

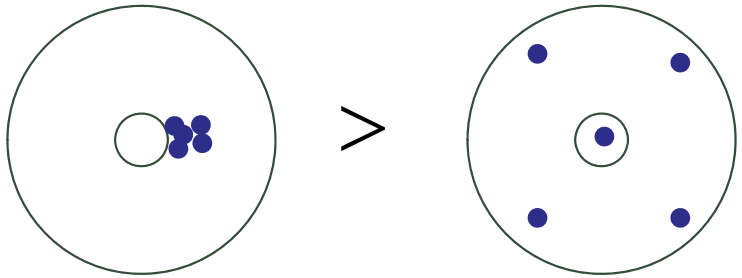
- Numerous studies have looked into recall bias in caregiver-reported symptoms and diarrhea
  (Alam 1989, Boerma 1991, Byass 1994, Ramakrishnan 1999, Melo 2007, Feikin 2010, Zafar 2010)
- It is presumed that reporting closer to the interview is more accurate (Ross 1986)
- Recall up to 2-3 days is the least biased
- Recall beyond 7 days is very poor
- Recommendation has been to ask about diarrhea in the past 2-3 days to minimize bias.
- Our recommendation differs from this – we will explain why.

In the WSP baseline, diarrhea reporting declines after day 3 and falls precipitously after day 7



When used to estimate treatment effects (RR or RD), poor symptom recall creates a bias-variance tradeoff

- Unbiased and highly precise estimators are desired but often unavailable.
- It is often better to use a slightly biased/precise estimator than an unbiased/noisy estimator.

Biased/precise  Unbiased/noisy

- With symptom recall, we face a tradeoff:
  - Short recall (2 days) = minimal bias
  - Longer recall = more information (lower variance)
  - Where is the “optimal” recall window?

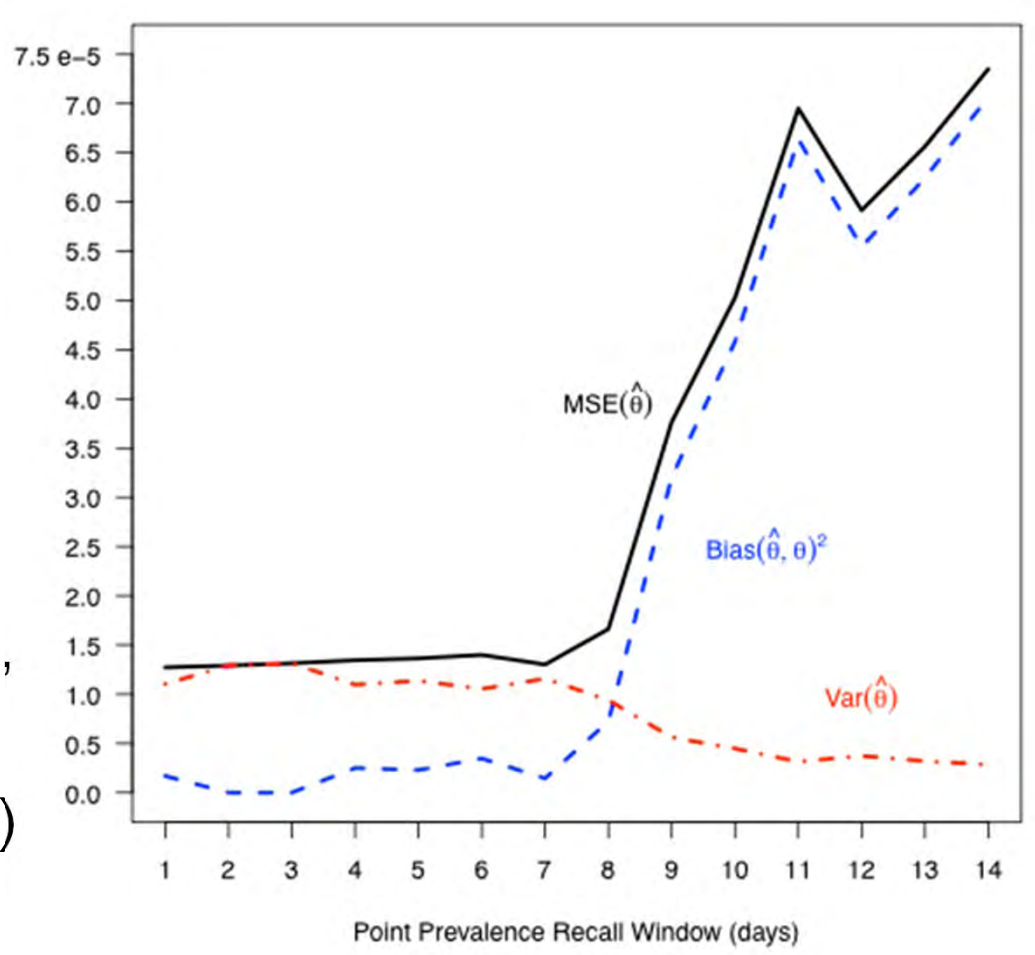
Diarrhea Recall
The MSE helps us chart the bias-variance tradeoff

- The Mean Squared Error (MSE) is a function that combines bias and variance:

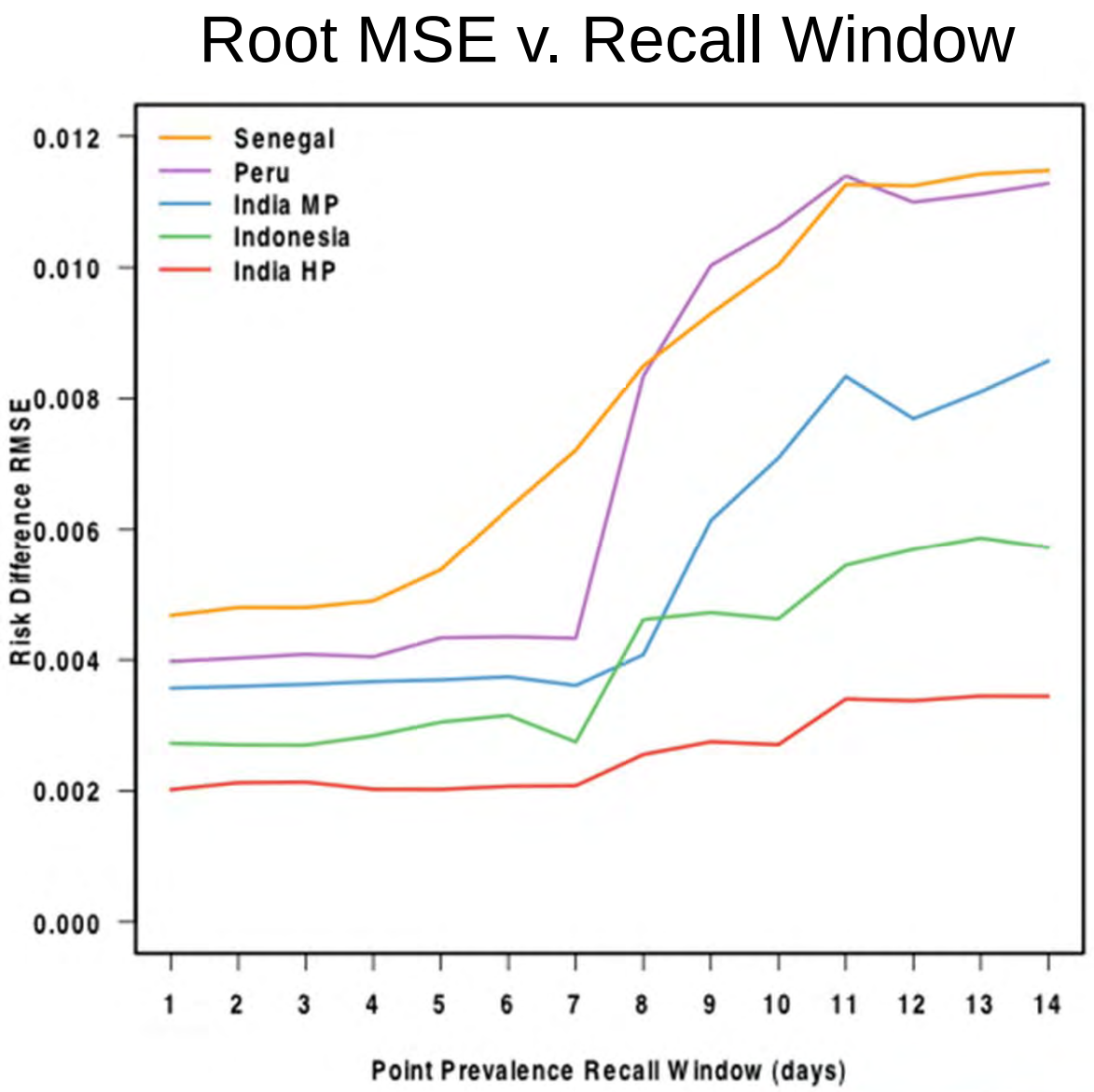
$$MSE\ (\hat{\theta}) = Var\ (\hat{\theta}) + Bias\ (\hat{\theta}, \theta)^2$$

- Estimators with lowest MSE optimize the bias-variance tradeoff (Geman 1992)
- In simulations from WSP data, bias dominates the MSE.
- But, bias is small (0.1 – 0.2 %) with up to 7 days of recall

India MP Cohort, Risk Difference



A 7 day recall window minimizes the MSE for the risk difference in diarrhea in 4 of the 5 WSP cohorts



Diarrhea Recall:
Use of 2 day versus 7 day recall requires larger samples

Relative Sample Size Required
2 day vs. 7 day Recall

Cohort	Period Prevalence	Point Prevalence
Senegal	1.52	1.20
Indonesia	1.77	1.27
India MP	1.73	1.40
India HP	1.89	1.51
Peru	1.92	1.52

Note:
Period prevalence = any diarrhea in the last X days?
Point prevalence = number of days ill / days of observation

Diarrhea Recall: Summary

- **Use a 7 day recall with daily symptom records**
- Recall windows beyond 3 days are biased, but the bias is very small in RR and RD estimators
- Recall beyond 7 days is very unreliable
- 7 day recall optimizes the bias-variance tradeoff
- Reducing the recall window from 7 days to 2 days would require an increase in sample size in the WSP cohorts of 20 – 92%

Contacts and references

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Auxiliary Slide:
Diarrhea Recall Simulation Analyses

- Simulated cohorts with and without recall bias using a validated model for recurrent infections (Schmidt 2007, 2009, 2010) with parameters from WSP
- Relative risk estimators with 7 day recall have little bias (< 0.1%)
- Risk difference estimators with 7 day recall also have very little bias: 0.1 – 0.2 percentage points.
- A typical profile from the India MP cohort:

True Risk Difference (RD)	-1.18%
RD at 7 days with error	-1.07%
Bias in the RD	**-0.11%**