

Efficacy of Waterless Hand Hygiene as Compared to Handwashing with Soap: A field study in Dar es Salaam, Tanzania



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Motivation



- Handwashing (HW) is effective at reducing illness, yet low rates of HW globally
- Evidence that availability of water correlated with frequency of HW
- Over 800 million do not have access to improved water supplies
- Lack of research on waterless hand hygiene methods, such as alcohol-based hand sanitizer (ABHS) in developing countries



Objectives



- Evaluate antimicrobial efficacy of ABHS compared to HW under field conditions
- Explore efficacy by baseline levels of bacteria
- Investigate relationship between baseline levels of bacteria on right and left hands
- Assess user perceptions of ABHS as an alternative hand hygiene method



Methods



- **Two field sites in Dar es Salaam:**
 - School health club event - Students & Teachers
 - Health clinic - Mothers & Nurses
- **Personal interviews with respondents**
- **Hand sampling before and after the use of ABHS, handwashing, or no hand hygiene**
- **Samples analyzed in field lab by membrane filtration for *E. coli* and enterococci (ENT)**

	ABHS	Handwashing	Control	Total
Students	38	0	15	53
Adults	80	53	18	151
Total	118 (58%)	53 (26%)	33 (16%)	204

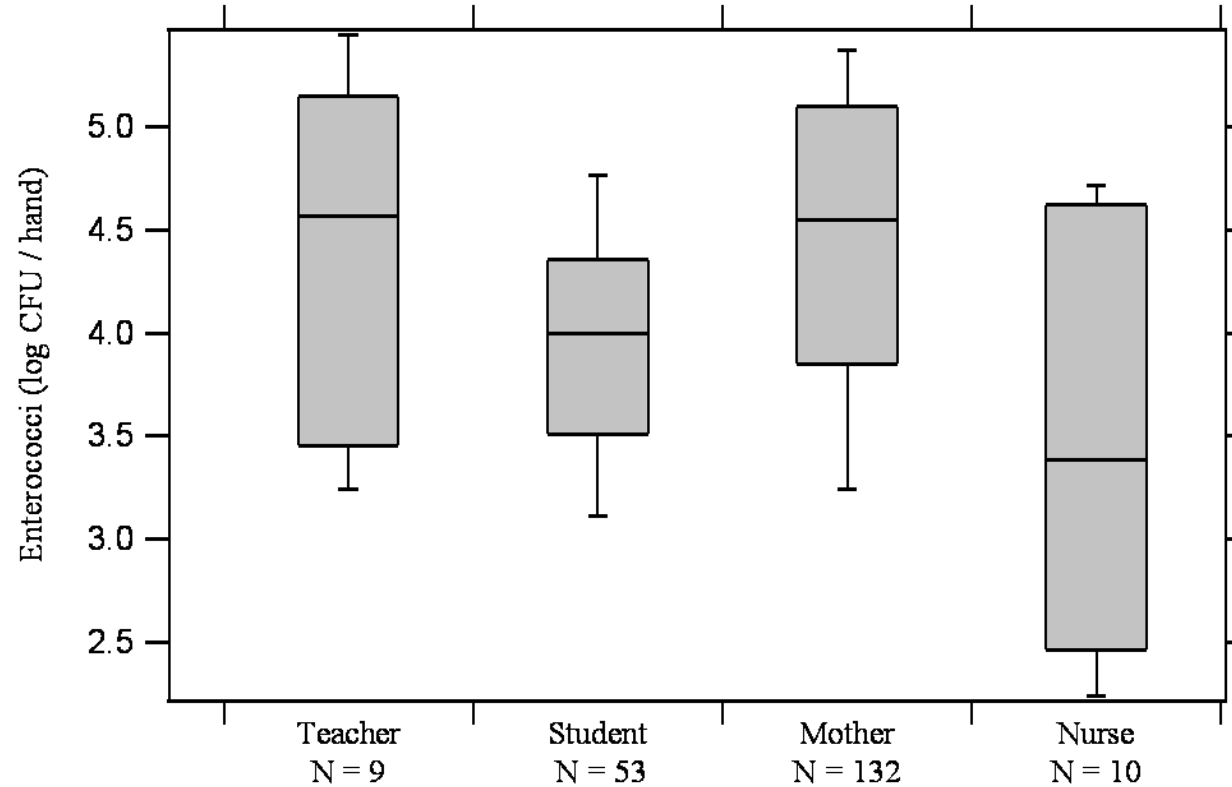
Other findings:

Girl students had less bacteria than boys

ENT higher on dominant (right) hands

ENT higher on hands of respondents reporting ARI

Regular soap use correlated with lower levels of bacteria



Results - Baseline levels of bacteria

E. coli 2.49 log CFU / hand

Enterococci 4.24 log CFU / hand



Levels of *E. coli* and enterococci on left and right hands of same individual significantly correlated

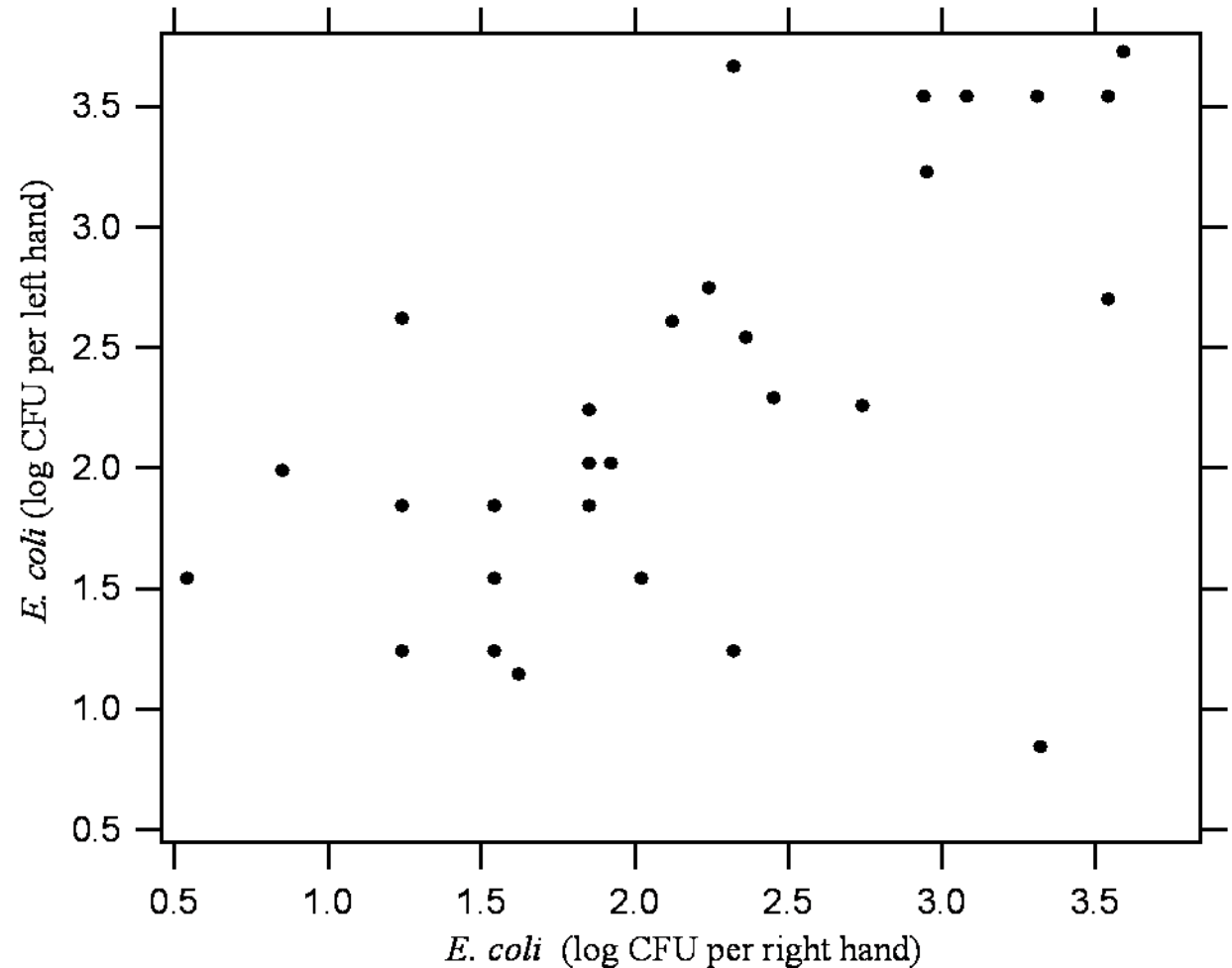
E. coli $r = 0.633$

ENT $r = 0.473$

Mean absolute differences between hands (log CFU/hand):

E. coli 0.51

ENT 0.66



Results: Control Group



Results:

ABHS efficacy under field conditions



Mean log
reductions in
CFU/hand (95% CI)

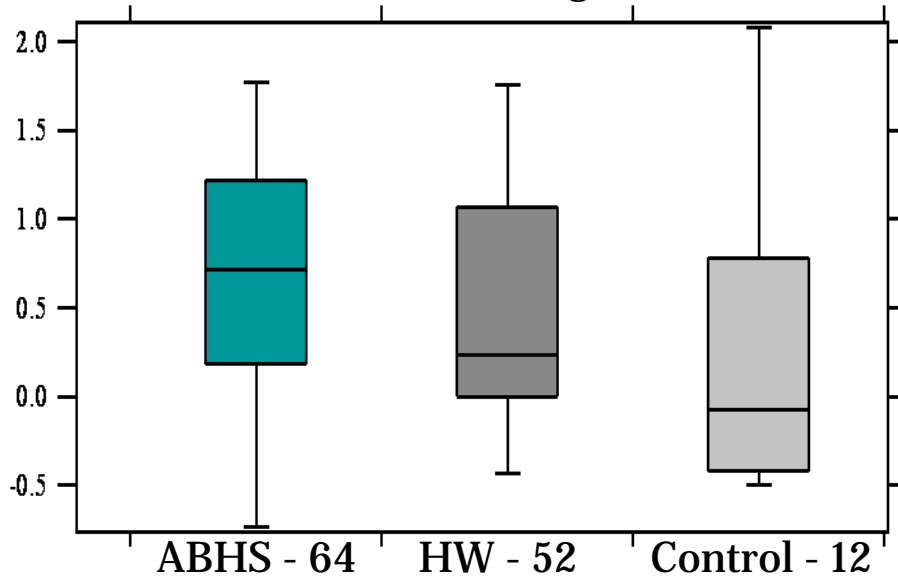
	Students (N=53)	Adults (N=151)
<i>E. coli</i>	0.25 (-0.03-0.53)	0.66 (0.46-0.86)
enterococci	0.37 (0.11-0.63)	0.71 (0.49-0.93)

Results: ABHS vs. HW among adult mothers

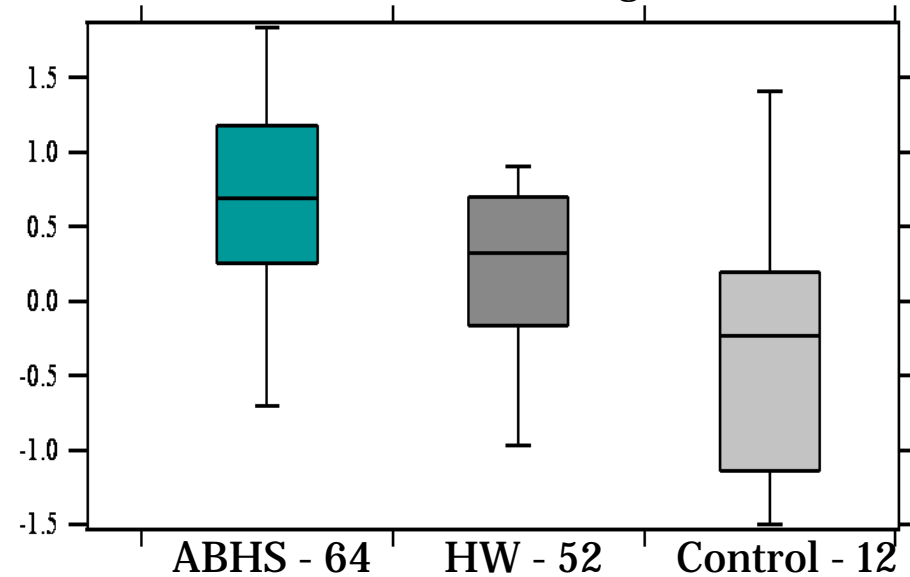


	Hand sanitizer	Handwashing	Difference
<i>E. coli</i>	0.66 $P < 0.001$	0.50 $P < 0.001$	0.16 $P = 0.34$
enterococci	0.64 $P < 0.001$	0.18 $P = 0.065$	0.46 $P = 0.004$

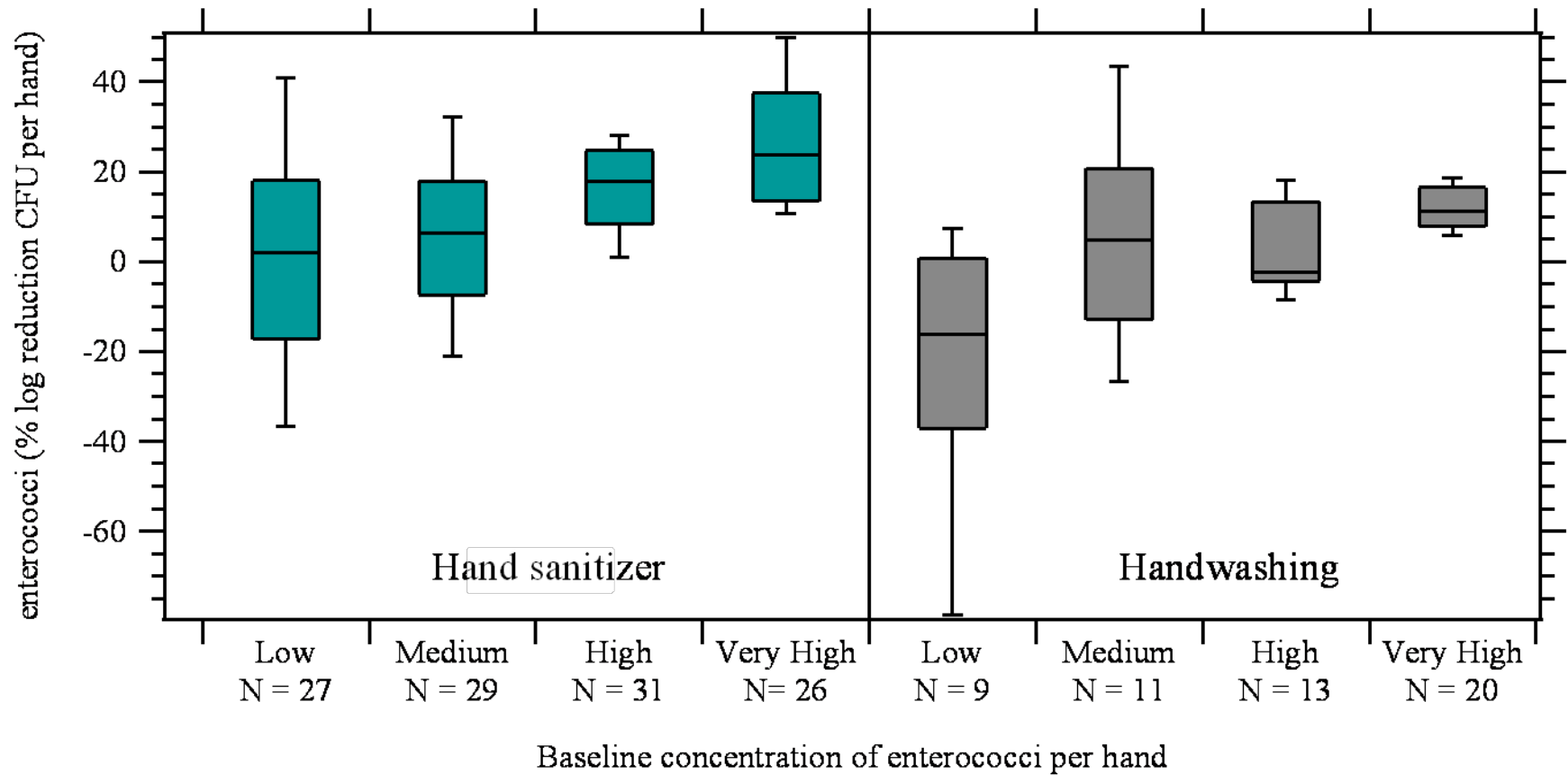
Reduction of *E. coli* (log CFU/hand)



Reduction of enterococci (log CFU/hand)



Results: Efficacy by Baseline Levels of Bacteria



Conclusions

- ABHS performed as well or better than HW in field
- 94% of respondents reported they would use ABHS in home
- Efficacy not affected by higher levels of baseline bacteria or visible dirt
- Variation in bacteria levels found between hands has implications for measuring hand hygiene in the field



- Future work :
 - Health benefits
 - Behavior
 - Financial viability