



# PROPAGATION OF BEHAVIOR AND ILLNESS: ADULT HANDWASHING AND ITS EFFECT ON CHILD ILLNESS IN SIDDHARTHANAGAR, NEPAL

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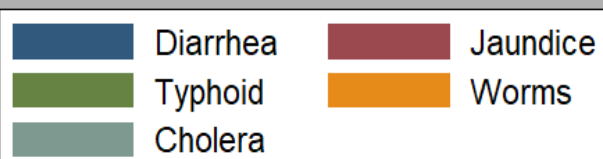
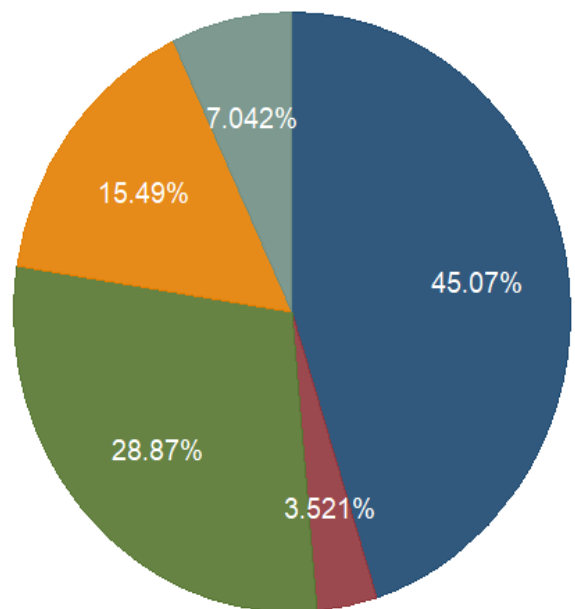
# MOTIVATION:

- Waterborne illnesses such as diarrhea, typhoid and cholera account for more than 500,000 deaths a year. The majority of which are children.– *World Health Organization*
- Improved water sources reduce diarrhea morbidity by 21%, while improved sanitation habits like handwashing can reduce the number of cases by 35%. – Center for Disease Control

# CHILD ILLNESS: SIDDHARTHANGAR

## Children Effected by Waterborne Disease

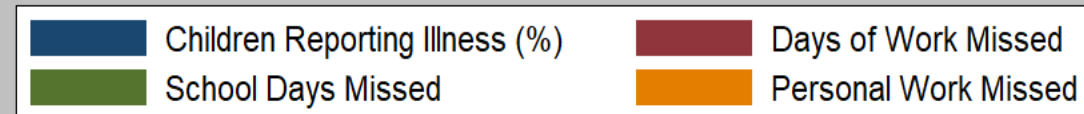
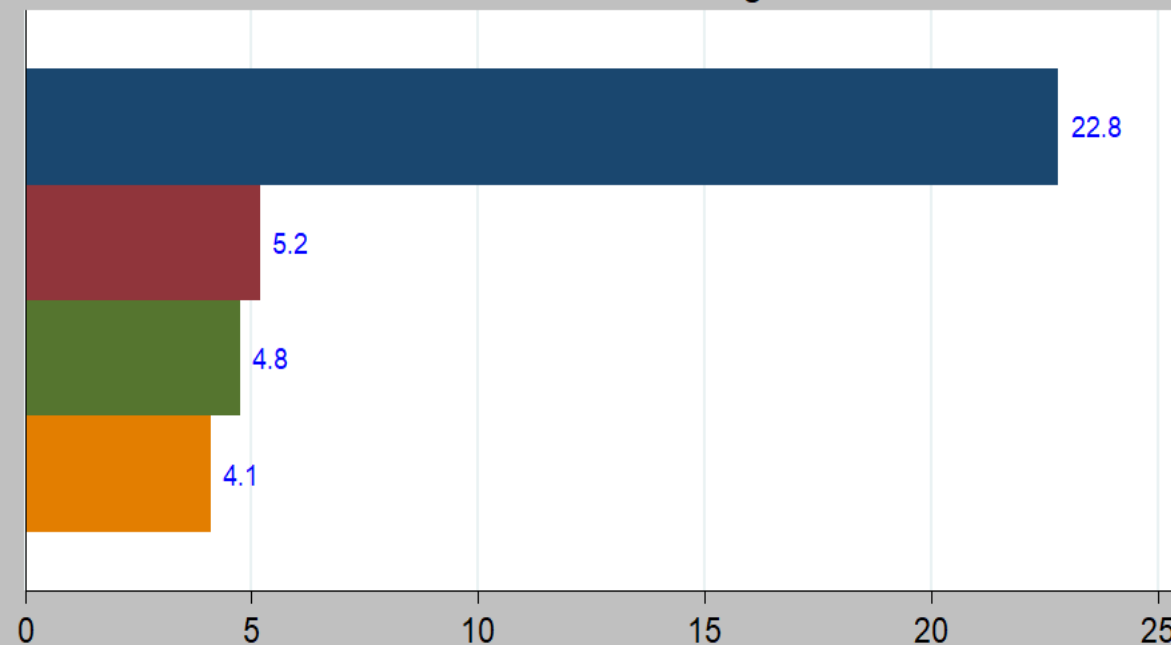
Location: Siddharthangar



Source: Nepal Study Center, UNM, June 2016

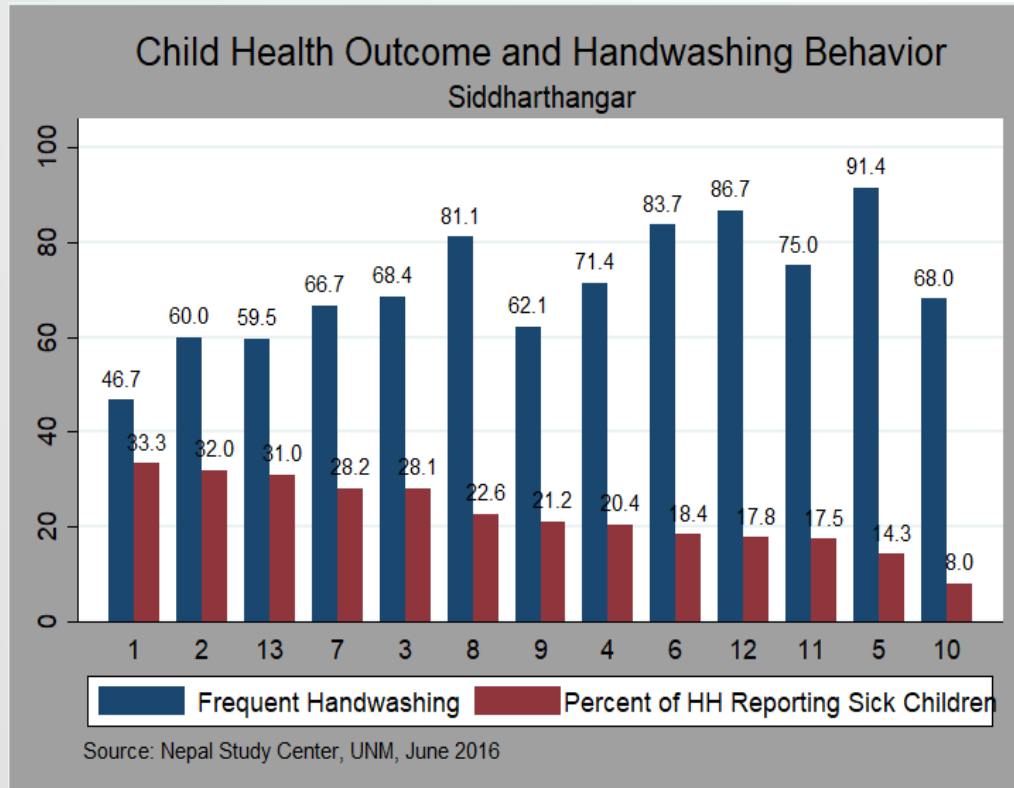
## Child Illness and Impacts

Location Siddharthangar



Source: Nepal Study Center, UNM, June 2016

# ADULT BEHAVIOR INFLUENCING CHILD HEALTH



- The survey indicates waterborne illnesses are having adverse effects on the community.
- Evidence suggests that children are at the highest risk of these diseases,
- The trend in the data matches the scientific literature.
- Higher frequency of handwashing corresponds to lower incidents child illness.

# RESEARCH QUESTIONS:

- Does adult behavior effect children's heath?
- Does adult handwashing reduce the frequency of child illness?

# PRIOR LITERATURE

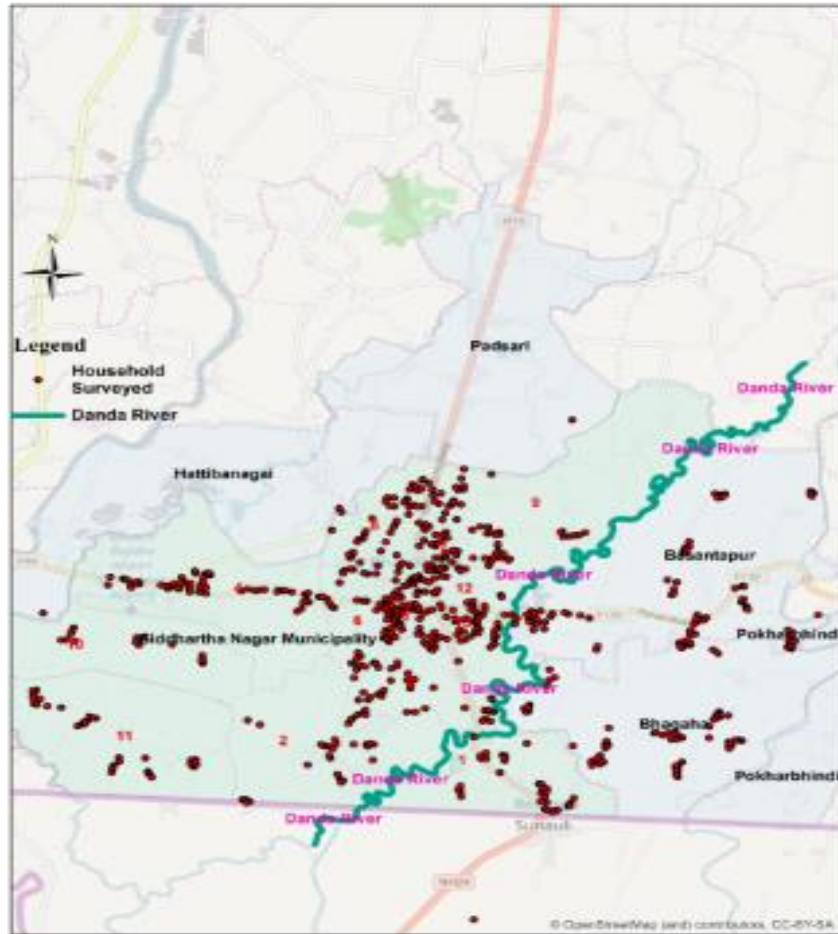
## **STANTON AND CLEMENS (1987): DHAKA BANGLADESH**

- Education intervention to improve: handwashing, food prep, open defecation, and inattention to proper disposal.
- 51 communities sampled
- 6<sup>th</sup> months after the intervention rate of diarrhea per 100 person-weeks in children under 6 was 4.3 in the intervention communities and 5.8 in the control communities (26% protective efficacy;  $p < .0001$ )
- Notable improvement in handwashing practices

## **CURTIS ET AL (2001): BURKINA FASO NIGER**

- Comprehensive 5 year preliminary survey.
- Designed curriculum and material for primary schools
- PAI's: Radio, comic play, house to house visits.
- Cluster sampling
- After the program there 31% of mothers reported using soap compared to 13% a priori.

# THE DATA:



- **Sampling Procedure:** Proportional random sampling based on the ward population size.
- **Total Sample:** 748 Households (Our model is focused on the 570 urban households sampled)
- **Source:** Nepal Study Center, UNM, Summer 2016

# METHODS

1. Log-Linear Regression Model
2. Probit Regression Model
3. Poisson Regression Model

Frequent Handwashing	Sick Child		Total
	0	1	
0	96	70	166
1	344	60	404
Total	440	130	570

Peason chi2(1)= **49.8701** Pr = **0.000**

$$(Sick\ Child)^* = \beta(Adult\ Hand\ Washing)^T + \epsilon$$

$$\log(Sick\ Child) = \phi + \gamma(Adult\ Handwashing) + \delta$$



# MODEL SPECIFIC VARIABLES:

Variable Description			
Variable Description	Description	Mean	S.D.
<b><i>Dependent:</i></b>			
Tot Number of Sick Children	Number of sick children reported by household.	0.3263	0.7081
log (Sick Child)	log( Tot No Sick Child +1)	0.1938	0.3777
Sick Child	Indicates whether a household reported a sick child. 1=Yes 0=No	0.2281	0.4200
<b><i>Independent:</i></b>			
Frequent Handwashing	Household reported always washing their hands after using restroom. 1=Yes 0=No	0.7088	0.4547
Treat or Boil Water	Household reported treating or boiling water before usage. 1=Yes 0=No	0.2824	0.4506
Own Tube-well	Households reported owning a tubewell. 1=Yes 0=No	0.3404	0.4742
Own Toilet	Households reported owning a toilet. 1=Yes 0=No	0.6736	0.4693

# LOG-LINEAR ESTIMATES

Log-Linear Estimates of Child Sickness			
	Model 1	Model 2	Model 3
<b>Total No. of Sick Children</b>			
Frequent Handwashing	<b>-0.229***</b>	<b>-0.224***</b>	<b>-0.233***</b>
	<b>(0.038)</b>	<b>(0.038)</b>	<b>(0.029)</b>
Boil or Filter Water		<b>-0.039</b>	<b>-0.044</b>
		<b>(0.031)</b>	<b>(0.032)</b>
Own a Tubewell			<b>-0.050</b>
			<b>(0.031)</b>
Own a Toilet			<b>-0.027</b>
			<b>(0.032)</b>
Constant	<b>0.354***</b>	<b>0.362***</b>	<b>0.177***</b>
	<b>(0.035)</b>	<b>(0.035)</b>	<b>(0.032)</b>
R-squared	<b>0.078</b>	<b>0.080</b>	<b>0.085</b>
BIC	<b>463.3309</b>	<b>468.3649</b>	<b>477.8906</b>
N	<b>569</b>	<b>569</b>	<b>569</b>
AIC	<b>454.6432</b>	<b>455.3332</b>	<b>456.1712</b>
*P<0.05, **P<0.01, ***P<0.001			

# PROBIT ESTIMATES

Probit Estimates of Child Sickness			
	Model 1	Model 2	Model 3
<b>Sick Children</b>			
Frequent Handwashing	<b>-0.854***</b> (0.125)	<b>-0.838***</b> (0.125)	<b>-0.858***</b> (0.128)
Boil or Filter Water		<b>-0.144</b> (0.140)	<b>-0.159</b> (0.142)
Own a Tubewell			<b>0.041</b> (0.131)
Own a Toilet			<b>-0.186</b> (0.129)
Constant	<b>-0.198*</b> (0.098)	<b>-0.170</b> (0.102)	<b>-0.119</b> (0.127)
R-squared			
BIC	<b>574.355</b>	<b>579.6331</b>	<b>590.1495</b>
N	<b>569</b>	<b>569</b>	<b>569</b>
AIC	<b>565.6677</b>	<b>566.6015</b>	<b>568.4301</b>
*P<0.05, **P<0.01, ***P<0.001			

# Poisson Estimates

## Poisson Estimates of Child Sickness

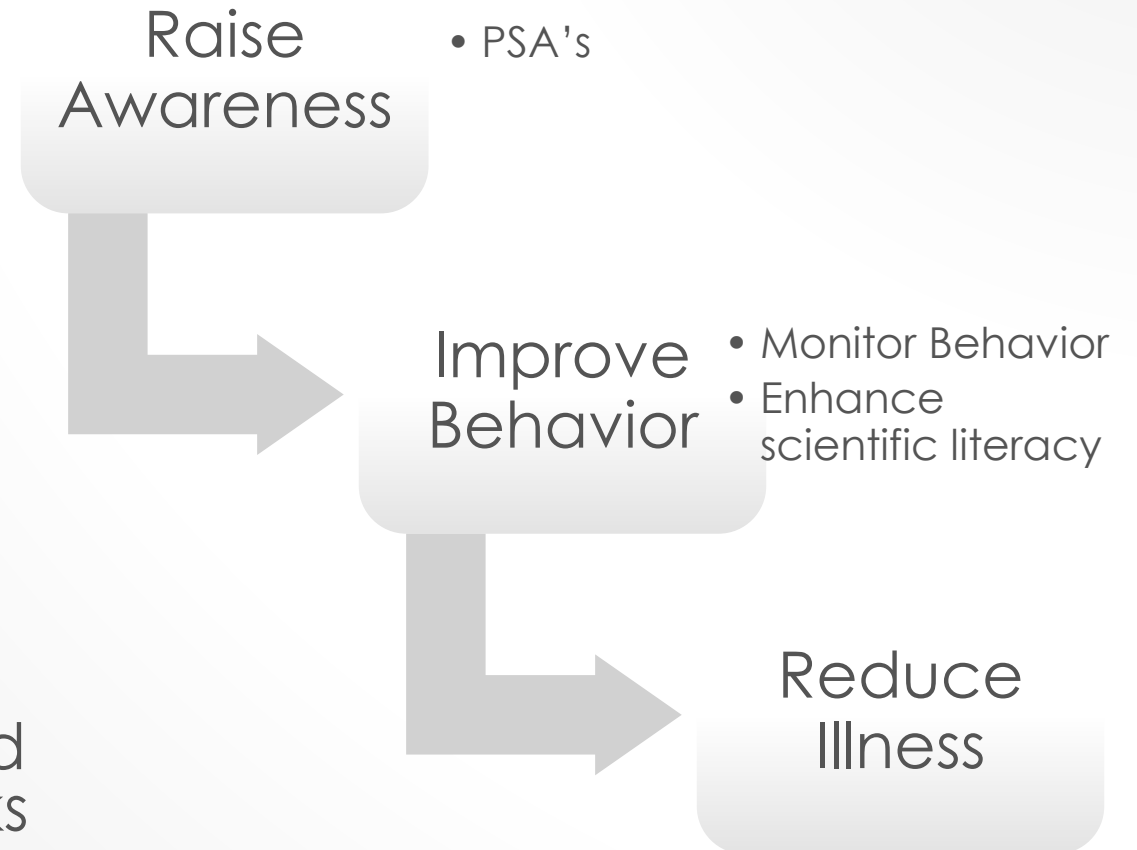
	Model 1	Model 2	Model 3
<b>Total No. of Sick Children</b>			
Frequent Handwashing	<b>-1.029***</b> (0.180)	<b>-0.995***</b> (0.182)	<b>-1.051***</b> (0.172)
Boil or Filter Water		<b>-0.290</b> (0.210)	<b>-0.327</b> (0.212)
Own a Tubewell			<b>-0.313</b> (0.189)
Own a Toilet			<b>0.186</b> (0.169)
Constant	<b>-0.527***</b> (0.110)	<b>-0.477****</b> (0.116)	<b>-0.461**</b> (0.157)
R-squared			
BIC	<b>837.7101</b>	<b>841.4819</b>	<b>848.9637</b>
N	<b>569</b>	<b>569</b>	<b>569</b>
AIC	<b>829.0224</b>	<b>828.4502</b>	<b>827.2443</b>
*P<0.05, **P<0.01, ***P<0.001			

# RESULTS

- Our tests validate the negative relation in adult handwashing behavior and child sickness that was initially observed in the earlier graphs as well as current empirical evidence.
- Across all models handwashing is a significant factor in reducing child illness
- Marginal analysis of the probit model indicates washing hands reduces the probability of child illness by 23.5 (ceteris paribus)

# SUGGESTIONS FROM EXISTING LITERATURE

- Stanton & Clemens (1987) and Curtis et al (2001) conducted a series of surveys and controlled intervention.
- Both works cite the efficacy of education intervention in decreasing the occurrence of diarrhea.
- Curtis et al: 18% increase in soap usage after the intervention.
- Stanton & Clemens: Post intervention diarrhea rates declined from 5.8 occurrences per 100 weeks to 4.3



# CONCLUSIONS AND RECOMMENDATIONS

- Initiate a series baseline surveys similar to those described in Curtis et al (2001), monitors household behavior.
- Formulate a series of public service announcements through local radio and media outlets to increase awareness on the relation between waterborne disease and handwashing.
- The final stage would be to implement a handwashing element to the current scientific curriculum in local schools.

# REFERENCES AND ACKNOWLEDGEMENTS

A special thank you to Professor Bohara, Jesus Vazquez, Aaron Montano and the team at the University of New Mexico. Without their tireless efforts and unyielding commitment, this project would not be possible.

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