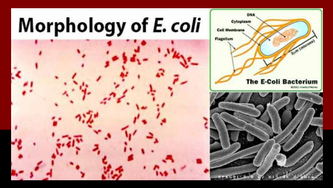
Sanitation and Hygiene Approaches and Their Impact on Health– A Case Study in Rural Nepal



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(Fall 2017, ECON 395, Department of Economics, UNM)

Introduction

In this project, we investigated sanitation and hygiene behaviors as well as presence of Ecoli in kitchen water as the factors that affect a person's likelihood of getting sick from diarrhea in three locations: Siddharthanagar (urban), Basantpur (rural), and Bagaha (rural). Availability of flush toilets and habit of washing hands is still a challenge in Nepal, along with safe drinking water. Our project looks at these factors to determine which variables are most relevant.

Literature Review

Water-related sicknesses form one of Nepal's major killer. An estimated 28,000 children under five die every year from diarrhea. In urban areas of Nepal an estimated 61.4% of households have a flush toilet; in rural areas, the number falls to 27%. There are now several grass root level effects being done by groups like UNICEF, WaterAid, Newah, and USAID that include community, especially women's, participation in water and sanitation programs and education via the school galvanizing students as agents of change, lobbying their schools to provide drinking water and toilet facilities and take sanitation and hygiene messages to their families

Research Question

What factors affect getting sick from diarrhea? How important is availability of flush toilets, habit of washing hands, and kitchen water free of E. coli? Does it vary for urban vs. rural areas?

Hypothesis

The probability of getting sick due to diarrhea decreases with availability of flush toilet, hand washing habit, and kitchen water free of E. coli bacteria as well as lower for urban vs rural area

Data

Data used for this analysis was collected by Nepal Study Center at University of New Mexico. The independent variables are FlushToilet (binary), HandWash (binary), ecoli_rank (binary), and Location. The dependent variable is family member sick due to diarrhea within the last six months by respondent.

Methodology

Method: STATA logit **Tests:** β–value, SE, AIC, BIC, chi-squared, pseudo R-squared

Independent Variables:

FlushToilet : Does the household has flush toilet? Binary Yes or No
HandWash : Do people in the household wash hand after going to toilet? Binary Yes or No
ecoli_rank : Is there a presence of fecal Coliform (E. coli) in kitchen water? Binary Yes or No
Location : Siddharthanagar (urban), Basantpur (rural), and Bagaha (rural)

Dependent Variables:

Diarrhea : Does any member of household has diarrhea or dysentery?

Models

Since our dependent variable is binary in nature, it is in our best interest to carry out a nonlinear statistical model. In our case, the method of choice is the robust logistic regression. Below is the written-out form of the model we will be implementing

Model 1: Diarrhea = β0 + β1*FlushToilet + β2*HandWash + ut

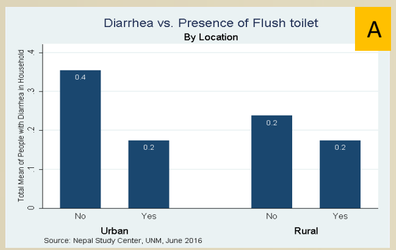
Model 2: Diarrhea = β0 + β1*FlushToilet + β2*HandWash + β3*ecoli_rank + ut

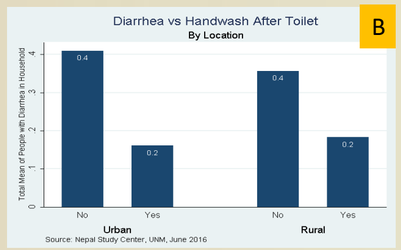
Model 3: Diarrhea = β0 + β1*FlushToilet + β2*HandWash + β3*ecoli_rank + β4*Basantpur + β5* Bagaha + ut

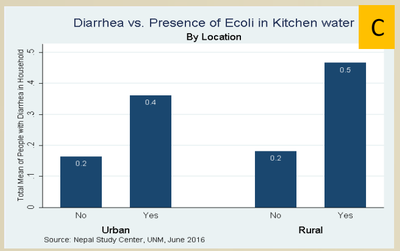
Descriptive Statistics

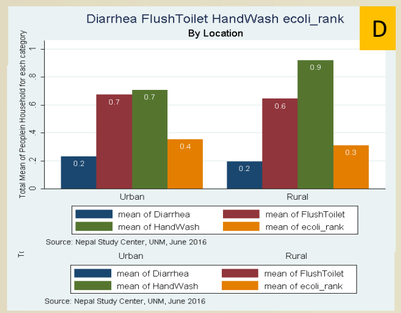
Factors Causing Diarrhea

VARIABLES	Model 1	Model 2	Model 3
FlushToilet	-0.164	-0.482	-0.452
	0.188	0.293	0.295
HandWash	-1.086	-0.709	-0.768
	0.194	0.311	0.317
ecoli_rank		0.700	0.682
		0.315	0.314
Basantpur			0.159
			0.520
Bagaha			0.546
			0.493
Constant	-0.098	-0.717	-0.748
	0.175	0.349	0.351
Observations	748	313	313
AIC	751.5	326.6	329.4
BIC	765.3	341.6	351.8
Log pseudolikelihood	-372.7	-159.3	-158.7
chi2	50.6	25.5	25.8
Pseudo R-squared	0.065	0.076	0.079









Histogram A-C plots mean of Diarrhea vs FlushToilet, HandWash, and ecoli_rank by Location. Histogram D shows means values of each of the variable by location

Results

Factors Causing Diarrhea

Variables	Correlation	Proportion Test	Chi 2 Test
FlushToilet	Negative	HH with flushToilet has less Diarrhea	Flush toilet and diarrhea are correlated
HandWash	Negative	HH that hand wash has less Diarrhea	Hand washing and diarrhea are correlated
ecoli_rank	Positive	HH that has ecoli in kitchen water has higher Diarrhea	Presence of Ecoli in kitchen water and diarrhea are correlated
Urban	Weak Positive	Proportion of HH with diarrhea does not show dependence on urban vs rural	Location and diarrhea are not correlated
Rural	Weak Negative		

Conclusions

- Availability of a flush toilet at home and habit of hand washing after toilet use reduces occurrence of diarrhea in the household, although flush toilet has weaker correlation in Model 2 and 3
- Presence of E.coli in kitchen water increases occurrence of diarrhea
- The occurrence of diarrhea does not show a strong correlation with urban vs rural area for the 3 locations studied
- The regression Model 2 is best fit based on lowest AIC as well as BIC value, supporting that flush toilet, hand washing and E.coli have an impact on diarrhea while adding location in model 3 weakens the model

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Acknowledgements

We would like to thank Dr. Alok Bohara and Niraj Khatiwada for their guidance during this project

Supervised by Dr. Alok Bohara as a partial fulfillment of the research requirement for Econ 395: Current Seminar in Economics (Department of Economics, University of New Mexico)