Household Waste Management Effects on Health and Behavior: A Case Study of Siddharthanagar

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Motivation

Poor hygiene and waste management practices are bad for the environment and health

According to WHO, the leading preventable diseases in Nepal are:

a. Respiratory infections (Tuberculosis, others)
b. Water, sanitation, and hygiene (Typhoid, others)
c. Diarrheal diseases

UN Children's Fund stated in 2005, that it was estimated that around 40 children die everyday in Nepal alone from diarrhea and other waterborne diseases; we should expect similar numbers for adults.

Its crucial to identify key factors and behaviors that are making people sick

What is known:

In Asia, municipalities are responsible for the collection and treatment of their waste. (GRID Arendal, n.d.)

Kathmandu, Lalitpur, Pokhara, Dhankuta, Tansen and Ghorahi are the only municipalities in Nepal that practice sanitary landfill of waste management. Other municipalities practice open dumping which has become major cause of environmental and human health hazards. (Asia Developing Bank, 2013)

Households that store their household waste inside their houses had higher rates of diarrhea, in Ghana. (Boadi & Kuitunen, 2005)

Households that collect their trash in bins located outside their homes had a positive correlation with malaria, a negative correlation with acute respiratory infections, and a positive correlation with diarrhea, in Kaya, Burkina Faso. (Kafando, Segda, Nzihou, & Koulidiati, 2013)

Research Questions

1. Is public health adversely affected by poor waste management practices?

Hypothesis: Dumping household waste into the river adversely affects public health.

2. *What drives poor waste management behavior?*

Hypothesis: General health knowledge and education influence people's poor household waste dumping behavior.

Survey

The survey was conducted to understand the opinions of the river ecosystem, environmental pollution and household water quality.

Conducted: Southern Nepal, Summer 2016

Total Sample: 748

Siddharthanagar (Urban) : 570

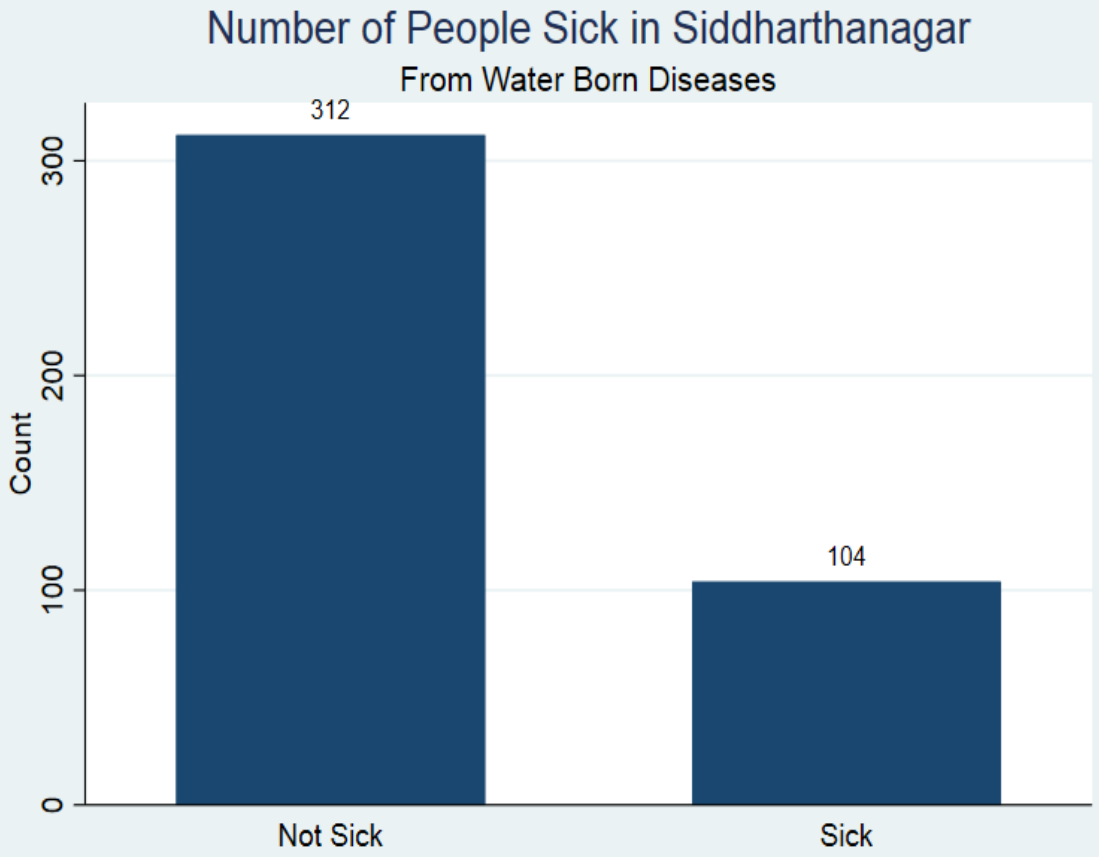
Basantapur (Rural) : 87

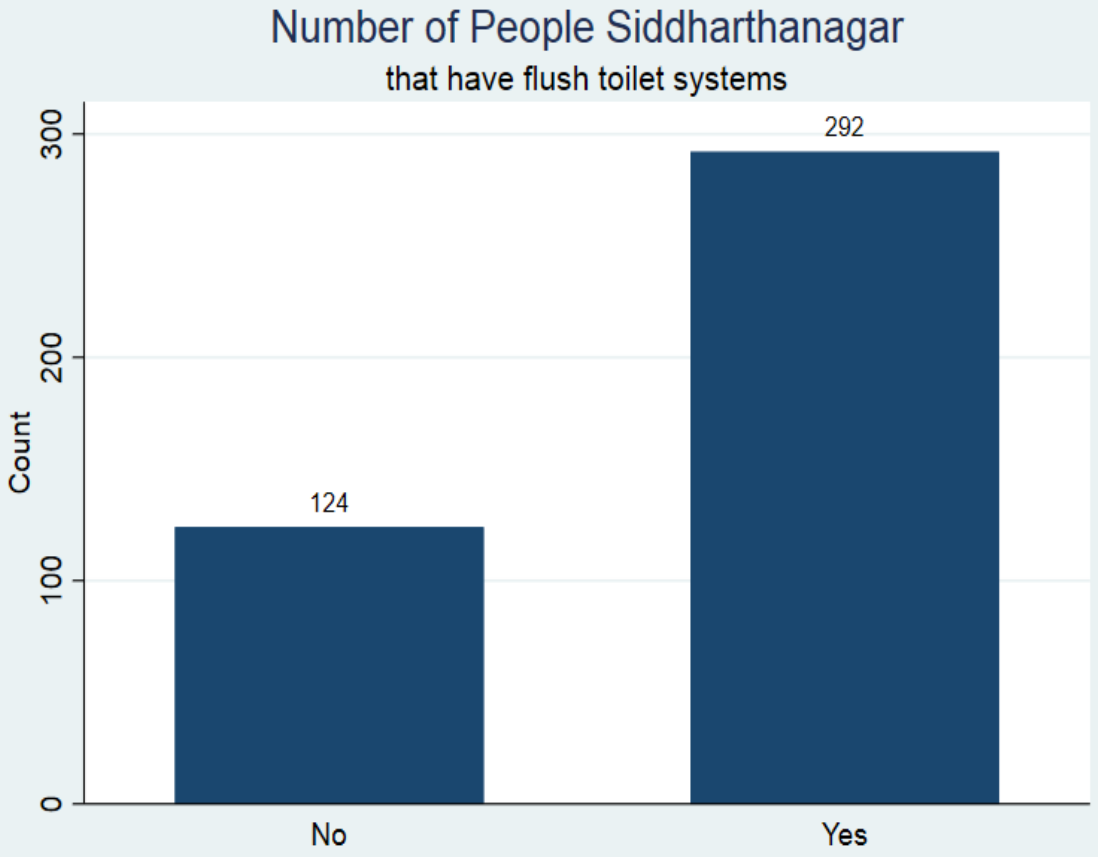
Bagaha (Rural) : 91

Sampling Method: Proportional based on the Ward Population Size

PSU: 1 Urban Area and 2 Rural Counties

SSU: 9 equally divided regions among PSUs

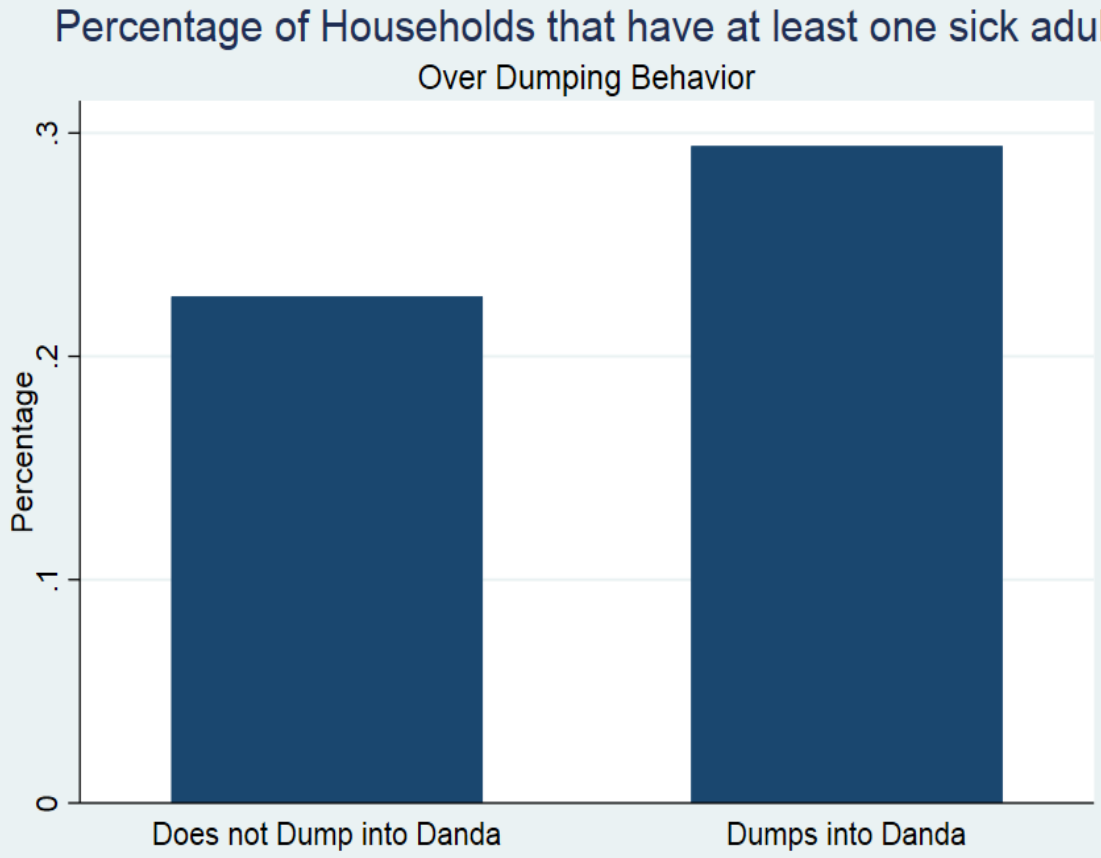


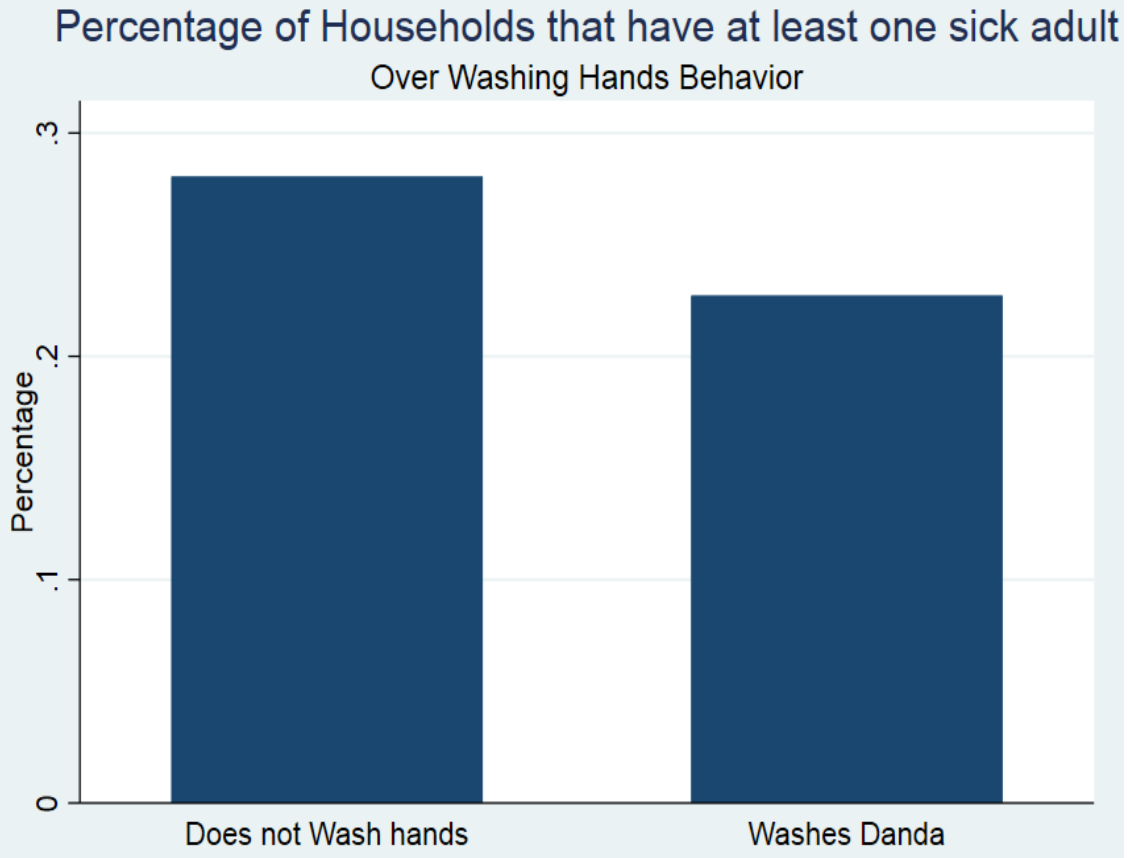


Source: Nepal Study Center, UNM, Summer 2016

Figure 1. Number of survey respondents that were sick due to water borne diseases.

Figure 2. Number of survey respondents that have flush toilet system in their home.





Source: Nepal Study Center, UNM, Summer 2016

Figure 3. Percentage of households that have at least one adult sick given then dumping behavior.

Figure 4. Percentage of households that have at least over their washing hands behavior.

Table 1: Description of Variables

Variable	Description	Mean	S.D.
Dependent Variables			
Sick	Indicates if anyone from household has had a person gotten sick from water borne diseases. 1= Yes, 0= NO	0.2468	0.4315
WasteDanda	Indicates whether household interviewed disposes household waste into the river. 1= Yes, 0= NO	0.1304	0.3370
Independent Variables			
WashingHands	Indicates if respondent washes his/her hands every time after using the restroom. 1= Yes, 0= NO	0.8369	0.3697
NoChildUnder5	Indicates the total number of children under 5 living in the interviewed household.	0.8555	1.1841
Flushtoilet	Indicates if interviwed household has access to a flush toilet. 1= Yes, 0= NO	0.6646	0.4724
GHK	Index of general health knowledge. (0-8)	4.8229	1.5343
Benefit	Index of perceived benefit of having a clean river. (1-6)	5.0124	1.1777
EducationLevel	Education level index (0-9)	3.4922	2.7233

Source: Nepal Study Center, UNM, Summer 2016

Variables Used

Logit Models

$$Sick = \beta_0 + \beta_1 WasteDanda + \beta_2 WashingHands + \beta_3 NoChildUnder5 + \beta_4 FlushToilet + \epsilon_1$$

Dumping household waste into the river, not washing hands, number of children under 5 in the household, and not having access to a flush toilet adversely affect public health.

$$WasteDanda = \alpha_1 + \alpha_2 GHK + \alpha_3 Benefit + \alpha_4 Education + \epsilon_2$$

General health knowledge, perceived benefit of having a clean river, and education influence people's household waste dumping behavior.

Logit Estimates of Adult Sick

Judging from the AIC, model 2 appears to be the best fitting model.

Table 2: Logit Estimates of Adult Sick

Predictor	Model 1	Model 2	Model 3
WasteDanda	0.632**	0.618**	0.614**
	(0.250)	(0.253)	(0.253)
WashingHands		-0.427*	-0.424*
		(0.245)	(0.247)
NoChildUnder5			0.0146
			(0.0924)
Flushtoilet	-0.723***	-0.669***	-0.670***
	(0.197)	((0.198)	(0.198)
Constant	-0.623***	-0.301	-0.314
	(0.161)	(0.247)	(0.260)
AIC	651.09	650.23	652.21
Observations	567	567	567
Pseudo R^2	0.0279	0.0315	0.0321

Source: Nepal Study Center, UNM, Summer 2016

Disclaimer: *0.10, **0.05, ***0.001

Logit Estimates of WasteDanda

Judging from the AIC, model 1 appears to be the best fitting model.

Table 3: Logit Estimates of WasteDada

Predictor	Model 1	Model 2	Model 3
GHK	-0.260***	-0.263***	-0.261**
	(0.0798)	(0.0788)	(0.0793)
Benefit		0.0183	0.0167
		(0.110)	(0.109)
Education			0.0246
			(0.0499)
Constant	-0.497	-0.574	-0.660
	(0.384)	(0.649)	(0.684)
AIC	410.41	412.38	414.11
Observations	493	493	493
Pseudo R^2	0.0253	0.0254	0.0260

Number of observations is different in this model due to item-nonresponse

Source: Nepal Study Center, UNM, Summer 2016

Disclaimer: *0.10, **0.05, ***0.001

How do all factors interact?

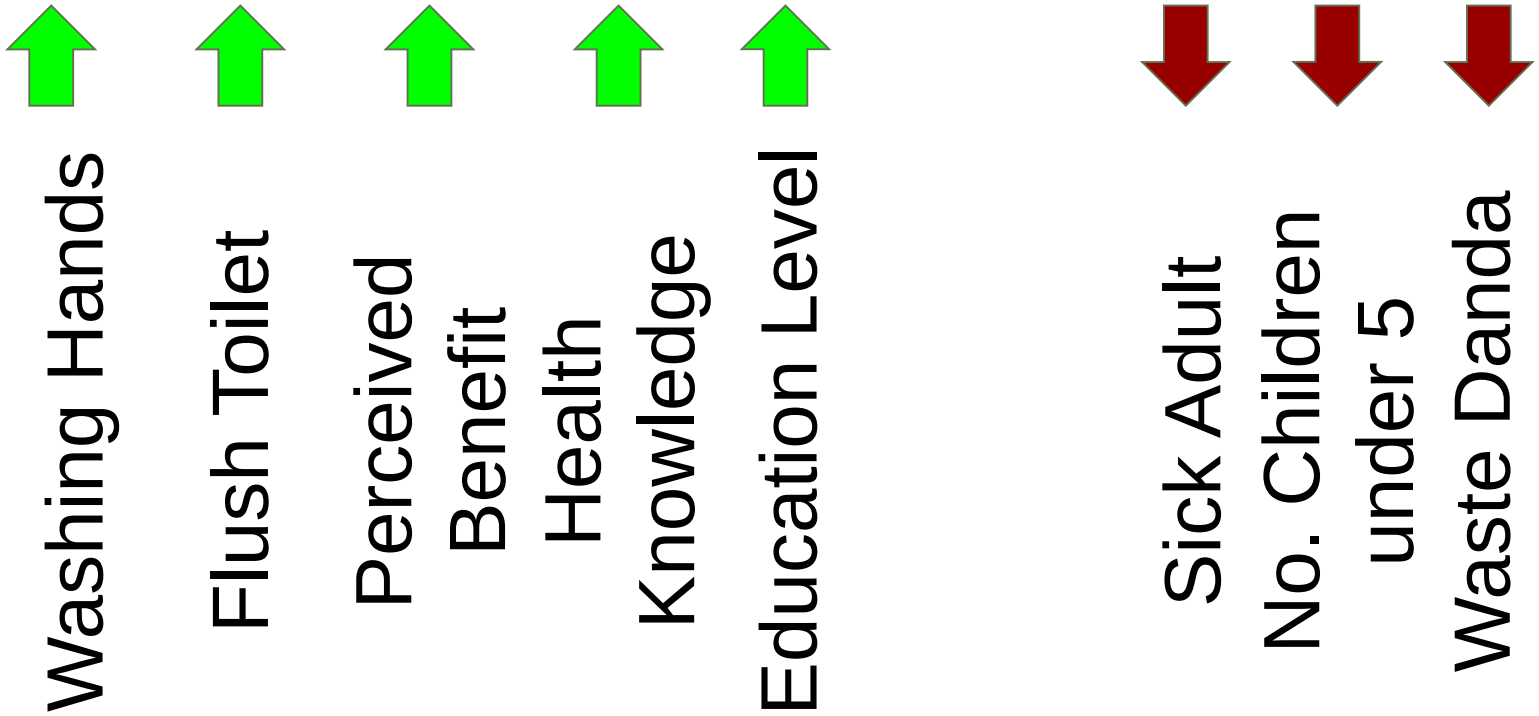
Table 4: Principle Component Analysis (PCA)

Variable	Sick	WasteDanda	WashingHands	NoChildHands	FlushToilet	GHK	Benefit	Education
Comp1	-0.015	-0.1867	0.5368	-0.2649	0.3902	0.5880	0.1775	0.2286
Comp2	0.5627	0.2246	0.2454	0.2476	0.1541	0.1576	-0.6671	0.1333
Comp3	-0.4629	0.3662	-0.0172	0.5627	0.5012	-0.1751	0.0545	0.2233

Table 5: Summary of PCAs

Component	Eigenvalue	Difference	Proportion	NoChildHands
Comp1	1.87895	0.75706	0.2349	0.2349
Comp2	1.21189	0.02507	0.1402	0.3751
Comp3	1.09681	0.10166	0.1371	0.5122

Principal Component 1



Proportion of variation explained ~24 %

Conclusion

We can say that there the likelihood of having a sick adult in the household increases if solid household waste is disposed into the river, but the risk is reduced if the household has a flush toilet facility and if hands are washed every time after using the restroom.

The likelihood of individuals dumping their household waste into Danda River decreases as their general health knowledge increases.

Recommendations

- Increase eco−friendly culture
  - Danda River Festival and other socio−cultural yearly events
- Educate individuals about importance of washing hands and subsidize personal hygiene materials(e.g. soap)
- Seek government subsidies for equal access to flush toilet systems & waste management systems

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References

Asia Develping Bank. (2013). *Solid Waste Management in Nepal.* ADB.

Boadi, K. O., & Kuitunen, M. (2005). Environmental and Health Impacts of Household Solid Waste Handling and Disposal Practices in Third World Cities: The Case of the Accra Metropolitan Area, Ghana. *International Perspectives* .

GRID Arendal. (n.d.). Retrieved March 04, 2018, from GRID Arendal: www.grida.com

Kafando, P., Segda, B. S., Nzihou, J. F., & Koulidiati, J. (2013). Environmental Impacts of Waste Management Deficiencies and Health Issues: A Case Study in the City of Kaya, Burkina Faso. *Journal of Environmental Protection*.

L, G. (2009, April 28). A review of waste management practices and their impact on human health. *Elsevier*.

Thank you for listening!

Questions?