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

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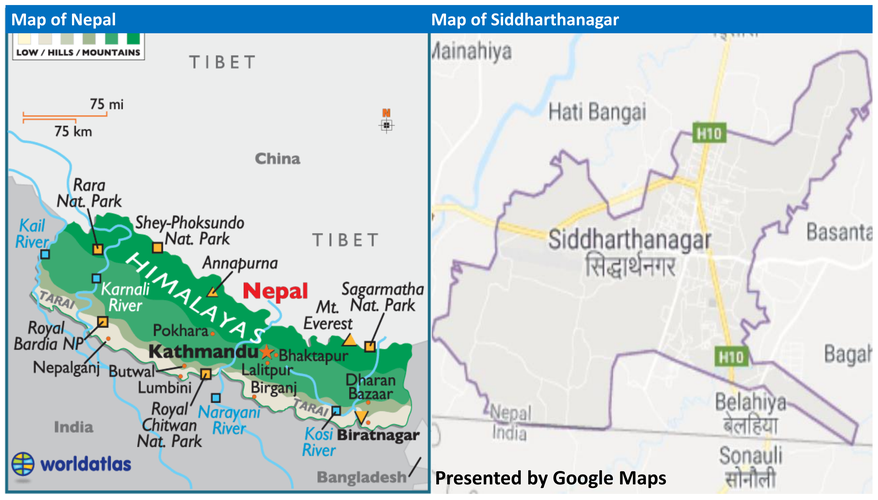
Abstract

There is little importance placed on or a lack of ability regarding the collection and management of solid waste. This is especially true for the municipality of Siddharthanagar in the southern Terai region of Nepal, where poor management of both commercial and household solid waste has resulted in environmental pollution and degradation. Increased waste in the Danda River, an important ecosystem to the region, has not only degraded the aesthetic value of the river but has adversely affected the public health of the community. In response to these concerns, during the summer of 2016, the University of New Mexico Nepal Study Center conducted a survey in the regions of Siddharthanagar, Basantapur, and Bagaha to assess local residents' perceptions, knowledge, and behaviors regarding the environment and health. Results show that in the region of Siddharthanagar, households that dispose their household waste into the river were 86% (OR=1.86 95% C.I. 1.13 - 3.04) more likely to have an adult in their household that was sick from waterborne diseases. Furthermore, washing hands and having a flush toilet system were preventative factors to having sick adults from waterborne diseases, 35% (OR= 0.65 95% C.I. 0.40 - 1.05) and 49% (OR= 0.51 95% C.I. 0.35 - 0.76), respectively. It was also found that an increase of 1 unit in an individual's general health knowledge index score (1-8) was associated with 20% (OR=0.80 95% C.I. 0.69 - 0.92) decrease in the odds of disposing the household waste into the river. If an effective waste management collection system is not attainable, then educating the residents of Siddharthanagar on health education could potentially contribute to the decrease of the prevalence of waterborne diseases. Potential future research would be to focus on the individual behavior behind waste disposal and the role that culture plays in poor waste management.

Introduction & Motivation

- On July 21, 2011, the Nepal Solid Waste Management came into place. [2]
- **Nepal only has six municipalities:** Kathmandu, Lalitpur, Pokhara, Dhankuta, Tansen and Ghorahi practice sanitary landfill of waste management. Other municipalities practice open dumping which has become a major cause of environmental and human health hazards. [1]
- 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)



Data

Survey Conducted in:	Southern Nepal, Summer 2016
Total Sample:	**Total: 748** Siddharthanagar (Urban) : 570
Sampling Method:	Proportional based on the Ward Population Size
PSU:	1 Urban Area and 2 Rural Counties
SSU:	9 equally divided regions among PSUs

Research Questions & Hypotheses

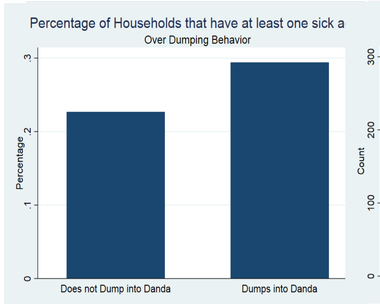
Q1: Is public health adversely affected by poor waste management practices?

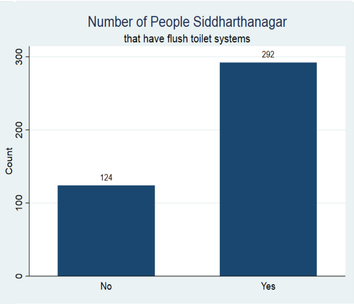
- H1: Dumping household waste into the river adversely affects public health.

Q2: What drives poor waste management behavior?

- H2: General health knowledge and education influence people's poor household waste dumping behavior.

Prevalence rate of **waterborne diseases** among people in Siddharthanagar is 24.68%. It also appears that about 13.04% of people dump their household waste into the river.





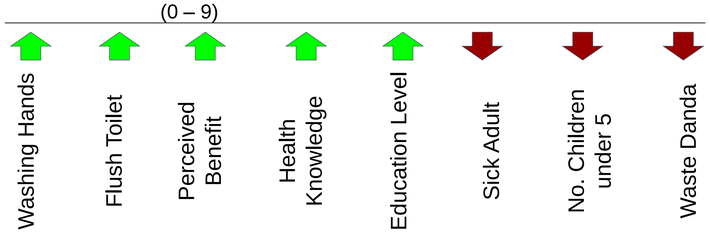
Source: Nepal Study Center, UNM, Summer 2016

Figure 1. Percentage of households that have at least one adult sick given then dumping behavior.

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

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 Diarrhea, Jaundice, Typhoid, Worms and Cholera. 1 = Yes, 0 = OW	0.2468	0.4315
WasteDanda	Indicates whether household interviewed disposes household waste into the river. 1 = Yes, 0 = OW	0.1304	0.3370
Independent Variables			
WashingHands	Indicates if respondent washes his/her hands every time after using the restroom. 1 = Yes, 0 = OW	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 interviewed household has access to a flush toilet. 1 = Yes, 0 = OW	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



Proportion of variation explained by PC 1 ~ 24 %

Results

H1: *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.*

Proposed model:

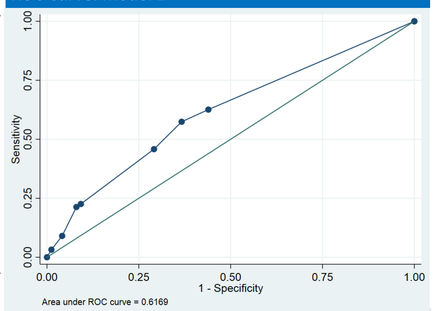
$$logit(P(Sick = 1)) = \beta_0 + \beta_1 WasteDanda + \beta_2 WashingHands + \beta_3 NoChildUnder5 + \beta_4 FlushToilet + \epsilon_1$$

Table 2: OR Estimates of Adult Sick

Predictor	Model 1	Model 2	Model 3
WasteDanda	1.8822*	**1.8556 ** **	1.8485 **
	[1.15, 3.07]	**[1.13, 3.04]**	[1.13, 3.03]
WashingHands		**0.6522***	0.6547*
		[0.40, 1.05]	[0.40, 1.06]
Number of ChildUnder5			1.0147
			[0.85, 1.21]
Flushtoilet	0.4855***	**0.5121****	0.5116**
	[0.32, 0.71]	**[0.34, 0.75]**	[0.35, 0.75]
Constant	0.5365***	**0.7399**	0.7307
	[0.39, 0.73]	**[0.45, 1.19]**	[0.44, 1.21]
AIC	651.09	**650.23**	652.21
Observations	567	**567**	567
AUC	0.6085	**0.6139**	0.6132

Source: Nepal Study Center, UNM, Summer 2016
Disclaimer: *0.10, **0.05, ***0.001

ROC Curve: Model 2



Conclusion: Dumping household waste is a risk factor of waterborne diseases, whereas washing hands and having access to a flush toilet are protective factors.

H2: *General health knowledge, perceived benefit of having a clean river, and education influence people's household waste dumping behavior.*

Proposed model:

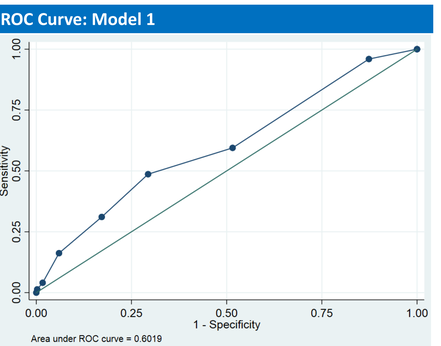
$$logit(P(WasteDanda = 1)) = \alpha_1 + \alpha_2 GHK + \alpha_3 Benefit + \alpha_4 Education + \epsilon_2$$

Table 3: OR Estimates of WasteDanda

Predictor	Model 1	Model 2	Model 3
GHK	**0.7714 *** **	0.7691 ***	0.7700**
	[0.66, .90]	[0.66, 0.89]	[0.66, 0.90]
Benefit		1.0184	1.01
		[0.82, 1.26]	[0.82, 1.26]
Education			1.0248
			[.93, 1.13]
Constant	**0.6081**	0.5631	0.5167
	[0.29, 1.29]	[0.15, 2.01]	[0.14, 1.97]
AIC	**410.41**	412.38	414.11
Observations	**493**	493	493
AUC	**0.6019**	0.6166	0.6091

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

ROC Curve: Model 1



Conclusion: General health knowledge is a protective factor towards dumping household waste into the Danda River.

Conclusions

This study established that dumping into the river was a risk factor for waterborne diseases and we also established that general health knowledge was a protective factor toward poor waste management practices. If a good waste management system is not attainable, educating the public might help reduce the prevalence of waster borne diseases. Future studies should also focus on the role of culture on waste management behavior.

References

[1] Asia Developing Bank. (2013). Solid Waste Management in Nepal. Asia Developing Bank.
[2] Nepal Government. (2011). Solid Waste Management Act of 2068. Law Commission.
[3] 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 .
[4] 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.

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