Effect of Arsenic Levels, Indoor Pollution and Age on Frequency of Hospital Visits In Nawalparasi and Rupendehi

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Introduction

In this project, we look at the factors that affect a person's likelihood of visiting a hospital in two villages in Nepal - Nawalparasi and Rupandehi. People living in these villages are still severely affected with groundwater Arsenic contamination and are also exposed to indoor pollution due to use of wood fire for cooking. Our project looks at these factors as well as age of respondent in one's decision to visit a hospital

Literature Review

More than half of the Nepalese population lives below the international poverty line. Of the many health issues that plague the country, none is more important than the prevalence of Arsenic in groundwater exceeding the WHO standard (10 µg/L) with approximately 0.5 million people at risk of consuming water with an arsenic concentration > 50 µg/L. The overall prevalence of arsenicosis symptomatic patients among the risk region is found to be 15.3% with 84.21% melanosis in trunk and 15.79% keratosis in sole and palm. Additionally, most cooking is done indoors using wood fire causing exposure to smoke causing lung disease

Research Question

What factors affect the frequency of hospital visits in Nawalparasi and Rupendehi?
Is it Arsenic poisoning, indoor pollution from cooking or age?

Hypothesis

The frequency of an individual visiting a hospital increases as a result of drinking Arsenic-contaminated water

Data

Dependent variable is Visit Hospital , which visit a hospital within the last six months by respondent. Independent variables are Smoky House (binary variable) whether or not home is polluted with smoke; Arsenic score that reveals the Arsenic levels (in PPM - parts per million) in the water source and lastly age of the respondent

Methodology

Method: R version of a robust logistic regression **Tests:** Deviance P-Value, AIC, McFadden's R-sq Value

Variables: ***Visit Hospital***
Has the respondent visited a hospital within the last six months? Binary Yes or No

Arsenic Score
Level of Arsenic in nearest groundwater source (in PPM) Numeric 0-0.5

Smoky House
Does the respondent reside within a smokey home? Binary Yes or No

Age **-Respondent's age. Numeric 0-99**

Models

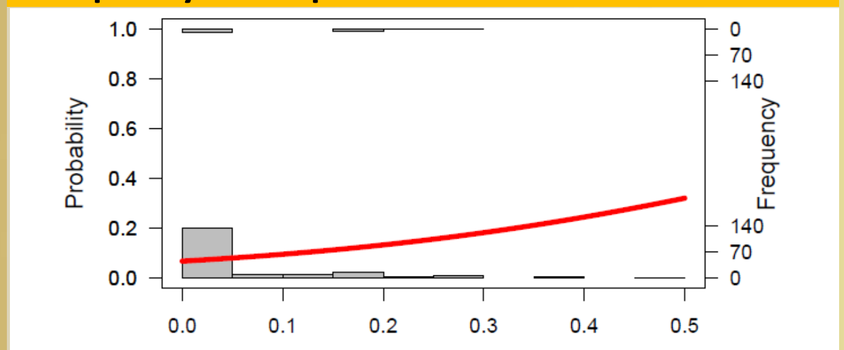
Since our dependent variable is binary in nature, it is in our best interest to carry out a nonlinear statistical model. In our case, the method of choice is the robust logistic regression. Below is the written-out form of the model we will be implementing

1. $VisitHospital = \beta0 + \beta1*\text{arsenic score} + ut$
2. $VisitHospital = \beta0 + \beta1*\text{arsenic score} + \beta2*\text{Smoky House} + ut$
3. $VisitHospital = \beta0 + \beta1*\text{arsenic score} + \beta2*\text{Smoky House} + \beta3*\text{age} + ut$

Results

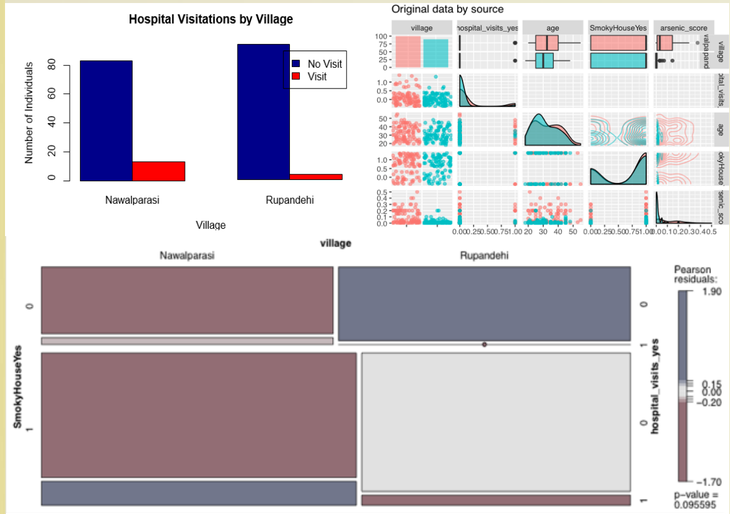
	Dependent variable:		
	VisitHospital		
	Model 1	Model 2	Model 3
Arsenic Score	0.385*	0.391*	0.389*
	(0.217)	(0.216)	(0.217)
Smoky House		0.068*	0.068*
		(0.040)	(0.040)
Age			0.001
			(0.002)
Constant	0.064***	0.028	0.009
	(0.024)	(0.032)	(0.083)
McFadden's R-sq.	0.052	0.099	0.1
Chi-Squared	15.261	15.036	15.031
Dev. P-Value	1	1	1
Observations	194	194	194
Log Likelihood	-29.644	-28.208	-28.174
AIC	63.288	62.415	64.348
BIC	123.167	125.941	131.037
Note:	* p<0.1; ** p<0.05; *** p<0.01		

Frequency of Hospital Visitation vs Arsenic Score



Histogram on the top and bottom of the plot depict the distribution of those that visited the hospital or not. Red line in the plot represents the probability of hospital visits

Descriptive Statistics



Conclusions

We found that 9% of respondent visited hospital in previous six months. Of the three models we tested, model 2 had the lowest AIC score of 62.4 supporting best model. However, the p-value for Arsenic Score and Smoky House had confidence level of ~8-10%. The analysis suggests that the respondents were visiting hospital due to symptoms of Arsenic poisoning and smoke related illnesses. Government should subsidize further exploration on the co-factors of individuals visiting the hospital, presence of Arsenic, ecology, air, and other information that might help us map out the health status of the region.

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