

**An Overview of Health in District 8, Cochabamba**

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## **Summary**

This working paper will provide a broad overview of health, covering current perceived health problems, potential perceived health problems, and attitudes towards healthcare, and explore associations between several variables to gain a more profound understanding of underlying social forces that affect health. The study took place in seven communities within District 8, one of the poorest and most under-resourced areas in the peri-urban zone of Cochabamba, Bolivia. Due to a lack of research of health in District 8 in the existing literature, this working paper will be the first of its kind illustrating what health looks like in this community.

## **Introduction**

Informal settlements in District 8 are neighborhoods in which their residents do not own the land on which they have built their homes. Although these communities have been legally established, they have not obtained the legal rights to the land. This is largely caused by absent landlords and land-rights disputes that have yet to be resolved. The majority of neighborhoods in District 8 are currently owned by the municipal government, or were former properties of the government (Walnycki, 2015).

A main underlying factor causing the issues present in District 8 is the Popular Participation Law (LPP), which was originally created with the intent to decentralize political reforms (Walnycki, 2015). Although government leaders believed it would decrease poverty and inequality and empower citizens, it resulted in weak and resource-deficient establishments at the community level. Almost half of District 8 communities do not have access to decentralized resources and support.

Because of the weak government structures, communities rely on civil society organizations and OTBs (grassroots organizations) to fulfill basic services. One example is the public water utility of District 8, the Municipal Water and Sanitation Service (SEMAPA). Underfunded until the 1990s, SEMAPA received less than 1% of public investment in the sector (SEMAPA, 2017). As a result, water utilities were provided by either informal communal provision and water vendors. Due to the lack of regulation of the standards of water cleanliness, anecdotally, the quality of water delivered to District 8 is highly variable, sometimes not safe to drink. Other material living conditions supplied more by the community than the government include public safety, solid waste disposal systems, and police posts. Essentially being an under-resourced volunteer effort, oftentimes, supervision is inconsistent and consequently, community safety and waste contamination become major concerns.

The effect of the lack of resources is exacerbated due to the fact that many of the poorest migrants live in District 8, with around 65% of them being female, and 50% of the residents living in extreme poverty (CIA, 2016). The majority of District 8 residents do not have a water supply, and according to a survey, District 8 inhabitants claimed that their most immediate needs are access to water and road improvements (Walnycki, 2015).

Informal settlements like District 8 are especially vulnerable health-wise because there are generally more health hazards in isolated areas. Furthermore, most of the people in these settlements are indigenous. There is still a lot of discrimination against those populations. Because of the location and the stigma against the people who live there, access to social services is poor and most people only have access to practitioners of traditional medical practices (United Nations, 2013). Because of the lack of access to even basic health care there are high

rates of TB and gastrointestinal disease (Montenegro 2006). Bolivia has the third largest number of TB cases in the Latin American region. The major challenges to improving service delivery are related to the need to train health workers in the new national norms for TB treatment, especially in rural areas, including treatment for the growing number of multi-drug resistant (MDR) TB cases (USAID Health Improvement Project, 2012). Because these areas are so isolated, finding transportation to areas with more medical services is very difficult. There is also a lack of access to water. According to the 2001 Census, only 27% of Bolivians have access to potable water, about 45% have sewerage services, and less than 10% of wastewater is treated (World Health Organization. 2016). The isolation also means there is not a lot of research about health outcomes in those communities (Montenegro 2006). These are some of the reasons why the data we have collected is so important. Knowledge about the challenges these communities face and what they need makes it possible to create meaningful change.

### **Research Objective and Methodology**

The purpose of this working paper is to present a current picture of health in the selected communities of District 8 that we surveyed. The survey questionnaire measures 67 variables that reflect health and quality of living (**Appendix A**). We sampled a total of 278 subjects from the following six informal settlements of District 8: Libertad, Alto Monte Rancho, Monte Olivo, Carolinas, San Francisco, and 4 de marzo. These settlements are those that we work with, and are not necessarily representative of all of District 8; thus, this survey was of a convenience sample.

To garner responses, we identified a household with an individual code to ensure that each house was not surveyed more than once. In order to maximize the number of responses, we turned to nursing students from *La facultad de enfermería Elizabeth Seton* to help us conduct the

surveys. The nursing students were trained in a two-hour long session. They were provided with a manual afterwards (**Appendix B**) that detailed how to conduct the surveys. The surveyors were told to introduce themselves and explain that the purpose of this survey was to collect data about water sanitation and health in order to learn more about the communities to better help them in the future and explain their needs to a global community, since there currently is not much information about District 8. The participants and the nursing students conducting these surveys were told that the data was eventually going to be used to implement interventions to improve the community. Prior to beginning the survey, both participatory and photographic consent were obtained (**Appendices C, D**). Surveyors were specifically instructed to try not to bias their asking of the questions and to record as verbatim as possible the responses. The surveyors used a recording sheet that we designed to facilitate ease of recording responses (**Appendix E**).

The majority of the survey questions was designed to be open-ended allowing the respondents freedom to share their experiences with healthcare. It was the responsibility of the surveyors to note down the primary response to the question. Potential issues were that surveyors would not record an accurate response if, for instance, they could not understand or extract an adequate response from a longer personal anecdote. Similarly, another potential issue stemming from the decision to make the survey open-ended was that participants might not answer the question in a manner that could be categorized easily later. Because the survey data was intended to primarily be categorical, by not giving participants a set list of responses to choose from in favor of freedom of anecdotal expression, it makes data collection more difficult. These are some factors to be considered in future studies.

## *Statistical Analysis*

We compiled summary statistics of 67 variables and looked at several associations between variables. All statistical analysis was conducted on R version 3.3.2.

### **Health Overview of District 8**

#### Characteristics of Target Population of District 8

##### *Demographics*

**Table 1.** Gender Distribution

<b>Gender</b>	<b>Frequency</b>
F	225
M	53

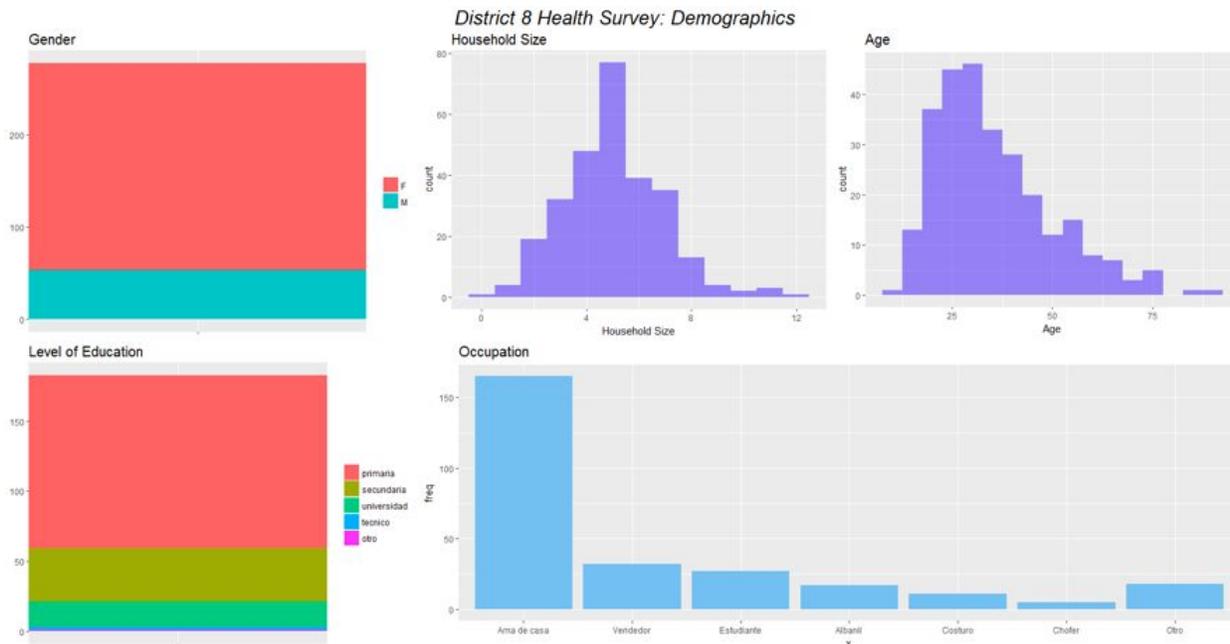
**Table 2.** Distribution of Level of Education

<b>Level of Education</b>	<b>Frequency</b>
Other	1
Primary	124
Secondary	38
Technical	2
University	18

**Table 3.** Distribution of Occupation

<b>Occupation</b>	<b>Frequency</b>
Housewife	165
Seller	32

Student	27
Mason	17
Tailor	11
Chauffeur	5
Agriculturist	2
Artisan	2
Electrician	2
Cleaner	2
Textile	2
Loader	1
Carpenter	1
Carretillero	1
Cook	1
Accountant	1
Musician	1
Publicist	1
Renter	1



**Figure 1.** Demographics of District 8. *a) Gender b) Household size c) Age d) Level of Education e) Occupation*

We surveyed 225 women (81%) and 53 men (19%) from 278 households. Subjects had a mean age of 35 and came from a mean household size of 5. 124 (68%) subjects received up to a primary education, 38 (21%) subjects received up to a secondary education, and 18 (10%) subjects received up to a university education.

A large number of women surveyed (71.4%) stated that they were stay-at-home-mothers, suggesting that there is a reliance on their husband's income. However, this reliance on husbands may be an issue when considering that a large proportion of surveyed men (29.6%) make a living as construction workers, an occupation that presents health and safety hazards.

### Household Attributes

**Table 4.** Distribution of Animals

Type of Animal	Frequency
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Dog	154
Cat	85
Chicken	43
None	29
Sheep	12
Rabbit	10

**Table 5.** Distribution of the Most Common Food

<b>Common Foods</b>	<b>Frequency</b>
Rice	110
Soup	69
Pasta	65
Beef	70
Vegetables	54
Potatoes	60
Fruits	45
Wheat	38
Lawa	18
Chicken	16

\*These are not the final frequencies

**Table 6.** Distribution of Bathroom Locations

<b>Location</b>	<b>Frequency</b>
River	88
Hole	73

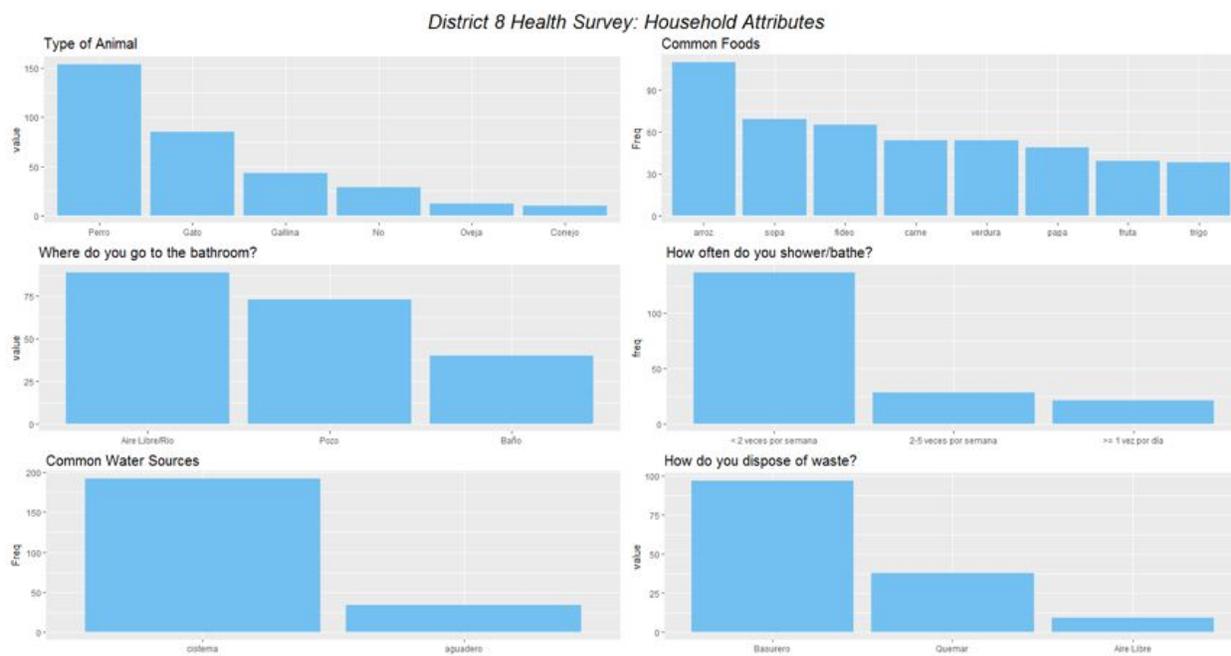
Toilet	40
Outdoors	1

**Table 7.** Distribution of Shower Frequency

<b>Shower Frequency</b>	<b>Frequency</b>
< 2 times per week	137
2-5 times per week	28
$\geq 1$ time per day	21

**Table 8.** Distribution of Waste Removal Means

<b>Waste Removal Method</b>	<b>Frequency</b>
Garbagemen	97
Burn	38
Litter	9
Juntar	3
Bury	2



**Figure 2.** Characteristics of households in District 8. *a) Type of Animal b) Common foods c) Where do you go to the bathroom d) How often do you shower e) Common water sources f) How do you dispose of trash*

Most households surveyed (154) reported having a dog. The presence of dogs in District 8 as family pets is often a form of security for families to protect against strangers. The three most commonly reported foods were rice, soup, and pasta. Our findings confirm field observations that the diets of District 8 are dominated by carbohydrates. Future studies may utilize a food frequency questionnaire or 24-hour recall questionnaire in order to more accurately assess the primary components of the District 8 diet.

Over 80% of respondents reported not having a bathroom. However, since the definition of a bathroom may vary based on the individual, it is difficult to assess how many of those who reported having a bathroom actually have a fully functioning Western-style toilet. In any case, it is clear that lack of sanitation infrastructure is a major problem in District 8.

Over 26% of respondents reported burning their garbage. Future studies should assess the prevalence of garbage burning while taking into account the environmental impact of this behavior.

### Medical Practices

**Table 9.** Distribution of Frequency of Visits to Clinics

<b>Visit Frequency</b>	<b>Frequency</b>
≥ 1 time per month	67
2-6 times per year	20
Each year	21
Control	3
Emergency	90
Doesn't go	59

**Table 10.** Distribution of Most Commonly Visited Hospitals

<b>Hospital</b>	<b>Frequency</b>
Centro de Salud	113
Viedma	28
Villa Pagador	17
Alto Pagador	11
Harry Williams	7
Cubano	5
Arbieto	4
Caja Nacional	4
Cochabamba	7

Cerro Verde	3
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**Table 11.** Distribution of Locations to Purchase Medicine

<b>Location</b>	<b>Frequency</b>
Pharmacy	178
Health center	9
Doctor	2

**Table 12.** Distribution of Reasons to Not Seek Medical Attention

<b>Reasons</b>	<b>Frequency</b>
No time	71
Not necessary	60
Too far	51
No money	21
Doesn't want to	6
Crowded	4



**Figure 3.** Medical Practices in District 8. a) *Frequency of medical visits* b) *Most commonly visited hospitals* c) *Household medical care* d) *Where do you obtain medicine* e) *Reasons to not seek medical attention*

Several subjects (90) reported that they only visit healthcare centers for emergencies.

This is consistent with the small number of respondents (3) who said that they go for regular check-ups. Although 67 respondents mentioned that they visit healthcare facilities at least once per month, many of these respondents may be pregnant women who are eligible to receive free care during their pregnancy. 59 subjects reported generally not going to healthcare centers.

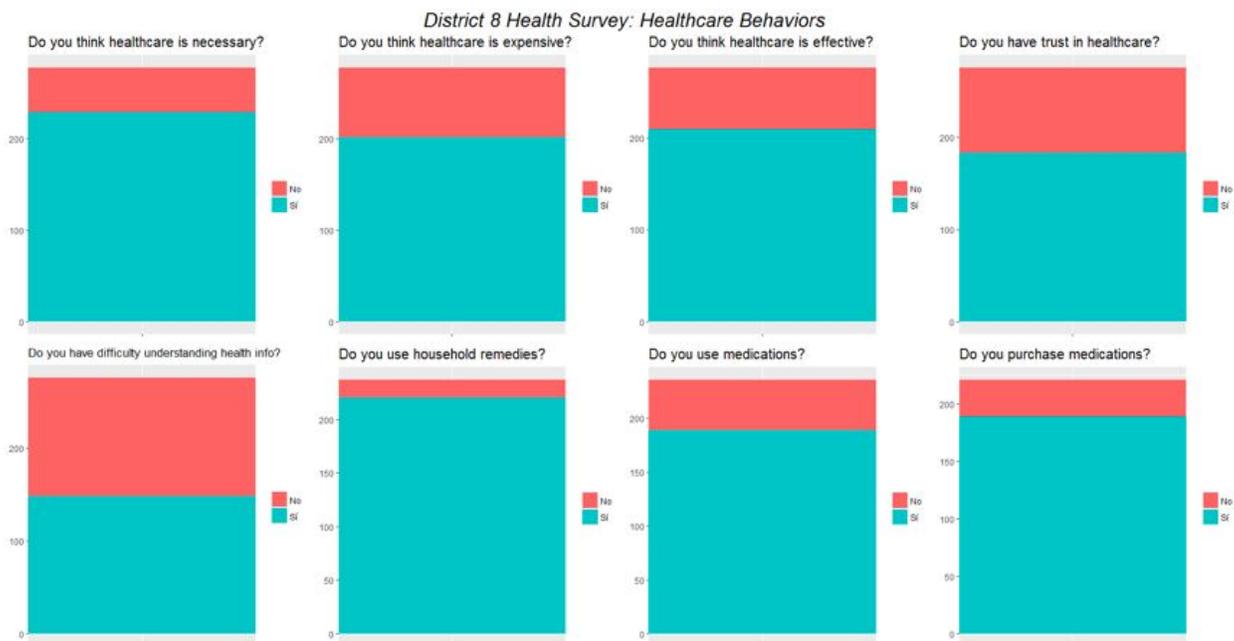
Those who reported going to healthcare facilities mentioned Viedma, Villa Pagador, and Alto Pagador as the most frequently attended facilities. Future studies may focus on why these facilities are most popular among the residents of District 8.

When someone in the household falls sick, the most common course of action (nearly 80 respondents) is to use herbs as initial treatment. Less than 40 respondents reported that their first

course of action is to go to the hospital or provide medicines when someone in the household falls ill.

A vast majority of respondents reported obtaining medications from a pharmacy. Future studies may focus on which pharmacies are most commonly visited by residents, as well as why so few people obtain medications from health centers or doctors.

Respondents' reasons for not receiving medical care include not having time, believing they don't need it, long distances to healthcare, and lack of economic resources. The most common response of not having time (71 responses) may be a reflection of the long commute residents have to make to reach health centers (sometimes upwards of 2 hours) as well as long wait times and long lines after arriving at facilities. According to these results, people consider distance and time to be more significant barriers to healthcare than lack of economic resources. This may mean that affordable healthcare options do exist, but that they are simply geographically inaccessible.



**Figure 4.** Perceptions About Medical Practices. *a) Do you think medical care is necessary b) Do you think medical care is expensive c) Do you think medical care is effective d) Do you trust medicine e) Is it difficult understanding medical information f) Do you use household remedies g) Do you use medicines h) Do you purchase medicines*

A majority of respondents believe that healthcare is necessary. This is a positive finding, but conflicts with a previous finding that many people don't receive healthcare because they believe it is not necessary. A possible explanation for this disparity is that respondents may believe that receiving healthcare in general is necessary for everyone, but that they personally may not require it.

75.9% of respondents stated that biomedicine is effective, that is, that visits to health care facilities resolved their health issue. Approximately two thirds of respondents trust biomedicine – which is a majority, but still implies that one third of respondents do not trust biomedicine. Future studies may assess the reasons for mistrust among residents of District 8.

53.2% of respondents find it difficult to understand medical information and the explanation of medical procedures. Approximately half of the respondents reported that medical information is difficult to understand. This may reflect the language barrier that many residents of District 8 face when visiting healthcare facilities. Since most residents of District 8 are indigenous, Quechua is their primary language, thus making it difficult to communicate with health professionals who may have little to no knowledge of Quechua. It may also be important to provide members of the community with texts and information sessions regarding the most pressing health issues of the region in order to help increase their understanding of potential signs for pressing medical issues and of their general health. 80.1% of respondents use medicines that are obtained from pharmacies, which when coupled with the fact that over half of respondents have trouble understanding medical procedures, suggests that although most

community members are familiar with modern medicine, there is limited understanding as to how those medicines function.

92.8% of respondents report using traditional medicine. It may be beneficial to incorporate community members' understanding of traditional medicine into explanations of the medical procedures commonly practiced in local health care facilities. Since traditional and household remedies are clearly play a significant role in District 8 healthcare, future interventions and studies may focus on specific household and traditional medicine practices.

## Self-Assessment of Perceived Healthcare Issues

### *Family Health*



**Figure 5.** Self-assessed Family Health Household Characteristics in District 8. *a) Perceived safety b) Biggest health problems in community c) Biggest health problems in family d) Biggest health problems facing children*

Analysis of perceived security reveals that nearly 50% of respondents feel unsafe in their communities. Future studies may focus on determining factors for this insecurity. Colds and diarrhea are perceived to be the biggest problems in the community. According to respondents, colds seem to be the biggest issue when the weather changes, especially when the temperature decreases. Diarrhea, general pains (e.g. headaches, stomachaches, etc.) as well as infections caused by water contamination are other big problems. Many of these are preventable diseases that can be resolved through basic sanitary behaviors and health practices. Other diseases that were mentioned were cancer, diabetes, tuberculosis, typhoid, STDs, pneumonia, chickenpox, and chikungunya, but not as frequently as colds and diarrhea. A problem that one respondent stated was drug addiction and delinquency, which is interesting because drug addiction is not commonly regarded as a public health problem, but a growing body of research shows that it actually is (Am J Public Health, 2011).

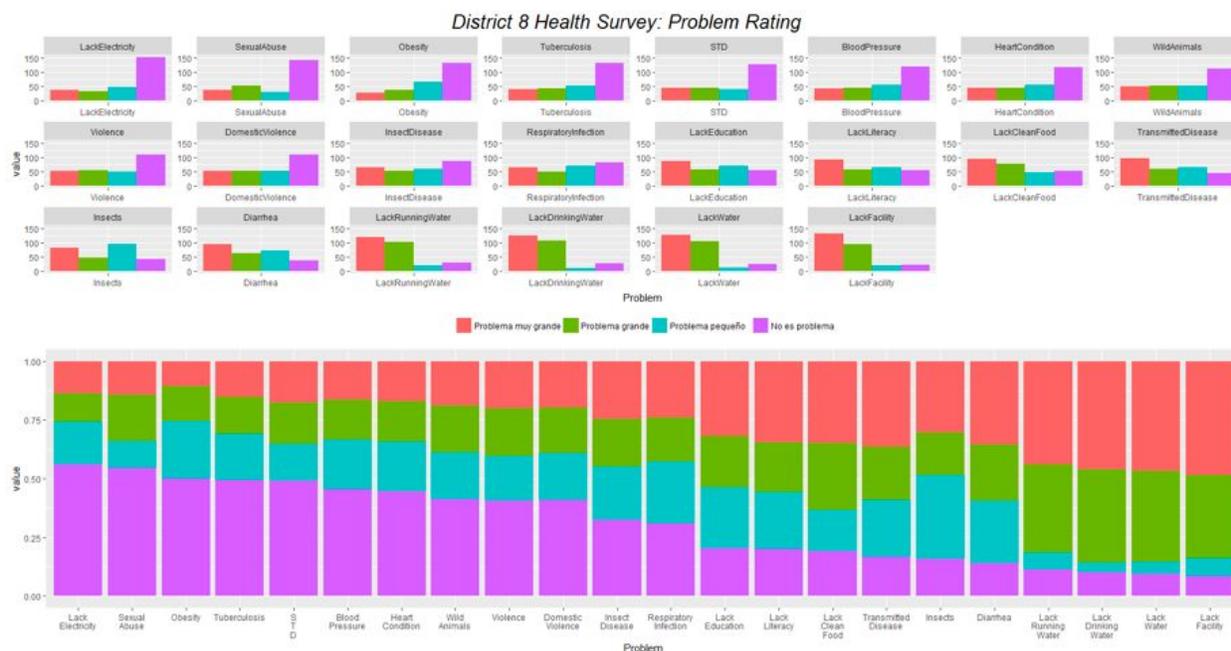
### *Problem Ratings*

Twenty-one questions of the survey aimed to identify health problems that could potentially affect the communities. They were asked in the format “Do you think [problem] is very big, big, small, or not at all a problem.

**Table 13.** Self-Assessment of Potential Health Problems

	<b>Very Big</b>	<b>Big</b>	<b>Small</b>	<b>Not a Problem</b>	<b>Total</b>
<b>Lack of Water</b>	127	106	14	26	273
<b>Lack of Potable Water</b>	126	108	11	28	273
<b>Lack of Running Water</b>	120	102	20	31	273

<b>Lack of Clean Food</b>	95	78	48	52	273
<b>Lack of Education</b>	87	59	71	56	273
<b>Lack of Literacy</b>	94	58	66	55	273
<b>Lack of Bathrooms and Showers</b>	132	96	21	23	273
<b>Lack of Electricity</b>	37	33	49	152	273
<b>Insects</b>	82	49	96	43	273
<b>Wild Animals</b>	51	54	54	112	273
<b>Diseases Caused by Water Contamination</b>	98	61	65	45	273
<b>Diarrhea</b>	96	64	72	38	273
<b>STDs</b>	46	46	41	129	273
<b>Diseases Caused by Insects</b>	66	54	61	87	273
<b>Obesity</b>	29	39	66	134	273
<b>Hypertension</b>	43	45	56	120	273
<b>Heart Conditions</b>	45	46	56	118	273
<b>Tuberculosis</b>	41	42	53	133	273
<b>Respiratory Infections</b>	65	50	71	84	273
<b>Violence/Terrorism</b>	54	55	51	110	273
<b>Domestic Violence</b>	53	52	53	110	273
<b>Sexual Abuse</b>	38	30	144	8	273



**Figure 6.** Self-Assessment of 22 Selected Potential Health Problems in District 8. *a) Lack of electricity b) Sexual Abuse c) Obesity d) Tuberculosis e) STDs f) Blood pressure g) Heart condition h) Wild animals i) Violence j) Domestic violence k) Insect-transmitted Diseases l) Respiratory Infection m) Lack of education n) Lack of literacy o) Lack of clean food p) Diseases from contamination q) Insects r) Diarrhea s) Lack of running water t) Lack of drinkable water u) Lack of water v) Lack of bathrooms and showers*

Lack of electricity was reported to be the least severe problem. This is consistent with our field observations that almost all homes have televisions, radios, or some form of light and electricity.

Gender-based issues such as sexual abuse, domestic violence, and STDs were rated as relatively small problems, even though field work has shown that these are in fact highly prevalent issues in District 8. The reasons for underreporting the severity of these issues is multidimensional. It may have to do with the stigma associated with talking about these topics. Alternatively, these issues may be such a normal part of society that women, and even some men, view them as non-issues.

This explanation may also justify the ratings of problems such as obesity, which were rated as non-severe but obviously highly prevalent from field-observations.

It is illuminating that the five most severely rated problems are all related to water and sanitation. This makes sense because there is currently little to no sanitation infrastructure or service in these communities, and the access to clean water is a daily priority that outweighs most other issues, especially chronic ones. What is also interesting is that similar problems are similarly evaluated. For instance the lack of literacy was evaluated at a similar severity to the lack of education, which demonstrates that the people of District 8 understand certain issues are closely related.

Water-related problems were identified as the most concerning among all the health problems presented in the survey. This agrees with general trends in the country mentioned above that indicate that only 27% of Bolivians have access to potable water (US Army Corps of Engineers, 2004). Eighty-five percent of individuals indicated a lack of water as a grave problem, 81% considered lack of access to running water a grave problem, and 86% indicated lack of access to drinking water as a grave problem. This indicates that more work needs to be done toward eliminating water related problems. In addition, 83.5% of individuals indicated the lack of bathrooms and showers as a major problem.

Lack of access to clean water also seems as a possible cause for other problems indicated by the residents of the community. For instance, 58% of individuals indicated that diseases due to water contamination and food poisoning were a serious problem and 58.8% reported that diarrhea was a grave problem. Both of these health concerns are derived from consumption of contaminated water or water that has not been prepared for drinking. Some measures that could

be taken to reduce the risk of these diseases are to use water filters, boil water, or use solar purification before consumption.

A problem also identified by most of the surveyed individuals is the presence of insects. This is closely related to the expressed severity of vector-borne diseases, which was indicated as a grave problem by a majority of respondents (44.3%). Vector-borne diseases are a common problem in tropical countries, especially when methods to prevent the reproduction of the insects responsible for the transmission of these diseases are not in place. In Bolivia, recent surveys of the general population have shown that the cases of dengue fever and Chagas have been on the rise (Tania C. de Araújo-Jorge and Nora Medrano-Mercado, 2009). To avoid the spread of these diseases, fumigations of the residencies and other public spaces should be carried out to kill potentially disease-carrying insects, especially in hospitals where cases of vector borne diseases are more likely to be found (World Health Organization, 2014). Workshops on practices that could be used to reduce the number of these insects might also be helpful in reducing the threat they represent (some of these practices include avoid having open containers with water or open containers that could accumulate rain water).

The attitudes towards chronic diseases indicate that they are not a problem faced by a majority. Most people (47.3%) did not think obesity was a problem, while only about 25.3% thought it was a grave one. Similarly, a majority of people (44.3%) indicated that high blood pressure was not a problem, while only 32.6% considered it a grave problem. Heart conditions were not considered to be a problem by 43.2% of those surveyed but 33.7% indicated it was a grave issue. Despite these trends, informative workshops aiming to increase awareness about these diseases might help the communities learn how to avoid them - especially as globalization

makes health issues typical of developed countries more common in developing ones - and to recognize when they appear.

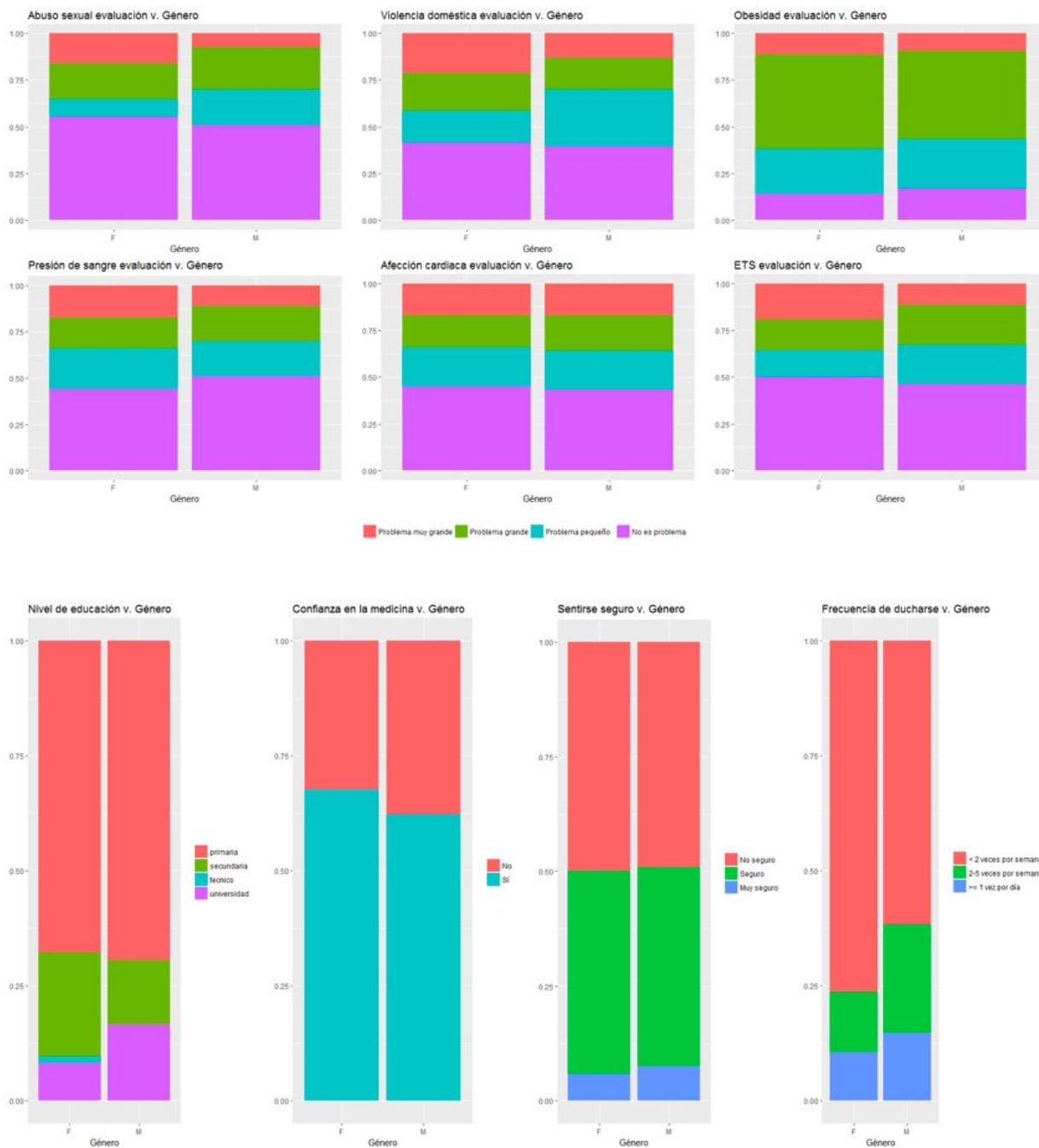
Despite this general trend in chronic diseases, most people (42.5%) found that respiratory infections were a grave problem. Curiously, even though Bolivia has one of the highest rates of tuberculosis in Latin America, most of the surveyed residents (48.7%) indicated that they did not find it to be a problem (USAID Healthcare Improvement Project, 2012).

A majority (48.7%) also thought sexually transmitted diseases were a problem - minor or grave, followed very closely by the percentage who did not consider it a problem (47.2%). This falls in line with national data indicating that Bolivia has the highest rate of STDs in Latin America.

Other health related issues also indicated by residents -either as grave or minor- were education (79.5%), violence or terrorism (59%), domestic violence (58.2%), sexual abuse (44.3%), presence of wild animals (58.2%), and electricity (43.6%).

### **Variable Associations**

We looked at the associations between gender and several other variables including education level, trust of the medical system, perception of safety, shower frequency, and their ratings of sexual abuse, domestic violence, obesity, blood pressure, heart conditions and STDs as potential problems. Other associations we decided to explore were 1) between treating the water for brushing and diarrhea, 2) between treating the water for brushing and transmitted disease, 3) between household size and the frequency of hospital/clinic visits and 4) between household size and the most common family health problems.



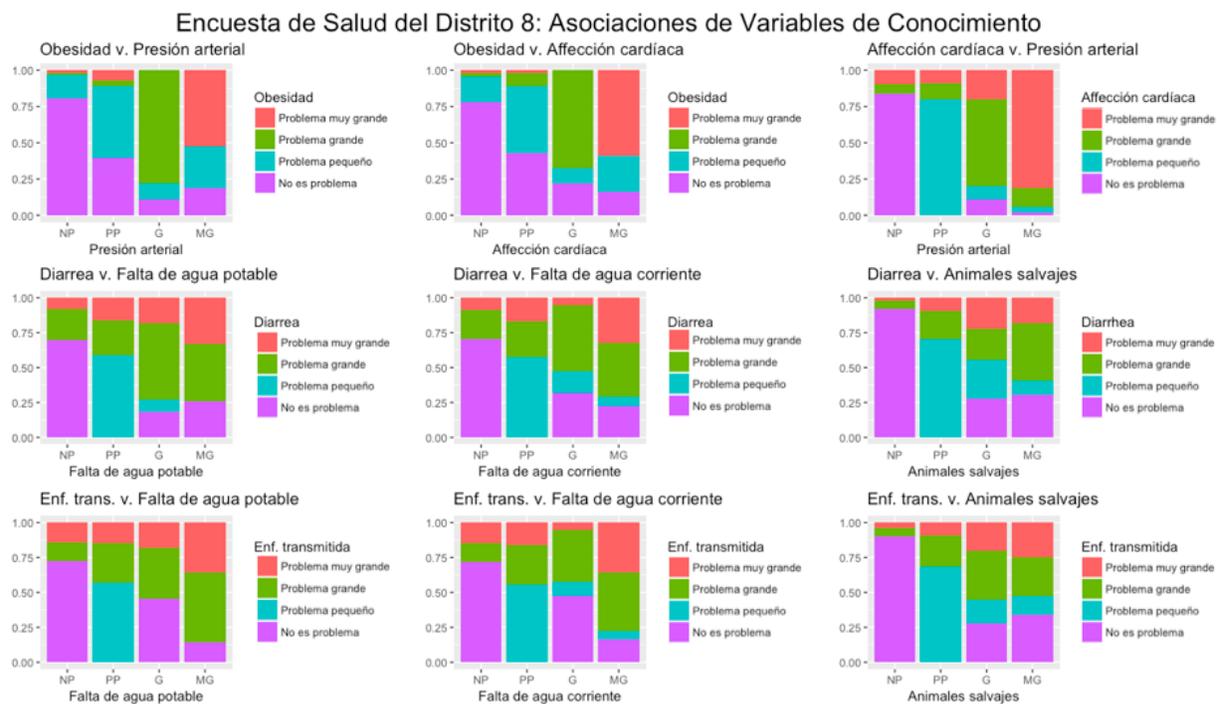
**Figure 7.** Variable Associations Between Gender and a) *Sexual abuse* b) *Domestic violence* c) *Obesity* d) *Blood pressure* e) *Heart condition* f) *STDs* g) *Level of education* h) *Trust in medicine* i) *Feeling of safety* j) *Frequency of shower*

Analysis of how gender affects the rating of different public health problems reveals interesting patterns. Contrary to our hypothesis, gender did not affect ratings for the selected public health problems notably. Although males tended to rate sexual abuse, STDs, and domestic violence as slightly less serious problems than females, overall no remarkable differences in these evaluations were observed between genders.

Other gender-stratified analyses reveal interesting trends. A greater proportion of males received a university education than females, which is consistent with gender roles and the patriarchal society of District 8. Males showed slightly less trust in medicine than women, perhaps due to the fact that women receive constant healthcare during pregnancy and postpartum. Both males and females had similar perceptions regarding perceived security in their communities.

Interestingly, men tend to shower/bathe more frequently than women. This may be due to male domination of household resources, such as water. This finding is troubling due to women's needs to properly clean themselves after menstruation and sexual intercourse. This need is particularly pressing in District 8, where many women do not have access to adequate feminine hygiene products to begin with.

## Knowledge



**Figure 8.** Associations of Variables to Test Level of Knowledge a) *Obesity v. Blood pressure* b) *Obesity v. Heart Condition* c) *Heart Condition v. Blood pressure* d) *Diarrhea v. Lack of drinkable water* e) *Diarrhea v. Lack of running water* f) *Diarrhea v. Wild Animals* g) *Diseases from contamination v. Lack of drinkable water* h) *Diseases from contamination v. Lack of running water* i) *Diseases from contamination v. Wild animals*

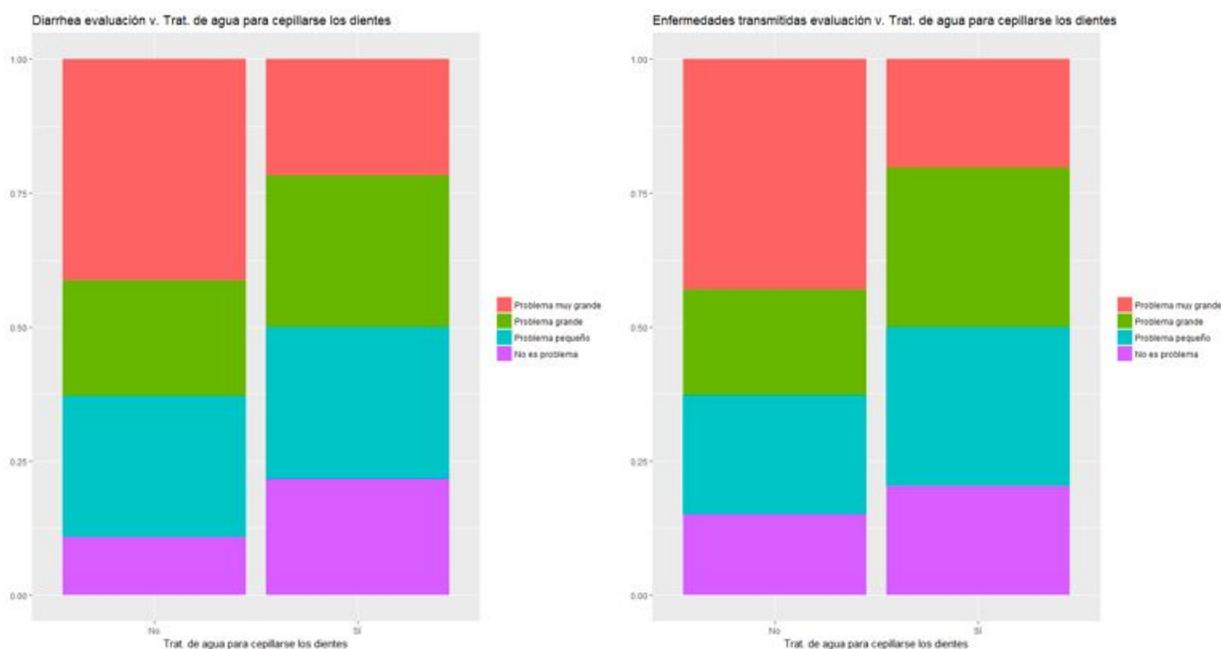
We looked at the associations elucidating the level of knowledge about basic health conditions (Fig. 8). Essentially we hypothesized that if they rated, for instance, high blood pressure as a severe problem, but not heart conditions, then that could serve as a starting point to focus public health education efforts because high blood pressure is known to lead to heart complications.

In Figure 8a, we see that both obesity and blood pressure are rated to be “no problem” by the majority, which indicates that the participants do inherently understand a direct relationship between obesity and blood pressure. It’s interesting to note that the percentage of those who

responded that blood pressure was a very big problem did not equally respond that obesity was also a very big problem. However, this could be attributed to the fact that the difference between a “very big problem” and a “big problem” was not made clear during the survey. This is a recurring issue for future improvement throughout this paper. However, the percentage of those who believe either of those variables to not be a big problem is slightly concerning for most of the people in District 8 are overweight or obese by standard metrics. In Figure 8b, we also see a similar trend as in 8a. The results in figure 8c are of note because the ratings match very closely. For instance the majority of those who responded that blood pressure was a very big problem also described heart conditions as a very big problem. Perhaps the reason this exact direct relationship was not present in the obesity comparisons is that the people of District 8 have a different notion of what obesity means. Anecdotally, participants have described obesity as the quality of being “morbidly fat”, which is only an extreme case.

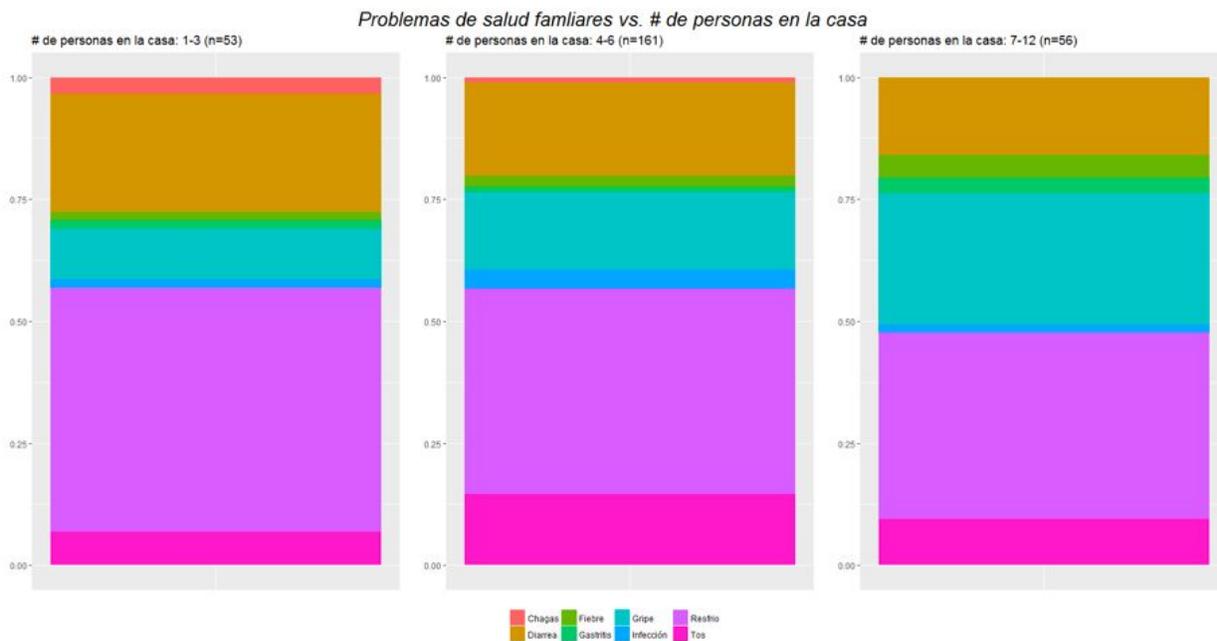
The evaluations of lack of drinking water, lack of running water, and the prevalence of wild animals are similarly correlated with the evaluations of diarrhea (Figs. 8 d,e,f). This relationship is especially clear if we combine the “not a problem” and “small problem” evaluations. Essentially, the percentages for those who respond that diarrhea is a certain level problem align with the percentages of those who respond that the aforementioned three variables is a certain level problem. It is interesting to note that Figure 8g and 8h are similar if we again combine “not a problem” and “small problem”, but the graphs are slightly different. Perhaps those who have running water do not evaluate diseases obtained from contamination as grand a problem is because they believe that having running water signifies a stronger sanitation system. Lastly, what’s interesting to note is that the correlation between the evaluations of diseases

obtained through contamination and the prevalence of wild animals is not as pronounced as that of the other associations. One possible explanation could be that knowledge of the link between wild animals and contamination may not be as prevalent. That is, knowing that wild animals that defecate in water sources that may runoff or otherwise get into the water that people consume is not as common.



**Figure 9.** Variable Associations Between Treatment of Water for Brushing Teeth and a) *Diarrhea* and b) *Transmitted Diseases*

Analysis reveals that the practice of treating water for brushing teeth affects the perception of diarrhea and infectious disease. In both cases, those who treated their water before brushing their teeth reported diarrhea and infectious disease to be less serious problems than those who do not treat their water before brushing. This may indicate that families that treat water before brushing teeth prevent diarrhea and infectious disease incidence. Future studies should assess whether treating water before brushing teeth does in fact reduce diarrhea and infectious disease incidence. This could help inform future water and sanitation interventions.



**Figure 10.** Variable Associations Between Household Size and Common Family Health Problems Split by Household Size Range a) 1-3 people b) 4-6 people c) 7-12 people

An analysis of how family health problems vary with household size reveal some interesting trends. Respondents were asked to report which health problems were most prevalent in their households. Diarrhea prevalence appears to decrease as household size increases. This may be due to improved diarrhea management in later children after parents have dealt with diarrhea in their earlier children.

Flu and fever appear to be more prevalent in households with more people. This may be because an infected individual in a large household will have the potential to infect many more people than an infected individual in a smaller household. Contrary to our hypothesis, prevalence of colds appears to decrease with increasing household size.

As this survey had limited sample size, a more robust and statistically powerful study is required to prove that these trends are statistically significant.

## Conclusion

Ultimately, the results from our preliminary general health survey were very revealing across a broad spectrum of health variables.

In looking at the demographics of the population in District 8, what was notable was the level of education because despite the young average age, the level of education was still fairly low, which indicates that perhaps there are cultural implications revolving around the value of secondary education in these communities.

What was surprising were the rates of bathroom and shower use frequency. The majority of participants said that they showered less than twice a week. This is troubling because the lack of hygiene not only results in a whole host of sanitation problems but also deeper undercurrents of mental health issues and loss of self-worth. It is also important to note that over 80% of the participants don't have bathrooms and 85% don't have running water. This indicates a great lack of infrastructure that leads to a whole host of sanitation issues.

In addition, what is interesting is that the most common problems that households state, flu, cough, diarrhea, and the cold, are entirely preventable with fundamental hygiene and sanitation practices. This is promising because this reflects an area of need that can be focused on through more directed workshop topics and preventative health services.

What is illuminating is that the primary reason for not seeking medical attention is that there is no time. Although this could be a reflection of the time required to reach far-off health centers, it may also be related to the fact that Western medicine is not well-understood, and that for many residents in District 8, resolving chronic health problems is much more abstract than receiving care for an acute health problem. Problem evaluation analyses revealed that the most

seriously rated problems were associated with water and sanitation. This is a strong indicator for what community members want in future public health interventions.

Surprisingly, gender-stratified associations revealed almost no notable differences between ratings for domestic violence, sexual abuse, STDs, and other health problems. One possible explanation may be that issues like rape and domestic abuse may be daily occurrences and thus not recognized as public health problems.

Association studies revealed that overall, people tend to correctly identify correlations between related diseases. That is, people who rated diseases like obesity and high blood pressure highly also rated cardiovascular disease highly, and similarly for water and sanitation related diseases.

Perhaps one of the most interesting findings from association analyses was the discovery that treating water before brushing teeth notably decreased the severity of rating for diarrhea and infectious disease, suggesting that treating water before brushing teeth may be an important health practice worth investigating in the future.

Some limitations of our study include relatively low sample size, wide range of variables measured, focus on qualitative measures, survey questions which limited possible responses, as well as certain vague survey questions which could have been reworded to yield more insightful information. As this is a working paper, we have not exhausted all possible variable associations and analyses.

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