Assessment of Behavioral Risk for Women's Health Conditions in Rural Nicaragua

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Assessment of Behavioral Risk for Women’s Health Conditions in Rural Nicaragua

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Interdisciplinary Honors Thesis

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University of Colorado Boulder
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Introduction

The idea for this project came out of a desire to improve the quality of health education programs conducted by foreign non-profit organizations, particularly one organization I have worked for: Health Outreach for Latin America (HOLA). After participating in public health education programs in Nicaragua in the spring of 2011, I realized that some of the information covered was not relevant to the community we worked in. During sexual health talks, we spent the majority of our time repeating information students had already received from teachers and local health workers. Although students did not ask questions, teachers asked them afterwards to write down topics they would like to hear more about and their comments illustrated ways we could have tailored the presentations to make them beneficial. Their concerns included HPV (human papillomavirus), a common STI in the area, urinary tract infection, domestic infidelity and abuse, among other issues. Providing community-specific information on these topics would have been possible if we had been more informed about education and issues specific to the area.

The mistakes in our educational curriculum arose because we did not understand the complexities behind the issues we were addressing. When discussing dehydration with older community members, we suggested that individuals monitor the color of their urine by checking the toilet after using the restroom. However, it occurred to me after the presentation that our non-profit group was residing in one of the only buildings in the community with toilets; most community members either use outhouses without running water or use the outdoors and thus would not be able to see the color. Upon reflection, I have wondered what other opportunities for education we missed due to our lack of cultural context.

In some cases our observations proved beneficial. One contributing cause of dehydration in the community was that individuals did not carry water with them, but only drank fluids at meals. We made this discovery by talking with a group of children who were fascinated by our colored Nalgene bottles. Accordingly, we adapted the health education program for the following spring (March 2012) to include a discussion about carrying water combined with distribution of donated water bottles.
Such circumstances and outcomes helped me realize the extent and types of information required to create impactful programs. In addition, it became evident that a meaningful program would need to be simpler, would require more legwork and research, and cover a smaller scope. Having too broad of an agenda hindered the in-depth knowledge necessary to making positive change. With this understanding, I began to reflect on the operations of our organization in the region. No research had been conducted in the area about local public health issues – the organization ran off of health assumptions. Similarly, having met with other organizations, mostly small non-profits and church groups, I found that a large number of organizations dive into operations with little to no information about the effect that their programs will have within a local context.

Motivated by the focus on women’s health and empowerment championed by the United Nation’s Millennium Development Goals, I subsequently set out to design a project that would address women’s health issues in the community. Many studies have demonstrated the link between women’s health and empowerment and the overall level of community development.\textsuperscript{1-3} Knowing that I needed to scope my research given time constraints, I decided to focus on bacterial vaginosis (BV) and yeast infections (YI) due to their prevalence and lack of proper attention and treatment.

With the spread of sexually transmitted infections (STIs), researchers have increasingly focused on women’s health conditions including BV and YI.\textsuperscript{4-6} Global maternal mortality is high, at 210 deaths per 100,000 births in 2010.\textsuperscript{7} Global adolescent fertility hovers around 50.4 per 1000 girls and there is a scarcity of skilled birth attendants in developing regions.\textsuperscript{7} Women are disproportionately affected by HIV as compared to men,\textsuperscript{8} more susceptible to STIs in general, less likely to display early symptoms, and experience non-sexually transmitted vaginal infections similar to STIs that can have serious health and social repercussions.\textsuperscript{9}

Studies about STIs have unveiled negative health and social ramifications including stigma, embarrassment and pain.\textsuperscript{10} Although most researchers overlook BV and YI, these conditions share many of the same health and social consequences of STIs.\textsuperscript{10} Lack of attention to these conditions causes additional problems, including mistaking these diseases for something else. Awareness about BV is
particularly low even though it is the most common vaginal infection, causing frequent misdiagnosis of BV for other conditions.\textsuperscript{11}

This study endeavors to uncover some of the factors that lead to BV and YI in Chacraseca, Nicaragua, and to propose behavioral changes that could decrease prevalence, such as educational programming. While working with teachers in rural Nicaragua on sexual health education initiatives, I observed that neither BV nor YI were covered in health programs even though they are both common in the area.\textsuperscript{12} Results of this research will be used to provide educational information to local girls that has been adapted to the local context. This study also provides a model for investigating root causes of these issues within a community.

Background

Bacterial vaginosis (BV) and vulvo vaginal candidiasis, more commonly known as yeast infection (YI) are two of the most frequently experienced vaginal infections.\textsuperscript{13} They can cause discomfort, embarrassment and pain during intercourse, yet more importantly, increase risk for a variety of other medical conditions.

The microorganisms which cause BV and their byproducts often damage vaginal epithelium, degrade cervical mucus and cleave immunoglobin A.\textsuperscript{14} In addition to these immediate damaging effects, BV is associated with increased risk for pre-term delivery,\textsuperscript{15-16} HIV and HPV among other sexually transmitted infections.\textsuperscript{17-18} Individuals with BV are 60\% more likely to contract HIV,\textsuperscript{18} at greater risk for HPV, and experience delayed clearance of infections.\textsuperscript{14} BV is also associated with obstetric complications including pre-term birth,\textsuperscript{15-16} which causes 70\% of perinatal mortality and nearly 50\% of long-term neurological morbidity.\textsuperscript{19}

According to the CDC Fact Sheet, BV is “the most common infection in women of childbearing age.”\textsuperscript{13} Prevalence of BV in the US among women ages 14-49 is 29.2\%.\textsuperscript{20} Of those individuals, 84\% have no symptoms,\textsuperscript{20} most likely causing BV to be under-reported. The only Nicaraguan study on BV measured an incidence of 30.5\% among several regions in Nicaragua.\textsuperscript{12} By definition, incidence (number
of cases over a specific period of time) is lower than prevalence (total number of cases). Thus, prevalence of BV in Nicaragua is mostly likely much higher than in the US than it appears from these statistics.

YI is a common infection causing discomfort, inconvenience and occasional psychological ramifications. Some Candida strains have more profound effects including penetration of the vaginal mucosal surface inducing mucosal swelling, erythema and exfoliation of cells. These symptoms are not only painful, yet if they progress to the point that yeast enters the bloodstream, the condition can become systemic, invasive and life-threatening. About 15% of YIs develop into the “cyclic recurrent type” where individuals can experience four or more YI cases per year. Cyclic recurrent infections negatively impact women’s personal confidence and self-esteem, likely because of the pain and embarrassment they cause during intercourse and their association with STIs. These infections may contribute to psychosexual problems.

YI is extremely common, affecting 70-75% of women at least once in their lifetime. However, only 40-50% of those women experience a recurrence, meaning that only 33% of women typically experience YI more than once. These statistics include individuals in developed countries. Even in the US, incidence of YI over a two month period was found by Foxman et al. to be 6.5%. Although this statistic already seems high, it pales in comparison to incidence of YI in Nicaragua. Claeys et al. (2002) found that incidence of YI in three regions of Nicaragua was 19.1%, three times the incidence within the US.

Not only are BV and YI high in Nicaragua, incidence of BV and YI is high when compared to other vaginal infections. According to Claeys et al. (2002), BV and YI occur more often than any other vaginal infection among Nicaraguan women. However, literature on women’s health conditions in Nicaragua overlooks both conditions in studies with regard to sexual and women’s health. According to Darce Bello et al. (2002), “In Nicaragua, we know very little about the prevalence and incidence of vaginal candidiasis.” In the literature review for this research, I found two studies that include

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1 The definition and treatment of recurrent YI remains controversial because different researchers express differing views about the point at which YI should be termed recurrent.
information for each of these conditions in Nicaragua: Claeys et al. (2002) included BV and YI in a study on STIs among 1185 women; Darce Bello et al (2002) studied strains of YI among 106 women; and Soto et al. (2007) briefly included information about BV in a study that included 461 Nicaraguan women. None of these studies examined behavioral risk factors for either BV or YI. This study will contribute to research in the field by discussing behaviors related to these issues and by adding needed information to the small body of data that has been collected in the past.

**1) Behavioral Risk for BV and YI**

A majority of past studies on BV and YI have focused on sexual behavior because risk for both conditions is known to increase after sexual debut. In particular, risk for BV increases strongly with an increase in number of sexual partners. Consequently, most studies have investigated sexually-related risk factors for both BV and YI, such as type of contraceptives used and number of partners. However, these studies fail to cover the scope of risks for BV and YI because women can get both infections without ever having had sex. The few studies which have investigated other behavioral risks found that practices outside of sexual behavior play an important role in susceptibility to infection.

Identified risks for YI range from hygiene practices to medical conditions and medications. Women who are pregnant, diabetic, have a diet high in sugar, and who have been taking lots of antibiotics all experience increased risk for YI. Daily habits play an additional role in susceptibility. Tight fitting clothing, sanitary pads and sanitary protection practices have been identified as likely risk factors. Women with poor genital hygiene practices including wiping back to front are also more likely to contract YI.

Risks for BV are less clear. Few studies have examined risk factors for BV and many of these potential factors are widely debated. Many of the identified risks for YI have been examined as potential risks for BV including contraceptive methods, diabetes, and tight jeans. The same study that found risk for YI to increase with wiping back to front found the same results for BV and vaginal infections in general. While all of these behaviors are either less studied or widely debated, two behaviors: sexual activity with multiple partners and vaginal douching, are considered uncontroversial
risks for BV. Use of perfumes in vaginal douches or use of perfumed feminine hygiene products further increases this risk. In particular, Ness et al. (2002) found a direct association between vaginal douching and BV. Although only two behaviors are widely accepted as definite risks for BV, given the large, ongoing controversy, it is reasonable to investigate other potential behavioral risks mentioned above in the local community of Chacraseca. Little is known about behaviors practiced in Chacraseca that may increase risk for these conditions. However, education about sexual health topics outside of the most common STIs is uncommon and access to information about hygiene and medical habits related to sexual health is minimal. This suggests that risk increasing behaviors may exist in the community, since individuals have not been counseled to avoid them.

(2) Educational Curriculum

Adolescents in Nicaragua exhibit low knowledge of basic sexual health information indicating that lack of education could contribute to high incidence of women’s health issues. Out of 3,142 females ages 15-19 examined in the 2001 Nicaragua Demographic and Health Survey, only 11% were aware of the ovulatory cycle and 46% had received only primary education or below.

Chacraseca, in particular, suffers from minimal locally accessible information about BV or YI. When working with teachers on sexual health curricula in local schools in 2011, I found that students are educated about STIs, yet not about other infections including BV and YI. Similarly, pictographic health posters in local medical clinics display information on topics ranging from pregnancy to STIs yet do not include information on BV and YI.

Research studies and results of HOLA’s patient care reports and community assessments have shown that development of women’s health education in general is a principal concern within Chacraseca, Nicaragua. In HOLA’s 2011 community assessment, secondary school students at the two high schools in Chacraseca reported that they would be interested in having an expanded sexual health program in the schools and that such a program would not meet resistance from parents or community members. Physicians interviewed about public health reported that education was the best way HOLA could help the community.
(3) Sexual Activity Places Individuals in Chacraseca at Higher Risk

Susceptibility to both BV and YI increases after sexual debut and activity with multiple partners is known to further increase risk for BV.\textsuperscript{13,17} Evidence of early sexual activity in Chacraseca suggests that girls are at greater risk for BV and YI at a younger age. There were 56 reports of unplanned pregnancies in 2010 in Chacraseca,\textsuperscript{66} a community with slightly over 5,800 inhabitants.\textsuperscript{65} Unplanned pregnancies were most common among fifteen and sixteen year old girls,\textsuperscript{64} and the number of young pregnancies is likely underreported. Nicaragua’s rate of adolescent pregnancy is the highest in the world outside of Sub-Saharan Africa; approximately half of Nicaraguan women give birth before age 20.\textsuperscript{67} Although contraception is supposed to be offered for free through medical clinics, most young people reported that supplies run out and are thus not readily available for free.\textsuperscript{66} Students report that if they want to buy condoms, they have to go to the nearest city, León.\textsuperscript{66} High school students have reported that either they or people they know have experienced issues with STIs. Given minimal local information about BV and YI, it is possible that the problems locals report of STIs may refer to either of these two conditions as well.

(4) Cultural barriers to sexual behavior change

Machismo largely dictates sexual behavior in Nicaragua, making it difficult to alter sexual practices. A local lawyer interviewed by HOLA commented that, “it is not uncommon for men of 20 years to go after girls as young as 13. By Nicaraguan law, this is considered statutory rape, but most people around here [in rural communities] don’t know that.”\textsuperscript{68}

Gender roles are important within society, and while men are encouraged to ‘go after girls,’ girls are raised to be feminine and submissive.\textsuperscript{68} However, the girl bears responsibility for raising the child if the man chooses not to support her.\textsuperscript{68} Single-parenting is a likely result of this dynamic, as evidenced by a 2001 Demographic and Health Survey which found that 83% of girls between the ages of 15 and 19 who
have already given birth are unmarried with no partner, partnered and living separately, or unmarried and cohabiting, as compared with the 17% who are actually married.64

Research Questions

To pursue a structured study of behaviors related to high prevalence of BV and YI in the Chacraseca community in order to make recommendations for future interventions, I have tried to answer two specific research questions: (1) *What behaviors contribute to high prevalence of BV and YI in the Chacraseca community?* and (2) *What are the root causes of those behaviors?*

To investigate these questions, I created structured interviews to ascertain which behaviors out of practices ranging from hygiene to compliance with medical prescriptions increase risk for BV and YI. The list of the behaviors I investigated included antibiotic use, vaginal douching, vaginal perfumes and perfumed hygiene products, wiping back to front, general hygiene as measured through washing practices, and practices that would increase moisture, including daily use of sanitary pads, using rags during menstruation instead of pads, and other likely risks observed during fieldwork.

I did not investigate people’s sexual activity or the number of sexual partners they have had, as my focus is on non-sexual environmental and behavioral factors. Many of the interview participants were high-school age, which assumes some portion are sexually active and some are not. Some information about sexual activity and age at sexual debut may be glimpsed through other measurements including age at first birth, marital status, frequency of Pap smear exams, and additional information supplied by interviewees.

The root causes of behaviors that may contribute to BV and YI cases are framed within Ajzen’s Theory of Planned Behavior.69 This theory states that behavior depends on an individual’s intention to perform a behavior. Intention for a behavior stems from three sources: behavioral beliefs, normative beliefs and control beliefs. As illustrated in Figure 1, these beliefs lead to three factors which subsequently affect intention: attitude toward the behavior, subjective norm (or social pressures), and perceived behavioral control.
These three technical sounding factors stem down to simple and intuitive causes of behavior. What an individual believes to be the expected outcome of a behavior governs his attitude toward the behavior. Beliefs about expected outcomes in the context of behavioral health boils down to an individual’s knowledge about the consequences of various health related behaviors. Subjective norms refer to beliefs about what others think the person should do, in other words, subjective norms mean social pressure. Finally, perceived behavioral control relates to access or perceived access to a behavior. It refers to an individual’s perception of his ability to perform a certain behavior. In a healthcare context, this corresponds to access or perceived access to resources.

Distilling Ajzen’s theory down to easily understandable causes in the context of health related behaviors, I have generated the following simplified diagram, Figure 2, which illustrates the direction I will take in analysis of root causes of behaviors.
Using this model, I consider whether each of the identified behaviors stem from knowledge, social pressure or perceived access to care. To examine such factors, I will include questions in interviews ranging from simplistic questions about why the individual practiced a certain behavior to questions designed to ascertain the individual's level of behavioral health knowledge. An additional section will address concerns about access to medical care and medication, as well as questions about the frequency the individual receives primary care.

These two research questions will direct my investigation toward the root causes of behavioral patterns in the community increasing risk for BV and YI. I will first examine what behaviors contribute to high prevalence of BV and YI in the community and subsequently investigate the root causes of these behaviors. To study the second research question, I will direct interview questions to examine behavioral influences as laid out in the Theory of Planned Behavior discussed above. This manner of assessment will reveal means of altering behavioral trends in the community in order to relieve BV and YI prevalence in a cost-effective, community-specific manner.

Methodology

Phase I. Study Development and Design

The goal of my research was to gather information that could later be incorporated into public health education curricula. Thus, I was interested in information that could assist with preventative
healthcare: information about behaviors that are realistically possible to alter. This meant that I should focus on public health issues. Thus, I began to design a study to investigate causes of public health issues identified in and surrounding Chacraseca, Nicaragua that could be mitigated by improved education in a manner acceptable to the community and feasible for implementation through development programs.

Preliminary design of the project consisted of conducting further literature review on health issues identified in the Chacraseca community through my work over the past two years, networking with Nicaraguan officials and professors at CU to discuss the appropriateness and viability of the study, and developing logistical plans to carry out the project. I subsequently set out to design research that would address a small portion of the health issues in the community in a responsible and informed way, deciding to focus on BV and YI due to their potential prevalence and lack of proper treatment.

(1) Related Work

With my focus on public health issues possible to alter through behavior, I began by consulting past documents produced by the HOLA Foundation to determine which issues to investigate. Adolescent pregnancy, STIs, malnutrition, UTIs, kidney problems, diarrhea and respiratory issues are principal concerns in Chacraseca, Nicaragua. Consequently, I decided to focus on these issues and proceeded by investigating literature outside of internal documents produced by HOLA.

Through background research, I found that these issues are concerns in Nicaragua at large. HPV and syphilis are prevalent and numbers of infected individuals have been increasing. Many Nicaraguans also experience nutritional deficiencies such as anemia and illustrate minimal knowledge about the causes of their condition. UTIs, kidney problems and diarrhea affect an even larger portion of the population leading to a substantial body of research on these topics. Finally, burning trash and open-fire cooking lead to a high incidence of respiratory issues throughout Nicaragua.

(2) Ethics

As required for studies involving human subjects, I completed an IRB application for this research and the necessary CITI training. I developed a process for acquiring informed consent from
participating subjects and reviewed all other protocols with the IRB to ensure that my research practices were ethically sound. The IRB approved my protocol (#12-0126).

(3) Review of Spring Pilot Project with HOLA

In conjunction with HOLA’s week-long spring trip to Nicaragua, I conducted preliminary surveys about behaviors related to the public health issues in spring 2012. Working with traveling medical clinics, I researched correlations between the extent of public health education and incidence of diagnosis with the health issues identified in the related works section. I designed a survey for patients in medical clinics that asked about hydration, diet, sexual health, cooking fire ventilation and hygiene practices. This survey was then put with patient’s files for physician use. I also created surveys to determine the extent of public health education in schools, which I administered in conjunction with public health educational programs I was already conducting through HOLA.

The pilot project did not yield meaningful quantitative data because the surveys were too long to be administered in a practical manner leading to a low sample size. Even though the surveys were long, they barely grazed the surface of each issue because questions were spread evenly to cover all of the issues discussed in the related work section. This meant that there was too little information on each subject to draw meaningful conclusions about which behaviors are practiced and why. However, students and some adult patients provided the following comments in the sexual health sections:

“We can see that sexually transmitted diseases have grown” -teacher

“What does it mean if Papa has a lot of women?” -teenage student

“Many students are having sex at a very young age now” -teacher

“In every family here, the parents don’t teach about this topic.” -teacher

“Just by educating on these themes, we can reduce a lot of the sexual health problems that are confronting us in reality, in Nicaragua” -teacher

These statements supported my focus on sexual health as a community issue, which then became the basis of my research questions.
(4) Constructing a new Interview Instrument

Through background research, I had found considerable cause to investigate all of these issues, yet until the pilot project, I neglected to realize that the extent of such a study was broader than that which I could achieve. Compared with the extent of HOLA operations, this small piece of behaviorally-related health concerns seemed like a practical and feasible project to tackle. However, I came to realize that the spread-thin method of operations in HOLA could be one of the contributing causes of reduced success. Already, I was aware that while the extent of these issues could be alleviated through improved education, developing culturally appropriate curricula requires further research about current education and knowledge.

I initially intended to focus my research on STIs at large, yet social barriers including machismo prevented me from interviewing men. I thus chose to focus my study on BV and YI because I could gather meaningful data by interviewing women alone.

The most important preliminary aspect was to ensure that I would have local support and approval. I contacted local individuals whom I knew from my work with HOLA, including the local principal of schools in Chacraseca, local teachers, the physician at the medical clinic, and a friend who could help me find living arrangements. Similar to my pilot study, I intended to conduct assessments both in local schools and in conjunction with the local health center. The physician, Dra. Somarriba, and the principal of schools, Flor de Parilles, supported the project and would allow me to conduct interviews and surveys in each of the respective locations. Our plan was that I would conduct interviews in the morning at the health center during its hours of operation from 7am-1pm. In the afternoon, I would travel around the community conducting further interviews and spend several days working with the schools, giving health presentations and conducting interviews.

I used both quantitative and qualitative data analysis methods to gather comprehensive information that would statistically describe the issues in the community and illustrate the issues through personal stories and experiences. I designed a semi-structured interview instrument where I ask the same set of questions in the same sequence yet could also ask follow-up questions as necessary.
Informed by the literature review and my past experiences in the community, I limited interview questions to access to medical care, medications, douching, hygiene concerns including direction of wiping, underwear material, feminine hygiene supplies, perfumes, re-use and washing of supplies. Several experts reviewed the questions and edited my Spanish translations. A colleague near Chacraseca verified that the translations were appropriate to the community. He also reviewed my translations of informed consent documents. See appendices A and B for these documents.

I began fieldwork at the beginning of June 2012 and gained substantial information in the first week that slightly altered the course of study I followed during my month of fieldwork. The following discoveries made it necessary to modify my data collection methods and tailor my interview questions to better fit the local environment:

1. The physician often did not come to the clinic meaning that I needed to spend more time going door to door in the community conducting interviews.
2. Given the sensitive nature of the questions I was asking, I needed to be introduced to potential interviewees by a trusted member of the community.
3. The pharmacy runs out of medications so frequently that individuals must typically buy their own antibiotics.
4. The closest available pharmacies are in León, and they sell antibiotics by the individual pill rather than by the complete prescription.
5. Not all members of the community can afford to buy toilet paper.
6. 100% of community members questioned on the matter do not use vaginal douches or perfumes, do not know what they are and were generally confused by these questions.

Given this new information, I removed questions about douches and perfumes and added questions about the following topics: ability to see the local physician, ability to see a private physician when the local one is unavailable, toilet paper use and antibiotic purchases (whether individuals buy antibiotics together or by the individual pill, whether they can get to León and how difficult this is).
(5) Subject Recruitment

I recruited subjects in separate ways with patients in the health center, community members in their homes, and students in schools. When I was working with the physician, I would recruit subjects waiting in line outside the clinic. Before beginning work, Dra. Somarriba would make a brief statement to waiting patients that I was a university student working on a research study to improve educational programs. I would then solicit subjects by discussing the study individually with women prior to their appointment using the informed consent script and form (see Appendices A and B).

While networking with friends and colleagues in the field, I made contact with a community member, Aida Chavez, who was interested in showing me around the community to conduct interviews. I recruited subjects outside of the health center by walking through the community with Ms. Chavez, who would introduce me to community members as a University student working on a study to improve educational programs. I would then explain the study using the informed consent script and ask individuals if they would like to participate.

I recruited subjects in schools by presenting the study to a class of students using the informed consent script. To ensure that participation was optional, I instructed students that they could draw on the back of the written survey if they did not wish to participate.

(6) Administering Interviews

Interviews in and outside the health center were administered in nearly identical ways. While working in the health center, I administered interviews in a private room prior to each subject’s appointment. In the community, I administered interviews in a private setting ranging from a separate room to a spot on the ground out of ear shot from other individuals. In both cases, I posed each question verbally with the same phrasing and sequence shown on the form attached in Appendix C. Depending on interviewee responses, I asked additional follow-up questions.

I administered interviews in schools using a written format. Following presentation of the study using the informed consent script, I gave each student an informed consent form and an interview form. Students were instructed to leave the consent form blank and to draw on the back of the interview form if
they did not wish to participate in the study. If they did wish to participate, they were instructed to write and sign their name on the informed consent form but not on the interview form, then to complete the questions in writing. I let them know that they could ask me questions at any time either by raising their hand or coming up to my desk. I then gave students a quiet period of 20 minutes to respond to the questions. Once students had finished, they were instructed to place the forms in separate boxes with slits in the top to maintain confidentiality.

(7) Observations

Outside of semi-structured interviews, I gathered data by observing and participating in community life. I did not have a car, rode local buses, ate, washed, and lived like women in the community. Through this process, I became familiar with typical hygiene and washing practices, local bus schedules and fares, local food, medications, home remedies and products available for purchase. I lived with a woman who ran a general store (‘pulperia’) out of her home, which is the only type of store available in Chacraseca. I went through the over-the-counter medications and hygiene supplies available through these stores. Finally, when friends or family were ill, I observed local methods of preparing and administering home remedies.

Phase II. Data Entry & Analysis

The first stage of data entry involved sorting, numbering and organizing notes I had collected during fieldwork. I assigned each subject a number, arranged the interview records in a binder, and assigned a number to each common response to a question (refer to the codebook in Appendix D).

Once I had developed a schema for all common responses in the 278 interviews, I began entering the data into Microsoft Excel™. In addition to the numerical code, I entered relevant qualitative information associated with the record, including observational data and quotes. From this data collection framework, I was able to sort data for easier analysis and generated data visualizations to help investigating trends in the findings in order to direct further analysis (see Appendix F for data visualizations).
(1) **Health Data**

From the data, the prevalence of BV and YI in the general public was higher than expected, with 43% of respondents reporting that they had experienced symptoms of YI and 45% reporting that they had experienced symptoms of BV. Prevalence among students was significantly lower: only 13% of students reported experiencing YI symptoms and 12% reporting BV symptoms. Possible reasons for lower prevalence among students include a lower likelihood of sexual activity, younger age and never having had children (if they are not having sex, they are not having children). Since students are significantly less likely to have BV or YI than the rest of the population for reasons that were not measured by these interviews, I did not include this group of subjects in the following analysis. When students are not included in the subject pool, prevalence of BV and YI rises to 52% and 48% of the respondents, respectively.

**Results and Analysis**

**Findings**

Behaviors increasing risk for BV and YI fell into three categories: access to healthcare, antibiotic use and hygiene. Specific behaviors within these general categories are discussed in detail within corresponding sections. Several behaviors investigated were either not associated with increased risk for BV and YI, or the data was inconclusive. All results discussed were generated through calculations performed in the excel workbooks as described in the methods sections. Note that the following statistics do not include student responses, except where noted.

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2 Since girls who become pregnant are obliged to drop out of school, 100% of the students do not have children. Additionally, girls only begin to have pap smears once they become sexually active. Only 22% of students know what a pap smear is compared to 76% of the general population (not including students). Of those individuals who know what a pap smear is, only 17% of students report having ever had a pap smear compared to 91% of the general population. This supports the conclusion that the large majority of girls in school are not sexually active and are thus at reduced risk for BV and YI.
(1) Access to Healthcare

Poor access to healthcare was reported in my findings. There is one public health center in the community that is supposed to be staffed with a physician from 7am-1pm Monday through Friday. This clinic is free, open to the public, and generally accessible through the local bus system. However, I observed that the physician only attended the clinic between half and three quarters of the time. One third of the total population (27%) reported that they either could not see the physician, that they can only sometimes see the physician or they skated around the question by saying that the physician does not often come or simply that it’s difficult. Inability to get care is disproportionately high among individuals with BV and YI. Compared with 27% of the whole population, 79% of subjects recurrently experiencing BV or YI symptoms report that they cannot or are only sometimes able to see the local physician. Overall, the inconsistency with which the doctor comes to the clinic has created the impression among the majority of community members that there is a reasonable likelihood that the doctor will not be there even if they make the trip out to see her. This is compounded because there is no notification mechanism to let individuals know whether or not the physician has come to the clinic, which affects people’s decision to go to the clinic or not.

From the data collected in this study, it appears that some of this disparity can be explained by difficulties in transportation, differences in class and possibly gender. Individuals that live further away must take the bus to and from the clinic, which costs approximately 60 cents round trip. This may seem like a small fee, yet 82.3% of the Nicaraguan population lives on less than $1 per day meaning that the bus trip alone costs more than half one day’s income. Individuals who live further away and are of lower socio-economic status experience greater difficulty receiving care. There is also a public hospital in the

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3 Although the majority of the population reported that they could not see the physician, when asked about the frequency with which they attend the physician, nearly all individuals (93%) report going annually or more frequently. These responses are counter-intuitive and require further investigation. It is possible that ‘going to the doctor’ was interpreted as attempting to see the doctor instead of meaning being successfully able to see the doctor. It is also possible that women counted not only the times they went to the doctor for themselves, but the number of times they took their children.

4 For the purposes of this study, recurrent infection was defined as experiencing symptoms 3 distinct times or more
nearest city, León, which is free but hard to reach due to cost and time. In emergencies people will go to the hospital, but not for routine health issues.

I discovered social factors that inhibit clinic and hospital visits. I learned that someone always stays with the house due to high rates of robbery. When a family goes to mass on Sunday, one member will stay behind to prevent burglary. The implication of this is that a woman must ask her husband for permission to go to the clinic because the husband must watch over the house while she is gone, which requires him to miss work and pay. If the woman comes back and tells her husband that she was unable to see the physician, “it is less likely that he will allow her to go the next time.”

The free alternative of going to the public health center is attending the nearest hospital in León. However, due to the time commitment, cost and bus schedule, this is difficult. The last bus returning to Chacraseca leaves the station around 3pm, and the first bus arrives in León at 6am, requiring an expensive overnight in León. Some people opt for this despite the financial hardship.

Private health clinics provide an alternative to the free, public forms of care. Patients report receiving superior care in a timely manner when they attend private clinics. According to one participant, she only goes to a private physician despite the expense because the physician at the health center “doesn’t solve anything.” Another participant remarked that she did not go to the public health center because, “it isn’t private. They often don’t close the door and other people or the nurses come in when I’m talking.”

Most community members are not financially able to access private care. Of those with recurring BV or YI, only 28% reported that they were able to see a private physician; the rest either said they were unable or answered the question simply by saying that it is very difficult or very expensive. However, 41% of individuals who have not experienced either BV or YI reported being able to see a private physician. When asked about this, many of the individuals who reported being able to see a private physician often go to one for the same reasons listed above. This suggests that individuals who do not
experience BV or YI are more likely to be among the group of individuals who attend a private physician more frequently.5

(2) Antibiotic Use

A majority of individuals in Chacraseca (82%) do not complete their prescribed antibiotic regimens and have minimal knowledge about antibiotics in general. The data suggest that most individuals do not finish their prescriptions because of a combination of logistical and economic factors. Logistical factors include the local health center running out of medications, local pharmacies selling antibiotics by the individual pill, and transportation obstacles to accessing pharmacies. Economic factors include difficulty or inability to buy medication when the health center runs out.

Since not completing antibiotic prescriptions is known to increase bacterial resistance to antibiotics,12 these documented behaviors may contribute to the high prevalence of recurrent BV infections in the area. No correlation was found between individuals with BV and failure to finish an antibiotic prescription; instead, both infected and symptom-free categories had a similar percentage of people who regularly did not finish their antibiotics (82% and 83% or subjects, respectively). However, this is not surprising since the percentage of individuals not finishing their prescriptions would build bacterial resistance among the strains causing infections in the area. This affects all other individuals in the community because anyone who contracts the strain of bacteria in the future experiences greater difficulty getting rid of the infection because the bacteria are more resistant to treatment.

The data suggests that most individuals do not finish their prescriptions because of a combination of logistical and economic factors. Logistical factors include the local health center running out of medications, local pharmacies selling antibiotics by the individual pill, and transportation obstacles to

5 The data also shows that individuals who typically respond to illness by going to the health center are more prone to experience yeast infection than those who respond by treating themselves at home. This could suggest that individuals who attend the health center are more likely to be prescribed and take antibiotics than those who do not, yet this claim requires further investigation. It does seem significant that 69% of individuals with recurring YI respond to illness by going to the health center compared to only 50% of individuals without YI who respond to illness in this way. Intuitively, it would be expected for individuals to have better health outcomes if they attend the health center more frequently for illness, yet this does not seem to be the case with YI. Future investigations could consider how frequently antibiotics are prescribed for which conditions at what level of severity.
accessing pharmacies. Economic factors include difficulty or inability to buy medication when the health center runs out.

When individuals in Chacraseca cannot receive antibiotics from the health center for free, they typically buy them in León one piece at a time because pharmacies sell antibiotics by the individual pill. This decreases the likelihood that individuals will complete their regimen because they begin to feel better before the course is run. Although people can buy their antibiotics together, this option is usually only available to the wealthy. Only 9% of the population buys antibiotics all together, whereas 83% buy them bit by bit. The behavior of the remaining 8% depends on their financial situation at the time.

Financial difficulty contributes substantially to the tendency of individuals not to complete their prescriptions. 77% of all individuals report that they cannot buy antibiotics. If individuals are financially unable to purchase the treatment for an infection, their condition is less likely to go away and more likely to flare up again. This is exactly what the data shows for individuals with BV. 90% of the individuals who recurrently experience BV cannot afford the treatment: antibiotics. A much lower number of individuals who have never experienced BV share this concern, only 73%.

Getting to León to buy medication contributes to some of the difficulty individuals experience acquiring medication. 9% of people cannot get to León, 13% can sometimes but not always get to León and the remaining 79% report that they can get to León if absolutely necessary. This still requires someone to stay at the house to guard against burglary, representing additional economic and logistical difficulties.

The data illustrated lack of general knowledge about antibiotics including gaps in information about what they are, when to stop taking them and risks associated stopping a regimen early. 34% have no knowledge about antibiotics, 6 20% have only minimal knowledge, 7 and the remaining 46% know that antibiotics are treatments for infection or bring up names of specific antibiotics.

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6 They respond in the interviews that they “do not know” what they are, and when concepts about antibiotics are explained, they still cannot answer any follow up questions about them or provide any other information.

7 They at least know that antibiotics are medicine (although some associate them with contraceptives) and once they have learned that antibiotics are medicines used to treat infections, they can answer some follow up questions.
Even the individuals who know enough about antibiotics to respond to follow-up questions struggle identifying when to stop taking them or risks of stopping them too soon. When questioned about when it is appropriate to stop taking antibiotics, 43% of respondents replied correctly, 8 31% replied that they could stop after a specified number of days, 9 and the remaining 26% reported that they could stop when they felt better.

Individuals who had never experienced BV were less common to report that they could stop when they felt better (18%) and individuals who had experienced BV were more common to report this (29%). The opposite trend was seen among subjects with a risk for YI. 21% of individuals who had experienced YI reported stopping when they felt better compared to 28% of individuals who had never experienced YI and reported stopping when they felt better. Thus, lack of knowledge about when to stop antibiotics clearly does not seem to be a risk for YI, but does seem to increase likelihood of BV.

Many individuals do not complete their antibiotic regimens partly because of lack of awareness about the risks they incur by stopping too soon. When asked about risks, 72% of respondents replied with a correct answer such as: “they will not get well,” “their sickness will come back,” or “their sickness will get worse,” yet the remaining 17% of individuals either responded that they did not know what the risks were (13%) or that there were no risks associated with such behavior (4%). It should be noted that many individuals with lower knowledge of antibiotics did not get to this question or could not respond to it.

Antibiotics are widely used within the community, even with the lack of knowledge described. All individuals with sufficient knowledge about antibiotics to respond to follow-up questions were asked how many times they had used antibiotics. Individuals replied to this question in a variety of ways. Some individuals reported a finite number of times that they had used antibiotics, some reported a number of times per year and others had difficulty quantifying a number of times and responded simply ‘lots’ or ‘various.’ A few individuals did not respond or reported that they use antibiotics when sick or just for certain conditions.

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8 Reasonable, correct responses included comments such as “as the prescription says,” “like the doctor says” or “when done with all the doses.”

9 The average number of days reported was 6.7
Regardless of the varied manner of responses, it is evident that community members take antibiotics frequently. The idea of ‘frequent’ antibiotic use is difficult to quantify. From follow up responses from a few individuals about what ‘lots’ and ‘various’ mean, I consider these two responses as frequent use of antibiotics. Two individuals who mentioned that they use lots of antibiotics also gave a number; one 22 year old individual reported that lots meant about 10 times, the other reported that lots meant 3-4 times per year. People responding ‘various times’ report that this means 4-20 times, or according to one respondent, once a month. Individuals who reported the number of times per year they take antibiotics responded that they take them between one and twelve times a year. To roughly ascertain how many individuals practice ‘frequent’ use of antibiotics, I pooled the number of individuals responding ‘lots,’ ‘various,’ four or more times (the bottom threshold for ‘various’), and once a year or more frequently. When pooled, 62% of interviewees report frequent antibiotic use. For the rest of the individuals, 34% have used antibiotics 3 times or less, 2% did not respond or reported that they did not know how many times, and another 2% reported that they use them when sick or for certain conditions.

The narrow range in types of antibiotics used is also important. All but one individual said they had used amoxicillin, tetracycline, or ciprofloxacin. This narrow number of antibiotic names reported suggests that a small number of antibiotics are widely available to the general public, and this narrow range of antibiotics prescribed would naturally build up bacterial resistance to those specific antibiotics commonly in use.

Over-use of antibiotics is more common among risk groups for YI. 74% of individuals with recurrent YI report frequent antibiotic use, compared with 54% of individuals who have never experienced YI. Individuals who have experienced YI but not recurring YI exhibit antibiotic use between the two, 65%, which is only slightly higher than the general population.

I included a variety of questions in interviews to ascertain whether or not individuals associated over-use of antibiotics with vaginal infections or YI. After describing YI, individuals were asked what they think might cause this condition or increase risk for it. Additionally, individuals were asked at another point in the interview about causes of vaginal infections. These questions generated a wide
variety of responses ranging from different foods to sexual relations to contaminated seats. No individual mentioned over-use of antibiotics as a risk factor for YI.

Some individuals are aware of risks associated with antibiotics even if they do not link this behavior to YI. 35% of individuals correctly identified some consequences of excessive antibiotic use including decreased immune defense, allergies, anemia, needing vitamins, or being prone to sickness. This statistic is lower among individuals who experience recurrent YI; only 21% identified issues with over-use of antibiotics.

In addition to pharmaceutical antibiotics, community members exhibit high use of antibiotics from natural sources. Most individuals in the community use herbal remedies with antibiotic properties including mango and guava leaves. Mango leaves contain five flavonoids with broad spectrum antibiotic properties\textsuperscript{84-85} and are used by 85% of the population. Guava leaves also have antibiotic properties\textsuperscript{86} and are used by 58% of the population. As shown in Table 1, individuals with recurrent YI use mango leaves more frequently than those who have not had YI (92% vs. 85%). The same trend is true for guava leaves; 67% of those who have recurrent YI use guava leaves versus 56% of those who have not had YI. These differences could be due to home use of guava and mango leaves to treat YI.

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<tr>
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<th>Use of Mango Leaves</th>
<th>Use of Guava Leaves</th>
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<td>67%</td>
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<tr>
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<td>85%</td>
<td>56%</td>
</tr>
<tr>
<td>Recurrent BV</td>
<td>75%</td>
<td>65%</td>
</tr>
<tr>
<td>No BV</td>
<td>92%</td>
<td>61%</td>
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\textbf{Table 1: Natural Antibiotic Use}

The opposite trend is observed for BV in the case of mango leaves; individuals who have never had BV use mango leaves more frequently (92%) than those who have recurrent BV (75%). However, the same trend is not true of guava leaves. Approximately the same number of individuals who have recurrent BV and have never had BV use guava leaves (65% vs. 61%). This suggests that, in absence of access to medical care or money for antibiotics, natural antibiotics may relieve BV symptoms.
High use of both of these natural antibiotics presents further evidence of potential origins for bacterial resistance to antibiotics. As discussed above, bacterial resistance created by high use of antibiotics by a few individuals would affect the risk for BV of the population at large.

(3) **Hygiene**

Several hygiene-related behaviors practiced in the community correlate with increased risk for both BV and YI: using rags instead of pads during menstruation, wiping back to front, and not using toilet paper. Vaginal douching, vaginal perfumes, poor washing habits, daily use of panty liners, underwear material and repeated use of underwear were all investigated as potential causes of high BV and YI prevalence, yet none of these behaviors contribute to prevalence of either disease in my small sample.

All community members who responded to menstruation treatment replied that they either use pads or rags. No women reported using tampons or any other menstrual products. The use of rags or pads during menstruation seemed to correspond with socioeconomic status because many women reported using pads when they could afford them and using rags when they could not. Individuals who either consistently used rags instead of pads or who reported using rags some of the time because they could not always afford pads were more likely to have recurrent BV or YI. Of the individuals who experience recurrent BV or YI, 41% use rags either some or all of the time for their menstruation. Of the individuals who have not experienced BV or YI, only 21% use rags either some or all of the time.

The rags used during menstruation are made of cut up pieces of old clothing, which are much thicker than pads once folded. It thus seems logical to guess that they would trap more moisture, although this has not been studied. It also seems likely that they would be less sanitary since women dry them outside on clotheslines above dirt yards in which domestic animals are kept.

Although moisture is typically only considered a risk for YI, using rags instead of pads was positively associated with both conditions. Out of the individuals with recurrent YI, 47% used rags compared to 25% who used rags but had not experienced YI. The statistics for BV are similar. Of those with recurrent BV, 43% used rags, compared to 19% of those who had not experienced BV who used rags.
While the statistics for BV and YI are similar, this does not necessarily mean that using rags increases risk for BV. There is fair amount of overlap between the two conditions. Of people who have experienced YI, 43% also report experiencing BV. Out of those with recurring YI, 69% experience BV and 46% experience recurring BV as well. People with BV are nearly as likely to have experienced YI as people who have YI are likely to have experienced BV. Of the individuals who have experienced BV, 39% report also experiencing YI. Out of the individuals experiencing recurrent BV, 63% experience YI and 40% have experienced recurring YI.

Direction of wiping after going to the bathroom correlates with risk for BV and YI. Nearly half (45% and 44%) of the individuals who have had recurring BV and YI report sometimes or always wiping back to front. In comparison, under one third (29% and 27%) of individuals who have never experienced BV or YI report wiping back to front. The data indicates that wiping in a less sanitary direction could be a risk factor for BV and YI.

Most individuals practice this behavior as a result of lack of education about healthy hygiene practices with regard to direction of wiping. In the course of the interview, subjects were asked which way of wiping is better. Out of the individuals who sometimes or always wipe back to front, 72% responded that wiping the way they currently wipe is the best method. When asked why this is the best method, subjects responded with comments including, “It’s as I do,” “It’s faster” and “It’s easier.” None of these comments illustrated any knowledge of increased risk for vaginal or urinary tract infection associated with wiping remains of bacteria-containing stool towards the front. It is thus logical to conclude that these individuals have not been educated about this risk.

Of the remaining subjects, some (20%) exhibited knowledge about this risk and the rest (8%) did not respond. The 20% of subjects who exhibited knowledge replied that the best way to wipe is front to back for reasons including, “it’s cleaner,” “there are parasites in back,” “to not contaminate,” and “to avoid infection.”

While the majority of the population uses toilet paper, 7% of the population does not and those individuals demonstrate increased risk for BV and YI. Out of the 7% of individuals not using toilet paper,
71% have experienced BV or YI. Materials used in place of toilet paper include leaves, discarded papers (newsprint or other) and rags. Reasons for not using toilet paper are economic; all of those individuals who do not use toilet paper do so because they cannot afford to buy it.

Vaginal douching, vaginal perfumes, poor washing habits, daily use of panty liners, underwear material and repeated use of underwear were all investigated as potential causes of high BV and YI prevalence, yet none of these behaviors seemed to contribute to prevalence of either disease from the data. Questions about use of vaginal douches and perfumes were included during the first 50 interviews, yet 100% of those individuals reported that they did not use them or that they did not even know what they were. Consequently, this question was removed.

Nearly all individuals interviewed reported changing their underwear at least once a day and washing themselves once a day. Few individuals were aware what material their underwear was made of, which rendered that set of questions unusable. Most individuals used qualifiers to describe their underwear such as “soft ones” or “fresh ones,” instead of “cotton” or “polyester.”

**Limitations**

This study was limited by its small sample size, differing qualitative responses of individuals to varying questions, the manner in which prevalence of BV and YI were measured, and by participants not responding to every question. However, given the limited information available on this topic and the logistical difficult of gathering data on sensitive sexual health topics among a foreign and marginalized population, this data still provides meaningful information to the field.

The sample size for this study was only 278 women among a population of 3,000-4,000 women. Out of the 278 participants, 55 were students meaning that the sample size analyzed was only 223. Additionally, not every woman responded to every question meaning that the sample size for each question varied and typically did not include all 223. In addition, individuals responded to questions with a wide variety of qualitative answers. These answers were sometimes difficult to pool into distinct categories of responses to allow for interpretable analysis. The ways individuals responded to questions
about the number of times they had experienced BV and YI was particularly varied. Although some individuals reported the distinct number of times, a majority responded with vague comments such as ‘lots’ or ‘various.’ The few people who replied what various or lots meant responded with numbers ranging from four to twenty times to once a year. Prevalence was also measured in terms of an individual’s life span which meant that older individuals were more likely to have experienced BV or YI a larger number of times than younger individuals simply because they have lived longer. However, it should be noted that older individuals typically could not report a number of times and simply replied ‘lots,’ ‘various’ or with the number of times per year. If this experiment were re-done, it should have sampled the number of times individuals had experienced BV or YI within the past year and compared prevalence between women of differing age groups.

Conclusion

Results of this study indicate that reported high prevalence of BV and YI in the Chacraseca community may come from health-related behaviors which individuals practice as a result of lack of education about the consequences of these behaviors, poor access to healthcare and misuse of medications.

Given the degree to which prevalence increases among individuals with less education and reduced access to quality care, it might be more beneficial to divert a greater portion of medical funding to efforts solving issues related to access and education. Development organizations in particular should consider solving illness from the bottom up by removing root causes of behaviors impacting health that have been revealed through studies such as this one. Conducting and acting on such studies could be more effective and cost-efficient at preventing illness than continuing to treat individual cases with medication in the same way.

This study was motivated by a desire to better inform educational health programs run by foreign development organizations – especially those that have a gender focus. Based on the data gathered, educational programs including information on hygiene and proper antibiotic use could ameliorate gaps in
practical knowledge leading to behaviors that increase risk for BV and YI in Chacraseca, Nicaragua. These programs should address specific behaviors that are practiced by the community. Curricula on hygiene should include information about using pads versus rags, wiping front to back and using toilet paper. In addition to providing information, programs must address practical concerns including providing a means for poorer individuals to access free toilet paper, pads and complete antibiotic prescriptions.

Results show that improper use of medication stems largely from financial concerns because the pharmacy frequently runs out of free medications leading individuals to forego treatment or take only a portion of the dose. This reality presents pertinent reasons for NGOs to address the efficacy of methods they use to address barriers to care. For instance, the HOLA Foundation uses its pharmacy budget to pass out a one month supply of needed medications to patients at its clinics once a year. The medications HOLA provides are also available at the local health center while those supplies last. HOLA could use its pharmacy budget more effectively by financially supporting the public pharmacy when it runs out of medications instead of providing free medications for patients at HOLA’s own clinics, which only run once a year.

Poor access to physician care was also associated with increased risk for these conditions. Minimal access stems primarily from low and inconsistent staffing at the local clinic. Currently, HOLA addresses poor access to care by running free clinics for one week each year. These annual free clinics are less consistent than the system currently in place. Results suggest that the population would receive greater benefit from programs to increase medical personnel, a mechanism to provide notification in cases of physician absence and means of discouraging repeated absences.

Based on the 278 interviews of community members included in this study, these suggested interventions would more effectively target the root causes of BV and YI in the Chacraseca community. By targeting the origins of medical issues such as those revealed in this study, development organizations including HOLA have the opportunity to tackle these in a cost-efficient and community specific manner.
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Appendix A: Informed Consent Script

English:

Hello; I was wondering if you would mind answering a few questions about your thoughts and behaviors in relation to certain public health concerns. These questions are part of a research project on local public health concepts and behaviors. The study aims to reveal information that might help people develop programs to improve community health. All of your responses will be anonymous, and your participation is voluntary. While the overall results of the study will be made public, your name will not be linked to it in any way. If at any point you feel uncomfortable and don’t want to continue, you can choose to stop answering the questions. If you decide not to participate, you will still receive all the benefits of the clinic, be able to see the doctor and receive vitamins.

Specifically, this study is investigating correlations between certain behaviors and frequency of women’s health issues. All that would be asked of you would be to respond to questions for several minutes, and allow the physician to mark your diagnosis on a sheet, then drop the sheet in the box with the slit in the top over there at the exit of the clinic. The only foreseeable risk involved with participating would be that some of the questions are personal and may make you feel uncomfortable; yet again, you can stop answering at any point. You could benefit through participating in this study because results will indicate how non-profit organizations, particularly foreign organizations, can respond more appropriately to community needs.

Feel free to ask me any questions you may have. Also, there are forms here with more information about the study, which you are welcome to keep. You’re welcome to think over this for a while. The consent document will be put in this box here with a slit in the top, so your name will not be connected with your survey responses. Do you have any questions right now? Have you decided whether or not you’d like to answer the questions for the study?

(if yes: Thanks for your participation) (if no: That’s fine; thanks for considering it)

Spanish:

Hola, quisiera saber si puede responder a pocas preguntas sobre sus pensamientos y comportamiento con respeto a algunas preocupaciones sobre la salud. Esas preguntas son parte de un proyecto de investigación sobre los conceptos y comportamientos de la salud pública en esta comunidad. El estudio quiere revelar información que puede ayudar a la gente en desarrollar programas para mejorar la salud de la comunidad. Todas de las respuestas son anónimos, y la participación es totalmente voluntaria. Mientras los resultados del estudio van a ser publicados, sus nombres no aparecerán en ninguna manera. Si siente incómodo en algún punto del estudio y no quiere seguir, puede elegir dejar de contestar. Si elige no participar, seguirá recibir todos los beneficios de la clínica, ser capaz de ver al médico, y recibir vitaminas.

Específicamente, este estudio está investigando correlaciones entre algunos comportamientos y la frecuencia de problemas de salud femenina. Todo que tendrá que hacer es responder a las preguntas por algunos minutos y permite al médico de marcar su diagnosis en una hoja, y poner la hoja en la caja por allá al salir de la clínica. El único riesgo previsible es que algunas de las preguntas son privadas y pueden hacerse incómodos – sin embargo, puede parar en cualquier momento que desee. Su participación en este estudio beneficiará a usted y a la fundación HOLA y otras organizaciones en que los resultados indicarán como las fundaciones sin fines de lucro pueden responder mejor a las necesidades de la comunidad.

No dude en consultarnos cualquier duda que pueda tener. Además, hay formas aquí con más información sobre el estudio, que le invitamos a guardar. Le invitamos a pensar en esto por un rato. El documento de consentimiento será aquí en este caja con una hendidura en la parte superior, por lo que su nombre no estará conectado con las respuestas de su encuesta. ¿Ha decidido si o no desea contestar las preguntas para el estudio? ¿Tiene alguna pregunta en este momento? En caso afirmativo: “¡Gracias por su participación!” En caso negativo: “Está bien, gracias por considerarlo.”
Appendix B: Informed Consent Form

University of Colorado: CONSENT TO PARTICIPATE IN A RESEARCH STUDY
Assessment of Public Health Concepts and Education in Rural Nicaragua

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<td>C.A. Foster</td>
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<td>Biochemistry</td>
<td>(303) 819-3400</td>
<td><a href="mailto:carolyn.foster@colorado.edu">carolyn.foster@colorado.edu</a></td>
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<td><a href="mailto:joanne.belknap@colorado.edu">joanne.belknap@colorado.edu</a></td>
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Your participation in this research study is voluntary. Please think about the information below carefully. Feel free to ask questions before making your decision whether or not to participate. If you decide to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose and Background: This study investigates causes of women’s health issues identified in and surrounding Chacraseca, Nicaragua that could be mitigated by improved education in a manner acceptable to the community and feasible for implementation through development programs.

Study Tasks and Procedures: All that would be asked of you would be to respond to questions for several minutes, and allow the physician to mark your diagnosis on a sheet, then drop the sheet in the box with the slit in the top over there at the exit of the clinic.
Sample Question:
- Where have you learned the information that you know about sexual health?

Risks and Discomforts: There is minimal risk in this study; sensitive questions regarding personal health and sexual health concepts and practices may cause you to feel awkward or embarrassed. Remember, you are free to stop answering questions at any point.

Benefits: Results of this study will be used to improve HOLA’s program development to respond to community needs and customs. By providing information through these interviews, the participants will benefit through improved development programs. Additionally, results of this study will be made public, and thus be available to other organizations working in the area whose programs could also be better tailored to fit the needs of the community.

Confidentiality: Your name will not be linked to your responses in any way. The interview sheet will not include a name.

Participant Rights
Taking part in this study is your choice. You may choose either to take part or not take part in the study. If you decide to take part in this study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you in any way. You will not lose any of your regular benefits. We will tell you if we learn any new information that could change your mind about being in this research study.
Contacts and Questions

For questions, concerns, or complaints about this study, call:
Carolyn Foster: +1 (303) 819-3400 OR Julio Delgado: +505 87 23 15 67

If you have questions about your rights as a research study participant, you can call the Institutional Review Board (IRB). The IRB is independent from the research team. You can contact the IRB if you have concerns or complaints that you do not want to talk to the study team about. The IRB phone number is +1 (303) 735-3702.

Signing the Consent Form

I have read (or someone has read to me) this form. I am aware that I am being asked to be in a research study. I have had a chance to ask all the questions I have at this time. I have had my questions answered in a way that is clear. I voluntarily agree to be in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

Name of Participant (printed) __________________________________________________________

Signature of Participant ____________________________________________ Date ___________

Name of Person Obtaining Consent (printed) ______________________________________________

Signature of Person Obtaining Consent ________________________________ Date ___________

Universidad de Colorado: CONSENTIMIENTO DE PARTICIPAR EN UNA INVESTIGACION DE SONDEO

Evaluación de Conceptos y Educación de Salud Pública en Nicaragua Rural

<table>
<thead>
<tr>
<th>Nombre</th>
<th>Papel</th>
<th>Departamento</th>
<th>Teléfono</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.A. Foster</td>
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<td><a href="mailto:carolyn.foster@colorado.edu">carolyn.foster@colorado.edu</a></td>
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</tr>
</tbody>
</table>

Su participación en este estudio es voluntaria. Por favor, piense atentamente en la siguiente información. No dude en hacer preguntas antes de hacer su decisión o de participar o no. Si decide participar, se le pedirá que firme este hoja y recibirá una copia.
Objeto y Antecedentes: Este estudio investiga las causas de los problemas de salud pública que han sido identificados en Chacraseca, Nicaragua que pueden ser mitigados por una mejor educación de una manera aceptable para la comunidad y factible para la implementación a través de programas de desarrollo. Causas consideradas incluyen a la educación sobre la hidración, higiene, salud respiratoria, la nutrición, y la salud sexual. Las evaluaciones de comunidad e información sobre cuidado de pacientes anteriores de esta región indicaron que la comunidad tiene preocupaciones sobre estos temas. Se investigará las correlaciones entre el grado de educación sobre estos temas de salud pública y la frecuencia de problemas de salud como anemia, infección de tracto urinario (ITU), problemas renales, diarrea, problemas respiratorios, el embarazo adolescente, y las infecciones de transmisión sexual (ITS). Las encuestas se administran en las escuelas rurales de Nicaragua y en las clínicas médicas de HOLA.

Tareas y Procedimientos del Estudio: Todo que tendrá que hacer es responder a las preguntas por algunos minutos y permite al médico de marcar su diagnosis en una hoja, y poner la hoja en la caja por allá al salir de la clínica. 

Ejemplos de Pregunta: ¿Cuáles (si hay) son las maneras de prevenir la transmisión de infecciones de ITS’s practicados por la comunidad?

Riesgos y Molestias: Existe un riesgo mínimo en este estudio; las preguntas sensibles relacionadas con la salud personal y de los conceptos de salud sexual y prácticas sexuales pueden hacerse un poco incómodo o avergonzado. Recuerde, usted es libre de dejar de contestar las preguntas en cualquier momento.

Beneficios: Los resultados de este estudio se utilizarán para mejorar el desarrollo de los programas de HOLA para responder a las necesidades de la comunidad y las costumbres. Por participar en el estudio y proporcionar información en las encuestas, los participantes se beneficiarán de la mejora de los programas. Además, los resultados de este estudio se harán públicos, y por lo tanto estar a disposición de otras organizaciones que trabajan en el área cuyos programas también se podría adaptar mejor a las necesidades de la comunidad.

Confidencialidad: Su nombre no estará conectado a las respuestas de ninguna manera. La hoja de encuesta no se incluye un nombre.

Derechos de los Participantes: La participación en este estudio es totalmente su decisión. Usted puede elegir o participar o no participar en el estudio. Si decide participar, puede retirarse de estudio en cualquier momento. No importa cuál sea la decisión que tome, no habrá penalidad para usted en ninguna manera. No perderá ninguno de sus beneficios regulares de HOLA. Nosotros le informaremos si nos aprendemos cualquier información nueva que podría cambiar su opinión de participar en este estudio de investigación.

Preguntas y Contactos

Con preguntas o quejas, llame: 
Carolyn Foster +1 (303) 819-3400 o Julio Delgado: +505 87 23 15 67

Firmando la Hoja de Consentimiento

He leído (o una persona me ha leído) esta hoja. Estoy consciente que los investigadores están preguntándome participar en esta investigación de sondeo. Antes de este momento, tuvo la oportunidad de preguntar todas mis preguntas. Todas mis preguntas han contestado en una manera claro. Estoy de acuerdo de participar en esta investigación, y hago esta decisión voluntariamente.

No renuncio ninguna derecho legal en firmando esta hoja. Voy a recibir una copia de esta hoja.

Nombre de Participante (impreso): _________________________________________________

Firma de Participante: _____________________________________________________ Fecha ________

Nombre de Persona Obteniendo el Consentimiento (impreso):________________________________

Firma de Persona Obteniendo el Consentimiento _______________________________________ Fecha ________

Appendix C: Interview Questions with English Translation

Información General (General Information):
1. ¿Cuántos años tiene? Tengo_________años
   How old are you? I am _________ years old
2. ¿Cuántos años de escuela cumplió? (haga un circulo) 0 1 2 3 4 5 6 7 8 9 10 más:_______
   How many years of school have you completed?
3. ¿Dónde vive usted?
   León; Raúl Cabeza; La Bolsa; El Recreo; Arenera; Concepción; Mojón Sur 1; Mojón Sur 2; Pedro Arauz; Las Lomas; Boca de Cántaro; Brisas del Paraíso; Miramar; Otro:__________________________

Where do you live (list of sectors in Chacaraseca follows, as well as León (the nearest city)
4. ¿Tiene acceso a: > la televisión > la radio > no tengo ni televisión ni radio
   Do you have access to: television, radio, neither
   Are you married? Do you have children?
7. ¿Cuántas años tenía cuando dio la luz a tu primer hijo? Tenía ____ años
   How old were you when you gave birth to your first child?

Medicamentos y Comportamientos:
1. ¿Que son los antibióticos? No sé______ Son___________________________________________
   What are antibiotics?
   a) ¿Ha tomado antibióticos? ¿Cuántas veces? Ha tomado _____ veces ___ Nunca ha tomado
   Have you taken antibiotics? How many times?
   b) ¿Cuándo una persona tiene una receta por los antibióticos, cuándo puede esta persona dejar de tomar los antibióticos? No sé____  o
   When someone has a prescription for antibiotics, when can they stop taking them?
c) ¿Qué son los riesgos de salud cuando una persona deja de tomar los antibióticos más temprano?
No sé ____ o Son ________________________________________________________________
What are the health risks when a person stops taking their antibiotics too soon?

d) ¿Qué son los riesgos de salud cuando una persona deja de tomar los antibióticos más tarde?
No sé ____ o Son ________________________________________________________________
What are the health risks when a person stops taking their antibiotics too late?

2. ¿Cuándo no hay medicamentos en el centro, puede ir a León para comprarlos?  Si  No
When there are no medications in the health center (free access to the public), can you go to León to buy them?

3. ¿Tiene bastante dinero para comprarlos?  Si  No  A veces
Do you have enough money to buy them?

4. ¿Es como difícil de comprarlos?  Mucho  Media  Poco
How difficult is it for you to buy them?

5. ¿Cuándo compra los antibióticos, las compras todas juntas o poco a poco?
When you buy antibiotics, do you buy them all together or little by little?

6. ¿Alguna vez, no ha tomado todas las pastillas antibióticos que la médica ha recetado?
Have you ever not taken all of the antibiotic pills that the doctor prescribed?
__Si, una vez o más ha tomado algunas pero no todas porque __________________________

__No, cada vez ha tomado todas porque ____________________________________

7. Si una persona no puede comprar todas las pastillas antibióticos (solamente puede comprar algunas), cuál cree usted es mejor recomendable:
If a person cannot buy all of the antibiotic pills, they can only buy a few, which do you think is more recommendable for this person:
__Comprar y tomar algunas pero no todos           o
To buy and take a few pills but not all
__No tomar antibióticos
Not to take antibiotics

8. ¿Usa cocimientos cuando está enferma?
Do you use herbal remedies when you are sick?
  a. ¿Usa la hoja de guayaba?_________
    Do you use guava leaves?
  b. ¿Usa la hoja de mango?__________
    Do you use mango leaves?

9. ¿Qué piensa usted provoca las infecciones vaginales?
What do you think causes vaginal infections?

10. ¿Usa protectores diarios?____________
    Do you use panty liner every day?

11. Cuando usted le limpia, en su momento de necesidad, como lo hace:
__De delante hacia atrás     o
__De atrás hacia delante
    Do you wipe front to back or back to front?

12. ¿Cuál cree usted es mejor recomendable __________________________
    ¿Porqué?________________________
Which do you think is more recommendable and why?

Menstruación:
1. ¿Qué utiliza para su menstruación? Drapos Toallas sanitarias Otro_____

What feminine higiene products do you use while on your period? (choices: rags; sanitary napkins; other)
2. ¿Dónde se enteró acerca de la menstruación la primera vez? (haga un circulo)

Where did you learn about menstruation the first time?
   Mi madre Otra familia (abuela, hermanas, tíos) Mis amigas Charlas Escuela Médica Otro_____

3. ¿Se enteró acerca de la menstruación: (circulo) Después de la primer vez Antes de la primer vez

Did you learn about menstruation before or after your first period?

4. Alguna vez, ha experimentado un momento en que un líquido claro, blanco, grisáceo salieron de su vagina y olía desagradable y sospechoso?

Have you ever experienced a clear, white, slippery vaginal discharge that smelled unpleasant and fishy?
   a. Sí, me paso ____ veces No, nunca____
   b. ¿Qué ha hecho al respecto? ____________________________

What did you do about it?
   c. ¿Sabe cuales comportamientos hacen estos síntomas más probables? Sí, son ______________

Do you know what behaviors make these symptoms more probable?

5. Alguna vez, ha experimentado un momento en que una espesa sustancia de cuajada, de color blanquecino salió de su vagina que le picaba y que no tenía mucho olor?

Have you ever experienced a White, cottage-cheese like vaginal discharge that itched but did not have much odor?
   a. Sí, me paso ____ veces No, nunca____
   b. ¿Qué ha hecho al respecto? ____________________________

What did you do about it?
   c. ¿Sabe cuales comportamientos hacen estos síntomas más probables? Sí, son ______________

Do you know what behaviors make these symptoms more probable?

6. ¿Cuántos días usa la misma ropa interior antes de cambiarla? Por ____ días

How many days do you use the same underwear before changing it?
7. ¿Sabe de cual tela esta hecho su ropa interior? Si, está hecho de ______________ o No, no sé

Do you know what material your underwear is made of?

8. ¿Usa toallas higiénicas en el inodoro? Si No A Veces

Do you use toilet paper?

9. ¿Cómo necesita una mujer hacerse cargo de su higiene femenina? ________________

What things should a woman do to take care of her feminine hygiene?

10. ¿Sabe por qué una mujer tiene su menstruación? No, no sé Sí, porque__________________________

Do you know why a woman has her period?

Cuidado Médico
1. ¿Cuándo tiene síntomas por una problema, qué hace? (haga un circulo):
When you get sick, what do you do: -wait for the symptoms to disappear –go to the doctor immediately –
wait for x days and if you still have symptoms, go to the doctor -other
   >Espero por las síntomas de desaparecer (no voy al médico) >Voy inmediatamente al médico
   >Espero por ____ días y si tengo síntomas, voy al médico >Otro: __________________________

2. ¿Va al médico cuando no tiene síntomas por un problema?
Do you go to the doctor when you do not have any symptoms?
   Sí, porque ____________________________ No, porque ____________________________
3. ¿Con qué frecuencia va al médico? (haga un circulo)
   *How frequently do you go to the doctor?*
   - Cada año
   - Cada medio año
   - Cada dos años
   - Con más frecuencia
   - Con menos frecuencia

4. ¿Cuándo tiene que ir al médico, puede ver el médico? (haga un circulo)
   *When you need to go to the doctor, can you see the doctor?*
   - Sí
   - A Veces
   - No, porque__________

5. ¿Cuándo no hay médico en el centro, puede ver el médico privado? (haga un circulo)
   *When there is not a doctor in the health center, can you see a private doctor?*
   - Sí
   - A Veces
   - No, porque____

6. ¿Qué es una examina de Pap? (haga un circulo)
   *What is a pap smear?*
   - No sé___
   - Es ____________________________________________

7. ¿Con cada tiene una examina de Pap? (haga un circulo)
   *How frequently do you get a pap smear?*
   - Cada año
   - Cada medio año
   - Cada dos años
   - Con más frecuencia
   - Con menos frecuencia

**Appendix D: Codebook**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Age Group:</th>
<th>Access to:</th>
<th>Married?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Raul Cabeza</td>
<td>1. School age (15-18)</td>
<td>1. TV only</td>
<td>1. Yes</td>
</tr>
<tr>
<td>2. La Bolsa</td>
<td>2. Adult (18+)</td>
<td>2. Radio only</td>
<td>2. No</td>
</tr>
<tr>
<td>5. Concepción</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Mojon Sur 1</td>
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<td></td>
<td></td>
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<tr>
<td>7. Mojon Sur 2</td>
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<td></td>
<td></td>
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<tr>
<td>8. Pedro Arauz (la Molas)</td>
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<td></td>
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<tr>
<td>9. Las Lomas</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10. Boca de Cantararo</td>
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<td></td>
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<tr>
<td>11. Brisas de Paraíso</td>
<td></td>
<td></td>
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<tr>
<td>12. Miramar</td>
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<td></td>
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<tr>
<td>13. Nuevo Amanever</td>
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<td></td>
<td></td>
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<tr>
<td>14. León</td>
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<td></td>
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<tr>
<td>15. Other</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>16. Esperanza</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Puerta de Piedras</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. No response/ unknown</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

What are antibiotics?
1. Don’t know, gives no more info with follow up questions, cannot answer other questions about antibiotics
2. Says ‘don’t know’ but can answer some follow up questions about antibiotics
3. Says ‘yes’ but associates with general medicines (i.e. says antibiotics are pills for pain or cough etc…). In case of students’ responses, marks that antibiotics are simply medicines
4. Treatments for infection
5. Gives antibiotic names (most commonly amoxicillin, penicillin and tetracycline)
6. Identifies both that antibiotics are treatments for infection and gives antibiotic names
7. Considers them contraceptives
Graduated Knowledge Scale for Antibiotics:
1. Don’t know at all
2. Some: 2&3&7 above – knows they’re at least medicine or can answer follow up questions to some extent or thinks they’re contraceptives
3. Knows: 4-6 (knows they’re for infection or knows names)

Have you taken antibiotics?
1. Yes
2. No
3. No response

When can you stop taking antibiotics?
1. When feels well/better
2. After a certain number of days
3. As prescription or doctor says
4. Don’t know
5. No response
6. Both # days and as rx or dr says
7. When feels well or when dr says
8. When feels well and # days
9. Other incorrect answer

Risks of stopping too soon/late (coding is the same for both questions):
1. Will not get well
2. Don’t know
3. No response
4. Sickness will get worse, or there will be worse problems including death
5. Not good because not following prescription
6. Sickness will come back
7. It’s a problem but no response as to why
8. Toxic
9. No problems or effect
10. Get other sickness
11. Other incorrect answer

Can you buy medication when supplies run out at the health center (in Leon)?
1. Yes
2. No
3. Sometimes
4. NR

Can you afford the medication
1. Yes
2. No
3. Sometimes

How difficult is it to buy?
(Note: in non-coded column, had started previous code where 1=very diff; 2=moderately diff; 3=not too difficult)
1. Very difficult
2. Moderately difficult
3. Not too difficult

Buy all together or bit by bit?
1. All together
2. Bit by bit
3. It depends
4. Can’t buy

Is it better to buy some or none?
1. Some
2. None
3. Did not answer actual question, responses such as: Better not to use pills at all (don’t use if prescribed); better to buy them little by little; ask my dr.
4. No response

Do you use home remedies?
1. Yes
2. No

Use panty liners Daily?
1. Yes
2. No
3. Sometimes

Wipe front to back or back to front?
1. Front to back
2. Back to front
3. Separately
4. Both ways

Which way is better?
1. Front to back
2. Back to front
3. Separately
4. Both ways equally
5. Don’t know

What did you use for your menstruation?
1. Rags
2. Pads
3. Other
4. Both

Where did you learn about menstruation?
1. Mother
2. Other family
3. Friends
4. Talks (charlas)
5. School
6. Health setting
7. Other

Did you learn about menstruation before/after your first period?
1. Before
2. After

BV/Yeast Sympt:
1. Yes
2. No
3. NR
4. Don’t know

What did you do about your BV/Yeast infection?
1. Go to dr to treat
2. Treat at home
3. Nothing
4. Other
5. Sometime go to dr and sometimes treat at home
6. Treated, yet whether at dr or at home is unknown

Medication used to treat:
- a. Ovulos (creams that come in a tube, often contain clotramidazole or metronidazole)
- b. Pomada (non-prescription soothing cream)
- c. Antibiotics
- d. Chamomile tea (women wash their vaginal area with the tea)

Know cause of BV/Yeast infection?
1. Don’t know
2. Answer is not correct
3. Sexually related
4. Poor hygiene
5. Infection
6. Not going to dr soon enough
7. Sexually related and poor hygiene
8. Describes symptoms, typically itching and odor
9. Eating certain foods, namely meat, fish, eggs, beans, fat

Underwear material:
1. Cotton
2. Don’t know
3. Synthetic/ microfiber
4. Silk
5. Wool
6. Varied
7. Other

Which material is best and why?
1. Cotton because it’s fresh (fresca; ask Spanish prof about other meanings)
2. Don’t know
3. Cotton because accustomed to it

Use toilet paper?
1. Yes
2. No
3. Sometimes
4. NR

How take care of feminine hygiene?
1. Wash/ stay clean
2. Use pads
3. Use toilet paper

4. Be careful about sexual relations
5. Change clothes/underwear
6. Don’t know
7. Dry well
8. ‘take care of self’ (haciendose)
9. No response
10. Go to dr.
11. Buy treatments (cream, pomada, ovulos)
12. Wash with chamomile and/or cinnamon

Why women menstruate:
1. Don’t know
2. Bad blood
3. To clean
4. From god
5. To grow up/develop
6. Egg goes out
7. To have kids
8. If not, woman is crazy/insane
9. If not, it’s a bad problem and usually means sickness
10. It’s normal
11. It’s good for health
12. Function of ovaries

When have sick, what do you do?
1. Wait till symptoms go away (don’t go to dr.)
2. Wait 1-4 days, then go to dr.
3. Go immediately to dr.
4. Treat at home
5. First treat at home, then if bad or doesn’t go away, go to dr.
6. Wait 5-8 days, then go to dr.
7. Wait 9 or more days, then go to dr.

Do you go to the dr. when you do not have symptoms?
1. Yes, for check ups
2. No
3. Yes, to get contraceptives
4. Yes, to get other medication (blood pressure, seizure)
5. NR
6. Sometimes

How frequently do you go to the dr.?
1. Annually
2. Bi-annually
3. Every 2 years
4. More frequently
5. Less frequently
6. NR

Can you see a private dr.?
1. yes
2. no
3. mention difficulty, sometimes, when money
4. NR

Why not?
1. Can see
2. Unknown
3. Financial reasons
4. Other

Know what pap smear is?
1. Yes
2. No
3. NR

Frequency get pap smear?
1. Annually (1.5 is every yr to half year)
2. Bi-annually
3. Every 2 years
4. More frequently
5. Less frequently
Appendix E: Recommendations for HOLA

In light of the experiences and conversations I had over the past month, I have made the following recommendations for HOLA. These suggestions aim to cut costs, increase sustainability, integration with the community, awareness of how the community works, increase accountability and ensure that funds are used appropriately.

OPERATIONAL Advice:

Chacraseca currently has a medical center that all individuals in Chacraseca have access to. The primary issue is that the center is inadequately and inconsistently staffed and frequently runs out of medications. There is currently no emergency care system or means of emergency transportation outside of borrowing a truck if a friend has one. Additionally, in the rainy season, the road often floods in areas where there are no bridges, further inhibiting transportation by vehicle. Other health issues in the community include dirt floors within houses, minimal health education, inadequate or no latrines in some houses, wood-burning stoves and frequent habits among children of going around or playing outside without shoes. To support the health of the community in a sustainable way, HOLA can help support the development of local health systems and use funds to pick of slack while local programs are still unable to cover those areas.

Note on issues with the health center:

MINSA pays for a doctor part-time, yet this physician frequently does not come for assorted reasons ranging from being able to find better pay working with a medical mission in some other area, caring for family, or working in private practice. When individuals take the trouble to come to the medical center only to find that the doctor has not showed up, they often stop coming, particularly if it is logistically difficult for them to make the trip. Public transportation within Chacraseca is relatively good, yet the process of taking the bus to and from the medical clinic, plus the wait is time consuming. This can be an issue for women because they must often ask their husbands for permission to go to the clinic. Due to the high probability of theft, individuals in Chacraseca rarely if ever leave their house unattended. Usually, the woman looks after the house. However, if she must go to the medical center, she may need her husband to look after it and must therefore ask for permission to go. Additionally, for poorer individuals, bus fare can become burdensome. It costs between four and nine cordobas to take the bus within Chacraseca, depending on the time and distance traveled (note: round trip is twice this cost). If an individual pays nine cordobas each way (amounting to nearly one dollar), this amount is nearly one day’s income for the poorest individuals.
Individuals are supposed to be able to get medications for free from the government sponsored health center, yet these are only available while supplies last. When the pharmacy does not have enough medication, individuals must go to León and purchase medications themselves. This is a particularly large issue with antibiotics, which are over-prescribed. Pharmacies sell antibiotics by the individual pill if people cannot afford the complete dose, which increases the probability that individuals will not complete the regimen. Additionally, scarcity of supplies causes some individuals to stop taking their antibiotics once they feel better so that they can ‘save pills for later’ in case they have symptoms again and cannot receive free medication or afford to buy it.

With respect to the local environment, I would recommend the following changes to HOLA operations:

Re-direct clinical funds toward more sustainable efforts. The medical brigade approach does not provide continuity of care, increases perception that we are a hand-out organization, does not encourage development of and attendance at local medical centers, and is not sustainable. The following clinical-focused efforts would support the community’s health in a more sustainable way:

1. Provide scholarships for Chacraseca community members to attend medical school
   - It costs about $1,500 per year (quote from Juan Enrique – check for accuracy before deciding on amount) for a student to attend medical school. This includes food, lodging, books, transportation, and school fees.
   - The individual receiving the scholarship must be from Chacraseca, and must sign a contract promising to practice full time within Chacraseca upon graduation. This contract should be negotiated through MINSA and HOLA with the assistance of a Nicaraguan lawyer. We would need MINSA to promise to provide the salary for this individual upon graduation for their full time work in Chacraseca. Additionally, to further discourage drop-out, a penalty should be included in the contract in the case that the individual refuses to practice within Chacraseca upon graduation. This penalty could be that the individual must pay back the entire cost of their scholarship with a 15% interest rate, or some consequence to that effect.
   - Since one of the main medical issues is insufficient personnel, let’s help locals acquire the training to fill this need permanently. This helps us move away from the band-aid approach of providing doctors in each sector once a year. It also increases opportunity and drive for poor country students. It finally provides incentive for dedication to one’s community.

2. Financially support full-time public health nurse to staff community health center and train health providers and educators in each sector (Leslie Penrose, Executive Director of Just Hope has also made this recommendation)

3. Support the pharmacy at the health center either financially or with surplus medications
   - Many individuals just come to our clinics to get medications because they can’t get them at the health center. Instead of spending money on paying doctors, moving supplies etc…let’s help solve the issue of insufficient medication supplies more directly.

4. Support emergency care through purchase of lay-flat vehicle and arrangement of emergency notification system, driver, and agreement with MINSA for eventual transfer of financial responsibility.

5. Support health education through school and after-school programs (I have much more information on each of these to discuss with members as we plan programs. A large amount of the resources I have are printed or hand written and thus difficult to send via email. I will be discussing these at length with Public Health coordinators/director).
   - Sexual health program including condoms in schools
   - First Aid program
   - Emerging youth clubs
   - Self-defense courses
(6) Provide work in the area through micro-economic programs – if interested I can elaborate on each of the following potential options I have thought of. Briefly, potential programs could be:

- Jewelry program: many locals create jewelry and other commodities. A micro-economic project could involve getting locals together to form a business making and selling jewelry.
- Bike program: most individuals use bikes as their primary form of transportation, yet usually take them into León if they need repairs. A micro-economic project could involve starting a bike repair shop in Chacraseca.
- Light program: power outages are common in Chacraseca. A potential micro-economic project could involve selling fixtures that allow natural light through ceilings. These fixtures can be made by filling a water bottle half way with water, creating a hole in scrap metal, inserting the bottle half way, then sealing gaps around the edges. These fixtures can then be inserted into ceilings and function by scattering light around the room, providing more effective illumination than a covered hole in the ceiling.

(7) Support Nicaraguan individuals and entities with their programs rather than creating our own. For example:

- MINSA is trying to organize to assist youth development and sexual health education through after schools programs; we could support these initiatives rather than starting our own
- MINSA currently sponsors medical brigades; we could support these rather than running our own

(8) Collaborate with other organizations, including the following:

1. Just Hope
2. Flutemaker Ministries
3. Manos Juntas
4. Millennium Challenge Corporation
Appendix F: Data Visualizations

- Students Symptoms of BV
- Student Symptoms of YI
- School Aged Subjects Symptoms of BV
- School Aged Subjects Symptoms of YI
- Subjects above School Age Symptoms of BV
- Subjects above School Age Symptoms of YI
- Entire Population BV Symptoms
- Entire Population YI Symptoms
- Entire Population Except Students BV Symptoms
- Entire Population Except Students YI Symptoms
- Whether Individuals Buy Pills Together or Bit by Bit
- Individuals who wipe Back to Front: Why is this better?
- Responses of Individuals with BV about When to Stop Antibiotics
- Responses of Individuals with Recurrent BV about When to Stop Antibiotics
- Responses of Individuals with no BV about When to Stop Antibiotics
- Responses of Individuals with YI about When to Stop Antibiotics
- Responses of Individuals with Recurrent YI about When to Stop Antibiotics
- Responses of Individuals with no YI about When to Stop Antibiotics

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Responses of Individuals with BV or YI about When to Stop Antibiotics

- When done with doses/ as rx/ as Dr. says
- When feel better
- # of days

Responses of Individuals with Recurrent BV or YI about When to Stop Antibiotics

- When done with doses/ as rx/ as Dr. says
- When feel better
- # of days

Responses of Individuals with neither BV nor YI about When to Stop Antibiotics

- When done with doses/ as rx/ as Dr. says
- When feel better
- # of days

Why Individuals did not Take all Antibiotics

- Financial Reasons
- Forgot to Take
- Felt Well
- Save Meds for Later
- Other

Ways Individuals Respond to How to Take Care of Feminine Hygiene

- Wash/stay clean
- Change clothes/ underwear
- Use toilet paper
- use pads
- Go to Dr.
- "Take care of self"
- Careful with sexual relations
- Do not Know
- Other

Responses of Individuals with Recurrent YI to Risks of Stopping Antibiotics too Soon

- Varying Correct Answers
- Do not Know
- Stopping early is not a Problem

Responses of Individuals without YI to Risks of Stopping Antibiotics too Soon

- Varying Correct Answers
- Do not Know
- Stopping early is not a Problem

Responses of Individuals with Recurrent YI to Risks of Taking Antibiotics too Long

- Varying Correct Answers
- Problem but Do not Know Why
- Do not Know or No Response
- Taking them too long is not a problem

Responses of Individuals to Risks of Taking Antibiotics too Long

- Varying Correct Answers
- Problem but Do not Know Why
- Do not Know or No Response
- Taking them too long is not a problem
Percentages of Individuals who report they cannot see the Public Dr. or It's Very Difficult

Percentages of Individuals who report they cannot see the Private Doctor

Percentages of Individuals who Use Rags During Menstruation

Percentages of Individuals who sometimes Wipe Back to Front

Percentages of Individuals who report Inability to Buy Antibiotics

Percentages of Individuals who Report not completing Antibiotic Prescriptions