# Hypertension Management in the Dominican Republic: Factors Affecting Medication Adherence

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**Abstract**
Patients with hypertension in HHI's Chronic Care Management Program were interviewed; questions focused on demographic data and information about patient health and hypertension. In addition to 49 random patients from four different communities, researchers interviewed nine Community Health Workers, three HHI staff members, two American physicians who have attended medical service trips with HHI, and one local physician. Numerous factors were found to be correlated with poor blood pressure control, including illiteracy/never having attended school, taking pills two times per day, and living alone. The results of this study can be used to establish guidelines for future HHI health, nutrition, and education programs.

## Introduction

While government-run public health initiatives in the Dominican Republic have recently been focusing on infectious disease, few resources have been allocated toward hypertension, which affects 24% of the nation's adults (PAHO, 2007). Health Horizons International, a nonprofit organization based in Boston and Montellano (in the region of Puerto Plata in the Dominican Republic), provides a medical home for patients with chronic illness. They accomplish this task via medical service trips, a Community Health Workers (CHW) program, and public health research in the communities they serve. They particularly focus on patient follow-up, providing free medications to chronically ill patients, as well as delivery of those medications and transport to appointments with local physicians.

Chronic diseases such as hypertension and diabetes are becoming increasingly important in global health (Abegunde, 2007). While effective chronic disease management could lead to a considerable decrease in morbidity and mortality worldwide, poor treatment adherence remains a huge problem. Barriers to adherence in the United States have been shown to involve finances, level of knowledge about the disease, medication side effects, the doctor-patient relationship, and logistical difficulties (Ogedegbe, 2004; Turner, 2009). However, few studies have looked at barriers to adherence in the developing world.

This research study aims to elucidate the problems involved in continual hypertension management in the Dominican Republic. The study took place in four underserved communities in the Puerto Plata region of the Dominican Republic over the course of 6 weeks. Barriers and facilitators to adherence were qualitatively assessed using oral surveys among hypertensive patients enrolled in a chronic disease management program involving community health workers (CHWs). Factors affecting adherence, including time enrolled in the program, educational level, number and type of medications prescribed, side effects, community, language, and knowledge of disease effects, will be studied. Chart reviews were performed to determine relationships between controlled blood pressure and other

factors, such as medication adherence. Key informant interviews were conducted to provide insight on themes highlighted in the patient interviews. It is hypothesized that education and knowledge of hypertension will correlate with better medication adherence and controlled blood pressure.

The results of this study have implications for HHI, other NGOs providing health care to rural areas, and to health care around the world. We will provide information to HHI about their patients' and CHWs' knowledge of hypertension, as well as suggestions for future educational initiatives and ways to increase medication adherence. As hypertension is a growing concern among the developing world, these suggestions may also be used in other areas under certain circumstances. Finally, this study has worldwide implications because the reasons for medication adherence may affect other populations. HHI patients provided us with a unique population of people with hypertension because they are given free medications and transport. As finances and logistical difficulties are significant barriers to medication adherence in the United States (Ogedegbe, 2004; Turner, 2009), we focus the study on other factors that can be addressed by health care providers, particularly disease knowledge.

## Background & Literature Review

A central theme found in literature on health beliefs and health practices among Dominicans is the role of family and community networks serving as the primary source of support and referral. The cultural history of the Dominican Republic and the ethnic diversity of the people are reflected in the country's practice of traditional medicine (Vandebroek et al., 2010). The country's demographic make up is a fusion of Taino Indigenous, African, and European origins and traditions (Babington et al., 1999). At the same time, the practice of biomedicine is present and interacts synonymously with its traditional counterpart. Concepts such as the hot-cold (humeral) classification of illness as well as common use of plant remedies are embedded in self-care practices. Within this system, it is believed that cold illnesses should be treated with hot medications or hot foods, and not with orange juice, fruit or cold remedies (López-De Fede & Haeussler-Fiore, 2002). In addition, health beliefs and practices are also framed around spiritual and physical disease etiologies (Vanderbroek et al., 2010). A study on the health care status of two communities in the Dominican Republic found that patients aged 40 and older were most often diagnosed with hypertension (27%) (Carman & Scott, 2004). Hypertension was also identified as one of the most frequent health problems overall outside of upper respiratory infections, parasitic infections, and headaches (Carman & Scott, 2004). It is essential for international health efforts to maintain sensitivity and awareness of a community's health practices and health beliefs when developing programs to improve health outcomes and medication adherence. A number of health-related themes present in the Dominican Republic include *esperanza, respeto,* and *prácticas espirituales y místicas*. This literature review explores themes and health practices observed in Dominican communities and serves to provide background and context to the data collected in this study.

*Esperanza*

An ethnonursing study of 45 Dominicans looking at the meaning of hope in a rural Dominican community revealed significant implications of religion and spirituality, relationships and kinship, as sources of meaning and happiness (Holt, 2000). The study also found that those with more resources are perceived as having more hope. Holt (2000) defines hope as "essential but dynamic", which originates from faith in God and is supported by relationships, resources and work, and the source of energy to work for a desired future. Additionally, it establishes that the understanding of culture care differences and similarities is a meaningful component to providing quality care in a multicultural world. Unique to this cultural group is the concept of faith in God as the source of hope, along with the idea of "active individual involvement" (Holt, 2000) in maintaining hope as a comforting and life-sustaining force. Application of this theoretical analysis of the meaning of hope to health beliefs and practices has several implications. Findings from this study indicate that relationships within a community assists with maintaining hope and lends support to the theme of family and community networks in Dominican health practice. Community networks developed around faith also serve to maintain hope and facilitate support for health practices. This theme of community and relationship is commonly found in literature surrounding Latino culture and self-care practices.

*Respeto*

Another ethnonursing study exploring meanings, beliefs and practices of care among rural Dominicans identified three major themes in the 29 interviews conducted in a rural village northwest of the Dominican Republic's capital of Santo Domingo (Schumacher, 2010). Phase three of their analysis identified recurrent patterns of ideas which include: need for family to be present to give care and

assistance to the ill; absence of family in illness experience, inhibiting health and well-being; respect as an essential characteristic in providing and showing care to others; 'paying attention to' perceived as care when a caregiver (professional or kin) is caring for one's emotional or physical needs; 'lack of paying attention to' one's needs perceived as uncaring; *machismo*, inhibiting respect and attention and resulting in perceived lack of care and threat to health and well-being; professional care in public and private clinics promoting health and well-being; folk caregivers and use of folk spiritual practices to promote health and well-being; and plants, vegetation, and home remedies used to promote health and well-being.

Following the final analysis of the identified themes, several major themes arose regarding rural Dominican beliefs and practices. Schumacher (2010) found that family presence is essential for meaningful care experiences and care practices. A key informant from Schumacher's study indicated, "We make decisions by consulting family members, close and extended. Family is the basis of our society. Family is central to everything all over this country." This indicates that in self-care, consultation and support from family is common practice and in fact, essential to meaningful care experiences. Another major theme identified "respect and attention" as central to care. Analysis of interviews found "*respecto"* mentioned in 81 different occasions and most frequently when discussing "meanings and expressions of care". The idea of "respect" involves showing consideration to an individual's thoughts, feelings, needs, wishes, ideas, and giving them "worth and value". The study found that respect for caregivers via listening, acknowledgment of their role, and addressing their own individual needs and concerns was also important.

The final and perhaps one of the key indicators of Dominican health practice and self-care decisions is the major theme of valuing generic (folk) and professional care practices to promote health. Schumacher (2010) found little distinction and boundary between "professional, generic, spiritual, and remedy-based" care practices. This duality between informal and formal services, traditional/folk medicine and biomedicine is another strong indicator of Dominican self-care practice and the fluidity in navigating the health system. The efficacy of treatment using professional, traditional, spiritual and remedy-based practices is an area deserving further research. The implications of utilizing mixed methods in Dominican health practices leads to the question of how much collaboration exists between biomedical providers, traditional/spiritual healers, and communication between patients and providers of home remedies.

*Prácticas espirituales y místicas*

Roman Catholicism, the official religion in the Dominican Republic, governs many aspects of the culture and way of life. With regard to healing, many believe the best way to connect to God is through intermediaries such as saints and clergies (López-De Fede & Haeussler-Fiore, 2002). Delgado (1988) identified that among the Roman Catholic population in the Caribbean, *espiritismo* (spiritism) is used as a folk healing tradition among one third of that group. The presence and usage of *espiritismo* maintains a large presence in literature regarding health beliefs and practices. The understanding of the role of supernatural forces and spirituality's affects on the perception of illness is essential to this population. Belief in spirits and supernatural powers are guised under the indigenous beliefs and practices such as *espiritismo*, Santeria, *brujos* (witches), and *curanderos* (curers) (López-De Fede & Haeussler-Fiore, 2002). The same authors cite that seeking support of "indigenous healers" along with traditional Roman Catholic practices of prayer allows Dominicans to cope with illness and "to reaffirm God's will (*que sea lo que Dios quiera*)". This resurfaces the idea of duality and the coexistence of two opposing beliefs and practices, as similarly seen with biomedicine and traditional medicine.

Babington et al. (1999) also explored the cultural context of rural Dominicans' health beliefs, and through focus groups including 17 individuals in seven different northern Dominican rural villages,

found that Dominican health beliefs fell into two major categories: physical and spiritual/mystical. The "physical" refers to health maintenance, hygiene, activity and diet, whereas the "spiritual/mystical" refers to the blend of traditional Catholic and folk beliefs. López-De Fede & Haeussler-Fiore (2002), among other literature sources, cite that Hispanics believe the cause of illness are "psychological states" which include embarrassment, envy, anger, fright, and worry, "environmental or natural conditions" such as bad air, dust, excess cold or heat, bad food or poverty, "supernatural causes" such as malevolent spirits, bad luck or witchcraft.

It is also essential to briefly acknowledge the influence of Haitian voodoo (which means *spirit*) and its integration into Dominican health practices and beliefs in supernatural causes of illness. Although data among self-identified Haitians were collected for this study, analysis of data will particularly focus on Dominicans due to sample size. However, it is still of interest to briefly address this demographic population. Voodoo practices include rituals, ceremonies, and alters and combine both Catholic and African religious beliefs. Haitians typically reside in tightly linked social and family networks, as evident in many of the Haitian communities in the Dominican Republic. For this reason, the family, close friends and relatives are called upon to help with an illness (Loue & Quill, 2001). Preventive medicine is practiced among Haitians and engaging in good diet, rest, and maintaining personal hygiene are cited as characteristic of this population (Loue & Quill, 2001).

Family consultation for any health problem is common practice. Family members will try to match the problem with something they have experienced themselves, making decisions on the cause of illness and how it should be treated via a collective decision-making process. Loue & Quill (2001) cite that within Haitian culture, illness has two types of causes, "supernatural forces" if indicated suddenly by the presence of pain or weakness, or "natural causes" if the illness appears slowly, and are of short duration. For illness related to supernatural forces, Haitians consult a voodoo priest to identify if the problem is related to an individual's "spirit protector" in need of special attention or if sorcery was involved. Natural illnesses are treated at home first using home remedies and medicines. If the condition persists, a folk healer is called upon to treat the illness with herbs and pills. Healers are a preferred form of treatment before seeking other more formal forms of care. Loue & Quill (2001) state that blood irregularities are the most significant health concepts for Haitians. As such, blood can be too "thick, thin, hot, cold, weak, dirty, dark, or yellow". Thick blood can cause hypertension, and is the result of being frightened. Thin blood can be caused by drinking too much alcohol and can lead to tuberculosis. Physical or mental weakness is the result of weak blood, and requires the addition of more red foods. The hot and cold system is also found among Haitians. Migraines, for example, result from hot blood and require cold medicine (Loue & Quill, 2001). Similarities can be found between Haitian and Dominican health beliefs. This includes the use of close personal networks for consultation on health remedies and treatment for illness, the concept of the hot-cold system, and belief that illness can be caused by supernatural forces. This connection, however, deserves further research and investigation in terms of its role and influences on the health beliefs of the two cultures.

Findings from literature identified several significant concepts relevant to the Dominican population and to the topics of health beliefs, perceptions and practices. To summarize, these include the essential role of family in health and self-care practices; the utilization of plant remedies accessible locally and through healers, or spiritualists; the concept of hope and resiliency in health perceptions and health beliefs; the influences of hot-cold (humeral) system, the supernatural and dualities between formal and informal services utilization; and influences from Haitian belief systems in the Dominican Republic. With these ideas in mind, this study aims to improve HHI's care for their patients with hypertension, while maintaining and respecting the patients' traditional beliefs and practices.

## Study Goals and Objectives

Goals

(1) Increase medication adherence among patients with hypertension in the developing world, thus decreasing the global burden of the long-term effects of hypertension such as heart failure, cerebrovascular accidents, and kidney failure

(2) Improve the education and support of community health workers in providing individualized home care to chronic disease patients

Objectives

- The primary objective is to qualitatively assess the positive and negative factors affecting adherence among hypertensive patients.
- The second objective is to determine the extent of change in blood pressure, medication adherence, and health behavior among patients seen by CHWs as part of HHI's Chronic Disease Management Program.
- The third objective is to provide suggestions toward programmatic improvement in CHW education and delivery of services.

## Study Design

The study was primarily exploratory and combined a retrospective cohort study with a cross-sectional study using oral surveys. Study recruitment took place in four communities surrounding Montellano, in the Puerto Plata region of the Dominican Republic where HHI operates: Negro Melo, Arroyo de Leche, Pancho Mateo and Severet.

The study consists of a quantitative component, which involved the review of 79 HHI medical charts. The chart review was conducted to assess for rates of adherence, mean arterial pressures, length of enrollment in HHI's Chronic Disease Management Program, and prescribed treatment regimens. The second component was qualitative and was conducted via patient and key informant interviews. Patients were recruited in HHI communities for a sample size of 49. During the patient interviews, respondents were asked both demographic and open-ended qualitative questions regarding their knowledge of hypertension, their lifestyle, the health care services they receive, and barriers to care. Key informants were also interviewed for the qualitative component. The key informant interviews were conducted with CHWs, HHI Program Directors, HHI medical care providers, local clinicians, and family members of patients with hypertension. The patient interviews were conducted via individualized home visits.

*Study Population:* Study population will be patients enrolled in HHI's Chronic Disease Management Program from the communities of Pancho Mateo, Severet, Arroyo de Leche, and Negro Melo. The communities are rural. Languages spoken are Spanish and Haitian Creole. Within the northern region of the Dominican Republic is a large community of Haitian immigrants due to the close proximity of Haiti and history of migration within the island of Hispañola.

*Quantitative Component*: 79 medical charts were reviewed and the following information was collected: community of residence, blood pressure measurements, gender, age, birthdate, assigned CHW, comorbidities, medications, and prescription information.

*Qualitative Component:* This portion consisted of patient and key informant interviews. Patients were interviewed if they were age 18 or older, are currently being treated by HHI for hypertension, and living in one of the four communities served by HHI. Key informant interviews were randomized and served to address the study's primary objective: namely, to qualitatively assess the positive and negative factors affecting adherence among hypertensive patients. Family members were interviewed if they were available and reportedly helped with the patient's care. All interviews followed a similar format: after explaining the consent process and obtaining signatures to confirm consent, we inquired about demographic information. The second part of the interview was recorded if patients gave permission to do so; this part included information about hypertension and the patient's health. Notes were taken as well. Interviews took about 30 minutes. Researchers were blinded, as we did not know the patients' health information, aside from their diagnosis with hypertension, prior to the interview. Prior to each interview, each patient was randomly assigned an identification number to maintain anonymity and confidentiality. Key informants were also assigned random identification numbers.

**Results**
[Numbers in parenthesis indicate percentages]

Demographic Data

*Data by COMMUNITY*

| | Arroyo de Leche | Negro Melo | Severet | Pancho Mateo | TOTAL |
|---|---|---|---|---|---|
| Total interviewed | 8 | 4 | 10 | 27 | 49 |
| Number Females | 6 (75) | 2 (50) | 5 (50) | 20 (74) | 33 (67) |
| Number Males | 2 (25) | 2 (50) | 5 (50) | 7 (26) | 16 (33) |
| Mean age | 58.13 | 50 | 63.4 | 53.74 | 55.57 |
| Number living alone | 1 (12.5) | 0 (0) | 0 (0) | 6 (22) | 7 (14) |
| Number living with others | 7 (87.5) | 4 (100) | 10 (100) | 21 (78) | 42 (86) |
| Number with no education | 2 (25) | 1 (25) | 2 (20) | 8 (30) | 13 (27) |
| Mean years education | 3.88 | 3.75 | 4 | 3.15 | 3.48 |
| Median years education | 3 | 2 | 3 | 3 | 3 |
| Number literate | 4 (50) | 2 (50) | 4 (40) | 15 (56) | 25 (51) |
| Number illiterate | 4 (50) | 2 (50) | 6 (60) | 12 (44) | 24 (49) |
| Number Dominicans | 8 (100) | 2 (50) | 10 (100) | 18 (67) | 38 (78) |
| Number Haitians | 0 (0) | 2 (50) | 0 (0) | 9 (33) | 11 (22) |

*Data by ETHNICITY*

| | Dominicans | Haitians |
|---|---|---|
| Total interviewed | 38 | 11 |
| Number Females | 24 (63) | 9 (82) |
| Number Males | 14 (37) | 2 (18) |
| Mean age | 57.47 | 49 |
| Number living alone | 4 (11) | 3 (27) |
| Number living with others | 34 (89) | 8 (73) |
| Number with no education | 8 (21) | 5 (45) |
| Mean years education | 3.57 | 3.18 |
| Median years education | 3 | 1 |
| Number literate | 19 (50) | 6 (55) |
| Number illiterate | 19 (50) | 5 (45) |

*Data by GENDER*

| | Females | Males |
|---|---|---|
| Total interviewed | 33 | 16 |
| Mean age | 52.42 | 62.06 |
| Number living alone | 2 (6) | 5 (31) |
| Number living with others | 31 (94) | 11 (69) |
| Number with no education | 10 (30) | 3 (19) |
| Mean years education | 3.09 | 4.33 |
| Median years education | 3 | 3 |
| Number literate | 17 (52) | 9 (56) |
| Number illiterate | 16 (48) | 7 (44) |

| | | |
|---|---|---|
| Number Dominicans | 24 (73) | 14 (88) |
| Number Haitians | 9 (27) | 2 (12) |

Blood Pressure Data

Most recent blood pressure was compared to first blood pressure measurement taken by CHW after entering Chronic Care Management Program. Criteria for controlled and uncontrolled blood pressures were as follows:

| | Controlled | Uncontrolled |
|---|---|---|
| Patients with hypertension | < 140/90 | ≥ 140/90 |
| Patients with hypertension and diabetes | < 130/80 | ≥ 130/80 |

The above criteria are based on "Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure" (2003). Blood pressures were considered uncontrolled if the systolic, diastolic, or both measurements exceeded the numbers considered controlled.

*Data by COMMUNITY*

| | Arroyo de Leche | Negro Melo | Severet | Pancho Mateo | TOTAL |
|---|---|---|---|---|---|
| Uncontrolled to controlled | 3 | 2 | 0 | 10 | 15 (31) |
| Controlled to uncontrolled | 0 | 0 | 2 | 3 | 5 (10) |
| Uncontrolled to uncontrolled | 4 | 0 | 5 | 7 | 16 (33) |
| Controlled to controlled | 0 | 2 | 2 | 2 | 6 (12) |
| 1 measurement only: controlled | 0 | 0 | 1 | 3 | 4 (8) |
| 1 measurement only: uncontrolled | 1 | 0 | 0 | 1 | 2 (4) |
| No measurements found | 0 | 0 | 0 | 1 | 1 (2) |

**Results Summary**

Patients with these qualities were more likely to have uncontrolled blood pressure:

- Living alone
- Never attended school
- Illiterate
- Taking pills 2 times per day (vs. 1 time per day)

Other groups were analyzed but did not show any differences in blood pressures (i.e. women vs. men, Haitians vs. Dominicans). Additionally, years of education did not correlate to blood pressure control. As long as patients attended school at some point in their lives, their blood pressure was more controlled.

**Data from summer 2010 interns**

- 28% of diagnosed and medicated hypertensive patients had uncontrolled hypertension (over 140/90)
    - Present study: 48% of those interviewed were uncontrolled
    - Possible explanations
        - Selection bias- we interviewed patients who were more accessible to CHWs, making their blood pressure easier to control
        - Blood pressures have improved over the past year
    - Education values of Pancho Mateo: shows same trend as the present study

18.5% 0 yrs education → 28.9% w/hypertension
55.6% some primary education (1-8) → 23.7% w/hypertension
25.9% some secondary or beyond → 15.8% w/hypertension

**Discussion**

There are a multitude of reasons why patients in certain demographics have decreased medication adherence. Below are possible explanations for the demographics that were found by this study to have the worst blood pressure levels, possibly indicating less medication adherence.

**Living Alone**

As discussed in the literature review and background, family plays a large role in managing a patient's health. In the key informant interviews, family members of patients reported that they often provided reminders to their family member (HHI patients) to take their pills. Without this support, it is likely that patients are either less motivated to take their pills or they simply forget more often. Only 14% of the sample population reported living alone, compared to 86% who do not live alone. For those who reported living alone, it was true in some cases that the role of the CHW served as a replacement of a family member and assisted with providing reminders to take their pills. Therefore, the support of this population of individuals living alone by CHWs is especially important in reducing medication adherence. The gender distribution of individuals living alone reflects a higher percentage of males living alone (31%) than women (6%).

**Never Attended School/Illiterate**

Lower health literacy and hypertension knowledge has been shown to correlate with higher blood pressures (Shibuya 2011). In our study, the disparity in education did have an effect on health. We discovered that 62% of the literate patients had controlled hypertension, while only 41% of the illiterate patients were controlled. Additionally, only 33% of those patients who had never attended school had controlled hypertension, while 60% with one or more years of education had controlled hypertension. Education is important in the management of chronic diseases like hypertension because medications and lifestyle changes are difficult to understand; they aim to treat the underlying condition, not noticeable symptoms. The health education disparity may contribute to lower medication adherence. Health education may serve as an area for future development to provide patients with knowledge about their condition, treatment options for prevention and management of their hypertension. While education reform in the Dominican Republic, is not a feasible goal, it is possible to provide vital facts and research results to the Dominican government to stress the important role of education in health outcomes, particularly in hypertension management. According to the Human Development Index, the adult literacy rate in the Dominican Republic is 90.1% (Human Development Reports, 2010). In our study, only 51% of the patients could read.

Health education by CHWs has been shown to be effective in many different contexts. Brownstein's 2007 meta-analysis, which analyzed studies involving education by CHWs, noted positive behavioral changes in nine of the ten studies. One study found that a single home visit by a CHW to educate family members and encourage behavioral changes was as effective in reducing blood pressure as a 15-minute educational interview in a health clinic and a support group lead by a social worker (Morisky 2002). This result shows that small groups (like those in a small community church) would be effective in improving the health of patients, even if they are short, one-time encounters. Our proposed strategy (see below) would include more than one health session so that more people have a chance to be exposed to it, and so that the community members learn the information well enough to pass it on to future generations.

**Taking pills two times per day**

Only 20% of patients who are prescribed more than one pill per day had controlled blood pressures, while those taking one compared to 55% of those taking one pill per day. This result may be due to the fact that patients prescribed pills more than once per day may have more severe

hypertension. It is not determined, however, if poor adherence is a result of taking more pills or increased forgetfulness to take pills. It is hypothesized that those taking more pills per day will be more likely to forget to take them at some point.

**Gender: no difference in blood pressures**

It is noted that no gender differences in blood pressure were found in this study. However, only 33% of the patients interviewed were male. This could be for a number of reasons, including men working more during the hours when interviews were conducted (thus making them unavailable for interview). This could also be due to men seeking health care less than women. Further research is needed to determine whether this is an issue for HHI.

**Awareness and knowledge of HTN in the Community**

In the qualitative interviews, the 49 patients were asked questions surrounding knowledge, community awareness and perceptions of hypertension. Patients most frequently cited the following responses regarding perceptions and knowledge of hypertension: most people suffer from HTN (35%; N=17), hypertension is associated with death (18%; N=9), HTN is dangerous (10%, N=5), HTN is associated with heat/temperature (10%; N=5), need to take pills for HTN (8%; N=4). Sample sizes of these responses are generally lower across the board because they were collected using a semi-structured qualitative interview. The calculations and responses that were most cited by patients are reported here. This portion of the exploratory study can serve to provide potential responses for future studies on this topic. For example, these responses can be incorporated into a qualitative survey that require patients to provide yes or no responses to the range of responses elicited through the qualitative interviews. The range of responses also reflects a limited knowledge surrounding hypertension. Most individuals when asked to explain what hypertension is or how you get it were either unable to respond to the question or cited death, heat, pills, and risk of mortality.

**Diet & Exercise**

Lifestyle factors such as diet and exercise are essential to hypertension management. To further explore the frequency and presence of exercise in patient's lives, they were asked whether they exercise and if so, what type. Of the 49 responses, 32 (65%) reported doing exercise to help manage their blood pressure. Among the 17 responses (35%) that reported not exercising, 24% stated that exercise was already present in their daily life, 12% stated not exercising due to their health condition, and 6% stated not exercising because they were tired. Among those who do exercise, 56% reported "walking" as part of exercise, 22% reported daily work as a form of exercise, and 9% reported household chores as a form of exercise. Dietary patterns varied but there were some consistencies observed. When asked about their daily food consumption, rice was the most common response (69%), followed by plantains (47%), beans (35%), and red meat (35%), and juice (14%). When patients were asked if they changed their diet due to their hypertension, 33% said they use less salt and 31% said that they eat less fat, oil, or butter. Additionally, 31% said that they had made no change to their diet. The decreases in fat and salt reflects a general knowledge of what should be done, but the fact that many still eat plantains (presumably fried) and red meat shows that they may not have the resources or knowledge of how to implement positive dietary changes.

**Supplements to pills**

To explore patterns and notions within self-care practices surrounding hypertension, patients were asked if they ate, drank, or did anything besides taking pills to help manage their blood pressure. The responses ranged across the board, but the most frequently cited supplement to medication included: *agua con azúcar y un chin de sal* (29%; N=5), *agua frío* (29%; N=5), *té de ani/chinola* (18%; N=3), and *agua con vanilla/azúcar* (12%; N=2). Again, the sample size of each response was limited

to those elicited from a semi-structured interview and were only provided based on each respondent's initiative. In addition to the items mentioned above, other supplements to medication included taking baths (*bañarse),* eating/doing "cool/fresh" things *(cosas frescas),* cundeamor *(té de cundeamor)*, *noni*, guava, jugo, malta, rest (descansa), oil with oranges (*aceite con naranjas*), and soursop (*guanábana*). *Cundeamor* is the fruit of a vine called Balsam Apple, used as an anti-inflammatory supplement, but literature citing it as a viable supplement to control blood pressure has yet to be found. Noni has origins in Southeast Asia, Polynesia, Oceania, and Central America and is rich in nutrients and antioxidants. Soursop is high in carbohydrates, Vitamin C, and Vitamin B1. There is room for future exploration of the nutritional values and benefits of these supplements in blood pressure control.

**Study Limitations**

- Accuracies of translation when interpreter was used
- Sedentary/generally nonworking population home during the workweek.
- Possible blood pressure measurement errors

**Recommendations for HHI**

**Exercise**
A few patients expressed that they would exercise if they could find someone with whom they could walk. We therefore recommend CHWs facilitating walking groups early in the morning so that patients can walk at a time that is not too hot. Perhaps this will also serve as a support group for the patients.
Specific goal: designate CHWs to create walking groups

**Diet**
Many patients knew they were not supposed to eat foods with fat and salt. However, when asked about their diet, they would often respond with fatty or salty foods (like fried plantains). Therefore they either do not know how to identify healthy foods or do not have access to these foods. We therefore think a nutrition class with specific dietary recommendations would be beneficial. It would also be help to clarify the foods that they can eat, as there are some misconceptions about spicy foods, red beans, and others causing high blood pressure.

Additionally, HHI can consider utilizing local social programs such as SeNaSa or Solidaridad, which provide assistance to low income families. A potential long-term project may look into building a nutritional guide that incorporates healthy options with food options found locally.
Specific goal: educate CHWs about feasible ways for patients to eat more healthily; if possible, find a way for them to access healthier food

**Network of Support**
Patients living alone and/or with a pill regimen of more than one per day were more likely to have uncontrolled blood pressure. In qualitative interviews with community health workers, patients, and family members of patients, it was found that having a support system to assist as daily or weekly reminders to take their medication was helpful. For patients of older age, living alone or taking more than one pill a day, it may be helpful for HHI to help patients develop their own network of support. This can be integrated with the facilitation of "charlas" for members of the community and for family members of patients with hypertension to enhance knowledge of hypertension and the importance of taking medications consistently; perhaps these charlas could also serve as support groups. Additionally, the CHWs could focus on those living alone to attend the daily walks (recommended above). Community health workers from each community may be best suited to identify and reach out to patients' neighbors or nearest living relative and informing them following consent of each patient.
Specific goal: CHWs should check in daily with those who live alone

**Gender Differences**
HHI should examine its records to determine if they are recruiting enough men into their programs. It may be harder for men to come to the clinics during daytime hours. Additionally, they may just be uncomfortable with asking for help. Therefore, perhaps HHI could make it known that male doctors are available (if that is true) and they could try encouraging more men to attend the clinics. Hypertension can be better controlled when it is detected early, so it is important that as many people are screened as possible.

**Education**
Both patients and family members expressed interest in a class about hypertension management (i.e. nutrition, exercise, medications). We think it would benefit patients to be told details about medicine adherence, such as not to take two pills at the same time if they forget one. Including family and

neighbors in informal "charlas" would benefit patients because often these people are the ones making nutritional decisions and reminding patients to take medications.
Specific Goal: design a curriculum for the charlas

**An additional note about education**

An efficient way for hypertension-specific education to lower blood pressures would be to focus on the Psychological Model of Health Behavior because it describes factors that determine whether individuals will change their health behaviors (Schneider, pg. 231). The first factor is the "extent to which individual feels vulnerable to threat." Therefore, education by the CHWs must focus on the fact that while hypertension is partially genetic, it is also heavily influenced by diet and lifestyle, putting many people at risk. The second factor is the "perceived severity of threat," so CHWs should point out that while patients cannot usually *feel* hypertension, it can cause outcomes like heart attacks and kidney problems later on in life, especially if it is uncontrolled.

The third factor in the Psychological Model is the "perceived barriers to taking action to reduce the risk." This issue is important because the CHWs must provide feasible ways for patients to improve their health. For example, simply telling patients to exercise 30 minutes per day would be ineffective because it is too hot in many areas to exercise during the day, and many people may not feel safe walking around by themselves. To solve this problem, CHWs could lead walking groups to improve safety, and these groups meet very early in the morning to avoid dangerous temperatures during the midday. Finally, CHWs need to address the "perceived effectiveness of taking action to prevent or minimize problem." Patients and families must understand that by making changes in their lives, like adding less salt to their food and taking medications consistently if they are available, they can greatly decrease their risks of complications resulting from hypertension.

Sometimes a fifth factor is added to the Psychological Model: self-efficacy. Patients are more likely to adopt specific behaviors if they have the ability to do so themselves and if they have a sense of control over the situation. Schneider emphasizes education's role in empowering people with problem-solving skills; if they are able to solve their own problems using the suggestions from the CHWs, they will be more likely to make changes in their behavior to improve their health.

In implementing this educational public health strategy, great care must be taken due to the limited financial resources available in the Dominican Republic. One study found that an educational intervention had no significant impact on adherence to medication (Guirado 2011), so the investment of time and money may not necessarily be effective. Not all health education directly leads to improved health behaviors and positive outcomes, so the model must be constantly evaluated and adjusted.

**Conclusion**

This study gives evidence for the fact that blood pressure is better controlled when patients are educated and have familial/social support to help them with their condition. HHI is already supporting these aspects of care for their patients; the above recommendations will help them to improve this care. Future research could include studies of those patients with co-morbidities, gender differences in health care attitudes, and how to sustainably help the communities procure healthy food.