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A COMPARATIVE ANALYSIS OF THE HEALTH STATUS OF  
CHILDREN UNDER 5 YEARS OF AGE IN THE DOMINICAN  
REPUBLIC AND DOMINICAN BATEYES

BY

FITUMAI MADRID

A THESIS SUBMITTED TO THE GRADUATE FACULTY OF  
GEORGIA STATE UNIVERSITY IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE  
MASTER OF PUBLIC HEALTH

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## ABSTRACT

**BACKGROUND:** Child malnutrition contributes to more than 33% of child deaths and is directly related to the productivity and success of the adult population. To combat these stark figures, the United Nations Millennium Development Goals set out to halve levels of malnutrition by 2015. While recent U.N. reports indicate that many countries are on track to reach the MDGs, there may be sub-populations within these countries that do not fair as well. The purpose of this study is to provide a comparative analysis of the nutritional status of children younger than five years of age in the Dominican Republic and the Dominican Batey sub-population. This comparison will be based on stunting levels, reportedly the best indicator of child malnutrition, as it indicates sustained levels of nutritional deficiency.

**METHODS:** Cross-sectional data from the 2007 Dominican Republic Standard and Special Demographic Health Surveys involving 11,149 Dominican children and 919 children from Dominican Bateyes, respectively, were used. Version 20 of the Statistical Package for Social Sciences (SPSS) was used to conduct descriptive statistics, analysis of variance tests, and independent samples T-test using selected socio-demographic variables.

**RESULTS:** A significant difference in height-for-age (stunting) was identified between Bateyes ( $M = -83.52$ ,  $SD = 134.783$ ) and the general population ( $M = -51.88$ ,  $SD = 134.576$ ;  $t(10,032) = -6.301$ ,  $p = .00$ , two-tailed). Study findings indicate that overall, children under five years of age who reside in Dominican Bateyes are more malnourished than their Dominican counterparts (15.9% in Bateyes as opposed to 10.8% in the general population). Furthermore, Batey children are .34 times more moderately stunted, and one time more severely stunted, than children who reside in other areas of the Dominican Republic.

**CONCLUSION:** While the Dominican Republic is on track to meet MDG Goal 1, a significant portion of the population does not fair as well. The substantial underlying differences that exist between the Dominican the Batey sub-population have led to higher rates of stunting and require further analysis. The findings of this study should guide the design of appropriate interventions aimed at reduction of malnutrition within Batey communities.

**KEY WORDS:** stunting, malnutrition, children, Dominican Republic, Batey, Millennium Development Goals

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## **Introduction**

The wellbeing of societies is highly dependent upon the health, social status and environmental conditions in which people live. Sadly, hundreds of thousands of people across the world are in great need of public health outreach as they are currently suffering from malnutrition, poverty, low literacy, maternal and child mortality, in addition to other chronic and potentially debilitating illnesses, all of which can be considered indicators of poor wellbeing. For example, as of 2013, 847 million people in the world did not have enough to eat, with the overwhelming majority (827 million) residing in developing countries (World Food Programme, 2014). Understanding the impact that these illnesses have on an individual's future requires extensive analysis of the conditions in which they exist, including the examination of biological, social, environmental and political factors. Furthermore, it may also be important to consider the syndemic relationship that exists between the various health issues within the community. Unfortunately, as the field of syndemics continues to expand, clinicians and health advocates must continue to address health issues from the biomedical view until the synergistic relationship is thoroughly understood. From a biomedical perspective, combatting these detrimental conditions requires substantial financial and human resources, but the positive outcome will greatly outweigh the initial costs.

In response to the poverty, hunger and disease that plagues millions of people worldwide, 192 world leaders and 23 international organizations came together in September 2000 to adopt the United Nations (UN) Millennium Declaration, which later became known as the Millennium Development Goals (MDGs). “The eight MDGs – which range from halving extreme poverty rates to halting the spread of HIV/AIDS, and

providing universal primary education, all by the target date of 2015 signified the beginning of a global partnership (“United Nations Millennium Development Goals,” n.d.-a). According to the UN, the MDGs represent unprecedented efforts to meet the needs of the world's poorest and have been agreed upon by all the world’s countries and all the world’s leading developmental institutions (“United Nations Millennium Development Goals,” n.d.-b). During the 2010 MDG Summit, a major push to accelerate progress on women’s and children’s health led to “a number of Heads of State and Government from developed and developing countries, along with the private sector, foundations, international organizations, civil society, and research organizations, pledging over \$40 billion in resources over the next five years” (“United Nations Millennium Development Goals,” n.d.-a). This pledge became the foundation for programs geared towards meeting the eight MDGs.

Of the eight MDGs, one that directly impacts children’s health is Goal 1: eradicate extreme poverty and hunger. The three targets of Goal 1 are to “(a) halve, between 1990 and 2015, the proportion of people whose income is less than \$1.25 a day; (b) between 1990 and 2015, halve the proportion of people who suffer from hunger; (c) achieve full and productive employment and decent work for all, including women and young people” (“United Nations Millennium Development Goals,” n.d.-c). Goal 1 is particularly important because nearly 100 million children in developing countries are underweight or malnourished (de Onis, Blössner, & Borghi, 2012). Furthermore, poor nutrition is responsible for nearly 45% of deaths in children under five years of age, claiming the life of 3.1 million children annually (World Food Programme, 2014). Achieving Goal 1 will result in decreased malnutrition and its associated adverse health

outcomes, such as developmental delays, compromised immune systems, reduced social skills, child mortality, and impaired school performance. All of these adverse health outcomes are directly related to inadequate intake of protein, calories and other nutrients (“Impact of Malnutrition on Health and Development,” n.d.). As 2015 is quickly approaching, it is advantageous to examine how close the world is to achieving MDG Goal 1. If the goal has already been achieved, examining by how much it has been surpassed can lead to further goal development.

The UN’s MDG program has stated that the Dominican Republic is one of the countries on track to halve child malnutrition by 2015. With a population of over 10 million people, of which 3 million are under the age of 14, reducing child malnutrition is of critical importance. Additional emphasis on reducing malnutrition is particularly essential in Dominican Bateyes, neighborhoods that are characterized as the most impoverished and isolated communities throughout the Dominican Republic. Located in Bahoruco, Barahona, El Seibo, Independencia, Puerto Plata, San Pedro de Macoris, Sánchez Ramírez, Monte Plata, Hato Mayor, Santo Domingo and various areas throughout the county, Bateyes are situated on the outskirts of the country or in areas of proximity to former sugar and agriculture plantations. Typically inhabited by individuals who have migrated from Haiti to acquire work in agriculture and construction, Batey residents have limited access to latrines, medical care, clean water and stable income. Furthermore, the Dominican Republic government has continued to deny Batey residents access to the health and social services afforded to Dominican residents. It may be suitable to postulate that the MDG findings do not include that Haitian and Dominico-Haitian populations, primarily because of the on-going battle between the Haitian

population and the Dominican government, in combination with the continued low wages that the former sugar cutters typically receive.

### **Purpose of the Study**

The primary purpose of this study is to evaluate the nutritional status of children under five years of age based on measurements obtained from two corresponding Demographic Health Surveys (República Dominicana Encuesta Demográfica y de Salud and República Dominicana Encuesta Sociodemográfica y sobre VIH/SIDA en los Bateyes Estatales de la República Dominicana). First, this study will review the literature for an accurate understanding of the issues that exist between the Dominican Republic and Haiti. This study will then examine how Dominican Bateyes were created. Thirdly, this study will examine the literature for an accurate understanding of malnutrition and its implication for future health status. Responses to the DHS surveys administered in the Dominican Republic and Dominican Bateyes will be examined to identify levels of malnutrition. Also, a comparative analysis will be conducted to highlight the differences between the two groups. Finally, recommendations will be proposed for public health interventions geared directly towards assisting Batey communities to reduce malnutrition and improve their quality of life.

The primary research question is whether there is a significant difference in the rates of malnourishment in children under age five (as measured by height for age in standard deviation units (H/A SD)) who reside in Dominican Bateyes as compared to those who reside in other areas of the Dominican Republic. Additionally, this study further aims to identify if any significant differences in mean H/A SD exist between each



Batey community. Findings from the first hypothesis will indicate (a) whether the UN's MDG statistics inaccurately capture the actual scope of malnutrition in the DR and (b) how much work is needed in the Bateyes to bring their health status up to equivalent rates as their Dominican counterparts. The second hypothesis will pinpoint which areas exhibit the greatest need for additional health and welfare services. The findings of this study will add substantially to the current public health and international health literature as there is no significant information available on the health of Batey residents, especially as it compares to other inhabitants of the eastern portion of the island of Hispaniola. Furthermore, this research can potentially lead the way to further initiatives geared specifically towards the Batey communities.

## **Literature Review**

### **Millennium Development Goal 1**

In September 2000, world leaders signed the eight Millennium Development Goals (MDGs) into action. These eight goals signaled a commitment by "the international community to combat poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women"(Food and Agriculture Organization of the United Nations, 2013). Particularly relevant to developing countries, such as the Dominican Republic, the eight MDGs "provided milestones for global and national developmental endeavors up until the end of 2015"(Food and Agriculture Organization of the United Nations, 2012).

In the simplest terms, the first MDG aims to eradicate extreme poverty and hunger. Using five progress indicators from UNICEF-WHO, the Food and Agricultural

Organization of the United Nations (FAO), and the World Bank, MDG Goal 1 provides a real snapshot of the health status of developing countries.

Some thirteen years since its implementation, and two years before the target deadline, the UN has stated that on a macro-level MDG Goal 1 has been reached.

“The proportion of people living in extreme poverty declined by half at the global level, the proportion of people living on less than \$1.25 a day in developing nations decreased five years ahead of schedule, and there was an 8.9 percent decrease in the proportion of undernourished people globally” (“United Nations Millennium Development Goals,” n.d.-b).

All of these findings suggest that the MDG is on track for greatly surpassing Goal 1, and that the programs that were developed in response to the MDGs are potentially very useful.

### **Measuring Malnutrition**

According to the World Health Organization (WHO), 6.6 million children under age five died in 2012, with 45% of these deaths being attributable to malnutrition, and 6,000 of these deaths occurring in the Dominican Republic (“WHO | Children,” n.d.; “Statistics,” n.d.). Contributing to nearly half of the deaths in children under five, the WHO describes malnutrition as inadequate nourishment of the following forms:

(a) secondary malnutrition in which people are unable fully to utilize the food they eat due to diarrhea or other illnesses, (b) overnutrition due to consumption of too many calories, and (c) undernutrition or protein-energy malnutrition caused by a diet that does not provide adequate

calories and protein for growth and maintenance (“WHO | Water-related diseases,” n.d.).

The Waterlow classification system is used further to identify the various forms of malnutrition. Taking into account weight-for-age and weight-for-height, the Waterlow classifications are used to present population-level malnutrition data. Weight-for-age, or underweight, “is the most common assessment of child nutrition status” (Setboonsarng, 2005). Underweight is also the official indicator used to monitor progress towards achieving Millennium Development Goal 1’s target of reducing the prevalence of malnutrition (Lutter et al., 2011). Weight-for-height referred to as wasting, is “a measure of acute or short-term exposure to an adverse environment, sensitive to changes in calorie intake or the effects of disease” (Setboonsarng, 2005). The third form of malnutrition is stunting. Measured using height-for-age, stunting is described as a better indicator of malnutrition than underweight because it reflects a cumulative nutritional deficit (Lutter et al., 2011; Setboonsarng, 2005; de Onis, Blössner, & Borghi, 2012; Carlson & Wardlaw, 1990). According to widely utilized WHO standards, a child is considered to be malnourished if any of these indicators is less than minus two standard deviations of the median value in the reference population. In most cases, the reference population is well-nourished children under five years of age, who reside in the United States. If these indexes fall below minus three standard deviations, the child is considered to be severely malnourished (Carlson & Wardlaw, 1990; Setboonsarng, 2005).

Stunting is the most common form of malnutrition, especially in developing countries (de Onis et al., 2012; Mitra & Rodriguez-Fernandez, 2010). In 2011, a reported 314 million children under the age of five years, residing in developing countries were

mildly, moderately, or severely stunted. Of these, 170 million had a height-for-age less than minus two standard deviations from the reference value (Stevens et al., 2012). The most recent statistics provided by UNICEF show that as of 2008, 197,000 or 18% of children in the Dominican Republic under five years of age were stunted (ChildInfo, 2010). The nutritional status of these children is described as "one of the most sensitive indicators of sudden changes in health status and food availability, acting as an early warning sign of distress, ill health, famine and eventual death" (Carlson & Wardlow, 1990, p. 15). Malnourished children are more likely to have developmental deficits, behavioral disturbances, poor health in adulthood, and suffer from early death (Duran, Caballero, & Onis, 2006; Karp, 1993; Group of European Nutritionists, Somogyi, & Haenel, 1982). Furthermore, it is believed that the effects of malnutrition are irreparable after a child is two years of age; as a result, identifying the existence of malnutrition is of critical importance (The Mother and Child Health and Education Trust, 2014; "The Lancet's Series on Maternal and Child Undernutrition Executive Summary," 2013; Ruel & Hoddinott, 2008).

### **Interventions Targeting Malnutrition**

Improving levels of child malnutrition require equitable economic growth, investments in healthcare, agriculture, technologies and policies, in addition to programs that improve access to food and nutritional education (Stevens et al., 2012; de Onis et al., 2012; Nichols, 1984). These interventions will empower families and communities to improve their health, sanitation and hygiene (Parikh et al., 2010). Examples of successful malnutrition interventions can be found throughout many developing countries,

particularly since the implementation of the Millennium Development Goals. However, only a small percentage of these programs can be found in Dominican Bateyes.

In 2006, the Children's Hospital of Philadelphia (CHOP) partnered with Dominican physicians to provide food supplementation and mobile clinic services to five area Bateyes. At a cost of 70 pesos or approximately \$2, community members received food packages with 5 pounds of rice, 1.5 pounds of oatmeal, 2 cans of sardines, and 1.5 pounds of dry milk. During this time, children under the age of 18 also received preventative and acute medical care. In the event that a child was found to be severely malnourished, they were referred to a large public hospital for inpatient nutrition management. Within one year of implementation, acute undernutrition rates decreased from 40% to 23% ( $P = 0.001$ ), and chronic undernutrition decreased from 33% to 18% ( $P = 0.003$ ) (Parikh et al., 2010). This program brought food and services directly to the impoverished community, effectively reducing the barriers that their economic and social status have placed on their health and well-being.

Identifying the presence of malnutrition and implementing programs similar to that of the CHOP can reduce enormous within country disparities, and give children who reside in Bateyes an equal chance to the prosperous future that their Dominican counterparts are privy to.

### **Past Tensions in Hispaniola and the Impact on Dominico-Haitians that Impact Child Malnutrition**

On-going tensions between the Dominican Republic and Haiti have existed since the sixteenth century. According to the Library of Congress' 2001 publication of Dominican Republic and Haiti: Country Studies, since the Spanish invasion of 1503, the

Dominican Republic has viewed its people as catholic, white Hispanics, while their Haitian neighbors were seen as black and utterly different (p. 21). During Haiti's occupation of the eastern portion of Hispaniola from 1822 to 1844, tensions between Haitians and Dominicans were at an all time high. Haitian forces occupied the Dominican land, created policies that were not followed, and worked diligently to sever any ties between the Dominican Republic and the Roman Catholic Church. The actions of the new leader caused animosity to grow between the groups. As noted by the Library of Congress (2001), "black Haitian troops reacted with resentment toward lighter-skinned Dominicans, while Dominicans came to associate the Haitians' dark skin with oppression and abuses of rule" (p. 21). This negative sentiment and desire to denounce any African lineage has continued for centuries. Unfortunately, this never-ending battle has a potentially negative impact on the health and welfare of Haitians and Dominico-Haitians who reside in the Dominican Republic (Library of Congress, 2001; Schumacher, 2010; Matibag & Downing-Matibag, 2010).

Since 1975, and possibly even longer, the Dominican government has worked tirelessly to deny Haitians a right to citizenship and the benefits that it includes. This was exemplified by legislator Vinicio A Castillo Seman who invoked the

"United Nations Assembly Resolution 869 IX General Assembly of 4 December 1975, Article 8, to the effect that the revocation of nationality can be justified in the cases in which it is proven that citizenship was obtained through fraud or false statements." With little regard for the impact that this article would have on the lives of many Dominico-Haitians who were not fraudulently living in the country, Castillo Seman

defended his actions by arguing, "the Haitian constitution guarantees Haitian nationality to children of Haitian parents regardless of the place of birth" (Matibag & Downing-Matibag, 2010).

Therefore, it was postulated that Dominico-Haitians would not be subjected to statelessness, the impact of which is devastating on children (Kosinski, 2009). Sadly, this is not the case for the approximately 600,000 to one million Haitians and their descendants living in the Dominican Republic. These individuals are routinely denied citizenship documentation, or possess documentation that goes unacknowledged by the Dominican civil registry, effectively leaving them stateless ("Refworld | World Directory of Minorities and Indigenous Peoples - Dominican Republic," n.d.).

The denial of citizenship, in addition to other Dominican policies creates critical barriers to the wellbeing of individuals of Haitian descent, regardless of their immigration status (Matibag & Downing-Matibag, 2010).

Pomeroy and Jacob (2004) identified socioeconomic status, health and education as the three commonly used indicators of well-being. Ilan goes further to describe "household well-being as defined by objective indicators of social concerns, such as education, access to information, adequacy of diet and sanitation, economic well-being, and employment" (Pomeroy & Jacob, 2004).

Policies implemented by the Dominican government, in addition to a shift in the economy from agriculture-based to industry and service-based, has caused a decrease in the overall well-being countryside (Pomeroy & Jacob, 2004; Library of Congress, 2001). This change is predominantly evident in impoverished communities, particularly the

Haitian communities, or Bateyes, which were highly dependent upon the agricultural industry for employment. Additionally, as the economic well-being of this minority population continues to decline, so does their health and education. As noted by Ostrach and Singer (2012), the Haitian children remain stateless, lack a sense of identity, and denied “access to education, healthcare, and the protections and constitutional rights granted by the State.”

All of these factors combined indicate that the Haitian community is subjected to a constant state of poor well-being and quality of life, something that MDG Goal 1 aims to combat.

### **Dominican Republic & Dominican Bateyes**

As of 2012 the Central Intelligence Agency's (CIA) World Factbook classifies the Dominican Republic as a country with medium levels of human development (“The World Factbook: Central America and Caribbean,” n.d.). Of predominantly mixed ethnicity, the DR has an estimated population of 10,349,741 with the majority of the population prescribing to the Roman Catholic religion. With such a substantial population size occupying a relatively small area of land, the DR is on an endless journey for developmental improvement. Improvement that included becoming an exporter of sugar, coffee, and tobacco. However, in recent years, “the service sector has overtaken agriculture as the economy’s largest employer, due to growth in telecommunications, tourism, and free trade zones” (“The World Factbook: Central America and Caribbean,” n.d.). The once thriving sugarcane industry encouraged many people to migrate to areas of the DR in hopes of acquiring wealth on the sugar plantations. Unfortunately, for some of these people, especially Haitians, life on a sugar plantation has not been as prosperous



as they would have wanted (Bittner, 1982; Library of Congress, 2001). By the 1990s, a large proportion of the country's sugarcane workers, also referred to as cane cutters, were of Haitian heritage. According to the Dominican-Canadian Development Group, these "sugarcane workers lived in village communities called Bateyes" ("The Dominican - Canadian Community Development Group - Sugarcane Bateyes," n.d.). These filthy hovels were conveniently located near the mills and surrounding fields to ensure that the exploited Haitians were in proximity to their place of work (Library of Congress, 2001, p. 75).

During the peak of the sugarcane industry Haitian and Dominico-Haitian cane cutters reportedly only received wages of \$3 per ton of sugar, barely enough for a family to live at a subsistent level. According to the 2003 article by Bernier, while \$3 per ton of sugar may equate to \$70 of monthly earnings, after any adjustments and discounts, by the end of the month a worker may only receive \$15 (Bernier, 2003). Fifteen dollars per month is the equivalent of fifty cents per day, 60% less than MDG Goal 1's targeted income level.

Approximately 200,000 inhabitants, predominantly of Haitian descent, occupy the four hundred Bateyes that currently exist throughout the Dominican Republic. These shanty neighborhoods typically have no running water, no electricity, no cooking facilities, no bathrooms and no school facilities for the children (Bernier, 2003). Forced to sleep with four to six people in a small room on bare floors Batey community members continue to receive low or no wages, and lack access to sufficient health clinics and many other services afforded to the Dominican people (Bernier, 2003; Parikh et al., 2010; PSI Research Division, 2008).

Due to their typically unacceptable living conditions, understanding the rates of malnutrition in Bateyes will provide further insight into the health and well-being of the Batey community members. Furthermore, despite the fact that the UN postulates that on a macro-level MDG Goal 1 has been achieved, at the micro-level, the Dominican Republic's within country disparities, such as those that exist in the Bateyes, may be masked by national estimates (Nations Unies, 2005; Lutter, Chaparro, & Munoz, 2011). This study will evaluate the nutrition levels of children less than five years of age within the two populations, and identify any differences. Gathering this information will illustrate if there truly are any masked within country variations, and if these disparities can be attributed to the political, social, and environmental warfare that Batey communities have been subjected to for centuries.

## **Methods**

### **Data Source**

The cross-sectional data for this study was obtained from the Measure Demographic and Health Survey (DHS) program. Established in 1984 by the United States Agency for International Development (USAID), the DHS Program has collected, analyzed and disseminated over 260 surveys in 90 countries. These surveys provide comprehensive information on the survey country's reproductive health, maternal and child health, immunization, fertility, HIV/AIDS, nutrition, and mortality rates, in addition to numerous other health indicators. According to Corsi, Neuman, Finlay, & Subramanian (2012) who published the article *Demographic Health Surveys: A Profile* in the International Journal of Epidemiology "all DHS are designed to provide national-

level statistics and reliable indicators for various population sub-groups such as by age, sex, education, urban/rural residence, wealth index and region of the country, and these statistics are released in a standard set of tables included with the country reports on survey completion.” Every few years USAID administers one of two main types of DHS surveys. The Standard DHS has sample sizes between 5,000 to 30,000 households and are conducted every 5 years. This survey size and distribution period allows for comparison over time. The second survey type is the Interim DHS. Usually with a smaller sample size and shorter questionnaire, the Interim DHS is distributed between Standard DHS periods and collects information on key performance monitoring indicators. Each survey consists of three questionnaires. The Household questionnaire collects information on the features of the home, and identifies eligibility of household members to participate in individual interviews, in addition to measuring the height and weight for women and children in the household (ICF International, n.d.). Men and women identified to be of reproductive age, 15-59 and 15-49 respectively are then eligible to complete the Men’s and Women’s questionnaires. Corsi, Neuman, Finlay, & Subramanian (2012) advise that “the core DHS questionnaire has been standardized and pre-tested to ensure comparability across populations and over time. In addition, the national coverage, high participation rates (response rates typically exceed 90%), standard data collection procedures and interviewer training ensure reliability and that survey estimates accurately represent the health situation in a wide range of low- and middle- income countries.” While each survey contains the same general information, certain sections may vary, especially since different countries need specific information

on topics that may not be included in the standard questionnaires, or relevant to other countries.

The Demographic Health Surveys granted permission to download the 2007 Dominican Republic Standard DHS and the 2007 Dominican Republic Special DHS. Unlike the Standard survey, the Special version of the DHS focuses specifically on Dominican Bateyes, something that was not exclusively done in previous DHS phases. The use of DHS datasets has been previously approved by the Georgia State University Institutional Review Board, who considers the data not human subjects research and exempt from additional approval requirements.

### **Study Design**

The 2007 Dominican Republic Standard and Special DHS were conducted by the Center for Demographic Surveys (Centro de Estudios Sociales y Demográficos (CESDEM)). Multistage sampling techniques were used to randomly select households across the nine national developmental regions. Distributed between March 2007 and August 2007, the Standard DHS contained a sample size of 32,431 households, 27,195 eligible female participants, and 27,975 male participants. Between July 2007 and August 2007, CESDEM administered the Special DHS throughout the Bateyes. Using the same nine developmental regions as the Standard DHS, ten primary areas were identified as representative of 209 Bateyes and 28,855 Batey households. The final Special DHS had a sample size of 2,540 households, 1,575 women respondents, and 1,820 men respondents. As noted by Griffiths, Madise, Whitworth and Matthews (2004) “data from the DHS

Program are particularly suitable for comparative studies since they contain similar core sets of information.”

### **Study Population**

Anonymous Children’s Recode SPSS files for each survey region were obtained from Measure Demographic Health Survey. These recoded files contain subsections from the Household and Women’s questionnaires. The Household questionnaire asked eligible women aged 15-49 about the nutritional status and anemia of young children. Likewise, the Women’s questionnaire, completed by women aged 15-49, raised questions about child immunization, recent occurrences of diarrhea, fever, and cough, Vitamin A supplementation and treatment of childhood disease. The questions that address anthropometric measurements in children aged less than five years are specifically important to this study. Additional questions addressing place of respondent’s birth, and region of survey completion were obtained from the Household questionnaire. Sample sizes obtained from Children’s Recode file were 11,149 for the Standard DHS and 919 for the Special DHS.

### **Variable List**

#### **Independent Variables:**

##### Region of Interview Completion

Prior to beginning the questionnaire, survey administrators recorded the region in which surveys were completed. This information was recoded as variable V024 in the recoded Household file. This study recoded the interview location data into a new

variable with “1” representing surveys completed in Bateyes and “2” representing surveys completed in other areas of the Dominican Republic.

#### Gender of child

Identified as variable B4 in the Children’s Recoded file, the child’s gender was identified using two questions: “please give me the names of the persons who usually live in your household who stayed here last night, starting with the head of household,” and “is (name) male or female.”

#### Age of child

The age of eligible children was obtained through two questions: “please give me the names of the persons who usually live in your household who stayed her last night, starting with the head of household,” and “how old is (name).” This data was as variable B8 in the Children’s Recoded data file. This study regrouped the age into three categories “1”, “2-3”, “4+”

#### Respondent’s place of birth

The respondent’s place of birth was identified by two questions: “where were you born (locality),” and “to which province does your place of birth belong.” Located in the Household file as variable SH14, participants were allowed to specify which of the 53 country categories they were born in, including countries such as Haiti and the United States.

#### **Dependent Variable:**

#### Height-for-age in standard deviations

Children's height-for-age was identified using three questions: "how old is (name)," "height in centimeters," "measured lying down or standing up." Identified as variable HW70 in the Children's Recoded file, height-for-age in standard deviations were calculated using the World Health Organization's new Child Growth Standards released on April 27, 2006. Data with values "9996", "9997", and "9998" were excluded from the analysis as these represent missing or implausible values.

The NCHS/CDC/WHO international reference standard is based on well-nourished children in the United States. Created through a combination of two reference standards: one for children under 24 months and the other for children 24–216 months. The first standard, called the Fels standard, is based on children whose height was taken while prone. The other standard, based on NHANES data, is derived from children 24 months and older whose height was measured while they were standing. For children 24 months of age or over, whose height was measured while lying down, one centimeter should be subtracted from their measured height before calculating the z-scores. (Measure DHS, 2006).

## **Statistical Methods**

This study utilized version 20 of IBM's Statistical Package for the Social Sciences (SPSS) to manage the DHS data that was previously provided in an SPSS compatible file. Descriptive statistics were conducted to obtain the distribution of data for variables: region of interview completion, gender of the child, age of the child, and respondent's place of birth.

An independent samples T-test was used to compare the means of the primary variable of interest, height-for-age in standard deviations between the Standard DHS and Special DHS. Following traditional convention to reduce the possibility of a Type I error, or rejecting the null hypothesis when in fact it is true, a significant difference will be obtained at an alpha level of 0.05. Partial eta squared was used to calculate the effect size or relative magnitude of differences between the means.

A one-way analysis of variance (ANOVA) with post-hoc tests was conducted to identify any statistically significant difference in height-for-age standard deviations among the five age groups. Post-hoc comparisons guard against the possibility of committing a Type I error due to the large number of simultaneous comparisons being made and the stringent significance criteria (Pallant, 2010).

A second ANOVA with post-hoc tests was conducted to identify statistically significant differences in the height-for-age standard deviations variable across the 10 surveyed Bateyes. As previously noted, post-hoc comparisons guard against the possibility of committing a Type I error, rejection of a true null hypothesis (Pallant, 2010).

## **Results**

### **Descriptive Analysis**

Primary descriptive statistical analysis indicated a study population of 919 in the Bateyes and 11,149 throughout the general Dominican Republic. However, further analysis showed an exact study population of 770 in the Bateyes and 9,255 in the



Dominican Republic, the number of children with an accurately recorded height-for-age measurement.

### Socio-demographic Characteristics

Of the 919 eligible Batey children under five years of age, each household had an average of 1.72 eligible children, 49.7% were females, 50.3% were males, and the majority of the children (41.1%) were two years old. Surveys were completed in Bahoruco (17.5%), Puerto Plata (13.5%), San Pedro de Mercurís (17.2%), Santo Domingo (23.4%), Monte Plata (15.5%), Sánchez Ramírez (.8%), Independencia (2.9%), Barahona (.2%), Hato Mayor (7.8%), and El Siebo (1.2%). While 53.75% of the eligible adult respondents were from the Dominican Republic, nearly 34% were from Haiti, 13% were from Cuba, and less than 1% came from the United States and Italy combined.

The 11,149 eligible children under five years of age consisted of 51.9% females and 48.1% males, relatively similar to the composition of the Batey population. Additionally, each household had an average of 1.58 eligible children, the majority of which were age four (21.5%), only 19.2% were age two. CESDEM administered the survey in the same ten regions as the Batey survey: Bahoruco (4.2%), Puerto Plata (3.2%), San Pedro de Mercurís (3%), Santo Domingo (4.7%), Monte Plata (3%), Sánchez Ramírez (2.5%), Independencia (3.4%), Barahona (3.3%), Hato Mayor (2.5%), El Siebo (2.8%), and twenty-two additional areas (67.4%). Of the survey respondents, 88.29% of the eligible adults were from the Dominican Republic, nearly 10% were from Haiti, and less than 2% came from other countries around the world.

Table 1 describes the socio-demographic characteristics of the study population, including the number of eligible children per household and the gender of children with recorded height-for-weight measurements. Table 2 illustrates the age distribution of children with recorded height-for-weight values. Figure 1 and Table 3 shows the providences in which the Special and Standard DHS surveys were completed. Figure 2 depicts the regions in which the Standard DHS respondents were born. Figure 3 depicts the regions in which the Special DHS interviewees indicated that they were born.

Table 1  
**General Descriptive Statistics**

	Bateyes (N = 919)	DR (N=1149)
Number of Children 5 & Under (average)	1.72	1.58
Gender of Child with Recorded Height-for-Weight	49.7% Female	51.9% Female
	50.3% Male	48.1% Male

Table 2  
**Percentage of Children by Age**

Age in Years	Bateyes (N=919)	Dominican Republic (N=1149)
0	18.5	19.6
1	20.2	19.2
2	22	19.2
3	20.3	20.5
4	19.1	21.5

Figure 1  
 Mapa de Conglomerados Seleccionados en Bateyes 2007 (Selected Cluster Map in Bateyes)



Table 3  
**Survey Completion by Region**

	Standard DHS	Special DHS
Distrito Nacional	3.80%	N/A
Azua	3.40%	N/A
Bahoruco	4.20%	17.50%
Barahona	3.30%	0.20%
Dajabón	2.70%	N/A
Duarte	3.20%	N/A
Elías Piña	3.10%	N/A
El Seibo	2.80%	1.20%
Españat	2.80%	N/A
Independencia	3.40%	2.90%
La Altagracia	2.50%	N/A
La Romana	3.10%	N/A
La Vega	3.70%	N/A
María Trinidad Sánchez	2.70%	N/A
Monte Cristi	2.10%	N/A
Pedernales	3.40%	N/A
Peravia	3%	N/A

Puerto Plata	3.20%	13.50%
Salcedo	2.30%	N/A
Samaná	3%	N/A
San Cristóbal	4.80%	N/A
San Juan	3%	N/A
San Pedro de Macorís	3%	17.20%
Sánchez Ramírez	2.50%	0.80%
Santiago	4.80%	N/A
Santiago Rodríguez	2.20%	N/A
Valverde	2.70%	N/A
Monseñol Nouel	2.90%	N/A
Monte Plata	3%	15.50%
Hato Mayor	2.50%	7.80%
San José de Ocoa	2.20%	N/A
Santo Domingo	4.70%	23.40%

Figure 2

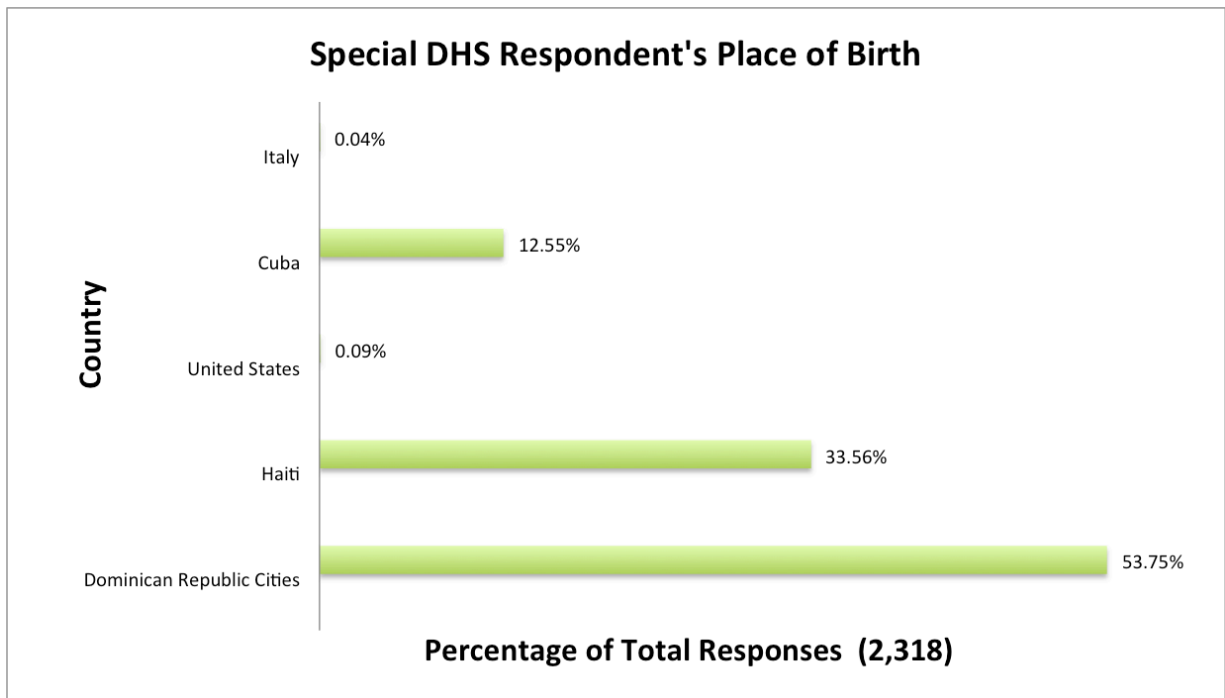
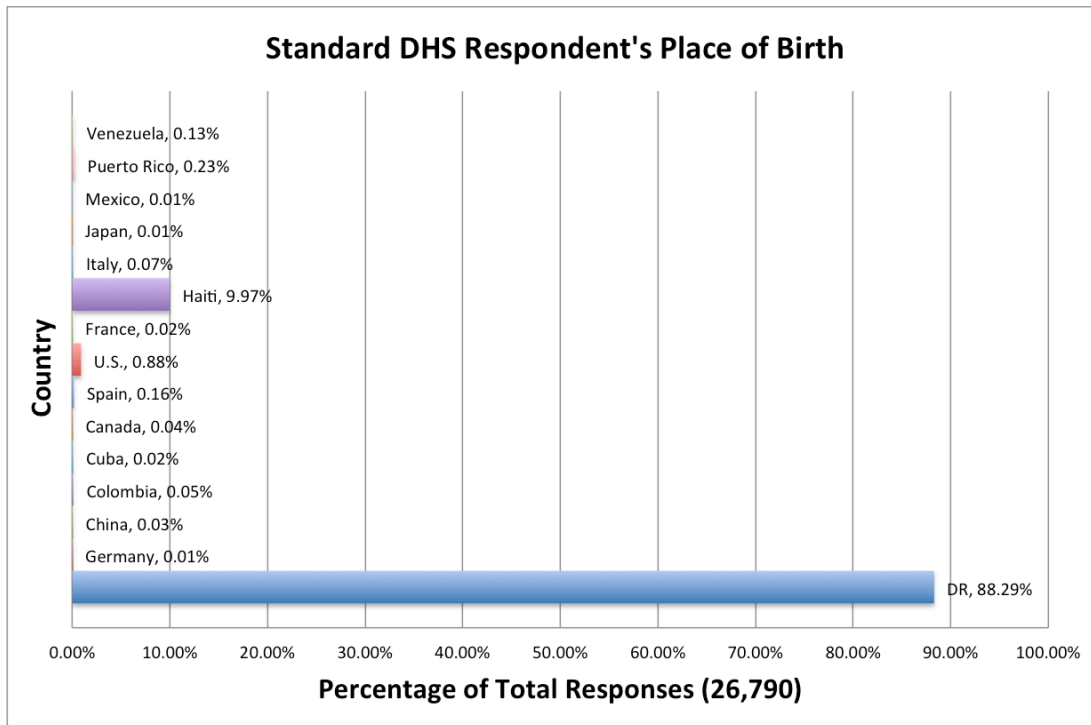


Figure 3



### Nutrition Levels

Descriptive frequency analysis was conducted to determine the overall nutrition levels of children less than five years of age. The data from each DHS was recoded to facilitate group analysis of equivalent ranges from -5 to 5 standard deviations (SD). Children were considered moderately stunted if their height-for-age was between -2 SD & -3 SD while severely stunted children had a height-for-age < -3 SD. Using these guidelines, 80.2% of the Batey population and 86.8% of the general Dominican population are considered adequately nourished, 11.7% and 8.7% moderately stunted, and 4.2% and 2.1% severely stunted, respectively. These findings indicate that overall, children under five years of age who reside in Dominican Bateyes are more malnourished than their Dominican counterparts (15.9% in Bateyes as opposed to 10.8% in the general population). Batey children are .34 times more moderately stunted, and one time more

severely stunted, than children who reside in other areas of the Dominican Republic. Furthermore, compared to children who reside in other areas of the Dominican Republic, Dominican Batey children are .15 times more stunted at the critical age of two years old.

Table 4 illustrates the nutrition levels, as measured in standard deviations, of children under age five in Dominican Bateyes and within the general Dominican Republic population.

Table 4  
**Nutrition Levels as Measured by Variance in Height-for-Age in Standard Deviations**

Standard Deviations from Mean	Batey Regions	General Dominican Population
-5	<1%	<1%
-4	<1%	<1%
-3	4.20%	2.10%
-2	11.70%	8.70%
-1	27%	24%
0	32.70%	54%
1	16.80%	7%
2	3.70%	1.80%
3	1.40%	<1%
4	<1%	<1%
5	<1%	<1%

### **Mean Comparisons**

#### Independent Samples T-test

An independent samples t-test was conducted to further compare the nutritional status of children less than five years of age in Dominican Bateyes to those in the general Dominican population. A significant difference was identified between Bateyes

(M = -83.52, SD =134.783) and the general population (M = -51.88, SD = 134.576; t (10,032) = -6.301, p = .00, two-tailed). Further analysis indicated that the magnitude of differences in the two population means (mean difference = -31.638, 95% CI: -41.481 to -21.796) was very small (eta squared = .004). These results indicate that while there is a significant difference in population means, only .4% of the variance in height-for-age as measured in standard deviation units, is explained by the questionnaire region. Therefore, when comparing height-for-age as an indicator of nutritional status, Batey children have higher negative means (more negative nutritional levels) than other children. However, this difference is not solely attributable to living in the Bateyes as the survey location only explained less than 1% of the height-for-age measurements.

Table 5 presents the level of variation between the two means, the partial eta squared and percentage of variance.

Table 5  
**Independent Samples Test of Batey Height-for-Age in Standard Deviations**

Levene's Test for Equality of Variances		t-test for Equality of Means	
F	Sig.	t	df
0.265	0.607	-6.301	10032
Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
0	-31.638	5.021	Lower -41.481 / Upper -21.796

One-way ANOVA with Post hoc Tests

Two one-way between-groups analysis of variance (ANOVA) were conducted to evaluate the impact of age for each survey on the corresponding height-for-age in

standard deviations. Levene's test indicated no violation of the assumption of equal variance for the Special DHS. The one-way ANOVA suggested a statistically significant difference at the  $p < .05$  level in height-for-age in standard deviations across the five Batey age groups:  $F(4, 778) = 5.120, p = .000$ . Despite reaching statistical significance, the actual difference in mean scores between the groups was quite small. The effect size, calculated using eta squared, was .02. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for children less than one year of age ( $M = -43.06, SD = 146.412$ ) was significantly different from children aged one ( $M = -91.06, SD = 142.344$ ), aged two ( $M = -108.10, SD = 132.422$ ), and aged four ( $M = -91.27, SD = 117.089$ ). Children aged three ( $M = -78.20, SD = 126.251$ ) did not differ significantly from either age group.

A statistically significant difference in height-for-age in standard deviations, when considering the age of the child was identified at  $p < .05$  in the general Dominican population:  $F(4, 9250) = 27.058, p = .01$ , between children less than one ( $M = -23.56, SD = 151.734$ ) and the four age groups (one ( $M = -62.26, SD = 141.508$ ), two ( $M = -61.00, SD = 136.626$ ), three ( $M = -55.58, SD = 122.930$ ), four ( $M = -57.68, SD = 113.416$ )). However, it must be noted that the assumption of homogeneity of variance was violated based on the reported Levene, Welch, and Brown-Forsythe test statistic.

Tables 6 and 7 present the descriptive characteristics for height-for-age amongst the five age groups.



Table 6

**ANOVA Comparisons**

Dependent Variable: Ht/A Standard  
deviations Batey (according to WHO)

Tukey HSD

(I) Current age of child	(J) Current age of child	Mean Difference (I-J)	Significance Level
0 years (N = 144)	1 year	48.055*	0.015
	2 years	65.090*	0
	3 years	35.196	0.155
	4 years	48.267*	0.018
1 year (N = 161)	0 years	-48.055*	0.015
	2 years	17.035	0.769
	3 years	-12.859	0.913
	4 years	0.212	1
2 years (N = 175)	0 years	-65.090*	0
	1 year	-17.035	0.769
	3 years	-29.895	0.255
	4 years	-16.823	0.793
3 years (N = 153)	0 years	-35.196	0.155
	1 year	12.859	0.913
	2 years	29.895	0.255
	4 years	13.071	0.916
4 years (N = 146)	0 years	-48.267*	0.018
	1 year	-0.212	1
	2 years	16.823	0.793
	3 years	-13.071	0.916
* The mean difference is significant at the 0.05 level.			

Table 7  
ANOVA Comparisons

Dependent Variable: Ht/A Standard deviations DR (according to WHO)  
Tukey HSD

(I) Current age of child	(J) Current age of child	Mean Difference (I-J)	Sig.
0 years (N = 1875)	1 year	38.705*	0
	2 years	37.439*	0
	3 years	32.024*	0
	4 years	34.125*	0
1 year (N = 1837)	0 years	-38.705*	0
	2 years	-1.266	0.999
	3 years	-6.68	0.547
	4 years	-4.579	0.835
2 years (N = 1766)	0 years	-37.439*	0
	1 year	1.266	0.999
	3 years	-5.414	0.738
	4 years	-3.314	0.945
3 years (N = 1888)	0 years	-32.024*	0
	1 year	6.68	0.547
	2 years	5.414	0.738
	4 years	2.101	0.989
4 years (N = 1889)	0 years	-34.125*	0
	1 year	4.579	0.835
	2 years	3.314	0.945
	3 years	-2.101	0.989
* The mean difference is significant at the 0.05 level.			

ANOVA conducted to evaluate the impact of Batey regions on the nutritional status of children as measured by height-for-age in standard deviations. As per the Special DHS areas of evaluation, ten Batey zones were examined. A histogram was generated to ensure that the values were normally distributed. Levene's test indicated a violation of the assumption of equal variance; however, the more robust Brown-Forsythe modification test showed no violation. The one-way ANOVA suggested no statistically

significant difference at the  $p < .05$  level in height-for-age in standard deviations across the ten Batey regions:  $F(9, 790) = 1.446, p = .164$ . The absence of a significant difference was further confirmed by post hoc tests with an average significance value of 1, much larger than the desired  $p < .05$  significance level. Additionally, a small effect size between Batey locations and nutritional levels was calculated using eta squared = .016. These findings illustrate that although there is a significant difference in means between Bateyes and the general Dominican population, there is no significant difference in height-for-age values between the ten surveyed Bateyes.

Table 8 presents the descriptive characteristics of height-for-age amongst the various Batey communities.

Table 8  
ANOVA Comparisons

Dependent Variable: Ht/A Standard deviations Batey (according to WHO)  
Tukey HSD

(I) Survey Region	(J) Region	Mean Difference (I-J)	Significance Level
Bahoruco (N=147)	Barahona	591.282	1
	El Seibo	555.56	0.992
	Independencia	555.449	0.902
	Puerto Plata	377.552	0.719
	San Pedro de Macorís	310.747	0.83
	Sánchez Ramírez	-1141.384	0.797
	Monte Plata	196.202	0.994
	Hato Mayor	364.266	0.896
	Santo Domingo	447.121	0.251
	Barahona (N=2)	Bahoruco	-591.282
El Seibo		-35.722	1
Independencia		-35.833	1
Puerto Plata		-213.731	1
San Pedro de Macorís		-280.535	1
Sánchez Ramírez		-1732.667	0.95
Monte Plata		-395.08	1

	Hato Mayor	-227.016	1
	Santo Domingo	-144.162	1
El Seibo (N=9)	Bahoruco	-555.56	0.992
	Barahona	35.722	1
	Independencia	-0.111	1
	Puerto Plata	-178.009	1
	San Pedro de Macorís	-244.813	1
	Sánchez Ramírez	-1696.944	0.603
	Monte Plata	-359.358	1
	Hato Mayor	-191.294	1
	Santo Domingo	-108.439	1
Independencia (N=21)	Bahoruco	-555.449	0.902
	Barahona	35.833	1
	El Seibo	0.111	1
	Puerto Plata	-177.897	1
	San Pedro de Macorís	-244.702	1
	Sánchez Ramírez	-1696.833	0.409
	Monte Plata	-359.247	0.995
	Hato Mayor	-191.183	1
	Santo Domingo	-108.328	1
Puerto Plata (N=104)	Bahoruco	-377.552	0.719
	Barahona	213.731	1
	El Seibo	178.009	1
	Independencia	177.897	1
	San Pedro de Macorís	-66.804	1
	Sánchez Ramírez	-1518.936	0.429
	Monte Plata	-181.35	0.998
	Hato Mayor	-13.285	1
	Santo Domingo	69.569	1
San Pedro de Macorís (N=142)	Bahoruco	-310.747	0.83
	Barahona	280.535	1
	El Seibo	244.813	1
	Independencia	244.702	1
	Puerto Plata	66.804	1
	Sánchez Ramírez	-1452.131	0.487
	Monte Plata	-114.545	1
	Hato Mayor	53.519	1
	Santo Domingo	136.374	0.999
Sánchez Ramírez (N=6)	Bahoruco	1141.384	0.797

	Barahona	1732.667	0.95
	El Seibo	1696.944	0.603
	Independencia	1696.833	0.409
	Puerto Plata	1518.936	0.429
	San Pedro de Macorís	1452.131	0.487
	Monte Plata	1337.586	0.615
	Hato Mayor	1505.651	0.47
	Santo Domingo	1588.505	0.343
Monte Plata (N=112)	Bahoruco	-196.202	0.994
	Barahona	395.08	1
	El Seibo	359.358	1
	Independencia	359.247	0.995
	Puerto Plata	181.35	0.998
	San Pedro de Macorís	114.545	1
	Sánchez Ramírez	-1337.586	0.615
	Hato Mayor	168.064	1
	Santo Domingo	250.919	0.951
Hato Mayor (N=62)	Bahoruco	-364.266	0.896
	Barahona	227.016	1
	El Seibo	191.294	1
	Independencia	191.183	1
	Puerto Plata	13.285	1
	San Pedro de Macorís	-53.519	1
	Sánchez Ramírez	-1505.651	0.47
	Monte Plata	-168.064	1
	Santo Domingo	82.855	1
Santo Domingo (N=195)	Bahoruco	-447.121	0.251
	Barahona	144.162	1
	El Seibo	108.439	1
	Independencia	108.328	1
	Puerto Plata	-69.569	1
	San Pedro de Macorís	-136.374	0.999
	Sánchez Ramírez	-1588.505	0.343
	Monte Plata	-250.919	0.951
	Hato Mayor	-82.855	1

## **Discussion**

This study aimed to examine the United Nations' claim that the Dominican Republic was on track to meet or exceed Millennium Development Goal 1, the eradication of extreme poverty and malnutrition by 2015. The study also aimed to identify the existence of any statistically significant differences between the ten surveyed Batey regions. Using the 2007 Dominican Republic Standard and Special DHS surveys, on the study results explicate the similarities and differences that exist between two very similar, but distinct entities that reside in the same country.

### **Stunting Rates in General and Batey Populations**

Analyses of the data exposed numerous differences, some of which were not originally suspected. For example, when comparing levels of moderate to severe stunting, as indicated by a height-for age less than -2 standard deviations from the mean, 17% of the Batey population were categorized as moderately to severely stunted, as opposed to 12% of the general population. Furthermore, when looking solely at moderate stunting, Batey children were .34 times more likely to be stunted than their Dominican counterparts. While this does not exclusively indicate that living in a Batey increases susceptibility to stunting, it does show that children in Bateyes have a poorer health status than children who reside in other areas of the country. This finding supports the initial hypothesis that differences in means existed between the study populations. The Dominican Republic's Global Health Initiative Strategy sites programs such as USAID's Batey Project that "works in an integrated way combining health, education, and economic growth" to improve the lives of Batey residents ("Dominican Republic Global

Health Strategy Initiative,” 2012). Implementing similar programs throughout the numerous Batey regions can combat levels of stunting and improve residents’ health outcomes.

Study results also indicated additional population differences, across height-for-age among the five age groups. Batey children less than one year of age were found to be statistically different than Batey children aged one, two, and four. There was no statistical significance identified between Batey children less than one and age three. Similar results were found for children who reside in other areas of the Dominican Republic. While greater differences were expected between older and younger ages, indicating more prolonged and severe stunting, at a basic level these findings suggest that children's nutrition levels change for the worse as they age. As illustrated by the literature, to reduce the prevalence of negative differences across the age groups, particular emphasis should be placed on combating child malnutrition at an earlier age, especially prior to the critical period of age two when the effects of malnutrition may no longer be reparable (The Mother and Child Health and Education Trust, 2014; “The Lancet’s Series on Maternal and Child Undernutrition Executive Summary,” 2013; Ruel & Hodinott, 2008). Furthermore, the American Heart Association suggests that children aged two years and older should consume “a diet that primarily relies on fruits and vegetables, whole grains, low-fat and nonfat dairy products, beans, fish, and lean meat” (Gidding et al., 2005). As a result, future interventions should place emphasis on improving Batey communities’ access to these nutritious foods.

The statistical findings of this study were consistent with the available literature that addressed the Batey communities' lack of access to healthcare services due to

financial limitations and the on-going political battle between the Haitian and Dominican populations, and the impact that this has on their well-being (Library of Congress, 2001; Schumacher, 2010; Matibag & Downing-Matibag, 2010). Even though the Batey study population consisted of 779 responses and the general Dominican population consisted of 9,255, the Levene's significance test indicated that there was equal variance between the two groups. Further analysis showed that although there was a significant difference between the Batey and general populations, only 3.9% of this variance was due to the survey location. The initial findings of a statistically significant difference support the purpose of this study and, illustrates that there is dissimilarity between the two groups. However, the small percentage of variance in height-for-age indicates that the mean difference is not as profound as initially expected, nor can these differences be solely attributed to individuals living in Bateyes as it was previously proposed.

### **Batey Comparison**

This study also focused on comparisons among the ten Bateyes to identify which regions, if any, are in greatest need of intervention. No statistically significant difference emerged in height-for-age amongst the ten Bateyes. This may indicate similar rates of availability of food choices and access to healthcare services across Bateyes.

Furthermore, the history behind the establishment of Bateyes aligns with the potential existence of homogeneous regions as they were all founded on the same premise (Library of Congress, 2001; “The Dominican - Canadian Community Development Group - Sugarcane Bateyes,” n.d.). However, due to changes that typically occur over time it may be assumed that significant differences would exist between these areas and that these differences would influence the health outcomes of the community members. Future



research examining additional input from members of the ten surveyed Bateyes, or the supplement of responses from the remaining Bateyes across the country may illustrate that significant differences do exist in these impoverished areas. The impact of these differences may result in more substantial height-for-age variations between individual Bateyes and the general population.

### **Nationality and its Impact on Bateyes**

Based on the literature, preliminary hypotheses included the presence of more individuals of Haitian descent residing in Dominican Bateyes as opposed to the other surveyed areas of the Dominican Republic. This was due primarily to the fact that Bateyes were created to house Haitians and other agricultural workers away from the general population and close to the plantations (Library of Congress, 2001). As a result, the majority of Special DHS responses were presumed to be from Haiti. Descriptive analysis supported this hypothesis, indicating that 33.56% of the eligible adults who completed the Special questionnaire reported being from Haiti, as compared to a lesser 9.97% of those who completed the Standard DHS questionnaire. Furthermore, while nearly the entire group of Standard respondents (88.29%) was from various parts of the Dominican Republic, only half (53.75%) of the Special respondents reported being born in the Dominican Republic. These findings support the earlier assumptions and indicate that Bateyes are composed of more Haitians than other nationalities. Unfortunately, due to the current scope of this study and available information, it was impossible to determine the impact that nationality had on nutrition levels. To truly understand the role that the respondents' place of birth has on levels of child malnutrition future research should involve logistic regression that includes the place of birth as a predictor variable.

## **Conclusion**

Through numerous statistical tests, it was concluded that while the Dominican Republic is on track to meet MDG Goal 1, a significant portion of the population does not fair as well. The substantial underlying differences that exist in the Batey sub-population have led to higher rates of stunting and require further analysis, particularly the administration of subsequent DHS surveys, to understand more fully how the full population of the Dominican republic is doing in comparison to the U.N.'s postulation. The results of this study to indicate a need for the Dominican Republic's government to focus on the health of the entire population, consistent with the 2012 Dominican Republic National Health Plan (NHP). NHP outlined "strategic objectives that address the major gaps that prevent the Dominican Republic – especially poor and vulnerable populations – from achieving better health outcomes by improving equitable access to health services (including out-of-pocket costs) and strengthening the health system" ("Dominican Republic Global Health Strategy Initiative," 2012). These changes will lead to substantial improvements in the lives of nearly all individuals who reside in the Dominican Republic, improvements that will positively impact generations to come.

## **Strengths**

The data used in this study were nationally representative, providing large randomized sample sizes from two regions, the general Dominican Republic population and the Batey communities, and allowing the data to be potentially generalizable. This study was also the first of its kind to examine stunting as an indicator of malnutrition and

compare these rates across Bateyes and against the general Dominican population. Furthermore, this study began to shed light on the plight of Haitians in the Dominican Republic and that of those who have resorted to living in Batey communities. There is limited literature available on Bateyes, and this study provides both general and comparative outlook.

### **Limitations**

While the information from this study may be generalizable, there are many limitations that must be acknowledged. First, this study did not use weighted data, which gives more appropriate prevalence rates based on the survey population. Due to this study's comparative nature, not utilizing weighted data did not significantly affect the analysis. Secondly, even though the sample sizes were relatively large, there were many variables with substantial missing data that may have inadvertently affected the results of the study. Thirdly, the cross-sectional nature of the DHS survey only permits comparison of interest variables at the same point in time, limiting the ability truly to understand cause and effect relationships that may exist between Batey composition and levels of child malnutrition. Lastly, the 2007 Dominican Republic Special DHS was the first DHS to target the Batey regions specifically. To accurately evaluate the progression of malnutrition levels subsequent Special DHS surveys will need to be administered and compared to the 2007 survey.

### **Recommendations for Public Health Initiatives**

Despite the limitations of this study, the results are significant enough to provide insight into the prevalence of malnutrition in the Dominican Republic and the varying impact that it has within the country. To mitigate the increased prevalence of this life-altering epidemic, it is imperative to address the social and economic factors that are directly related to its occurrence. This study did not examine these factors in depth; however, future research should include variables such as income levels and education as indicators. As a result of increased social standing and economic stability, those who are at increased risk will be empowered with the tools that they need to seek nutritional food and adequate healthcare. Furthermore, political awareness to address the needs of Batey community members, combined with policy development, community mobilization, and health education are essential to improving the health and well-being of this marginalized population. Future malnutrition initiatives may benefit from modeling the Children's Healthcare of Philadelphia program, which brought the services directly to the community (Parikh et al., 2010). This will reduce the barriers that currently prevent community members from obtaining care, and it can be the first of a multi-stage initiative that aims to transform the lives of community members.

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