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Chronic Conditions of US-Bound Cuban Refugees: October 2008-September 2011

Sarah Ward
Georgia State University

CHRONIC CONDITIONS OF US-BOUND CUBAN REFUGEES: OCTOBER 2008-SEPTEMBER 2011

by

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ABSTRACT

SARAH ELIZABETH WARD
Chronic Conditions of US-Bound Cuban Refugees: October 2008-September 2011

Background: Historically, most refugees have originated from countries with high rates of infectious diseases. However, non-communicable diseases are becoming increasingly more common in refugee populations resettling in the United States.

Purpose: Examine the prevalence of selected chronic conditions among newly arriving adult Cuban refugees and compare the results to the prevalence of the same chronic conditions among the other top five incoming refugee populations: Burmese, Bhutanese, Iranians, Iraqis, and Somalis

Methods: Data used in this study were derived from the Department of State's Medical History and Physical Examination Worksheet and included all adult (≥20 years) Cuban, Burmese, Bhutanese, Iranian, Iraqi, and Somali refugees identified through the Center's for Disease Control and Prevention Electronic Disease Notification Center, and who entered the United States during October 2008-September 2011. Data were analyzed using SPSS version 19.0. Descriptive statistics, chi-square analysis, and logistic regressions were performed to assess the prevalence of chronic conditions, check for associations between country of origin and outcome of interest, and to estimate the relative risk for Cubans compared to the remaining top five incoming refugee populations.

Results: A total of 99,920 adults were included in the study. The largest population was Iraqi (27.6%), followed by Bhutanese (26.2%), Burmese (24.4%), Iranian (8.6%), Cuban (7.9%), and Somali (5.3%). All outcomes of interest were significantly associated with country of origin. Cubans were at a greater risk for asthma but were not the greatest at-risk population for the remaining outcomes of interest.

Conclusion: The prevalence of non-communicable diseases was higher among the incoming refuges than has been traditionally assumed. These findings point to the need for a better understanding of the health status of refugee populations and the development of culturally appropriate health programs that include education on prevention and treatment of chronic conditions.

INDEX WORDS: CHRONIC CONDITIONS, NON-COMMUNICABLE DISEASES, REFUGEE HEALTH, CUBAN REFUGEES

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- Conduct an epidemiologic study and analysis on the prevalence of public health conditions in the top 6 incoming refugee populations, i.e. Burmese, Iraqi, Bhutanese, Cubans, Iranians, and Somalis, utilizing the Electronic Disease Notification surveillance system.
- Conduct an epidemiologic study design and implementation for complex medical health problems among 7,000 newly arriving refugees during January 2011-December 2011.
- Establish a data collection database for assessing complex medical health problems among 7,000 newly arriving refugees.
- Collect public health data on complex medical health problems among 7,000 newly arriving refugees from various sources, i.e. United Nations High Commissioner for Refugees and International Organization for Migration.
- Conduct epidemiologic analysis on complex medical health problems among 7,000 newly arriving refugees utilizing data collected by the United Nations High Commissioner for Refugees and International Organization for Migration.

- Assist in evaluation of Supplemental Services for Recently Arrived Refugees Program grant review.
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- Assist in the Division of Global Migration and Quarantine Biomosaic data visualization project by investigating to communicate
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- Worked on a grant investigating Alzheimer's and Huntington's Disease in a monkey model
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- Worked on a grant investigating the cognitive abilities of adult *Macaca mulatta*, pre-lesion surgery.
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- Collected and processed blood and saliva samples.
- Organized, managed and analyzed cognitive, anthropometric, radiograph and DEXA data.
- Trained and conducted reliability with student employees on cognitive tasks, anthropometrics, radiographs and DEXA collection.
- Managed and updated databases for cognitive testing conducted with control and experimental animals.
- Coordinated the collection of cognitive tasks, anthropometric measurements, radiographs and DEXA scans that included timing all tasks with the phase of the experiment, assuring staffing needs would be met for that task and that the task did not adversely impact animals in other phases of the study.
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Abstracts/Presentations

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Chapter I

Introduction

1.1 Background

The United Nations (UN) 1951 Convention Relating to the Status of Refugees, defined a refugee as an individual who "owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country; or who, not having a nationality and being outside the country of his former habitual residence as a result of such events, is unable or, owing to such fear, is unwilling to return to it".[1] Originally, refugee status was limited to persons within Europe who were fleeing the events of World War II. However, the 1967 Protocol Relating to the Status of Refugees removed the geographical and time-sensitive limitations, giving the Convention universal coverage. As of April 1, 2011, 145 States were party to the 1967 Protocol, including the United States which ratified the protocol in 1968.[2] Worldwide, by the end of 2010, an estimated 43.3 million persons had been forcibly displaced due to conflict and persecution. Of those an estimated 10.55 million were classified as refugees.[3]

1.1.1 United States Refugee Legislation

The United States (US) has a long history of legislation relating to refugees, dating back to the Displaced Persons Act of 1948, which allowed the resettlement into

the US of certain displaced European persons.[4,5] Additional legislation includes the Refugee Relief Act of 1953 and the Fair Share Refugee Act of 1960. United States law was brought into compliance with the UN 1967 Protocol Relating to the Status of Refugees with the Refugee Act of 1980. The Act, which is still in place today, established a geographically and politically neutral definition of refugee while also distinguishing between refugee status and asylum status. Moreover, certain refugee populations were granted the right to be processed while still in their countries of nationality.

1.1.2 Cuban Refugees and Parolees

Prior to the late 1950s, Cubans seeking to immigrate to the United States were required to follow the same procedures as any other potential immigrant. However, with the assumption of power by Fidel Castro in 1959, exodus from the country began *en masse*.[6,7] Between 1962 and 1979, under the Attorney General's parole authority, hundreds of thousands of Cubans were allowed to enter the US legally. What is known as the Mariel boatlift in 1980 resulted in approximately 125,000 Cubans making landfall on US soil within a six-month time span. The slow trickle of Cubans post 1980 again reached record heights in 1993-1994 (~33,000) after Castro, once again, declared that any Cuban wishing to leave the country could do so. In September of 1994 in order to stem the flow of Cubans into the US, the two governments reached an agreement known as the Cuban Migration Agreement. Under the agreement, Cuba agreed to use "persuasive measures" to discourage Cubans from attempting to reach Florida by boat and the US agreed to allow 20,000 Cubans to immigrate annually. Additionally, the Clinton administration adopted a "wet feet, dry feet" policy by which Cuban refugees intercepted

at sea would be returned to Cuba, but if they made it on to a US shore they would be allowed to remain. Subsequent administrations have continued to follow the policy.

As a result of the aforementioned history, in addition to entering as refugees, Cubans are also allowed to enter the US as parolees under Title V (Fascell-Stone Amendment) of the Refugee Education Assistance Act of 1980, also known as the Cuban/Haitian Entrant Act.[8] The Department of Homeland Security (DHS), under section 212(d)(5) of the Immigration and Nationality Act (INA), may temporarily grant parole status to persons for "humanitarian reasons or for emergent or compelling reasons of significant public benefit".[9] Cubans entering the US under the Cuban/Haitian Entrant Act, including Cuban parolees, are eligible for Office of Refugee Resettlement (ORR) funded refugee assistance programs, including cash and medical assistance, under Part 401 of Title 45 of the Code of Federal Regulations (45 CFR 401). For the purposes of this paper, all Cuban refugees and parolees will be collectively referred to as Cuban refugees.

1.2 Purpose of Study

The large number of refugees entering the United States yearly poses a unique challenge to the health care system in terms of financial burden and access to care, as well as provision of culturally sensitive and applicable care. Understanding the health conditions specific to a particular refugee population allows for the development of a health care approach that adequately meets the needs of the refugee population in question. The purpose of this study is to examine the prevalence of selected chronic conditions among newly arriving adult Cuban refugees using the Department of State (DS) Overseas Medical Examination form and to compare the results to the prevalence of

the same chronic conditions among the other top five incoming refugee populations: Burmese, Bhutanese, Iranians, Iraqis, and Somalis.

1.3 Research Questions

Question #1: What is the prevalence of selected chronic conditions among newly arriving Cuban refugees during October 2008-September 2011?

Question #2: What is the prevalence of selected chronic conditions among the remaining top five newly arriving refugees (Burmese, Bhutanese, Iranians, Iraqis and Somalis) during October 2008-September 2011?

Question #3: How does the prevalence of selected chronic conditions among Cuban refugees compare to the prevalence of selected chronic conditions among the other top five refugee populations?

Chapter II

Review of the Literature

The purpose of this study is to determine if Cuban refugees have a greater prevalence of chronic conditions than five other refugee populations by examining the prevalence of selected non-communicable diseases (NCDs) in Cuban refugees compared to the prevalence in the other five refugee populations. This literature review will focus on the following areas: the global burden of disease, refugee health, and the health of Cubans and Cuban refugees.

2.1 Global Burden of Disease

The World Health Organization (WHO) quantifies the burden of disease in terms of disability-adjusted life-years (DALYs).[10] In simple terms, the burden of disease can be thought of as the gap between a population's current health status and their health status if everyone survived to old age in perfect health, while a DALY is one year of healthy life lost.

2.1.1 Formulas

Disability-adjusted life-years are measured as the sum of Years of Life Lost (YLL) due to premature mortality and the Years of productive life Lost due to Disability (YLD). [10] The formula for DALYs is as follows:

$$DALY = YLL + YLD$$

The YLL are the number of deaths multiplied by the standard life expectancy at the age in which death occurred.[10] The basic formula for YLL, not taking any other demographic or social characteristics into account, is as follows:

$$YLL = N \times L$$

N = number of deaths

L = standard life expectancy at age of death in years

Years Lost to Disability are calculated for a specific cause during a given time period by multiplying the number of incident cases in that period by the average duration of the disease, as well as a weight factor that reflects the severity of the disease on a scale from 0 (perfect health) to 1 (dead). [10] Without applying additional demographic or social characteristics, the basic formula for YLD is as follows:

$$YLD = I \times DW \times L$$

I = number of incident cases

DW = disability weight

L = average duration of the case until remission or death (years)

2.2 Non-Communicable Diseases

Historically, in low-income and middle-income countries, infectious diseases have been the major source of DALYs. Additionally, NCDs were believed to only be an issue of wealthier nations. However, an epidemiologic transition has been underway and NCDs are increasingly becoming a concern for low-income and middle-income countries, often occurring alongside infectious diseases, creating a double burden of disease.[11]

A number of causes have been proposed for the epidemiologic shift in disease. Advancements in medical research following the Second World War—including vaccinations, antibiotics, and overall improvement of life conditions—have attributed to the decrease in communicable diseases worldwide.[12] This has resulted in an aging population and, therefore, an increase in the health issues related to older age.[13,14] Global economic development has led to greater urbanization, changes in lifestyle, including diet, physical activity, smoking, and alcohol use, and increased adiposity.[11,15] In high-income countries, approximately 90% of new diabetes mellitus cases and 70% to 80% of new cardiovascular diseases (CVDs) may be accounted for by relatively modest differences in lifestyle factors.[15] Lastly, other social and environmental changes, such as changes in air quality and early childhood exposures, may also contribute to the increase in chronic conditions.

2.3 Risk Factors for Non-Communicable Diseases

The most common risk factors for chronic diseases are behavior based and preventable in nature. Four behaviors in particular are associated with most NCDs: tobacco use, physical inactivity, unhealthy diets, and alcohol use.[16] In turn, these behaviors can lead to increased blood pressure and overweight/obesity. Globally, most deaths from NCDs can be attributed to hypertension (13%), tobacco use (9%), raised blood glucose (6%), physical inactivity (6%) and overweight/obesity (5%).[17]

2.3.1 Tobacco Use

Tobacco use is a significant risk factor in a number of NCDs—most notably cancer, but also chronic respiratory disease and CVDs.[12] Globally, approximately 71% of lung cancer, 42% of chronic respiratory disease, and 10% of cardiovascular disease is

associated with smoking.[17] Currently, deaths from smoking-related diseases are lower in low-income countries than in middle-income and higher-income countries due to past lower rates of smoking in low-income countries. However, as rates of smoking decrease in high-income countries, they continue to increase in low-income countries, suggesting smoking-related deaths in these countries may surpass smoking-related deaths in high-income countries.[12,17] Deaths related to tobacco use are not limited to the users themselves. Each year over 600,000 of the 6 million tobacco-related deaths are attributable to second-hand smoke exposure among non-smokers.

2.3.2 Hypertension

Hypertension refers to raised blood pressure and is a risk factor for stroke, heart disease, and kidney failure.[16,17] Worldwide, the blood pressure of most adults is higher than ideal levels, with the overall prevalence of hypertension in adults 25 years of age and older at 40% in 2008.[16] For all age groups, the risk of dying from high blood pressure is more than double in low-income and middle-income countries compared to the risk of death in high-income countries.[17] Similar to diabetes, the rates of hypertension in low-income countries is more prevalent in persons under 60 years of age; in the WHO African region, 25% of deaths caused by high blood pressure occur in those under age 60 years as opposed to only 7% of deaths in high-income countries.

2.3.3 Overweight and Obesity

Changes in diet and sedentary lifestyles have led to an increase in overweight and obesity worldwide. The WHO estimated, in 2005, more than 1 billion people were overweight (body mass index [BMI] $\geq$25 kg/m^2) while more than 300 million were obese (BMI $\geq$30 kg/m^2); by 2015 the WHO projects 1.5 billion people will be overweight.[17]

The risk for numerous chronic conditions (diabetes mellitus, heart disease, stroke, and various cancers) increases with increasing BMI, as does mortality associated with overweight and obesity.[16] The WHO region of the Americas has the highest prevalence of overweight and obesity for both men and women, while the lowest prevalence is found in the WHO region of South-East Asia. Women are more likely to be obese than men in all WHO regions, and as income level of a country goes up so does the prevalence of overweight and obesity.

2.4 Global Non-Communicable Disease Mortality

In 2008, 36 million (63%) of the total 57 million deaths worldwide were due to NCDs, primarily CVDs, diabetes, cancer, and chronic respiratory diseases.[16] Of those, almost 29 million (80%) occurred in low-income and middle-income countries. In five out of the six WHO regions (the Americas, the Eastern Mediterranean, Europe, South-East Asia, and the Western Pacific), the most common cause of death is chronic disease.[12,16] In each of these regions, NCD mortality exceeds that of communicable, maternal, perinatal, and nutritional conditions combined.[12] The leading causes of deaths attributable to NCDs were CVD (17 million), cancers (7.6 million), respiratory diseases (4.2 million), and diabetes (1.3 million). By 2020, the WHO projects deaths resulting from NCD will increase by 15% globally (44 million deaths).[11,16] Most of the increase will occur in the WHO regions of Africa, South-East Asia and the Eastern Mediterranean.

2.4.1 Cancers

Cancer takes many forms and is an important cause of not only mortality but also morbidity throughout the world. Regional variations have been observed in frequency and fatality. The most common types of cancer in low-income and middle-income

countries are lung, stomach, and liver cancers in males, while breast, cervix, and lung cancers are most common in females.[16] It is estimated by 2020, developing countries will experience a 73% increase in the number of new cancer cases, predominately due to an aging population, increased urbanization, and changes in dietary habits.[12]

2.4.2 Respiratory Diseases

Chronic respiratory diseases include asthma and chronic obstructive pulmonary disease (COPD). In 2008, almost 90% of COPD deaths occurred in low-income and middle-income countries.[16] Chronic obstructive pulmonary disease most commonly affects men, appears after 45 years of age, and increases in frequency as age increases.[18] Since it is not usually diagnosed until it is clinically apparent and already moderately advanced, the global prevalence of COPD may be underestimated. Conversely, asthma is more prevalent in adults younger than 40 years and even more prevalent among children than adults. Like COPD, males are more likely to be affected by asthma than females.

2.4.3 Diabetes

In nearly every country in the world, diabetes is a chronic disease of significant concern. In 2011, 36 million people were living with diabetes; this number is expected to rise to 55 million by 2030.[19] That is a 50.7% increase with an average annual growth of 2.7%, 1.7 times more than the annual growth rate of the world's adult population. While most persons with diabetes in high-income countries are over 60 years of age, those living in low-income and middle-income countries are of working age, between 40-60 years.[14,19] Diabetes is associated with an increased risk of lower limb amputations, visual impairment, and blindness.[16] Compared to those without diabetes, persons with diabetes

require two-to-three times more health care resources and may account for up to 15% of national health care costs.

2.5 Refugee Health

Limited information is available on the health status of refugee populations both directly prior to their arrival in the US and post-arrival. Many refugees reside in refugee camps, potentially for decades, before they are resettled in a host country. The limited resources and medical care available in camps as well as the stress of camp life can result in the refugee developing any variety of communicable and non-communicable conditions that can persist long after resettlement.[20]

2.5.1 Communicable Diseases in Refugees

As previously discussed, historically infectious diseases have been the norm for low-income and middle-income countries. Common infectious diseases diagnosed in refugees include tuberculosis (TB), parasitic infection, and malaria. Although TB prevalence in the US reached an all-time low in 2002, TB cases among foreign-born individuals increased from 27% in 1992 to 50% in 2002.[21] In a study examining the effectiveness of overseas medical screening in diagnosing TB, the authors found that 63% of the 124 refugees and immigrants examined within one year of arrival were classified as having active TB, while 14% had inactive TB.[22] Gastrointestinal parasites have been diagnosed in all refugee populations, though many may be asymptomatic. Among 2185 refugees screened by the Minnesota Department of Health upon arrival, 471 (22%) were diagnosed with parasitic infection.[23] Unlike other common communicable diseases found in refugee populations, malaria screening is not routinely performed. However, prevalence in endemic areas may exceed 75%.[24] In a study of African refugees

in Canada, the authors found, 3-4 months after arrival, of 55 refugees investigated for malarial infection, 15 were confirmed as positive for ongoing malarial infection.[25]

2.5.2 Non-Communicable Diseases in Refugees

While communicable diseases are still seen in newly arriving refugees, other conditions are becoming increasingly more prevalent, largely due to the required screenings for refugees pre-migration and post-migration, as well as the administration of prophylactic treatment for communicable diseases. In fact, international travelers and other migrant populations are more responsible for the global spread of infectious diseases than are refugee populations.[26]

Rates for health risk behaviors associated with chronic diseases were calculated for 591 adult refugees screened by the Texas Refugee Health Screening Program.[27] Among the 413 refugees for whom BMI could be calculated, 162 (39.2%) were overweight or obese, while 194 (38.5%) of 504 screened refugees reported a history of smoking. Dookeran et al[28] found similar results in their study of refugees resettling in Massachusetts. Almost 20% of the sample was obese, while more than 25% was overweight; a hypertension diagnosis was made for almost one-fourth of the screened refugees.

As evidenced by the epidemiologic shift in the burden of disease, more than half of the refugees resettling in the US originated in nations with prevalence rates of diabetes and hypertension similar to the United States.[29] In a retrospective analysis of Massachusetts' health screening data for 4239 refugees and asylees, the authors found 12.8% were anemic, 3.7% had coronary artery disease (CAD), and 3.1% were diabetic.[28] Compared to other immigrant populations, refugees are more likely to have heart disease

and hypertension,[29] while a study of refugee psychiatric patients demonstrated the prevalence of diabetes was higher in refugees under 65 years of age than the prevalence of diabetes in the US population.[30]

2.6 Cuban Health

Like other refugee populations, little research has been conducted on the health status of Cuban refugees. In the years immediately following the Mariel boatlift, studies were done to determine the health concerns facing this unique population.[31,32] However, in the decades since the Cuban population has been largely ignored.

2.6.1 Health in Cuba

Health care in Cuba is unique for that of a middle-income, developing country and it is this uniqueness that may result in a greater prevalence of chronic conditions among Cuban refugees. Universal health care, subsidized 100% by the government, is available and accessible country wide, with 99% of Cubans receiving coverage.[33,34] Over 95% of the population is immunized for 13 vaccine-preventable diseases, resulting in the eradication of polio, diphtheria, measles, whooping cough, rubella, and neonatal tetanus. Additionally, more than 1000 generic drugs are produced within Cuba, covering 86% of the drugs consumed in the country. This increased access to high-quality health care has resulted in low rates of infectious diseases, accounting for only 0.1% of deaths[34], as well as a population with a life expectancy at birth higher than the other top five incoming refugee populations included in this study.[35]

Due to the political environment in Cuba, limited information is available on the specific health conditions affecting Cubans in Cuba. However, in 2000-2001, the Cuban government conducted the Second National Survey on Risk Factors and Chronic Disease.

Results of the study estimated that the prevalence of overweight and obesity in the adult population was 30.8% and 11.8% respectively.[36] In the six years between the first survey in 1995 and the second survey, the overall prevalence of overweight increased from 26.1% to 42.3%.[37] While prevalence of overweight was similar for men and women, levels of obesity was twice as high in women as in men.[36] Obesity was significantly associated with diabetes and a known history of heart disease, and both overweight and obesity were significantly more prevalent in individuals with hypertension. In a second study conducted on the Isle of Youth, 31.3% of adults aged 20 years and older were overweight and 13.4% were obese.[38] Hypertension in overweight and obese individuals was 31.5% and 51%, respectively, while rates of diabetes were 5.2% and 11.3%, respectively.

2.6.2 Cubans in the United States

While few recent studies have been conducted specifically on Cuban refugees, some studies that have investigated the prevalence of chronic diseases in refugee populations have included information on Cubans. Barnes et al[27] reported 47.4% of the Cubans included in their study were overweight. Out of 184 with available information on smoking, 31% had a self-reported history of smoking. In a study investigating the association between refugee region of origin and the risk factors for and levels of chronic diseases, the authors found rates of overweight and obesity were 18.6% and 31.2%, respectively, for persons originating from Latin America and the Caribbean, including Cubans.[28] For the same population, 14.4% were hypertensive and 3.3% were diabetic.

Studies examining the effects of race/ethnicity on health status in the US have often grouped Hispanics together as a single ethnicity. However, some studies have

attempted to examine the differences in the various Hispanic subpopulations, including Cubans, as well as look at the difference in health status between US-born Hispanics versus foreign-born Hispanics. Using data collected during the 1997-2005 cycles of the National Health Interview Survey (NHIS), Borrell et al[39] found that 11% of Cuban Americans had a BMI greater than 25 kg/m^2. Cuban Americans exhibited an overall self-reported unadjusted prevalence for hypertension of 24.2%. Compared to US-born Cubans, foreign-born Cubans reported a greater prevalence of hypertension.[40]

2.7 Summary

Research has indicated that chronic diseases are increasing in prevalence in low-income and middle-income countries. This has led to a corresponding increase in chronic diseases in refugee populations seeking to resettle in the United States, though the prevalence may not be equal among the various refugee populations. This study will examine the prevalence of chronic conditions in Cuban refugees and will compare the prevalence to the prevalence for the same conditions in the remaining top five refugee populations: Iraqi, Iranians, Burmese, Bhutanese and Somalis.

2.8 Hypotheses

Based upon the review of the available literature on refugee health and the health of Cubans, the following hypotheses were developed for this study.

Null Hypothesis #1: Cuban refugees will not have greater prevalence of non-communicable diseases than the other top five refugee populations combined.

Alternate Hypothesis #1: Cuban refugees will have greater prevalence of non-communicable diseases than the other top five refugee populations combined.

Null Hypothesis #2: Cuban refugees will not have greater prevalence of non-communicable diseases than the other top five refugee populations individually.

Alternate Hypothesis #2: Cuban refugees will have greater prevalence of non-communicable diseases than the other top five refugee populations individually.

Chapter III

Methodology

3.1 Data Source

United States law and regulations set forth by the Department of Health and Human Services (DHHS) requires all refugees accepted for resettlement in the US undergo a medical examination prior to arrival. The data used in this study were derived from the Medical History and Physical Examination Worksheet (form DS-3026) portion of the US Department of State's (DS) Medical Examination for Immigrant or Refugee Applicant (Appendix A). Technical instructions for the exam are provided by the Centers for Disease Control and Prevention (CDC) Division of Global Migration and Quarantine (DGMQ). In general, panel physicians appointed by the US Consulate or Embassy conduct the exams. However, due to political challenges, the medical examinations in Cuba are completed through an in-country process by a Cuban physician. After completion, the DS forms are sent to the CDC and entered into the Electronic Disease Notification (EDN) surveillance system, which is used by the CDC to notify state and local health departments about the arrival of refugees and immigrants with health conditions of public health concern.

The Medical History and Physical Examination Worksheet is divided into five sections: 1. Past Medical History, 2. Physical Examination, 3. Additional Testing Needed Prior to Approving Medical Clearance, 4. Follow-Up Needed After Arrival, and 5.

Remarks. This study analyzed the relevant information provided in the first and second sections, the past medical history and the physical examination. Measurements from the past medical history section included hypertension, diabetes mellitus, and asthma. Information provided in the past medical history is based on self-reporting and has not been verified by a physician. From the physical exam, body mass index (BMI) was calculated using the height and weight measurements, and the recorded blood pressure (BP) measurement was used to determine hypertension.

3.2 Study Population

The study population consisted of all Cuban, Burmese, Bhutanese, Iranian, Iraqi, and Somali refugees identified through the EDN and who entered the United States during October 2008-September 2011. The population was restricted to adults aged 20 years and older at time of the initial examination and included both males and females.

3.3 Data Variables

Table 3.1 lists the variables used in this study. Age was calculated in whole numbers as years at the time of the initial overseas medical examination. Age was then classified into three categories; 20-44 years, 45-64 years, and 65+ years. Hypertension was defined in two ways: self-reported hypertension as recorded on the past medical history section and through a one-time BP measurement on the physical exam section. Those with a systolic blood pressure (SBP) of ≥140 mmHg or diastolic blood pressure (DBP) of ≥90 mmHg were classified as hypertensive. Excluded from the analysis were those with a SBP less than 80 mmHg or greater than 600 mmHg, or those with a DBP less than 40 mmHg or greater than 500 mmHg. Diabetes mellitus and asthma were determined through self-report on the past medical history section. Body mass index was

calculated by dividing a person's weight in kilograms by the person's height in meters squared. The weight and height information were recorded on the physical examination section. Using standard weight status categories as outlined by the CDC, overweight was defined as BMI = 25.5–29.9 kg/m^2 and obesity was defined as BMI ≥30 kg/m^2. To account for potential outliers, only BMI measurements between 12.0-65.0 kg/m^2 were included in the analysis. Additionally, pregnant women were also excluded from BMI analysis.

Table 3.1 List of Variables Used in Analysis

Variable	Coding	Type
Country of Origin	Cuban = 1, Burmese = 2, Bhutanese = 3, Iranian = 4, Iraqi = 5, Somali = 6	Categorical
Age	20-44 = 1, 45-64 = 2, 65+ = 3	Categorical
Sex	Male = 1, Female = 2	Categorical
History of Tuberculosis Disease	No = 0, Yes = 1	Categorical
History of Tobacco Use	No = 0, Yes = 1	Categorical
Self-Reported HTN	No = 0, Yes = 1	Categorical
Measured HTN (SBP ≥140 mmHg or DBP ≥90 mmHg)	No = 0, Yes = 1	Categorical
BMI	<18.5 = 1, 18.5-24.9 = 2, 25.0-29.9 = 3, 30+ = 4	Categorical
Overweight/Obese	No = 0, Yes = 1	Categorical
Self-Reported DM	No = 0, Yes = 1	Categorical
Self-Reported Asthma	No = 0, Yes = 1	Categorical

BMI, body mass index; DBP, diastolic blood pressure; DM, diabetes mellitus; HTN, hypertension; SBP systolic blood pressure

3.4 Analysis

Data were de-identified by a CDC epidemiologist and analyzed on a secure CDC computer using IBM SPSS Statistics version 19. Microsoft Excel was used for the presentation of tables and figures. Descriptive statistics were calculated for all variables. Crosstabulations were performed for each outcome and a chi-square test was calculated to check for associations between country of origin and each outcome of interest. Logistic regression analyses were performed to estimate the relative risk for Cubans as compared

to the remaining top five incoming refugee populations. For all outcomes of interest (self-reported hypertension, measured hypertension, overweight/obesity, self-reported diabetes and self-reported asthma), Cuba was used as the indicator variable. Controlled for variables were age, sex, history of tobacco use, and history of tuberculosis.

Chapter IV

Results

4.1 Descriptive Statistics

4.1.1 Study Demographics

A total of 99,920 adult (≥ 20 years) refugees entering the US during October 2008-September 2011 were identified in the EDN system and included in this study. The largest represented population was Iraqi (27.6%), followed by Bhutanese (26.2%), Burmese (24.4%), Iranian (8.6%), Cuban (7.9%), and Somali (5.3%). Of the total population, 48,292 (48.3%) were female. Among Iranians and Somalis, most refugees were female (51% and 53% respectively), while the Cuban population was evenly distributed between males and females. Conversely, the majority of Burmese, Bhutanese and Iraqis were male, 54.8%, 50.4%, and 52.3%, respectively. Over 73% (73,770) of the population were between the ages of 20-44 years, over 20% (20,263) were between 45-64 years and almost 6% (5887) were 65 years of age or older. Across all six refugee populations, most were between the ages of 20-44 years: Cuban (64.1%), Burmese (84.7%), Bhutanese (72.3%), Iranian (59.2%), Iraqi (71.4%) and Somali (82%).

Figures 4.1 and 4.2 graphically present the number of refugee arrivals per country of origin by sex and age stratum, respectively. Demographic characteristics for the sample population are presented in Table 4.1.

Figure 4.1 Refugee Arrivals: Country of Origin by Sex

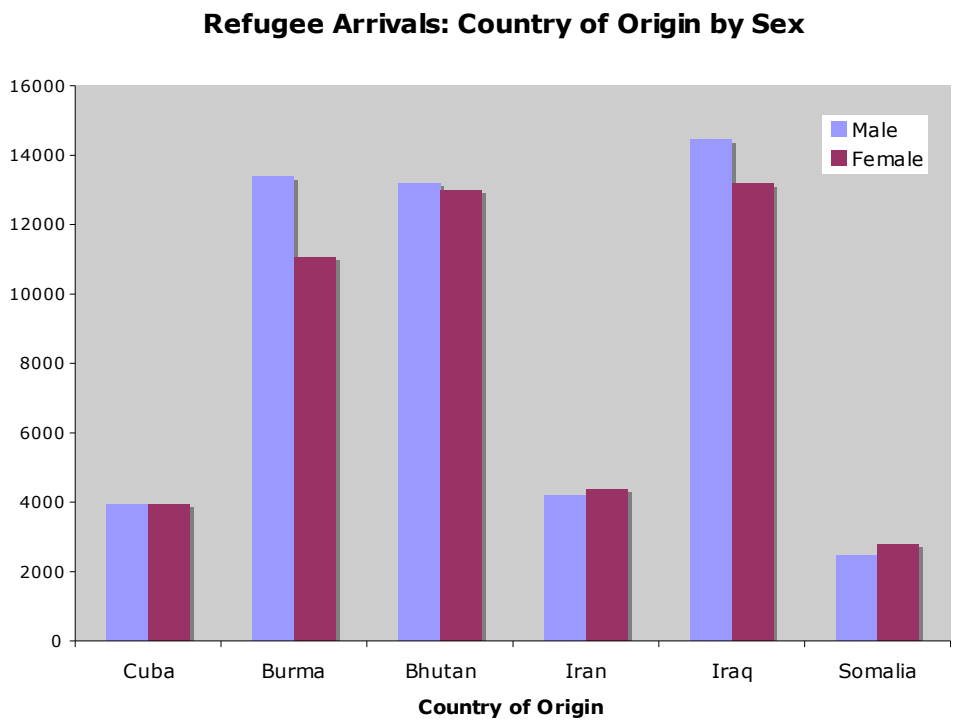

Figure 4.2 Refugee Arrivals: Country of Origin by Age Stratum

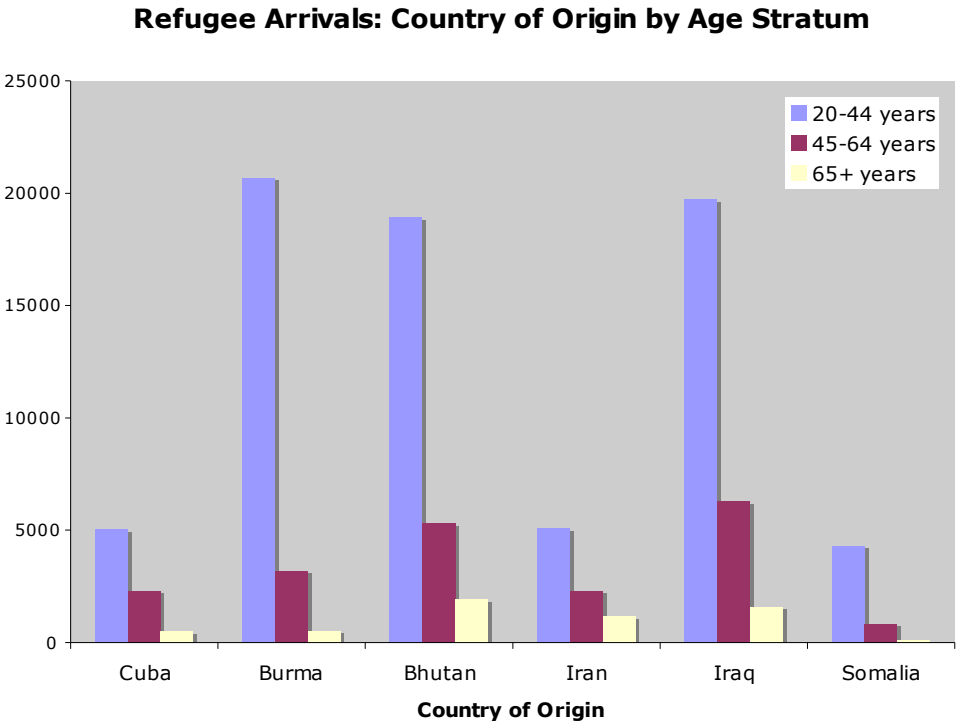

Table 4.1 Demographic Characteristics (n = 99,920)

Variables	n	%
Sex		
Male	51,624	51.7
Female	48,292	48.3
Age		
20-44	73,770	73.8
45-64	20,263	20.3
65+	5887	5.9
Cuba	7870	7.9
Male	3938	50
Female	3931	50
20-44	5041	64.1
45-64	2315	29.4
65+	514	6.5
Burma	24,421	24.4
Male	13,376	54.8
Female	11,045	45.2
20-44	20,694	84.7
45-64	3200	13.1
65+	527	2.2
Bhutan	26,179	26.2
Male	13,193	50.4
Female	12,986	49.6
20-44	18,922	72.3
45-64	5310	20.3
65+	1947	7.4
Iran	8574	8.6
Male	4202	49
Female	4372	51
20-44	5079	59.2
45-64	2304	26.9
65+	1191	13.9
Iraq	27,618	27.6
Male	14,442	52.3
Female	13,173	47.7
20-44	19,723	71.4
45-64	6297	22.8
65+	1598	5.8
Somalia	5258	5.3
Male	2473	47
Female	2785	53
20-44	4311	82
45-64	837	15.9
65+	110	2.1

4.2 Chi-Square Analysis

4.2.1 History of Tuberculosis

Information on history of tuberculosis (TB) was available for 98,955 refugees, 1383 (1.4%) of which responded positively. The distribution of history of TB among the refugee groups was statistically different from what would be expected by chance (χ^2 (5) = 841.6, p<0.001). Burmese (2.4%) had a higher prevalence than Bhutanese (2.3%), Somalis (2%), Iraqis (0.2%), Cubans (0.1%), and Iranians (0.1%). For all refugee populations, males had a statistically higher prevalence of TB history (χ^2 (1) = 128.9, p<0.001). While TB was statistically more prevalent among those 65 years of age and older (χ^2 (2) = 77.6, p<0.001) across all refugee populations, Iranians between 45-64 years of age (0.3%) were more likely to self-report a history of TB, as were Cubans 20-44 years of age (0.1%) and Cubans 45-64 years of age (0.1%). History of TB was statistically associated with self-reported asthma (χ^2 (1) = 10.8, p = 0.001) and measured hypertension (χ^2 (1) = 10.8, p = 0.001).

4.2.3 Risk Factors

History of tobacco use was self-reported by 15,786 (16%) of 98,949 refugees with available information. The distribution of history of tobacco use among the refugee groups was statistically different from what would be expected by chance (χ^2 (5) = 3636.0, p<0.001). Iraqis (25.9%) self-reported a higher prevalence than did Iranians (17.9%), Burmese (15.9%), Somalis (11.3%), Bhutanese (9%), and Cubans (5.7%). Across all refugee populations, history of tobacco use was statistically more likely among males (χ^2 (1) = 7858.4, p<0.001) and refugees aged between 45-64 years (χ^2 (2) = 132.8, p<0.001), though Somalis aged 20-44 years self-reported an equivalent prevalence to those aged 45-64 years (11.4% and 11.3%, respectively). For all refugees, history of tobacco use was statistically

associated with self-reported hypertension (χ^2 (1) = 10.6, p = 0.001), measured hypertension (χ^2 (1) = 206.860, p<0.001), and self-reported diabetes (χ^2 (1) = 52.1, p<0.001).However, history of tobacco use was not statistically associated with self-reported asthma (χ^2 (1) = 2.9, p = 0.089).

Self-reported hypertension information was available for 98,953 refugees, 6393 (6.5%) of whom self-reported having hypertension. The distribution of self-reported hypertension among the refugee populations was statistically different from what would be expected by chance (χ^2 (5) = 2119.3, p<0.001). A higher prevalence was found among Cubans (11.5%) compared to Iraqis (10.6%), Iranians (8.4%), Bhutanese (4.6%), Burmese (2.4%), and Somalis (2.3%). Females were statistically more likely to report hypertension (χ^2 (1) = 165.8, p<0.001) as were refugees 65 years and older (χ^2 (2) = 13695.0, p<0.001). Among 93,698 refugees who received a one-time blood pressure measurement, 16,134 (17.2%) were hypertensive (systolic blood pressure [SBP] ≥140 mmHg or diastolic blood pressure [DBP] ≥90 mmHg) and 45,210 (58.3%) were prehypertensive (SBP = 120-139 mmHg or DBP = 80-89 mmHg). The distribution of measured hypertension among the refugee groups was statistically different from what would be expected by chance (χ^2 (5) = 3359.0, p<0.001). Iranians (33%) had a higher prevalence than Iraqis (24.2%), Somalis (16.2%), Burmese (14.8%), Cubans (13.9%), and Bhutanese (9.6%). As opposed to self-reported hypertension, measured hypertension was statistically more prevalent among males (χ^2 (1) = 412.3, p<0.001) though similarly, it was statistically more prevalent among refugees 65 years and older (χ^2 (2) = 8644.3, p<0.001). Only 3469 (21.5%) refugees who had measured hypertension also had self-reported hypertension. Cubans positive for measured hypertension were more likely to self-report hypertension (36.8%) than were the remaining

refugee populations: Iraqis (27.4%), Bhutanese (23.4%), Iranians (17.7%), Burmese (11.9%), and Somalis (10.8%).

Of 92,042 refugees with a calculated BMI measurement, 7934 (8%) were underweight (BMI = <18.5 kg/m^2), 48,644 (49.2%) were normal weight (BMI = 18.5-24.9 kg/m^2), 23,113 (23.4%) were overweight (BMI = 25.0-29.9 kg/m^2), and 12,351 (12.5%) were obese (BMI = ≥30 kg/m^2), for a total of 38.5% who were overweight/obese. The distribution among the refugee populations of overweight/obesity was statistically different from what would be expected by chance (χ^2 (5) = 18821.5, p<0.001). Iraqis (68.9%) were more likely to be overweight/obese than were Iranians (53.6%), Cubans (50.5%), Somalis (27%), Burmese (20.6%), or Bhutanese (18.6%). While across all refugee populations females were statistically more likely to be overweight/obese (χ^2 (1) = 223.7, p<0.001), Cuban males had a higher prevalence than Cuban females, 51.8% and 49.2% respectively, as did Iranian males compared to Iranian females, 57% and 50.3%, respectively. Refugees aged 45-64 years had a significantly higher prevalence of overweight/obesity (χ^2 (2) = 1778.5, p<0.001). Among all refugees, overweight/obesity was statistically associated with self-reported hypertension (χ^2 (1) = 2472.2, p<0.001), measured hypertension (χ^2 (1) = 3308.7, p<0.001), self-reported diabetes (χ^2 (1) = 961.4, p<0.001), and self-reported asthma (χ^2 (1) = 95.991, p<0.001).

Overall, Iraqis and Iranians had the highest prevalence of risk factors, putting them at a greater risk for developing non-communicable diseases. Iraqis had the highest prevalence of history of tobacco use and overweight/obesity, and ranked second in prevalence in measured hypertension. Iranians ranked second in prevalence behind Iraqis for history of tobacco use and overweight/obesity, but had the highest prevalence of measured hypertension. Among all six of the refugee populations, the group with the lowest risk for

chronic conditions appears to be the Bhutanese, as they had the lowest prevalence of measured hypertension and overweight/obesity, and had a prevalence of history of tobacco use that was only higher than that of the Cubans. The results of this study indicate that Cubans have a relatively low risk of developing chronic conditions as evidenced by their low rates of history of tobacco use and measured hypertension. However, the high prevalence of overweight/obesity does place Cubans at a greater risk for developing non-communicable diseases associated with that risk factor, such as diabetes, heart disease, and respiratory conditions. Prevalence of risk factors for chronic diseases by demographic characteristics is presented in table 4.2.

Table 4.2 Risk Factor Prevalence by Demographic Characteristics

Risk Factor	Variables	%	p Value
History of Tobacco Use	**Total**	**16**	--
	Country of Origin		
	Cuba	5.7	<0.001
	Burma	15.9	
	Bhutan	9	
	Iran	17.9	
	Iraq	25.9	
	Somalia	11.3	
	Sex		
	Male	25.9	<0.001
	Female	5.3	
	Age		
	20-44	15.2	<0.001
	45-64	18.6	
	65+	16.3	
Self-Reported Hypertension	**Total**	**6.5**	--
	Country of Origin		
	Cuba	11.5	<0.001
	Burma	2.4	
	Bhutan	4.6	
	Iran	8.4	
	Iraq	10.6	
	Somalia	2.3	
	Sex		
	Male	5.5	<0.001

	Female	7.5	
	Age		
	20-44	1.5	
	45-64	16.3	<0.001
	65+	34.6	
Measured Hypertension	**Total**	**17.2**	--
	Country of Origin		
	Cuba	13.9	
	Burma	14.8	
	Bhutan	9.6	<0.001
	Iran	33	
	Iraq	24.2	
	Somalia	16.2	
	Sex		
	Male	19.6	<0.001
	Female	14.6	
	Age		
	20-44	10.9	
	45-64	31.2	<0.001
	65+	50.2	
Overweight/Obese	**Total**	**38.5**	--
	Country of Origin		
	Cuba	50.5	
	Burma	20.6	
	Bhutan	18.6	<0.001
	Iran	53.6	
	Iraq	68.9	
	Somalia	27	
	Sex		
	Male	36.2	<0.001
	Female	41	
	Age		
	20-44	34.6	
	45-64	51.1	<0.001
	65+	44.7	

4.2.3 Non-Communicable Diseases

Of the 98,957 refugees with available information on self-reported diabetes mellitus, 1970 (2%) were diabetic. The distribution among the refugee populations of self-reported diabetes was statistically different from what would be expected by chance (χ^2 (5) = 1238.0, p<0.001). Iraqis (4.3%) had a higher prevalence than Iranians (2.7%), Cubans (2.1%),

Bhutanese (1%), Somalis (1%), and Burmese (0.4%). Females were statistically more likely to report diabetes (χ^2 (1) = 15.6, p<0.001), as were refugees 65 years and older (χ^2 (2) = 3669.8, p<0.001).

In total, 43,063 (43.6%) of refugees with available information had one of three chronic medical conditions: measured hypertension, self-reported diabetes, or overweight/obesity; 10,047 (10.2%) had two of these conditions; and 741 (0.7%) had all three. Prevalence of having one or more of the three medical conditions was associated with country of origin. Iranians and Iraqis had the highest prevalence of comorbidities compared to the other four refugee populations, while the Burmese and Bhutanese had the lowest. Prevalence of comorbidity by country of origin is presented in table 4.3.

Table 4.3 Comorbidity by Country of Origin

Comorbidity	Country of Origin	%	p Value
1	Cuba	57.7	<0.001
	Burma	31.2	
	Bhutan	26	
	Iran	65.8	
	Iraq	72.9	
	Somalia	38.7	
	All	43.6	
2	Cuba	8.4	<0.001
	Burma	4.8	
	Bhutan	3.3	
	Iran	22.9	
	Iraq	20.6	
	Somalia	6	
	All	10.2	
3	Cuba	0.4	<0.001
	Burma	0.1	
	Bhutan	0.2	
	Iran	1.1	
	Iraq	2	
	Somalia	0.3	
	All	0.7	

Information on self-reported asthma was available for 98,959 refugees, with 1094 (1.1%) responding positively. The distribution of self-reported asthma among the refugee groups was statistically different from what would be expected by chance (χ^2 (5) = 824.0, p<0.001). The highest prevalence was found among Cubans (4.2%) compared with Iraqis (1.4%), Somalis (0.8%), Burmese (0.7%), Bhutanese (0.6%), and Iranians (0.5%). For all refugee populations, self-reported asthma was statistically more prevalent among females (χ^2 (1) = 63.7, p<0.001). While asthma was statistically more prevalent among those 65 years and older across all refugee populations (χ^2 (2) = 137.0, p<0.001), Cubans aged between 20-44 years (4.4%) and Somalis aged between 45-64 years (2%) were more likely to self-report having asthma.

Table 4.4 presents prevalence of non-communicable diseases by demographic characteristics.

Table 4.4 Non-Communicable Disease Prevalence by Demographic Characteristics

Non-Communicable Disease	Variables	%	p Value
Diabetes Mellitus	**Total**	**2**	--
	Country of Origin		
	Cuba	2.1	<0.001
	Burma	0.4	
	Bhutan	1	
	Iran	2.7	
	Iraq	4.3	
	Somalia	1	
	Sex		
	Male	1.8	<0.001
	Female	2.2	
	Age		
	20-44	0.5	<0.001
	45-64	5.4	
	65+	9.8	

Asthma	**Total**	1.1	--
	Country of Origin		
	Cuba	4.2	<0.001
	Burma	0.7	
	Bhutan	0.6	
	Iran	0.5	
	Iraq	1.4	
	Somalia	0.8	
	Sex		
	Male	0.8	<0.001
	Female	1.4	
	Age		
	20-44	0.9	<0.001
	45-64	1.7	
	65+	2	

4.3 Logistic Regression Analysis

For all outcomes of interest (self-reported hypertension, measured hypertension, overweight/obesity, self-reported diabetes and self-reported asthma), Cuba was used as the referent and age, sex, history of tobacco use, and history of TB were included to control for these effects. For self-reported hypertension, being Cuban was a significantly greater predictor of hypertension than was being Burmese, Bhutanese, Iranian, or Somali. However, having a Cuban origin was only a significantly greater predictor of measured hypertension compared to Bhutanese refugees, whereas compared with the other four refugee populations (Burmese, Iranians, Iraqis, and Somalis), being Cuban was a significant protective factor against measured hypertension. Cubans had a significantly greater likelihood of being overweight/obese compared with Burmese, Bhutanese and Somalis, but were significantly less likely than Iranians and Iraqis. For self-reported diabetes, being Cuban was a significantly greater predictor than was being Burmese or Bhutanese. However, Iraqis were significantly more likely to self-report being diabetic than were Cubans. Compared with all

of the other refugee populations, Cubans were significantly more likely to have self-reported asthma.

Based on the results of the logistic regressions, Iranians and Iraqis appear to be at a heightened risk for the development of the non-communicable diseases examined in this study. When compared to Cubans, Iraqis had an odds ratio (OR) >1.0 for all outcome variables except self-reported asthma, while Iranians had an OR >1.0 for measured hypertension and overweight/obesity and an OR only slightly less than 1.0 for self-reported diabetes. As suggested by the chi-square analysis, among all the refugee populations, the Burmese and Bhutanese had the lowest risk for chronic conditions. Burmese had an OR <1.0 when compared to Cubans for all variables except measured hypertension, while the Bhutanese had an OR <1.0 for all outcome variables. Logistic regression analyses for all outcome variables are presented in Table 4.5.

Table 4.5 Logistic Regression Analysis of Country of Origin and Outcome Variables

Outcome Variables	Country of Origin	OR	95% CI	p Value
Self-Reported Hypertension				
	Cuba		Referent	
	Burma	0.307	0.274-0.345	<0.001
	Bhutan	0.333	0.302-0.369	<0.001
	Iran	0.433	0.385-0.487	<0.001
	Iraq	1.069	0.977-1.170	0.148
	Somalia	0.265	0.216-0.325	<0.001
Measured Hypertension				
	Cuba		Referent	
	Burma	1.607	1.480-1.745	<0.001
	Bhutan	0.691	0.635-0.752	<0.001
	Iran	3.057	2.795-3.344	<0.001
	Iraq	2.476	2.286-2.682	<0.001
	Somalia	1.802	1.620-2.006	<0.001
Overweight/Obesity				
	Cuba		Referent	
	Burma	0.28	0.263-0.298	<0.001

	Bhutan	0.228	0.214-0.242	<0.001
	Iran	1.081	1.008-1.159	0.028
	Iraq	2.263	2.133-2.402	<0.001
	Somalia	0.389	0.357-0.423	<0.001
Diabetes Mellitus				
	Cuba		Referent	
	Burma	0.32	0.247-0.414	<0.001
	Bhutan	0.492	0.402-0.603	<0.001
	Iran	0.952	0.770-1.177	0.648
	Iraq	2.483	2.086-2.955	<0.001
	Somalia	0.744	0.539-1.028	0.073
Asthma				
	Cuba		Referent	
	Burma	0.169	0.139-0.206	<0.001
	Bhutan	0.131	0.107-0.159	<0.001
	Iran	0.107	0.077-0.147	<0.001
	Iraq	0.319	0.273-0.372	<0.001
	Somalia	0.198	0.144-0.273	<0.001

4.4 Refugee, Country of Origin, and US Population Comparisons

Table 4.6 presents the prevalence of measured hypertension, overweight/obesity, and diabetes for Cuban, Burmese, Bhutanese, Iranian, Iraqi, and Somali refugees compared with the prevalence of the same conditions among the populations still residing in their country of origin, as well as the general US population. Country data were acquired from the WHO's Country Profiles[41]; information was not available for all countries or all variables within each country. Diabetes prevalence for the Country Profiles was based on a fasting glucose blood sample as opposed to the self-reported prevalence analyzed in this study.

While straight comparisons are difficult to make--since some information is missing, the ages of the populations examined are not identical, and/or the timeframe in which the data were collected is different—some general observations can be made. Country information on measured hypertension was available for only three countries (Cuba, Bhutan, and Iran), two of which (Cuba and Bhutan) showed a higher prevalence among the non-

refugees, while Iranian refugees had a higher prevalence than their non-refugee counterparts, 33% and 14.8%, respectively. Compared to the general US population (20.1%), only Iranian (33%) and Iraqi (24.2%) refugees had a higher prevalence of measured hypertension. For the three countries (Cuba, Bhutan, and Iran) with available information on prevalence of overweight/obesity, higher rates were found among the refugees compared to the population still residing in the country of origin. Conversely, all refugee populations, except for the Iraqis (68.9%), had a lower prevalence of overweight/obesity than the general US population (66.9%). Prevalence of diabetes for the general US population was greater than for any of the refugee populations. Only the Country Profiles for Cuba and Iraq reported prevalence of diabetes, and for both, the measured prevalence within the country was higher than it was for the corresponding self-reporting refugee population. The prevalence amongst the in-country Cubans was surprisingly high and may be a reflection of their urban residence.

Table 4.6 Prevalence for Selected Outcome Variables among Refugees, Non-Refugees and the General US Population

Outcome Variables	Cuban Ref.	Cuba	Burmese Ref.	Burma	Bhutanese Ref.	Bhutan	Iranian Ref.	Iran	Iraqi Ref.	Iraq	Somali Ref.	Somalia	General US Population
Measured Hypertension	13.9	23.8[a]	14.8	--	9.6	22.1[d]	33	14.8[f]	24.2	--	16.2	--	20.1
Overweight/ Obesity	50.5	42.5	20.6	--	18.6	12.1[d,e]	53.6	42.8[f]	68.9	--	27	--	66.9
Diabetes	2.1	24.8[b,c]	0.4	--	1	--	2.7	--	4.3	5.3[g]	1	--	6.8

--Information not available

[a]Individuals 15-74 yrs

[b]Individuals 25+ yrs

[c]Only includes urban residents

[d]Individuals 25-74 yrs

[e]Only includes those with a BMI ≥30 kg/m^2

[f]Individuals 15-64 yrs

[g]Individuals 25-65 yrs

Chapter V

Discussion

The purpose of this study was to examine the prevalence of selected chronic conditions among newly arriving adult Cuban refugees and to compare the results to the prevalence of the same chronic conditions among the other top five incoming refugee populations: Burmese, Bhutanese, Iranians, Iraqis, and Somalis.

5.1 Discussion

The prevalence of tuberculosis (TB) in refugees originating from middle-income countries as designated by the World Bank[42] (Cuba, Iran, and Iraq) was low but remained high in refugees originating from low-income countries (Burma, Bhutan, and Somalia). This finding is similar to those from studies investigating the burden of disease in low-income and middle-income countries. The highest mortality from communicable diseases occurs in developing countries[12] and economic growth is generally accompanied by a decline in infectious diseases.[11]

5.1.1 Risk Factors

Country of origin was strongly associated with all the risk factors for and prevalence of chronic conditions among the sampled refugee population. Prevalence of history of tobacco use varied between refugee populations and for all included refugees, the rate of self-reported history of tobacco use was lower than the current cigarette smoking prevalence (19.3%) for US adults aged 18 years and older.[43] Similar to global smoking trends,[44] sex differences in tobacco use rates were noted, with males having a

significantly higher prevalence of history of tobacco use than females. Prevalence of self-reported hypertension was lower in all refugee populations compared to the prevalence of measured hypertension and the rank order for each was different, as well. While Cubans had the highest prevalence of self-reported hypertension, their rates of measured hypertension were only higher than that of the Bhutanese refugees. Conversely, Somalis self-reported the lowest prevalence of hypertension but had the third highest prevalence of measured hypertension. This difference in knowledge about hypertension status may be a result of the greater accessibility of health care in Cuba than in Somalia.

Over one-fourth of the sample was overweight and over one-tenth was obese. Overweight and obese levels were highest in Iraqis, Iranians, and Cubans. The high levels of obesity upon arrival is particularly alarming, as research has shown for immigrant populations, length of residence in the United States is associated with a higher body mass index (BMI) after 10 years.[45] Early intervention programs aimed at diet and physical activity education may assist in ensuring refugees who are already overweight/obese do not continue further down the obesity spectrum, and in preventing those who are not yet overweight/obese from becoming so.[45,46]

5.1.2 Non-Communicable Diseases

The prevalence of self-reported diabetes varied considerably across the refugee populations, with the Iraqis reporting the highest prevalence while the Burmese reported the lowest, 4.3% and 0.4%, respectively. The higher prevalence rates among the Iraqis (4.3%), Iranians (2.7%), and Cubans (2.1%) were comparable to rates in other studies of refugees in the US.[28,29,30] For all refugee populations, the prevalence of self-reported asthma was low, however, the prevalence amongst Cubans (4.2%) was three times that of

the next highest population, Iraqis (1.4%). Asthma is not often included in research on the chronic health conditions of refugee populations though reports on the health of Cuban refugees arriving in the US during the Mariel boatlift of 1980 noted high numbers of refugees with asthma.[31,32,47]

Although information is limited, similar results for levels of chronic conditions in the included refugee populations have been noted in previous studies. Previous research on Iraqi refugees has shown comparable levels of hypertension, diabetes, and obesity.[48,49] Very little information is available on chronic conditions in Iranian refugees, though one study found 75.9% of Iranian asylum seekers to the Netherlands considered their health to be poor and half of them suffered from more than one chronic condition, a rate 2.55 times more than that of the Somali refugees included in the study.[50] Other studies of Somali refugees found higher rates of infectious diseases, including TB and parasitic infections, compared to chronic conditions.[51,52] In a study of Karen refugees, the largest Burmese ethnic group resettling in the US, the authors reported a slightly lower (6%) though comparable prevalence of hypertension, while the prevalence of diabetes in their study was considerably higher than the results of this study, 4% and 0.4% respectively.[53] However, the diabetes findings in this study were based on self-reported information, emphasizing the potential for reporting bias. Self-reported information may be influenced by a refugee's desire to conceal their health status or may be a reflection of their lack of knowledge about their status due to limited access to health care.

The high rates of comorbidity found in the refugee population may place the refugees at an increased risk for cardiovascular disease (CVD), the leading cause of death in the US.[54] Over 43% of the sampled refugees had at least one of three medical

conditions considered main risk factors for CVD: measured hypertension, diabetes, or overweight/obesity. Research on immigrant populations have highlighted the "healthy immigrant effect"; immigrants often enter the US healthier than their US counterparts,[55] but the longer their duration of residence the more likely their morbidity levels reach that of the US population. This effect previously was discussed in regard to obesity levels, however, duration of residence also appears to have an effect on rates of CVD in immigrants.[56,57]

5.1.3 Cuban Refugees

Contrary to the hypothesis put forth in this study, Cubans did not have a higher prevalence than the other refugees in all of the risk factors and chronic conditions of interest. And, compared to the general US population[41], Cuban refugees had a lower prevalence for measured hypertension, overweight/obesity, and diabetes. Little information is available on the health status of the Cuban Mariel boatlift refugees[31,32,47] or on the influx of Cubans during 1993-1994. However, the results of this study are similar to more recent research on Cuban refugees,[27,28] though prevalence levels for diabetes and hypertension were lower than those noted in foreign-born Cuban Americans.[39,40,58] In addition, the prevalence for the majority of the outcome variables was higher among Cubans than it was among refugees originating from the low-income countries of Burma, Bhutan, and Somalia, further suggesting the higher income status and greater accessibility to health care in Cuba may be positively associated with higher rates of chronic conditions compared to low-income countries, where infectious diseases are of greater public health importance.

5.1.4 Implications for the United States

The economic burden of chronic disease on the US is extremely high. In 2003, estimated annual costs for the top seven chronic diseases—cancers, diabetes, heart disease, hypertension, stroke, mental disorders, and pulmonary conditions—was $277.0 billion for treatments and $1,046.7 billion in lost productivity.[59] Projected costs, in billions, for 2012 were $53.03 for hypertension, and $46.28 for diabetes. The average cost of treatment (adjusted to 2011 dollars) for a patient with hypertension is $1,690 per year.[48] The estimated average annual cost to treat the refugees in this study who were diagnosed with hypertension (16,134) would be $27.27 million. Although prevalence for measured hypertension, overweight/obesity, and diabetes were lower among the incoming refugees compared to the general US population, the prevalence is likely to increase as the duration of residence for the refugee increases. Furthermore, while the costs associated with treating chronic conditions in the refugee population is small compared to the costs to treat the general US population, since refugees are entitled to federal assistance, including medical coverage, for the first eight months after arrival; are frequently uninsured following those eight months[29] thus utilizing emergency care; or are on Medicaid, the economic burden associated with their non-communicable diseases on the receiving states can be significant. Ultimately, however, contrary to the belief of some that immigrants and refugees import disease thus placing the US population at risk and causing a financial burden, as evidenced by the results of this paper, in terms of chronic conditions in refugee populations, the overall risk and cost to the US is minimal.

5.2 Study Limitations

This study has a number of limitations. First, the use of self-reported data that could not be verified by a physician creates the possibility of reporting bias. Refugees may not be aware they have a health condition or may chose to not report a known health condition or risk factor for fear of what affect it may have on the approval of their resettlement application. Second, worldwide, trained panel physicians appointed by the local US embassy or consulate conduct the medical examinations. However, due to the political situation in Cuba, the examinations are not performed by panel physicians, raising concerns about the validity of the medical examinations. Third, the measured hypertension was based on a single measurement, when medical standards require two separate measurements for a diagnosis of hypertension. Lastly, the medical examination form primarily focuses on infectious diseases and is not collected for research purposes.

5.3 Recommendations

Based on the findings of this study, the development of a more comprehensive overseas medical examination that includes a greater focus on chronic conditions would provide a better understanding of the medical needs of arriving refugee populations. Often refugees have limited access to secondary and tertiary health services in the resettlement country[21] and may experience delayed treatment until the more comprehensive domestic examination has been completed.[48] A more comprehensive overseas examination will allow for early referral and treatment of refugees arriving with chronic conditions.

Additionally, the differences in prevalence of chronic conditions across the various refugee populations points to the need for developing health programs that are

population specific and culturally appropriate in approach. Continued research on chronic conditions in refugees is needed to ensure interventions aimed at addressing their health needs remain up-to-date and relevant.

5.4 Conclusions

Overall, it appears rates of non-communicable diseases are higher than has traditionally been assumed, given the historical emphasis in refugee health on infectious diseases. This may in part be due to increased knowledge worldwide on the importance of chronic diseases; long-term stays in refugee camps where accessibility to treatment of infectious diseases may be improved; an increase in the number of conflicts in middle-income countries; or any combination thereof.[60] As the global life expectancy continues to rise and greater strides are made in the treatment and eradication of infectious diseases, chronic diseases in refugee populations will continue to increase, underscoring the need for health programs aimed at refugee populations that provide population and culturally appropriate information and treatment for the prevention and care of chronic conditions.

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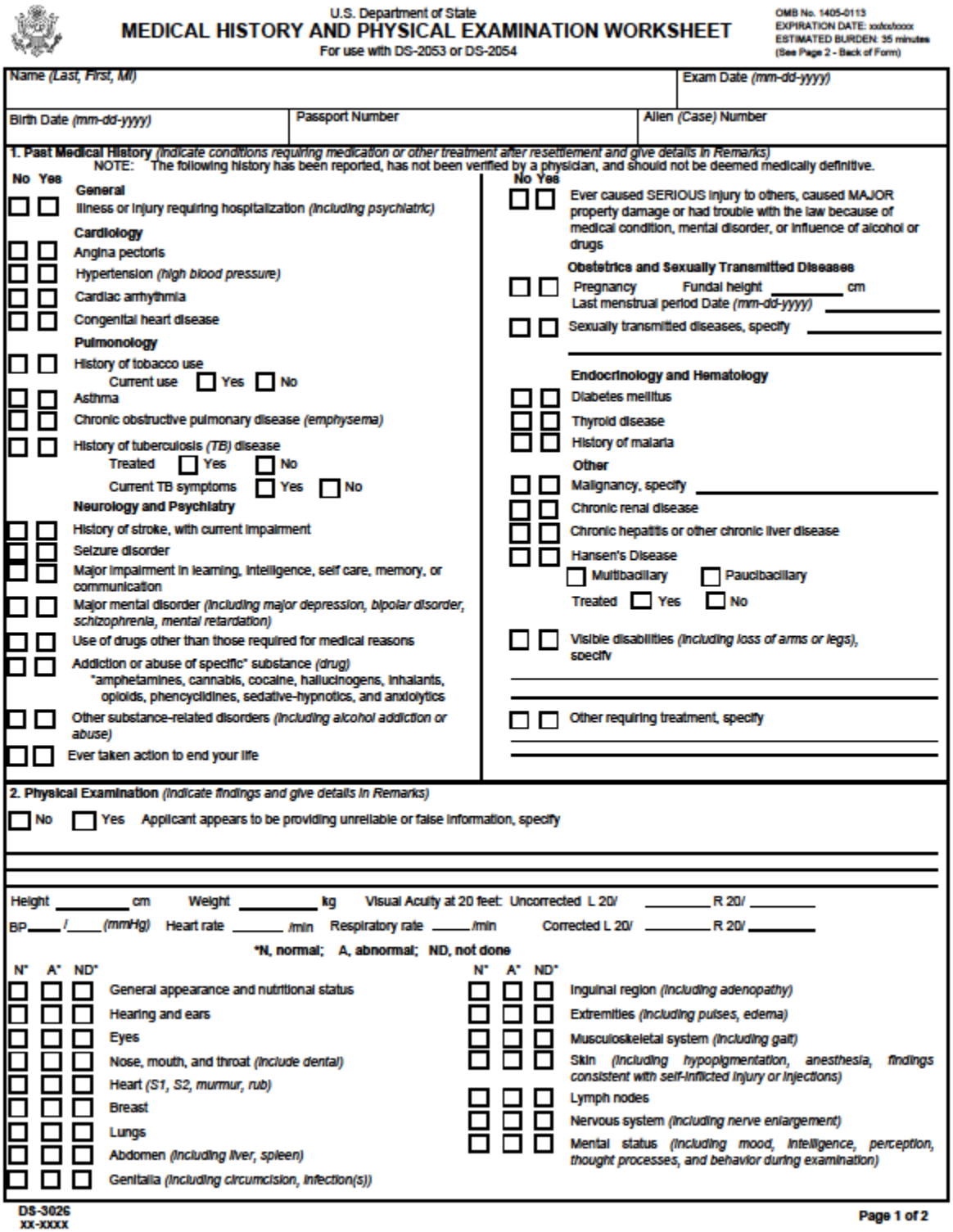
Appendix A. US Department of State Medical History and Physical Examination Worksheet



U.S. Department of State

MEDICAL HISTORY AND PHYSICAL EXAMINATION WORKSHEET

For use with DS-2053 or DS-2054

OMB No. 1405-0113
EXPIRATION DATE: xx/xx/xxxx
ESTIMATED BURDEN: 35 minutes
(See Page 2 - Back of Form)

Name *(Last, First, MI)* | Exam Date *(mm-dd-yyyy)*

Birth Date *(mm-dd-yyyy)* | Passport Number | Alien *(Case)* Number

1. Past Medical History *(Indicate conditions requiring medication or other treatment after resettlement and give details in Remarks)*
NOTE: The following history has been reported, has not been verified by a physician, and should not be deemed medically definitive.

No Yes

General
- Illness or injury requiring hospitalization *(including psychiatric)*

Cardiology
- Angina pectoris
- Hypertension *(high blood pressure)*
- Cardiac arrhythmia
- Congenital heart disease

Pulmonology
- History of tobacco use — Current use ☐ Yes ☐ No
- Asthma
- Chronic obstructive pulmonary disease *(emphysema)*
- History of tuberculosis *(TB)* disease — Treated ☐ Yes ☐ No; Current TB symptoms ☐ Yes ☐ No

Neurology and Psychiatry
- History of stroke, with current impairment
- Seizure disorder
- Major impairment in learning, intelligence, self care, memory, or communication
- Major mental disorder *(including major depression, bipolar disorder, schizophrenia, mental retardation)*
- Use of drugs other than those required for medical reasons
- Addiction or abuse of specific* substance *(drug)* *amphetamines, cannabis, cocaine, hallucinogens, inhalants, opioids, phencyclidines, sedative-hypnotics, and anxiolytics
- Other substance-related disorders *(including alcohol addiction or abuse)*
- Ever taken action to end your life

No Yes

- Ever caused SERIOUS injury to others, caused MAJOR property damage or had trouble with the law because of medical condition, mental disorder, or influence of alcohol or drugs

Obstetrics and Sexually Transmitted Diseases
- Pregnancy Fundal height _____ cm; Last menstrual period Date *(mm-dd-yyyy)* _____
- Sexually transmitted diseases, specify _____

Endocrinology and Hematology
- Diabetes mellitus
- Thyroid disease
- History of malaria

Other
- Malignancy, specify _____
- Chronic renal disease
- Chronic hepatitis or other chronic liver disease
- Hansen's Disease — ☐ Multibacillary ☐ Paucibacillary; Treated ☐ Yes ☐ No
- Visible disabilities *(including loss of arms or legs)*, specify _____
- Other requiring treatment, specify _____

2. Physical Examination *(Indicate findings and give details in Remarks)*

☐ No ☐ Yes Applicant appears to be providing unreliable or false information, specify _____

Height _____ cm Weight _____ kg Visual Acuity at 20 feet: Uncorrected L 20/ _____ R 20/ _____

BP ____ / ____ *(mmHg)* Heart rate _____ /min Respiratory rate _____ /min Corrected L 20/ _____ R 20/ _____

***N, normal; A, abnormal; ND, not done**

N*	A*	ND*		N*	A*	ND*	
☐	☐	☐	General appearance and nutritional status	☐	☐	☐	Inguinal region *(including adenopathy)*
☐	☐	☐	Hearing and ears	☐	☐	☐	Extremities *(including pulses, edema)*
☐	☐	☐	Eyes	☐	☐	☐	Musculoskeletal system *(including gait)*
☐	☐	☐	Nose, mouth, and throat *(include dental)*	☐	☐	☐	Skin *(including hypopigmentation, anesthesia, findings consistent with self-inflicted injury or injections)*
☐	☐	☐	Heart *(S1, S2, murmur, rub)*	☐	☐	☐	Lymph nodes
☐	☐	☐	Breast	☐	☐	☐	Nervous system *(including nerve enlargement)*
☐	☐	☐	Lungs	☐	☐	☐	Mental status *(including mood, intelligence, perception, thought processes, and behavior during examination)*
☐	☐	☐	Abdomen *(including liver, spleen)*				
☐	☐	☐	Genitalia *(including circumcision, infection(s))*				

DS-3026
XX-XXXX

Page 1 of 2