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Acculturation and Causes of Death Among Filipinos in the US: Focus on Cancer

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ACCULTURATION AND CAUSES OF DEATH AMONG FILIPINOS IN THE US: FOCUS ON CANCER

By

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Abstract

Filipinos in the US are 3.4 million, yet the main causes of death among this primarily immigrant population have not been well characterized nor compared with the mortality experience of their counterparts in the Philippines. Age-adjusted mortality rates were computed for the main causes of death for three populations: Filipinos living in the Philippines (FPHs), Filipinos living in California (FCAs), and non-Hispanic whites in California (WCAs). Regression-derived mortality rate ratios stratified by sex were used to compare the populations, using WCA as the referent population. Included causes of death were ischemic heart disease, stroke, cancer and chronic lower respiratory disease, as well as two common causes of death in the Philippines, pneumonia and tuberculosis. For cancer, the four most common cancer mortality sites and cervical cancer were examined.

A total of 858,388 FPH, 256,395 WCA, and 9,280 FCA decedents were analyzed. In the US, cancer was the leading cause of death for Filipinos of both sexes, while in the Philippines, it was fourth after ischemic heart disease, pneumonia and stroke. For all cancers combined, no significant differences in mortality were recorded between Filipinos in CA and in the Philippines ($p>0.05$); however, patterns varied by cancer site. For liver, prostate and cervical cancers, FPHs fared considerably worse than FCAs, while for lung cancer among women, FCA had a 56% (95%CI 1.20-2.02) higher risk of death than FPH.

Overall, mortality rates from the major causes of death are much lower among FCAs than FPHs, suggesting that Filipinos in CA benefit substantially from living in the US in terms of health outcomes and life expectancy. Access to a more developed health care infrastructure, effective prevention programs, and better treatment opportunities likely explain the lower mortality rates in the US for ischemic heart disease, stroke and infectious diseases. However, the differences in

cancer between the two populations are not as striking as for other causes of death, with differences in the prevalence of risk factors, including obesity, smoking, fertility patterns, and Hepatitis B impacting cancer rates. Risk factor interventions in the US and enhancing the health infrastructure in the Philippines should result in health gains for Filipinos on both sides of the Pacific.

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Introduction

Leading Causes of Death

Cancer

Cancer is a chronic disease that impacts people all over the world, without discriminating against race, background, socio-economic status or age. Cancer is the abnormal growth of cells that multiply and spread throughout the body (World Health Organization (WHO), 2017). Globally, cancer is one of the leading cause of death. (Centers for Disease Control and Prevention (CDC), 2014; WHO, 2017). In the United States (US), cancer is the second leading cause of death with 1,596,486 new cases reported in 2014 (CDC, 2014). Geographically, certain states have a higher risk for cancer due to differences in environmental factors, lifestyle choices, and age distribution, as shown in Figure 1. Non-modifiable risk factors for cancer include ethnicity, genetic background, race, and age. Ongoing research can help the public understand, prevent, and overcome this chronic disease.

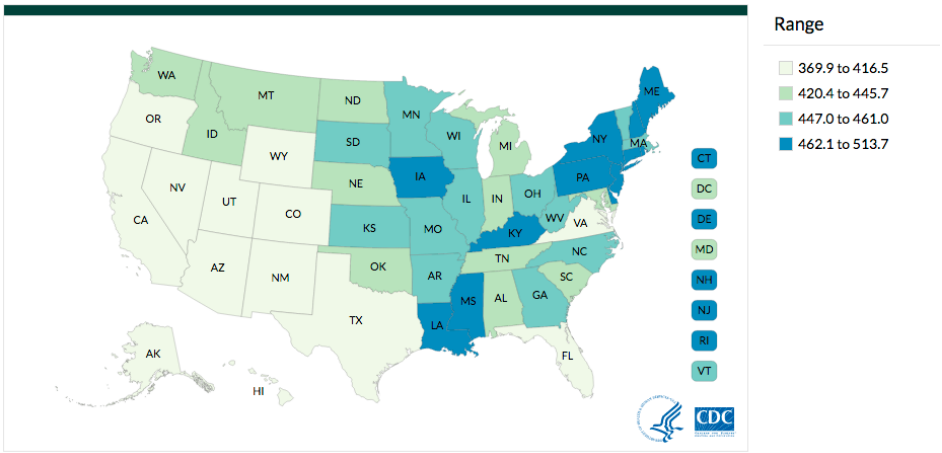

Figure 1. All Cancers Combined Incidence Rates by State, 2014
*rates are per 100,000 and are age-adjusted to the 2000 U.S. standard population. (CDC, 2014)

Ischemic Heart Disease

Ischemic Heart Disease (IHD) is a form of cardiovascular disease (CVD). Within the US, IHD is the leading cause of death (CDC, 2015). IHD is caused by the build-up of plaque in the walls of the arteries that supply blood to the heart (CDC, 2015). Over time, the walls of the artery become narrow and weak, preventing the heart muscle from functioning appropriately. IHD is a chronic disease that is preventable through lifestyle changes such diet, physical activity and reduction in smoking. Cardiovascular disease is the number one cause of death worldwide (WHO, 2017).

Stroke

Stroke is the second leading cause of death worldwide (WHO, 2016), with approximately 6.6 million deaths annually across the globe (WHO, 2016). In the US, stroke mortality is more common among lower income populations. (Johnston, Mendis, & Mathers, 2009, and is the fifth leading cause of death. Stroke occurs when the blood flow to the brain is blocked or restricted. Blocked blood vessels can burst, causing a deadly hemorrhagic stroke (CDC, 2016). Similar to IHD, stroke is largely preventable. Modifiable risk factors are lifestyle changes such as reducing tobacco use, increasing physical inactivity, and avoiding or controlling high blood pressure, high cholesterol, and diabetes.

Chronic Lower Respiratory Disease

Chronic Lower Respiratory Diseases (CLRD) are diseases of the airways and other structures of the lung. Some common types include chronic obstructive pulmonary disease (COPD), asthma, occupational lung disease, and pulmonary hypertension. Mortality from CLRD

worldwide was estimated at 3 million deaths in 2015 (WHO, 2016). In the Philippines CLRD accounted for 5% of total deaths for both sexes (WHO, 2016). Within the US in 2005, there were approximately 126,000 COPD related deaths (CDC, 2009). Smoking is the main risk factor, followed by environmental factors, sedentary lifestyles and unhealthy diets (WHO, 2016).

Tuberculosis and Pneumonia

Tuberculosis and pneumonia are communicable diseases affecting the lungs that are prevalent in low-income countries (WHO, 2017). Tuberculosis (TB) mortality rates within the US have decreased significantly since 1992 due to prevention programs and advanced treatment (CDC, 2015). Because of vaccination programs, tuberculosis is not a common disease among Americans. However, among low-income countries, vaccinations are an emerging practice that have not yet been well-implemented, resulting in higher mortality rates (WHO, 2017). Modifiable risk factors for TB are smoking, drinking heavily, living in confined areas, and other environmental and lifestyle risk factors (Auer, Sarol, Tanner, & Weiss, 2010).

Pneumonia is another disease that can be largely prevented by immunization. Most prevalent among South Asian countries (WHO, 2016), it is a common disease that impacts the vulnerable, including children and older individuals. Within the US, there were approximately 3 million cases of pneumonia in 2009 (Self et al., 2013). Smoking, pre-existing illnesses such as asthma and COPD, or older age can increase the risk of contracting pneumonia. However, it is a treatable disease, and patients who live in the US have a much higher chance of surviving due to better health care than patients in developing countries.

Filipino Populations

Previous research about health disparities in the US focused mainly on non-Hispanic whites (NHW) and non-Hispanic Blacks. More recently, studies have been conducted addressing

the health experience of the Asian population. In these research studies, Asians are typically aggregated as one whole group, with only a few studies that divide into sub-groups. Therefore, little research exists that focuses primarily on the Filipino sub-group.

Filipinos in the Philippines and Migration to the US

The Philippines is a country located in the southeast region of Asia, composed of 7,107 islands (WHO, 2017). The Philippines is categorized as a developing country; most residents are in the lower-middle income group (WHO, 2017). Three main languages are spoken in the Philippines: Cebuano, Ilocano, and Tagalog. However, in schools, English is the primary medium of instruction. About 100.7 million people currently live in the Philippine islands (WHO, 2017). According to the population country meter, there are more males than females, 52 million compared to 51 million (Country meters, 2017). When compared to neighboring countries such as Vietnam, Malaysia, and Thailand, health outcomes in the Philippines are relatively better (WHO, 2017). Looking at how the Filipino population is growing, there are more young people than older people. The average life expectancy of Filipinos living in the Philippines is about 68.3 years old (WHO, 2017). The relatively low life expectancy is due to lack of quality health care, lifestyle habits such as consumption of alcohol, smoking, eating fatty foods, and high prevalence of high blood pressure. According to the WHO, IHD was the cause of death for almost 88,000 thousand Filipinos in 2012 (WHO, 2017). This disease is the leading cause of death for Filipinos, followed by stroke, which was the cause of death for 63,000 people, and lower respiratory infections, including tuberculosis, pneumonia, and chronic lower respiratory diseases, accounting for 52,000 deaths in the Philippines in 2012. (WHO, 2017; DOH, 2016).

The probability of a Filipino dying before the age of 70 is about 68% for males and 48% for females (WHO, 2017). For Filipinos between the ages of 30-70 years old, the probability of dying from cancer, cardiovascular disease, or diabetes is 28% (WHO, 2017). Cancer in the Philippines is among the fastest growing diseases. Breast, lung, and liver are the three most common cancer sites among men and women living in the Philippines (Redaniel et al., 2008). By sex, breast, cervix, and ovary are the most common cancer sites for Filipino women while lung, liver, and prostate are the most common for men. (Redaniel et al., 2008).

Filipino migration to the United States was first documented in the 1500's (Dela Cruz & Periyakoil, 2010). Of all Asian sub-groups, Filipinos are the second largest group of immigrants to United States, while Chinese are the largest (Dela Cruz, Lao, & Heinlein, 2013). After the 1500's, there were four waves of Filipino immigrants to the United States. Following the Spanish-American war in 1898, Filipinos who had served in the military had an opportunity to become nationals and were able to migrate to the United States (Dela Cruz & Periyakoil, 2010). Then during World War II when the US had a military base in the Philippines, some Filipino women who married American soldiers were later brought to United States and referred to as "war brides" (MPI, 2015). In addition to war brides immigrating to the US, there were also many Filipinos who were recruited into the Navy as servicemen during WWII (Dela Cruz, & Periyakoil, 2010). As a payment for service, some of those who served were naturalized. Additionally, during World War II, there were many healthcare workers who immigrated to the United States (MPI, 2015). The last wave of Filipinos that immigrated to the United States came as a result of the Immigration and Naturalization Act 1965, also known as the Hart Cellar Act. This act allowed skilled workers and people who had family already living in United States to immigrate to the United States (MPI, 2015).

Early immigrants from the Philippines were not well-educated and had a relatively low socioeconomic status (MPI, 2015). However, later immigrants from the Philippines were more educated, achieving higher socioeconomic status. Figure 2 depicts the growth of the Filipino immigrant population in the United States from the 1980s to 2013.

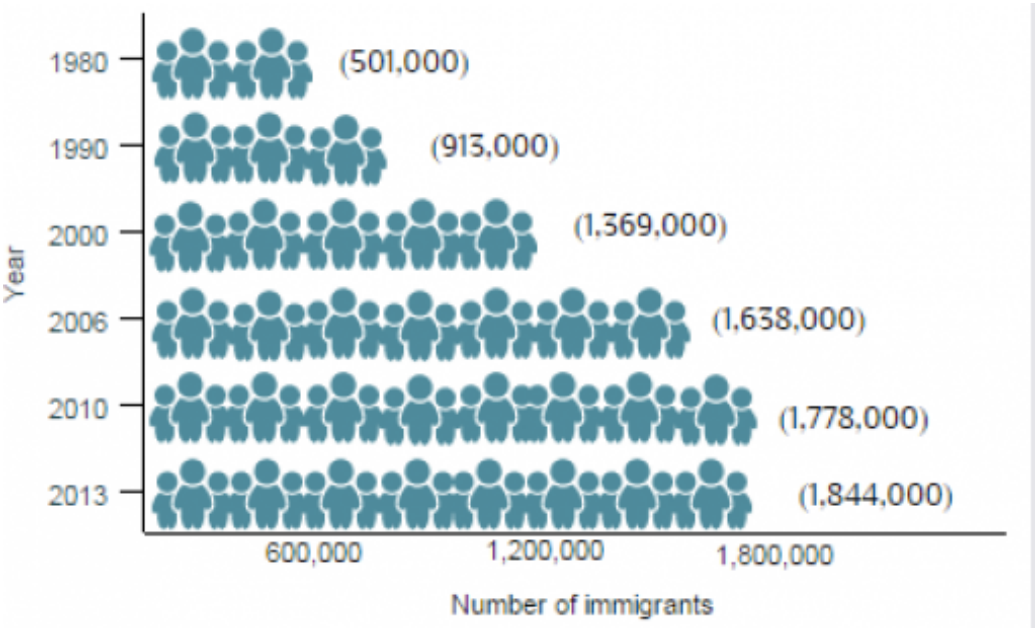

Figure 2. Growth of the Filipino Immigrant Population to the US, 1980-2013

Acculturation among Filipinos

The immigrant population continues to grow as Filipinos seek better opportunities for themselves and their families; opportunities that are available in the United States. While seeking the "American dream", Filipinos undergo acculturation in the US. Marielena Lara and her colleagues defined acculturation as, "development of the cultural elements of the dominant society- language, food choice, dress, music, sports, etc., a process by which assimilation was achieved." (Lara, Gamboa, Kahramanian, Morales, & Hayes Bautista, 2005). Measuring acculturation is usually achieved through use of one the following five scales: "1. Engaging in culturally specific behaviors such as music, diet, and media; 2. Proficiency in, use of, and preference for the Tagalog or English language; 3. Knowledge of culture- specific history and

current events; 4. A sense of cultural identity; and 5. Adoption of and belief in culture-specific values." (Lara, Gamboa, Kahramanian, Morales, & Hayes Bautista, 2005). Acculturation is a process whereby Filipinos may lose some of their original cultural background, and acclimate to their new culture, referencing the non-Hispanic white population. There are advantages and disadvantages associated with migration and acculturation. Filipinos who migrate to the U.S. have better access to health care and health screenings. Due to the better availability of job opportunities and job advancement, those able to work in the United States earn a higher income, and are thus better able to provide for their families compared to their counterparts working in the Philippines (Serafica, 2011). Filipinos immigrating to the United States also have better access to education. Additionally, Filipinos may engage in opportunities to adapt healthy habits by performing voluntary exercise. While there are beneficial aspects that impact health for Filipinos after migration, there are also negative aspects. Filipinos may adopt new unhealthy habits, as well as carry over unhealthy habits from the Philippines, such as poor diet, smoking, or drug use. Instead of the typical diet consisting of seafood and vegetables that Filipinos consume in the Philippines, they develop a taste for high-fat fast food, which is much more accessible in the US (Serafica, 2011). Although the adoption of voluntary exercise is a potential benefit to counteract the intake of fatty foods, Filipinos living in the U.S. have a more sedentary lifestyle than in the Philippines, where Filipinos get their daily physical activity by walking and using the public transport system (Tudor-Locke, Ainsworth, Adair, & Popkin, 2003). The decrease in physical activity such as walking can be attributed to the convenience of owning a car, which is common in the US. Moreover, acculturation, including adjusting to the new culture, language barriers, and unfamiliar places can be stressful, and Filipinos may choose to release their stress with drinking or drug use. Notably, Dela Cruz and her colleagues found that older Filipinos who

migrate to the US are less likely to adapt to the westernized culture than Filipinos who migrate at younger ages (Dela Cruz, Padilla, and Butts, 1998).

The Current Filipino Population in the United States

Approximately 3.4 million Filipinos are living in the US (Hoeffel, Rastogi, Kim, & Shahid, 2012). While Filipino populations are spread throughout the country, there are nine primary states where most Filipinos have settled: California, Hawaii, Illinois, Texas, Washington, New Jersey, New York, Nevada, Florida, and Virginia (MPI, 2015). According to the US Census Bureau, California has the largest population of Filipinos (U.S. Census Bureau, 2017). One reason why Filipinos settled in California is the presence of several military bases; many Filipinos who served in the military, as well as many of the so-called "war brides", were based the subsequently settled there. Because of its large Filipino population, California is an ideal state with ample data for research on the health outcomes of Filipinos in the US.

Little is known about the mortality experience from the major causes of death for Filipino populations in the US. However, some research has previously been conducted on cancer. Miller and her colleagues found that overall cancer incidence rates for the Asian population, including Filipino men and women, were lower overall than rates for non-Hispanic whites (NHW) (Miller, Chu, Hankey, & Ries, 2008). In another study, NHW males were found to have a higher incidence rate of prostate cancer than Filipino men. Nevertheless, prostate cancer is still the most commonly diagnosed cancer in Filipino men in the US (McCracken et al., 2005) (Bernstein, Miu, Monroe, Henderson, & Ross, 2003) (Jin, Pinheiro, Xu, & Amei, 2016). Likewise, amongst Filipino women, breast cancer is the most common type of cancer (CDC, 2017), although NHW women had the highest invasive breast cancer rates in California in 2002 (Deapen, Liu, Perkins, Bernstein, & Ross, 2002). Breast cancer is the leading cancer in women from all Asian sub-

groups (Jin, Pinheiro, Xu, & Amei, 2016). Screening is critical for early diagnosis and treatment of cancer, yet Filipino men and women have relatively low rates of cancer screening (Bernstein, Miu, Monroe, Henderson, & Ross, 2003)

Cancer mortality rates among Filipinos in the US have been increasing over time, despite advances in cancer prevention and control. Filipino men living in the US have higher mortality rates of colorectal cancer than any other Asian subgroup (Miller, Chu, Hankey, & Ries, 2008). Additionally, Thompson and her colleagues reported that lung cancer was one of the top cancer mortality sites for Filipino males (Thompson et al., 2016). For cancer mortality, prior research showed that Filipino women living in California (FCA) have the highest death rates from breast cancer, followed by lung and colorectal cancer (Miller, Chu, Hankey, & Ries, 2008), confirmed by a more recent study by Thompson and her colleagues (Thompson et al., 2016).

Smoking and obesity are among the main risk factors for chronic diseases. Table 1 presents the prevalence of smoking and obesity among Filipinos in the Philippines (FPH), Filipinos in California (FCA), and non-Hispanic whites in California (WCA) (CHIS, 2017) (Ng, et al., 2014) (WHO, 2014). Obesity has increased among Asian populations living in the US (Huang, Appel, Nicdao, Lee, & Ai, 2012). Among all Asian sub-groups living in California, Filipinos have the highest BMI and obesity (Palaniappan, Wong, Shin, Fortmann, & Lauderdal, 2011). Moreover, obesity is associated with increased risk of diabetes. (Palaniappan, Wong, Shin, Fortmann, & Lauderdal, 2011). Filipino males living in the US also have a higher prevalence of drug usage, alcohol intake, and cigarette smoking compared to other Asian sub-groups, leading to increased risk of chronic diseases (Huang, Appel, Nicdao, Lee, & Ai, 2012). Filipinos who immigrate to the US may have a lower risk of chronic diseases; however, the longer Filipinos stay in the US, the more their risk increases.

Table 1. Prevalence of smoking and obesity among FPH, FCA, & WCA

	Smoking		Obesity	
Population	**Males**	**Females**	**Males**	**Females**
FPH	39.8%	8.1%	4.6%	8.0%
FCA	8.5%	2.8%	30.8%	14.0%
NHW	14.0%	12.9%	25.1%	22.9%

Additional research focusing on Filipino men and women is needed to provide more evidence for the establishment of chronic disease prevention programs in Filipino communities. Comparing the health outcomes between FCA and FPH will provide valuable baseline information; those who live in the Philippines may experience more hardships in managing their health problems. They may be more at risk of death from chronic disease due to lack of quality healthcare. Conversely, Filipinos living in California may experience negative acculturation, the adoption of unhealthy behaviors, which could lead to increases in lifestyle risk factors for chronic diseases. With this study, we will increase our understanding of health outcomes from the leading causes of death both in the US and in the Philippines. This baseline knowledge can be used to developed risk factor interventions to prevent chronic disease, and to focus efforts on improving the health infrastructure in the Philippines to treat and manage chronic diseases.

Study Aims and Hypothesis

The purpose of this study is to calculate and compare rates for major causes of death, with a focus on selected cancer deaths between three groups, Filipinos living in CA, NHW living in CA, and Filipinos living in Philippines as the reference group.

Aim: To calculate and compare mortality rates for the major causes of death for FCA, FPH, and WCA populations.

H_0: There will be no significant differences in the rates of major causes of death between populations analyzed in this study.

H_A: There will be significant differences in the rates of major causes of death between the population analyzed in this study.

Methods

A cross-sectional study design was used compare mortality rates among Filipinos living in the Philippines, Filipinos living in CA, and NHWs in CA.

Mortality Data

Cancer and Other Causes of Death

Mortality data for Filipinos who died in the CA were obtained from the California Department of Health Vital Statistics for years 2008-2012. All FCA decadents in CA were included in this study regardless of birthplace. For Filipinos who died in the Philippines, mortality data was obtained from the World Health Organization Mortality database (WHO, 2017). Data was carefully organized and cleaned in preparation for analysis.

Cancer overall as a major cause of death, as well as the leading causes of cancer death - lung, prostate, liver, and colorectal for males and breast, lung, colorectal, liver and cervical - were analyzed for the three population groups. Other major causes of deaths analyzed in this study included ischemic health (IHD), stroke, pneumonia, tuberculosis (TB), and chronic lower respiratory diseases (CLRD). Cause of cancer deaths in both California and the Philippines were coded using International Classification of Diseases – 10th revision (ICD-10).

Variables

For the three populations, cause of death, age, and sex were the variables taken into consideration.

Data Preparation

Data from Philippines and California were downloaded and cleaned, then recoded appropriately for statistical analyses.

Population Data

Population denominators for Filipinos who live in CA were acquired from the 5-year American Community Survey based from 2008- 2012 (Ruggles, Genadek, Goeken, Grover, & Sobek, 2016). Birthplace of the decedents was not considered. Population denominators for Filipinos living in the Philippines were gathered by year and sex for 2008-2011 for the entire area of the Philippines from the United Nations Statistics Division (UNSD) (UN data, 2017). (2012 data was unavailable, but given the size and the variation in cancer rates from year to year, having only four rather than five years of data like we had for California is unlikely to make a substantial difference.)

Mortality Rates

Cancer and major causes of death mortality rates were calculated for those who died in 2008-2012 for FCA and WCA and those who died in 2008-2011 for FPH. The rates were calculated per 100,000 persons, stratified by sex, annualized, and age-standardized to the 2000 US Standard Population using eighteen age group bands, all 5-year except the last, which was 85 and older. Corresponding 95% confidence intervals were calculated for each mortality rate.

Statistical Analyses

To compare all three population groups, negative binominal regression modelling was used. Negative binominal regression is a type of generalized linear model in which the dependent variable is a count of the number of times an event occurs (Zwilling, 2013). It is implemented using the maximum estimation. Count data is used to group each age group, sex, and cause of death, rather than having individual rows for each subject. The regression model avoids issues arising when populations have very unequal age groups. In our case, the standard population in United States is quite different from the standard population in the Philippines as the age

structure differs considerably between the two countries. Since the US has a relatively older population, and the Philippines has a very young population, this age difference between the countries could potentially cause confounding of results. However, the negative binominal regression corrects for the age difference between the two countries with a calculation of age-adjusted site-specific cancer mortality rate ratios for WCA and FCA, with FPH as the referent population. For this analysis, only age groups 30 years and older were included since mortality numbers for the major causes of death are exceptionally low below that age.

The common cancers as well as IHD, stroke, and CLRD as cause of death were selected for inclusion in modelling rate ratios. Pneumonia and tuberculosis were not included because of the huge difference in mortality rates between the Philippines and the US. Due to better access to care in the US, those cause of death are very rare. In this study, acculturation is used as a plausible explanatory tool for our findings, but is not included in our statistical analyses.

Ethical Considerations

This is a secondary data analysis and did not involve direct recruitment of study participants. As data was in de-identified format, consent from individuals was not required. Ethical approval for the research was given by UNLV IRB protocol # 798947-2. For California, Protocol # 16-02-2412 was approved by the Committee for the Protection of Human Subjects under the California Health and Human Services Agency.

Software

IBM SPSS Statistical software, SAS, version 24 and Microsoft Excel version 15.36 were used in cleaning and preparation of the datasets and for data analyses.

Results

Total Number of Deaths

Table 2 depicts the total number of deaths analyzed in the study, including IHD, stroke, CLRD, tuberculosis, pneumonia, and all cancers. Of 1,165,497 Filipinos from the Philippines, 662,080 were males and 503,417 were females. Filipinos decedents in CA were 20,156, with slightly more females than males, 10,174 compared to 9,982. Among non-Hispanic whites in California, there were 536,361 deaths; 50.1% of those were among males and 49.9% among females.

Table 2. Total Numbers of Deaths

	Males		Females		Total	
Populations	**n**	**%**	**n**	**%**	**n**	**%**
FPH	662,080	56.8%	503,417	43.2%	1,165,497	100.00%
FCA	9,982	49.5%	10,174	50.5%	20,156	100.00%
WCA	268,860	50.13%	267,501	49.9%	536,361	100.00%

Cancer Deaths

There were 306,909 cancer deaths among FPH, 2008-2011, 48.65% in females, 51.35% in males (Table 3). The smallest population studied, FCA had 10,876 deaths, with females accounting for a larger share of deaths, 53.1% compared to males at 46.9%. There were 279,966 total cancer deaths among the WCA population, almost evenly split by sex.

Table 3. Cancer Deaths, 2008-2012 for CA, 2008-2011 for Philippines

	Males		Females		Total	
Populations	**n**	**%**	**n**	**%**	**n**	**%**
FPH	157,512	51.35%	149,397	48.65%	306,909	100.00%
FCA	5,105	46.94%	5,771	53.06%	10,876	100.00%
WCA	141,802	50.65%	138,164	49.35%	279,966	100.00%

Mortality Rates

The mortality rates for selected cancers and causes of death among the three populations are presented per 100,000 persons by sex in Table 4. For male FPHs, the top three causes of death were IHD with a rate of 209.09 per 100,000 persons, followed by stroke and pneumonia. For female FPHs, IHD was the also the leading cause of death, with a rate of 133.21 per 100,000, followed by pneumonia and stroke. Cancer was the fourth leading cause of death among both male and female Filipinos in the Philippines.

In California, cancer was leading cause of death among Filipino males at 149.07 per 100,000, followed by IHD and stroke. Likewise, although rates uniformly were lower than their male counterparts, Filipina women in CA had the same three leading causes of death. In California, only rarely did either male or female Filipinos die from tuberculosis, with mortality rates of 1.53 per 100,000 and 0.56 per 100,000, respectively.

Male WCA had cancer as the leading cause of death, with a mortality rate of 200.68 per 100,000 persons. IHD was second and stroke third, like male Filipinos in California. For female WCA, cancer and IHD were the top two causes of death; however, CLRD was third with a rate of 44.62 per 100,000.

Table 4. Average Annual Age-Adjusted Mortality Rates for Selected Cancers and Major Causes of Death per 100,000. 2008-2012

	FPH		FCA		WCA	
Males	**Rate**	**95% CI**	**Rate**	**95% CI**	**Rate**	**95% CI**
Colorectum	14.3	(13.98-14.62)	14.3	(12.79-16.03)	17.0	(16.63-17.38)
Liver	18.6	(18.30-18.97)	12.7	(11.25-14.24)	8.0	(7.71-8.21)
Lung	31.0	(30.58-31.49)	45.1	(42.22-48.01)	49.5	(48.81-50.10)
Prostate	20.4	(19.92-20.84)	16.0	(14.14-17.92)	22.3	(21.86-22.73)
All Cancers	129.4	(128.40-130.40)	149.1	(143.88-154.39)	200.7	(199.40-201.99)
IHD	209.1	(207.75-210.42)	134.1	(128.90-139.36)	159.8	(158.61-160.91)
Stroke	183.2	(181.96-184.36)	46.9	(43.91-50.10)	36.3	(35.76-36.87)
Tuberculosis	81.3	(80.58-82.04)	1.5	(1.04-2.15)	0.1	(0.09-0.15)
Pneumonia	167.6	(166.27-169.01)	18.4	(16.38-20.46)	17.1	(16.69-17.45)
CLRD	105.5	(104.54-106.48)	36.5	(33.69-39.47)	49.8	(49.15-50.45)
Females	**Rate**	**95% CI**	**Rate**	**95% CI**	**Rate**	**95% CI**
Colorectum	9.8	(9.58-10.03)	8.9	(7.99-9.97)	12.9	(12.63-13.22)
Liver	7.6	(7.37-7.76)	4.7	(4.01-5.46)	3.2	(3.01-3.31)
Lung	9.9	(9.71-10.15)	17.3	(16.01-18.74)	38.7	(38.22-39.26)
Breast	21.3	(21.03-21.61)	18.2	(16.89-19.60)	24.6	(24.13-24.98)
Cervix	5.7	(5.56-5.85)	2.0	(1.61-2.55)	1.9	(1.80-2.06)
All Cancers	94.4	(93.75-95.05)	100.0	(96.82-103.32)	151.8	(150.76-152.82)
IHD	133.2	(132.31-134.12)	67.5	(64.75-70.38)	89.1	(88.35-89.79)
Stroke	128.1	(127.26-128.96)	36.1	(34.11-38.20)	36.6	(36.12-37.04)
Tuberculosis	30.9	(30.53-31.30)	0.6	(0.34-0.88)	0.1	(0.04-0.08)
Pneumonia	130.9	(129.91-131.79)	12.4	(11.16-13.64)	12.5	(12.23-12.77)
CLRD	34.1	(33.66-34.54)	12.6	(11.42-13.90)	44.6	(44.08-45.15)

CI: Confidence Intervals

Regression Ratios

Mortality rate ratios for the three populations by sex for selected cancers and selected causes of death, 2008-2012 for California, and 2008-2011 for Philippines, are presented in Table

5. For all cancers combined, there was no significant difference between either male or female Filipinos in California compared their counterparts in the Philippines. Overall cancer mortality rates for non-Hispanic whites in California were 26% higher than the referent Filipino population in the Philippines for males, and 33% higher for females. However, mortality rate ratios varied greatly by specific cancer site. For liver cancer, male and female FCA were 45% less likely to die from liver cancer than male and female FPH, while male and female WCA were 67% and 62% less likely to die. Similarly, male FCA were 32% less at risk of death from prostate cancer than males FPH, while there were no significant differences between WCA and FPH. For cervical cancer, FCA had 75% and WCA had 78% lower risk of death than women in the Philippines.

Conversely, females in the US were more at risk of dying from lung cancer than FPH. FCA were 56% more likely to die of lung cancer, and WCA were three times more likely than FPH. Lastly, female WCA had a 21% higher risk of dying from colorectal cancer than female FPH. For males, the difference was not significant for those cancers.

Mortality rate ratios for IHD, stroke, and CLRD were mostly statistically significant, with much worse outcomes in the Philippines. For IHD, male FCA had 50% lower risk of death and WCA had 44% lower risk compared to FPH. Among males, FCA were 50% less likely at risk of dying of IHD compared to FPH, while WCA were 44% less likely at risk of dying from IHD than FPH. For females, FCA were 72% less likely to die from IHD than FPH. Similarly, for stroke, FCA males and females were 81% and 78% less likely to die, while WCA males and females were 88% and 87% less likely to die from stroke, respectively. Lastly, except for female WCA who were not statistically significant different than females FPH, male non-Hispanic whites and male Filipinos as well as female Filipinos in California were much less likely to die

from CLRD than their counterparts in the Philippines.

Table 5. Mortality Rate Ratio for Selected Cancers and Selected Causes of Death, 2008-2012 for California, 2008-2011 for Philippines

		Males				Females			
	Philippines	**FCA**		**WCA**		**FCA**		**WCA**	
Site	Referent	MRR	95% CI	MRR	95% CI	MRR	95% CI	MRR	95% CI
Colorectum	1	0.94	(0.79-1.09)	1.08	(0.96-1.21)	0.88	(0.74-1.04)	1.21	(1.06-1.36)
Liver	1	0.55	(0.40-0.76)	0.33	(0.25-0.44)	0.55	(0.45-0.69)	0.38	(0.33-0.45)
Lung	1	1.18	(0.92-1.50)	1.18	(0.95-1.48)	1.56	(1.20-2.02)	2.84	(2.23-3.62)
Breast	1	-	-	-	-	0.85	(0.69-1.04)	1.14	(0.94-1.39)
Cervix	1	-	-	-	-	0.25	(0.20-0.32)	0.22	(0.21-0.24)
Prostate	1	0.68	(0.58-0.81)	0.99	(0.88-1.12)	-	-	-	-
All Cancers Combined	1	0.96	(0.82-1.11)	1.26	(1.09-1.46)	0.96	(0.80-1.16)	1.33	(1.11-1.61)
IHD	1	0.50	(0.42-0.60)	0.56	(0.49-0.66)	0.28	(0.22-0.35)	0.42	(0.34-0.51)
Stroke	1	0.19	(0.15-0.24)	0.12	(0.10-0.15)	0.22	(0.17-0.27)	0.17	(0.14-0.21)
CLRD	1	0.67	(0.12-0.23)	0.32	(0.24-0.42)	0.17	(0.12-0.25)	0.82	(0.57-1.17)

CI: Confidence Intervals

Discussion

Overall, mortality rates from the major causes of death, with the exception of cancer, are much lower among Filipinos in California than Filipinos in the Philippines, suggesting that FCA benefit substantially in terms of health outcomes from living in the US. This study reviewed major causes of deaths including cancer, IHD, stroke, tuberculosis, pneumonia, and CLRD, finding that mortality from most major causes of death was consistently higher for FPH, except for CLRD in females from FPH, and cancer.

Cancer Risk and Survival

When all cancers combined were analyzed, with FPH as the reference, mortality was higher for WCA and similar for FCA but these numbers hide significant difference according to specific cancer sites. Females WCAs are at a higher risk of dying from colorectal cancer. Colorectal cancer is a cancer linked to individual lifestyles, including risk factors such as being overweight, physical inactivity, diets high in red meat, smoking, and heavy use of alcohol (McCracken et al., 2005). The risk is lower in the Philippines likely because these risk factors are lower; however, when Filipinos immigrate to the US, their risk of cancer increases. Higher levels of acculturation play a role in this increasing risk, associated with the adoption of "Western lifestyles" (McCracken et al., 2005). The prevalence of obesity among FCAs was 30.8%, highest among the three compared populations, likely carrying increased risk of cancer. However, Filipinos who immigrate to the US also likely have increased survival rates compared to the Philippines because of better access to healthcare to screening programs and quality healthcare. Although screening rates were shown to be relatively low among Filipinos in California in the McCracken study, they may still be higher than in the Philippines (McCracken et al., 2005).

Therefore, higher risk in the US is likely partially offset by increased survival from colorectal cancer.

Liver cancer mortality among FPHs was higher than US populations, likely attributable to a higher prevalence of Hepatitis B infections in the Philippines (Magtubo, 2016). Hepatitis B infection is commonly passed from mother to child (WHO, 2017). Lack of availability of vaccinations and poor healthcare access explain the relatively high rates of Hepatitis B in the Philippines (Gish, Sollano, & Lapasaran, 2016). Only recently are children in the Philippines receiving appropriate vaccinations at birth, due to the lack of vaccine stock in hospitals as well as inadequate public education on the benefits of vaccinations (Gish, Sollano, & Lapasaran, 2016). Without access to vaccinations, it is difficult to prevent this disease, increasing the risk of liver cancer later in life.

Lung cancer is a poor prognosis disease that will most likely be fatal regardless of access to healthcare. Female FCAs and WCAs have significantly higher mortality from lung cancer than FPHs, consistent with higher smoking prevalence than female FPH. As shown in Table 1, the prevalence of smoking among male FPHs is 39.8%, compared to male FCAs at 8.5% and male WCAs at 14%. However, it is likely that the higher lung cancer rates in the US reflect a heavier per day smoking habit among males in the US.

Breast cancer mortality patterns among FPH women are similar to FCA and WCA women. However, the explanations likely differ. Females in the Philippines likely have lower risk of breast cancer; however, when they do get it, their survival rate will be lower due to less access to screening and treatment. For FCA the risk of breast cancer likely increases when they immigrate to the US, due to acculturation and the adoption of the western lifestyles and behaviors (McCracken et al., 2005). High fertility is protective of breast cancer, and fertility is

higher in the Philippines. Filipinos in the US have children later in life and have fewer children, due to prioritizing their careers.

Mortality from cervical cancer was much higher in the Philippines than in the US. In the US, screening is the major factor that lowers the risk of cervical cancer. Prevention practices, such as the pap smear and HPV vaccination, are not as common in the Philippines as the US due to cultural beliefs as well as the cost of getting screened and vaccinated in the Philippines (Guerrero, et al., 2015).

Prostate cancer impacts older populations, ages 50 and older. Filipinos who immigrate to the US have lower prostate cancer mortality rates than men in the Philippines, a common finding in other immigrant populations (Pinheiro, et al., 2016). While negative acculturation including the adoption of a poor diet likely increases the risk for Filipino males in the US, they also benefit from access to screenings and treatment options, which would improve survival. Conversely, in the Philippines, risk may be low, but survival rates are also low due to lower access to complex prostate cancer treatment. In developing countries, many patients diagnosed with prostate cancer could die, in contrast to those diagnosed in the US. The treatment of prostate cancer is very complex and requires higher standards of healthcare, with options such as radiotherapy, chemotherapy, surgery, and advanced diagnostic technology.

Other Major Causes of Death

Chronic diseases are increasing in developing countries such as the Philippines. Many factors impact the mortality rates for chronic diseases among our three studied populations. Ischemic heart disease is the leading cause of death worldwide (WHO, 2013), with the mortality rates in the Philippines higher than in California. Diabetes, which accounts for 6% of all deaths in the Philippines, elevated cholesterol levels, and lifestyle factors such as smoking and

sedentary behaviors are risk factors for IHD. Filipinos living in the Philippines are increasingly addicted to electronic devices as entertainment, which may be decreasing physical activity level. Moreover, the consumption of highly refined sugars or *pandesal* at every meal is common. Pandesal is a breakfast bread that Filipinos pair with a hot drink which has been associated with diabetes (Tan, 2015). As well as increasing diabetes mellitus rates, obesity is also increasing in the Philippines (WHO, 2016). These factors combined may lead to increasing risk of IHD. Filipinos who experience acculturation are more likely to smoke heavily when they immigrate to the US (Dela Cruz & Periyakoil, 2010). This could be attributed to the stress that Filipino immigrants are experiencing. They also likely increase unhealthy behaviors, such as consuming diets heavier in red meat or fast foods, and having a sedentary lifestyle. However, while heart disease is common in the US, with modern medicine, access to quality health care, and prevention programs, people who live in the US are able to live with IHD, which explains the lower mortality from IHD among both populations in California.

Stroke mortality in the Philippines for both men and women is extremely high, above 100 per 100,000 persons. While Filipinos living in the Philippines typically consumed a healthy diet of rice, fish, and vegetables, the Filipino people are increasing their obesity rates and increasing their risk of hypertension (Global Disease Burden, 2016). Additionally, many Filipinos have excessive sodium intake, a risk factor for hypertension which is the strongest risk factor for stroke (Dela Cruz & Periyakoil, 2010). Filipinos include salt in their cooking as well as using salty side sauces at the table called *patis* and/or soy sauce to enhance the taste of food. Also, Filipinos living in the Philippines have a non-compliant attitude towards healthy eating. They tend not to consider whether food is healthy or not (Dela Cruz & Periyakoil, 2010). They eat to satisfy their needs versus being more cautious of their health (Dela Cruz & Periyakoil, 2010).

Meanwhile, Filipinos immigrating to the US adopt aspects of the westernized culture such as increasing their intake of high glycemic index types of food such as rice, bakery products, and processed foods, which increases their risk of stroke (Dela Cruz, Lao, & Heinlein, 2013). However, similar to IHD, the mortality rates for stroke are lower in the US due to widespread availability of medication to control high blood pressure, and as well as prevention campaigns such as CDC's Division for Heart Disease and Stroke Prevention.

The mortality rates for tuberculosis (TB) are substantially higher among Filipinos living in the Philippines than in the US. TB is one of the leading causes of death in the Philippines (Philippine Health Statistics, 2013). It requires a rigorous treatment protocol over a relatively period of time. In the Philippines, some people cannot or do not follow through with this protocol due to refusal to take medication, access to treatment, or lack of knowledge that they have TB (Auer, Sarol, Tanner, & Weiss, 2010). Lack of education is also a factor, as many Filipino citizens are not aware of that TB is contagious (Steyn et al., 1997). In the US, health care prevention and treatment is far more advanced than in the Philippines, which heavily impacts the low mortality rates in the US. Filipinos living in CA and NHW are at much lower risk of contracting TB in the first place, and if diagnosed, their survival rates would be much higher.

Pneumonia mortality is also a relatively rare occurrence in the US, especially among Filipinos and NHWs living in CA. Pneumonia death is preventable with the help of modern medicine, effective antibiotics treatment, and immunization (CDC, 2016). However, in the Philippines, the mortality rates from pneumonia are very high. Among Filipinos, seeking medical assistance for a family member who is sick is a low priority. Sometimes if a family member has a cough, the cough will be ignored or they will turn to home remedies to treat it. Filipinos are

afraid of the cost if they seek medical attention. They feel that if they go to the hospital to get treated, it will put a financial burden on the family.

Chronic lower respiratory diseases such as chronic bronchitis and asthma are preventable and treatable. One of the risk factors of chronic bronchitis is smoking. In the US, health care and prevention programs have been helpful in decreasing the mortality rates attributable to smoking. Nonetheless, mortality rates among females WCA are higher than in females FPH, certainly attributable to higher smoking prevalence. In 2015, 13.6% of NHW females were smokers compared to the female Asian prevalence of only 7.0% (CDC, 2016).

Our study shows that there are many more people dying of IHD, stroke, tuberculosis, pneumonia, and chronic lower respiratory diseases in the Philippines than among a similar Filipino population in California. Moreover, the Philippines does not have the adequate prevention programs to detect cancer at an early stage, which would decrease mortality (Gijsel, 2016). It is likely the death burden is highest in rural communities in the Philippines, where people may not be educated about chronic diseases and health issues that can affect their future health status. Even if educated, there may be cultural obstacles to health promotion, as seen in the Filipino traditional saying “Bahala na habit”, which means “Whatever happens, happens.” Although Filipinos that immigrate to the US may become unhealthier due to negative aspects of acculturation, they will also have better access to quality health care. Those diagnosed with leading causes of death, including tuberculosis, pneumonia, IHD, stroke, cancer, or chronic respiratory disease in the US will get high quality treatment from healthcare providers. Unfortunately, those diagnosed with these same diseases will likely not receive adequate care in the Philippines, leading to lower survival and higher mortality.

Implications for Public Health

Based on our findings, when comparing all three population groups, most mortality rates from major causes of death in the Philippines are higher than in the US. This indicates that health care and prevention programs are neither well-established nor well-implemented in the Philippines. In the US, with the help of modern technology and proactive preventive care, people who acquire these diseases have better survival rates. While cancer mortality rates are higher overall in the US, when examined by specific cancer sites, the patterns are diverse. Prevalence of risk factors among each population, including obesity, smoking, fertility patterns, and Hepatitis B drive the cancer rates seen here.

Due to insufficient access to health care in the Philippines, mortality rates from preventable and controllable cause of death are much higher in the Philippines than in the US. Without preventive care and modern medicine, it is difficult to treat those who developed these diseases.

Strengths and Limitations

To my knowledge, this study was the first to compare major causes of death, including common cancers, between FCA, WCA, and FPH. The study is population-based, with large data sets providing stable results. However, individual level risk factor information as well as comorbidities are not available from death certificate data. For the Filipinos in California, we do not have length of time in the US or any other proxy for acculturation. Only the leading cause of cancer deaths among males and females were analyzed, although there were many different types of cancers; we limited the study to cancers that could be compared across all three populations.

Conclusions

As hypothesized, FCA have rates of death from many major causes of death that lie between the rates of FPH and WCA. Only cancer mortality rates are higher among NHWs than Filipinos due to NHWs higher incidence of cancer. Cancer mortality rates among FCA are lower than WCA, yet acculturation likely explains their higher rates than Filipinos in the Philippines. Filipinos adapt to the western culture by choosing unhealthier foods which increases their risk of diabetes and obesity; they are less active; and they are more likely to smoke or drink (Dela Cruz, Lao, & Heinlein, 2013). Thus, Filipinos immigrating to the US increase their risk of cancer. However, their survival increases and fatality rates decreases. Conversely, FPH have a lower risk of cancer, although their survival is low and fatality is high due to the lack of accessibility to modern medicine and prevention programs, as well as the attitude of Filipinos having the "bahala na" connotation (Gijsel, 2016). For the other major causes of death, mortality rates are consistently higher in the Philippines. The Philippines simply lacks adequate prevention programs and funding to help individuals get treatment for their illnesses (Gijsel, 2016).

Continued research on the health of the Filipino population in the US should be encouraged, as immigration rates are increasing. Future studies should consider using the acculturation scales to identify specifically how acculturation impacts Filipinos who immigrate to the US. Also, the identification of lifestyle factors at the individual level would help clarify their contribution to mortality from cancer and other causes of death. One interesting study might examine the impact of exposure to Filipino restaurants and food stores, most commonly found in California, on the health of Filipinos in the US. It is very important in the Public Health community both here and in the Philippines to identify and monitor health trends. The population in the Philippines is a relatively younger population; as these individuals age, their risk of cancer

and other causes of death increases. In the US, we need to continue monitoring the health of the second largest Asian immigrant population.

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Curriculum Vitae

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Education

University of Nevada, Las Vegas
Master of Public Health (MPH)- Expected Graduation December 2017
Concentration - Epidemiology and Biostatistics

University of Nevada, Las Vegas
Bachelor of Science in Health Education December 2013

Employment History

July 2016-present Las Vegas, NV
Senior Academic Advisor, Division of Health Sciences (DHS) Advising Center

- Advising Health Science undergraduates on academic and graduation plan
- Attend recruitment of new/ prospective students
- Assist Assistant Director and Director in implementing new and current policies and procedures
- Verify graduation applications
- Presents in New Student Orientation (NSO)/ group advising/ UNLV events
- Train new employees

January 2014- June 2016
Academic Advisor, Division of Health Sciences (DHS) Advising Center

- Advised Health Science undergraduates on academic and graduation plan
- Attended Recruitment events of new/ prospective students
- Updated DHS materials and handouts
- Presented in New Student Orientation (NSO)

Internship

Nevada Division of Public and Behavioral Health- Office of Public Health Informatics and Epidemiology
May-August 2016

- Developed Nevada's first Healthcare Associated Infection report

Nevada Division of Public and Behavioral Health- Office of Public Health Informatics and Epidemiology
September-December 2013

- Created Norovirus toolkit for Psychiatric setting
- Assessed any outbreaks among the facilities