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EPIDEMIOLOGY OF ISLAND AND MAINLAND POPULATIONS: HOW DOES CULTURE
INFLUENCE HEALTH RISK FACTORS OF NON-COMMUNICABLE, CHRONIC, AND
METABOLIC DISEASES?

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EPIDEMIOLOGY OF ISLAND AND MAINLAND POPULATIONS: HOW DOES CULTURE INFLUENCE HEALTH RISK FACTORS OF NON-COMMUNICABLE, CHRONIC, AND METABOLIC DISEASES?

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Abstract:

Non-communicable diseases (NCDs), including chronic and metabolic diseases, are responsible for 74% of global mortality and are strongly influenced by health risk factors. Geographical differences in NCDs have been identified in several countries but have not been completely explained through cultural factors, specifically island and mainland cultures. This study aimed to develop an epidemiological framework for determining diseases with the highest mortality for further investigation regarding different health risk factors rooted in a specific population's cultural foundations. Preliminary findings indicated diabetes type II (D2) and CKD caused by hypertension and D2 to have the highest risk factor and mortality percentage in both island and mainland populations. Further analysis indicated the potential for each population's culture as a harmful influence regarding non-communicable, chronic, and metabolic diseases. The study suggests family-based educational programs implemented in each population's respective healthcare systems to manage and prevent the heavy disease burden of diabetes type II and chronic kidney disease.

Keywords: Cultural impact, epidemiology, health risk factors, Guam, type 2 diabetes, chronic kidney disease, global burden of disease, non-communicable diseases

INTRODUCTION

Non-communicable diseases, commonly known as chronic diseases or NCDs, are diseases not spread through infection or transmission through other individuals and are typically the consequence of unhealthy behavioral, physiological, environmental, and hereditary variables. NCDs are the biggest cause of mortality worldwide, killing 41 million people each year, accounting for 74% of all deaths worldwide, and pose a significant danger to health and development, particularly in low- and middle-income countries³⁶. However, these NCDs are largely preventable through lifestyle changes such as quitting smoking, eating a healthy diet, being physically active, and discontinuing harmful alcohol use. The risk of non-communicable diseases is decreased through healthy behaviors, effective disease management,

and access to high-quality, affordable healthcare. Due to the ongoing care that NCDs demand over extended periods, people living with them are more vulnerable to crises. These crises can disrupt this care and impede the flow of medications, which can result in health issues that may entail further treatment and expense. In emergency scenarios where NCDs may make it more difficult for a person or their family to handle the emergency, coordinating care between various healthcare providers and locations can be exceedingly difficult or even impossible⁵⁰. Due to these factors and the chronic nature of NCDs, a long-term, more comprehensive approach is necessary with many variables playing into the treatment of these diseases. The four categories of NCDs—cancer, chronic respiratory illnesses,

cardiovascular diseases, and diabetes—account for two-thirds of all global mortality³⁵.

A strong determinant of NCD's prolonged effects involves health risk factors. Health risk factors are qualities, traits, or exposures that, in most cases, negatively impact the probability of mortality. Determining which NCDs to evaluate for this study was based on high-risk factor percentages affecting each disease. Other disease burden measurements or 'BoD' such as Risk factor percentage, DALYs, YLLs, and YLDs were used for comparisons. Risk factor percentage is the average likelihood an individual has for developing a disease based on their health risk factors²³. A higher risk factor percentage of a particular diseases indicates an individual is more likely to die from the disease if they have high health risk factors associated with poor lifestyle habits, i.e., smoking, drinking, obesity, etc. Years lived with Disability (YLDs) are the number of years of what could have been a healthy life that were instead spent in states of less than full health which represent non-fatal burden, and years of life lost (YLLs) are the number of years of life lost due to premature death, defined as dying before the ideal life span²³. Disability-adjusted life years (DALYs) are the sum of the years of life lost due to premature mortality (YLLs) and the years lived with a disability (YLDs) due to prevalent cases of the disease or health condition in a population²³. A disease's or condition's DALYs are calculated by adding the years of life lost to premature death and the years spent with a disability because of the disease or condition's high prevalence in the population⁵⁰. Age, sex, disease cause, and risk factors are other criteria that are considered when utilizing these measurements.

Regional differences in disease burden in NCDs have been identified in many countries but not fully explained through the lenses of culture, most specifically island, and mainland populations. It is evident that risk factors affect these diseases, but few studies have made this comparison with the intent to study and address how cultural components impact these health risk factors specifically. Some of the highest rates of metabolic and other chronic diseases are experienced by Pacific Islanders, and although

risk factors have been identified and preventive care has been improved, there are still many variables that may cause this phenomenon such as genetics, geography, socioeconomic status, and other preventative barriers³⁵. While one must first understand how each disease affects each region as well as treatment strategies, ultimately, the intent of this study was to understand how culture affects the specific way a population treats a disease.

In this study, Guam and Washington's island and mainland populations were compared for different epidemiological factors and cultural components. The US island territory of Guam has been a strategic stronghold for the US military for the past 120 years. Guam is most notable for its white-sanded beaches and beautiful sunrises (*Where America's Day Begins*) but also for its rich history deeply rooted in the Pacific Islander culture. Guam is home to the native Chamorro peoples, who account for half of the population, and while Guam is a melting pot for those of Pacific Islander and Asian ancestry, these ethnic groups account for 78% of the population who are currently burdened with some form of metabolic or chronic disease. With 30% of the population being obese and a drastically smaller population than the state of Washington, Guam was a region of interest to compare risk factors to identify any key differences regarding the effects of three specific NCDs in each population due to differences in culture¹². A key trend of differences in disease burden between island and urban areas was also a factor in evaluating each region, hence why the state of Washington, most specifically the Seattle greater metropolitan area, was evaluated.

This study aimed to identify whether island and mainland populations differ in non-communicable, chronic, and metabolic disease management and prevention due to differing health risk factors rooted in their respective cultural foundations. Using Institute for Health Metrics and Evaluation (IHME) virtual tools, the study utilized a disease-determinant workflow to identify diseases from both regions to compare high-risk factors and other BoDs for evaluation of disease burden in different populations. A synthesis of qualitative and quantitative findings was used to analyze the cultural impact of each

disease in their respective population. Clinical interviews were conducted for on-site perspective and clarity of the burden of each disease. The study argues that key regional difference between mortality, risk factor percentage, DALYs, and YLDs between Guam and Washington can be explained through the four proposed pillars linking higher rates of these diseases to culture. This study viewed NCDs, chronic, and metabolic diseases in a cultural context to provide perspective, clarity, and importance of how culture can shape the health and well-being of any population. The importance of addressing these diseases plaguing both mainland and island populations is essential in the formation of healthcare policies to combat the predicted increases in the regional and global burden of each disease³⁵. This study is intended to be replicated and applied to any study comparing the disease burden of different populations from a cultural standpoint.

METHODS

Epidemiology Framework This study used computational tools, qualitative and quantitative findings, statistical analysis, and clinical interviews to develop a disease-determinant workflow to compare high-risk factors and other BoDs for the evaluation of disease burden in various populations, and to detect diseases from any region. IHME tools were used to determine the top 10 diseases in each region, and comparative trends regarding different BoDs. Statistical analysis was used to compare and indicate significantly different trends in BoDs to derive more conclusions about the burden of each disease in relation to prevalent health risk factors of each region. A literature review was conducted to indicate the cultural influence of each disease in its respective population using a synthesis of qualitative and quantitative findings from several research studies. For an on-site viewpoint and clarity of the impact of each disease, clinical interviews were conducted.

IHME Virtual Tools The Global Burden of Disease tool (GBD) from the Institute for Health Metrics and Evaluation analyzes and visualizes updated data about the world's health levels and

trends from 1990 to 2019 from the Global Burden of Disease (GBD) study provided by the University of Washington in Seattle, WA^{23b}. The GBD Foresight Visualization analyzes forecasts and better and worse scenarios from 2017 to 2040 for both causes of death and risks, as measured by years of life lost (YLLs), and total mortalities^{23a}. Both visualizations can control for sex, age, year, and location in relation to either cause or risk with the BoDs being deaths, risk factor percentage, YLDs, or DALYs displayed as percentages. The US Health Map visualization tool from the Institute for Health Metrics and Evaluation explores the health trends in the United States by race and ethnicity for all-cause mortality and life expectancy from 200-2019²⁵. The Causes of Death (COD) Visualization depicts where various data sources have placed trends in causes of death overtime in 204 countries and territories²². The global burden of disease (GBD) results provides the viewing and ability to download the raw data estimates of the world's health from 1990 to 2019. These tools served three primary purposes, (1) To provide raw data in correlation to each disease's burden in its respective region for statistical analysis and comparisons, (2) to integrate initial observations of the GBD compare, foresight and COD visualization, (3) and to provide impactful values to aid the under in the understanding of each disease's burden on each respective population. Due to their high-risk factor percentage and high mortality percentage, the non-communicable, chronic, and metabolic diseases of diabetes mellitus and chronic kidney disease were chosen for further research and evaluation.

Statistical Analysis Using IHME virtual tools, this study used statistical methods to evaluate and confirm any statistically significant correlations between BoDs, year, and geographic regions for further comparison and connection with health risk factors and cultural implications. Using RStudio, the initial statistical analysis was conducted using the summarized BoDs from the GBD compare and foresight³⁷. This provided perspective of the global burden of each disease as well as possible synergistic effects between each disease that can be connected to their high health risk factor percentages.

Literature Review A combination of qualitative and quantitative findings from several research projects was used to create a literature review to show the cultural influence of each disease in its specific demographic. Using the top three diseases of interest derived from the disease-determinant pipeline in Guam and Washington, the review stands as a comprehensive summary of previous research on metabolic, chronic, and non-communicable diseases in relation to cultural implications. The four pillars, *Health Behavior, Clinical Access and Care, Social and Economic Factors, and Physical/Environmental Factors*, serve as the foundation for explaining how an individual's health risk factors differ due to their associated culture. These are essential core concepts that constitute how culture can be integrated with health.

Clinical Interviews Each interview provided insights into lifestyles, challenges, barriers, and history of how chronic, metabolic, and non-communicable diseases have been plaguing the island of Guam. This study intends to draw conclusions from the unique perspective of three different healthcare providers on the island of Guam. Unfortunately, due to time constraints and geographic limitations, clinical interviews of healthcare providers in the greater Seattle metropolitan area were not conducted. Patient care provided by physicians is a key resource in understanding how behavior, socioeconomic factors, environment, and affordable clinical access and care affect the burden of a disease on a specific population.

RESULTS

Identifying the Disease The disease-determinant workflow identified the top ten diseases in both Guam and Washington based on their high mortality rate, and the global mortality was used as a cumulative standard for comparison. Using IHME virtual tools, the top ten diseases in both Guam and Washington in 2019 with the highest mortality rates were ischemic heart disease (IHD), stroke, tracheal, bronchus, and lung cancer (Lung C), chronic kidney disease (CKD), diabetes mellitus (general including type I and II), Alzheimer's disease and other dementias, chronic obstructive pulmonary disease (COPD), lower

respiratory infection (LRI), cirrhosis and other chronic liver diseases, hypertensive heart disease (HTN-HD) (A in **Figure 1**). It is also worth noting that nine out of ten of the top ten global diseases with the highest mortality percentage are non-communicable diseases except for LRI, a type of communicable disease. Comparing mortality percentage and DALYs in Guam in Washington between 1990 and 2019, diabetes, CKD, and HTN-HD have all increased in the past 30 years. Risk factor percentages of Guam, Washington, and Global populations in 2019 was compared for each of the top ten diseases. CKD, Diabetes, and HTN-HD were the top 3 diseases with the highest risk factor percentage of 100%. No statistically significant interactions were found comparing different BoDs in relation to region and year. Among the top three diseases linked to a 100% risk factor and high mortality percentage, chronic kidney disease (CKD) had a 3.47 mortality percentage followed by diabetes (3.19%) and hypertensive heart disease (2.14%). CKD had the highest increase in mortality average since 1990 in Guam (CKD (2.34%) than Washington (CKD (1.76%).

Island and Mainland Trends of Diabetes Type II and CKD The US Health Map IHME virtual tool was used to analyze and note any trends between mortality in rural or urban areas in relation to diabetes mellitus and CKD. The trend identified found mortality for non-communicable, chronic, and metabolic diseases increasing per 100000 population when moving away from an urban area, most specifically when leaving King County and the Seattle greater metropolitan area to surrounding counties on the Olympic peninsula and border counties near Canada. Initial observations also confirmed the highest mortality stemming from diabetes type II and CKD due to hypertension in both regions with an average mortality onset age of 70-75²². For all causes of CKD and both type I and II diabetes, the mortality percentage is most notable in the senior population (65+) and more prominent in men than women.

When comparing diabetes mellitus and CKD in general in Guam, Washington, and global populations as a standard, CKD had a higher mortality rate than diabetes in both Guam and

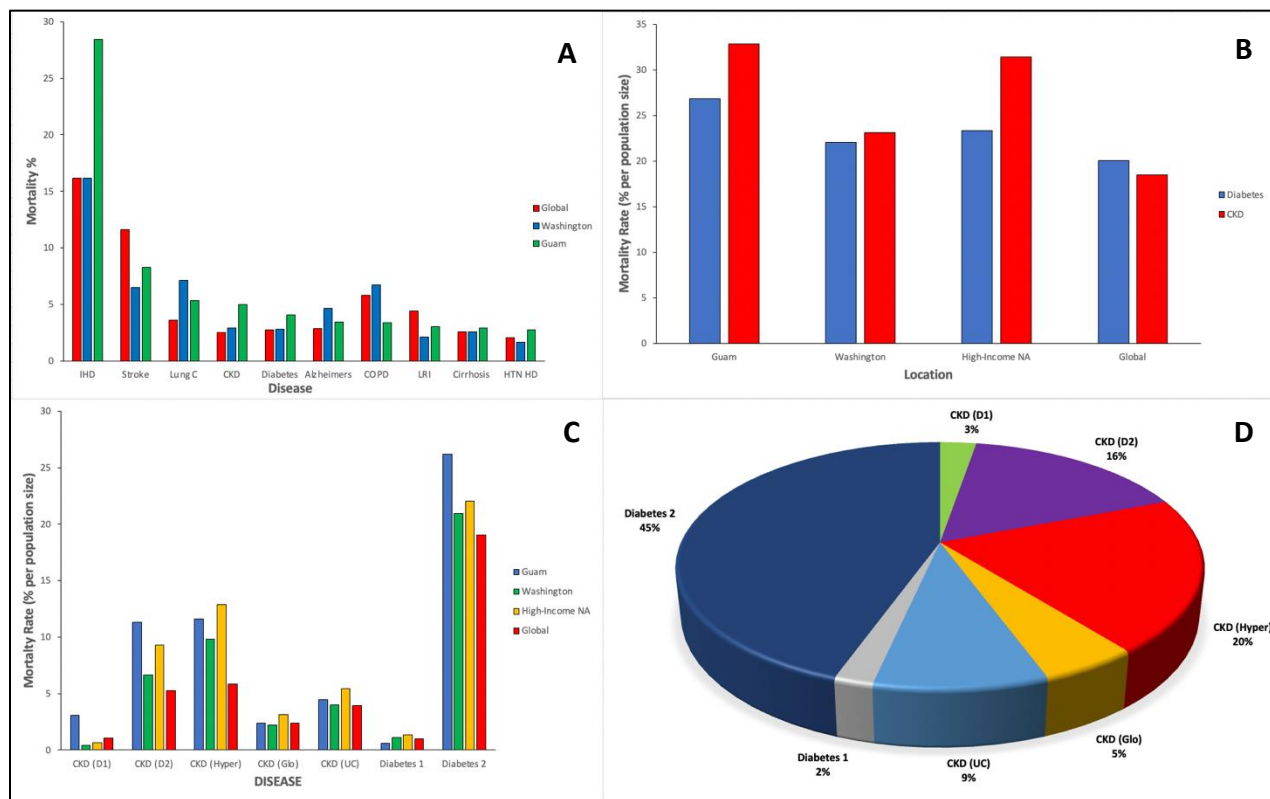


Fig. 1 Summary of mortalities based on population and disease group. (a) Top ten diseases with highest mortality in GU, WA, & Global 2019 **(b)** Average mortality rate of diabetes and CKD based on population **(c)** Diabetes and CKD mortality causes based on population **(d)** Average mortality of all disease causes and populations combined.

Washington (B in **Figure 1**). When looking specifically at diabetes and CKD with their causes of mortality in each region, Guam has a higher mortality of CKD due to hypertension than CKD due to type II diabetes (D2) where on average D2 has a higher mortality rate than D1 by 25% and 8% more in CKD caused by D2. Between Guam, Washington, and global populations, D2 overall has the largest mortality, indicating possible synergistic effects between CKD, D2, and hypertension. For Washington, CKD due to hypertension (hyper) had a higher mortality rate compared to other CKD causes. According to rates and not population size, Guam has the highest mortality rates in CKD due to D2 and D1, and D2 in general (C in **Figure 1**). On average, diabetes type II and CKD due to hypertension had the highest mortality percentage among all populations (D in **Figure 2**). For perspective, diabetes type 2 has the highest mortality rate overall indicating synergy with CKD caused by D2 and hypertension due to the highest risk factor influence. Globally, diabetes type II had a 19.03% mortality rate with 1472934 deaths in 2019²⁴. Globally CKD due to D2 had a 5.247% mortality rate with 405994 deaths, and CKD due to hypertension had a

5.818% mortality rate with 450148 deaths in 2019²⁴. In total combining all, diabetes and CKD-related deaths yielded a 35% mortality rate with 2978401 deaths in 2019 alone²⁴.

Summary of Non-communicable, Chronic, and Metabolic Diseases Noncommunicable diseases are responsible for 74% of all deaths globally killing 41 million people annually where 86% of these mortalities come from premature deaths in low- and middle-income countries²². All ages are susceptible to the risk factors for NCDs, including poor diets, inactivity, exposure to tobacco/smoke, and problematic alcohol use. The positive and negative consequences of NCDs are most specifically regulated by the control of modifiable health risk factors. In the context of this research conducted, metabolic risk factors for CKD, diabetes, and their causes were of particular interest. These included high blood pressure, morbid obesity, hyperglycemia (high blood glucose levels), and hyperlipidemia (high amounts of fat in the blood)²². Chronic kidney disease (CKD) is defined as reduced kidney function shown by glomerular filtration rate (GFR) of less than 60 mL/min per 1.73 m² or signs of kidney damage, or both, of at least 3

months duration⁴⁶. In many low-income nations as well as high- and middle-income countries, diabetes and hypertension are the major causes of CKD. According to social determinants of health and ethnicity, CKD incidence, prevalence, and progression differ between nations, presumably due to the influence of epigenetics and health risk factors⁴⁶.

Indian doctors Sushruta and Charaka first discussed the difference between type 1 and type 2 diabetes about 500–600 BC, with type 1 being related to beginning in youth and type 2 being tied to obesity. Diabetes is now understood to be a complicated, diverse illness that can affect people at various periods of life¹³. Type 2 diabetes was first identified as a component of metabolic syndrome. D2 is the most prevalent type of DM and is caused by interactions between genetic, environmental, and behavioral risk factors. Physical inactivity, a sedentary lifestyle, heavy alcohol consumption, smoking, and a variety of other lifestyle factors are all recognized to play significant roles in the development of type 2 diabetes mellitus, as well as a strong genetic predisposition. Along with the diabetes epidemic, there has been a sharp rise in the number of people receiving a diagnosis of diabetic kidney disease (DKD), also known as diabetes-induced CKD. According to current estimates, 382 million people worldwide had diabetes in 2013, and by 2035, that figure is predicted to increase to 592 million¹⁸. Risk factors for diabetic kidney disease include nonmodifiable (genetic factors, age, sex, etc.) and modifiable (hypertension, smoking, salt intake, endotoxins, etc.) factors. Due to these risk factors, end-stage kidney disease (ESKD) is still primarily caused by diabetic kidney disease, which is also linked to an elevated risk of cardiovascular disease and early death³³. The four fundamental pillars of health behavior, clinical access and care, social and economic factors, and physical/environmental factors can be used to explain culture's role in the effects of these chronic and metabolic diseases. These four pillars form the basis for the explanation of how deeply ingrained and radically different cultural underpinnings affect health risk factors in particular populations.

Health Behavior Health behaviors are actions that have a direct impact on health outcomes. This pillar is the most important when connecting disease to self-mediated interactions that directly affect the outcome of an individual's health. Lack of approved medications and efficient psychosocial or educational treatments are two main obstacles to the effective management of D2 and CKD. In a survey assessing healthy behaviors, risk factor control, and awareness of CKD, the researchers looked at the relationship between self-reported healthy behaviors and risk-reduction goals and a person's awareness of their CKD⁴⁴. They postulated that engagement in behaviors and achieving risk-reduction goals thought to lower the risk of negative health outcomes would be related to CKD awareness among CKD patients who do not require renal replacement therapy. The limited correlation between CDK awareness and healthy behavior raises the possibility that patients were aware of their illness but continued to engage in bad behaviors. Another study predicted medication adherence, quality of life, and physiological outcomes in diabetic patients using the self-determination theory (SDT) model of health behavior⁴⁷. They proposed that perceptions of autonomy support from healthcare professionals were favorably correlated with autonomous self-regulation of medication use, which in turn was positively correlated with perceptions of competence for managing diabetes. Medication adherence, quality of life, and physiological results for diabetic patients were all favorably impacted by healthcare providers' support for patients' autonomy and competence regarding medication usage and diabetes self-management⁴⁷.

Clinical Access and Care This pillar has strong ties with social and economic factors with many components aiding its effects in different global populations, but this study aimed to understand how clinical access to specialists and quality of care may be the result of specific cultural components based in different populations. There is evidence to suggest a connection between socioeconomic status (SES) and both healthcare access and health outcomes. Due to the relationship between financial resources and health status, efforts must be made to help the

overburdened healthcare system financially. According to one study, improving SES among older persons using grassroots methods, interventions, and data-driven policy and system change can be done most successfully³⁴. Their paradigm essentially stresses the socioeconomic gradient, highlighting the favorable correlation between money and health. Health improves as money does, and lower economic status is associated with worse health, which creates a dangerous feedback loop of increased poverty.

With longer lifespans and more exposure to harmful behaviors including urbanized sedentary lifestyles and bad diets, non-communicable disease risk factors like obesity, hypertension, and diabetes become more prevalent. Cardiovascular disease and chronic renal disease are caused by these risk factors. For those with end-stage kidney disease, renal replacement therapy (RRT)—either dialysis or renal transplantation—is a lifesaving but expensive treatment. It has been accessible in high-income nations for more than 50 years, during which time the number of patients treated has increased significantly. There are significant regional variations in the use of dialysis to treat end-stage renal disease, likely because of variations in population demographics, the frequency of end-stage kidney disease, and variables affecting access to and availability of RRT³¹. CKD awareness and education gaps are a major reason why RRT incorporation into marginalized populations is lacking.

Health-related quality of life refers to patient-reported outcome measures of how disease and treatment affect a patient's sense of subjective well-being. A patient's health-related quality of life is influenced by their lived experience of illness across a broad range of dimensions. In a survey of diabetes services in Guam, one in five patients did not receive diabetes self-management education from their medical professionals, and over 40% of patients were unaware of the type of diabetes they had⁹. Diabetes has a substantial negative impact on Guam's population and is strongly linked to two of the top three killers on the island: heart disease and stroke. The financial impact of diabetes treatment and care as well as the decreased

quality of life brought on by uncontrolled diabetes add to the health burden associated with this chronic and burdensome condition¹². In the study, Chamorros made up fifty percent (50%) of the respondents, while Filipinos made up one-fourth and Micronesians made up roughly one-fifth⁷. Successful management of chronic metabolic diseases like diabetes, which heavily rely on lifestyle modifications for prevention and control, depends on patient understanding and engagement, but this may be hampered by behavioral factors related to the person's associated culture. Patient feedback is essential for preventative care success and quality improvement in this study.

Social and Economic Factors Clinician perceptions of low socioeconomic status (SES) patients have been proven to influence clinical decision-making and health care delivery. In a clinical survey study, it was discovered that patients believed their SES had an impact on their health care, with recurring themes including the type of therapy received, access to care, and interactions between patients and healthcare professionals². Complex impressions of a person have an impact on their medical care, and through a better understanding of their effects on the unique patient-provider relationship, understanding the reasons behind these perceptions offers opportunities to reduce healthcare disparities. Healthcare inequities are getting worse in the USA as the wealth gap widens. Patients with lower socioeconomic status (SES) are impacted by these inequities because healthcare services are less accessible and of worse quality. The interaction between patients and medical staff, which is an important aspect of healthcare and essential for a healthy environment, may be deteriorated because of medical staff rushing to examine as many people as possible and not trying to build a meaningful relationship with their patients. Varied social class structures and experiences can result in varied interpersonal behavior patterns as well as misalignments between an individual's social class culture and the culture of significant social institutions. In short, one's SES can influence cultural dynamics, which include the emergence, preservation, and evolution of culture over time.

Physical and Environmental Factors Non-communicable, chronic, and metabolic diseases are largely influenced by risk factors such as behavior, SES, and healthcare access, but studies have indicated the association of diabetes and CKD with physical, genetic, and environmental factors. Pollution, arsenic exposure, mercury exposure, occupation, socioeconomic status, environment, ethnicity, sleep, and stress were found to have a correlative impact on diabetes mellitus²⁷. Diabetes was discovered to have a strong and favorable association with the serum concentrations of different contaminants in a national health examination study conducted between 1999 and 2002²⁷. Due to a demonstrated dose-response association between arsenic in drinking water and diabetes prevalence and death, arsenic has also been related to diabetes. It has been hypothesized that arsenic causes both insulin-dependent and non-insulin-dependent diabetes via increasing oxidative stress. Other elements that play a significant role in the development, manifestation, and causation of diabetes are frequently undervalued or ignored. These elements, which are byproducts of the culture we interact with, include stress, environmental pollution, chemical exposure, occupation, ethnicity, and low socioeconomic level. Therefore, if we are to effectively control and manage diabetes, specifically type II diabetes, these cultural factors also need equal emphasis.

Effects on Island and Mainland Populations

The four pillars of health risk factors can be used to understand how diabetes type II and CKD are caused by hypertension and D2 plague island communities in a cultural context, but recent studies have found a genetic component increasing specific ethnic group's likelihood of contracting one of these diseases. A possible genetic component found in Pacific Islander populations in Guam and Saipan involves the association of CREBRF variants with obesity and diabetes¹⁶. In Polynesian populations, variations in the regulatory factor protein CREBRF have been strongly linked to higher BMI and lower risk of type 2 diabetes. Polynesians frequently have the A allele, although it is uncommon in most other global populations. The Marianas and Micronesian populations from Guam and Saipan

were the focus of this study, which showed a connection between CREBRF mutations and obesity and diabetes in Pacific Islanders. The findings supported the relationships between CREBRF polymorphisms and greater BMI and a decreased risk of diabetes, but more significantly, they suggested that these variants may increase the risk of obesity and diabetes in Oceanic populations¹⁶. Synergistic effects between genetic predispositions and specific health risk factors impacted by behavioral interaction with their respective culture can be one way to interpret how chronic and metabolic diseases have a high mortality rate in island populations.

Clinical Interviews *(All three providers gave permission for usage of their speech and input)*

Clinical interviews provided an on-site perspective and insights into lifestyles, challenges, barriers, and history of how diabetes and CKD are currently plaguing island communities. Dr. Mo-Ping Tham, DO, Ed Stanley, PA-C, and Dawn Ostberg, NP were interviewed in December 2022 for insight on how the Guam population is affected and handles diabetes and CKD where risk factor components come into play with key concepts derived from each interview.

Dr. Mo-Ping Tham, FHP Urgent Care, December 14, 2022, 3:45 PM

The past 40 years have experienced a skyrocketed nationwide increase in obesity due to fewer people cooking at home, a sedentary lifestyle, and a fast-paced society that has continued to evolve. As a species, we have developed a sedentary lifestyle due to mobile devices, gaming, fast food, junk empty calories, and advances in easily accessible and commercialized technology. When it comes to comparing Guam and the mainland in general, lifestyles and foundations are very similar. Challenges between Guam and the mainland are very similar, but Guam lacks recreational spaces and safety is more compromised. Due to a lack of recreational spaces, poor law enforcement, increased crime rate, lack of federal funding, and barriers in general, diabetes and chronic-related issues increase. There are few nutritionists on the island, no obesity clinics, no tools to treat morbid obesity, and several different minority groups compared to the states. Overall, the mainland has more resources and support.

Ed Stanley, PA-C, FHP Urgent Care, December 23, 2022, 2:52 PM

Diabetics are more prone to infection where type II is most common in Guam due to obesity-related problems. Type I used to be more problematic in peds. At-home hospice is most popular in Guam due to the strong family-based community. A problem Guam faces with treating many conditions is tied-in to the referral process and different accessibility to specialists which is limited and not within reach of certain SAS. There is now an increase in medical tourism due to this factor. Cultural type is also a concern, like the Micronesian population which is at a disadvantage. But the biggest disadvantage is the lack of specialty care due to geographical proximity. When it comes to Guam, the biggest disparity is between geography and socioeconomic status influences how you are affected by geography because money always closes the gap. When it comes to specialists Guam surprisingly has a lot of optometrists, only 2 endocrinologists, and a few OBGYNs, but is in serious need of dermatologists. Overall, there are more diabetics per square mile and per capita than anywhere else in the USA. The biggest thing that decreases development in Guam is geographic limitations, finance to overcome the geography, and cultural assimilation vs importation. A decision to bring mainland aspects to Guam all boils down to business and what is profitable. Culture and health care disparities and development are interwoven. We want to recruit providers, but they want to visit first and see what their resources would be out here. There has been progress in Guam, but it is very slow. Finance>Desire>Probability>Geography

Dawn Ostberg, NP, FHP Urgent Care, December 18, 2022, 7:45 PM

When comparing Guam and the US, what would be considered "minority" in Washington is the majority in Guam due to a different culture dominating. If we look back at the 1960s and compare racism and socioeconomics, media plays a big role in how big ideas integrated into culture are interpreted and perceived. Racism and the role of socioeconomic status in society have gotten better, but certain ethnic groups are still at a disadvantage due to socioeconomic factors and components. Guam has high rates of hypertension and diabetes, and at the end of the day, there is no overarching problem that differentiates the two places. If you really think about it when comparing Guam to the states regarding disease burden and dispersion, it's like cheating on a

homework assignment: Different media, same assignment.

Each interview brought a unique perspective and topic into the overall question of "How does Guam handle these metabolic and chronic diseases, and what are the health risk factors rooted in Guam's cultural foundations that hinder disease management and prevention?"

DISCUSSION

Policy in Healthcare Using an epidemiological framework and the disease-determinant workflow the study identified health risk factors having a strong correlation with how a population is effected by D2 and CKD due to their cultural interactions, most specifically in island populations. A regional difference was predicted between mortality, risk factor percentage, DALYs, and YLDs between Guam and Washington which was not the case where BoDs of D2 and CKD did not significantly differ between different populations. Culture was found to have a notable impact on the way a specific population is affected by D2 and CKD. The persistence of CKD and ongoing diabetes can be attributed to societal factors that promote unhealthy behavior. CKD, Diabetes, and HTN-HD mortalities attribute to biological, psychological, family, community, and cultural factors that are 100% more likely to influence the mortality of each disease. This raises the question, "Does socioeconomic status stand as a defining factor for better-quality healthcare and better health in life?" Patient feedback is essential for preventative care success and quality improvement in this study, which can be combined with the teaching of self-management skills to patients with diabetes and chronic kidney disease (CKD) to decrease the effect of both modifiable and unmodifiable health risk factors. Synergistic effects between genetic predispositions and specific health risk factors are impacted by behavior rooted in cultural foundations. This can be used to interpret how chronic and metabolic diseases have a high mortality rate in island populations. Given the heavy burden diabetes mellitus and CKD have on island populations, comprehensive plans for the prevention, screening, diagnosis, treatment, and

follow-up of diabetes may be more suitable for treatment if approached from a cultural perspective. Therefore, culture should be respected without sacrificing fundamental moral principles.

When comparing Guam and Washington's cultural foundations that influence their health risk factors and disease management and prevention methods, the mainland has more support, resources, and fewer obstacles to overcome. All aspects mentioned in each interview regarding high-risk factors and no significantly different aspect between these diseases in Guam and Washington correlate to results regarding D2, CKD, and their causes. Guam is at a disadvantage in relation to increased health risk factors where a good business model also plays into decreasing the disease burden of a population. Culture overall plays a big role due to its ability to endorse specific habits that can be adopted by the individual. Assimilation of mainland healthcare providers to island culture isn't always simple, thus patient-provider relationships should be prioritized in healthcare settings located in underserved populations. Thus, a family-based education program aided by policy in each population's respective healthcare system is necessary for prioritizing patient feedback and care while also accounting for cultural foundations.

Importance and Impact of Culture Although these studies predicted and stated that reducing health risk factors in diabetes and CKD stems mainly from self-management and positive patient-care interactions, cultural components could also be a leading factor for negative outcomes of health behavior. Personal health behavior, access to quality health care, SAS, and environmental conditions are strongly influenced by the culture you interact with. In a study examining the family history of diabetes, awareness of risk factors, and health behaviors among African Americans, it was discovered that those with a family history of the disease were more aware of the risk factors for the disease and more likely to practice specific healthy behaviors than those without such a history. Having a family history of diabetes is linked to greater knowledge of diabetes risk factors, involvement in diabetes

screenings, and adoption of a healthier and more active lifestyle⁴. Changes in health and lifestyle can be used to promote weight and glycemic control, coronary heart disease risk, and self-management behaviors. Ongoing diabetes and CKD synergetic relationship and persistence can be attributed to cultural factors increasing bad health behavior.

Research over many years has shown a high association between disease risk and culture. Only a small portion of these differences can be explained by various biological, physiological, and environmental factors. The more immediate influences of culture on a person's behavior and physiology can be used to explain a portion of the variance. Studies of how individuals differ in their capacity to act on shared cultural models, studies of how a disease affects a population through health risk factors, studies of how communities differ in their exposure to modernizing influences, and studies of sociocultural stresses generated within the process of social change and modernization may prompt in-depth research into the stressors and resources for resistance that are specific to each community's culture. According to studies on cultural dynamics, consonance, and health, people's ability to imitate the archetypal behaviors embodied in cultural models is correlated with greater health¹¹. Understanding culture in connection to disease burden might help us better understand how an individual's overall life circumstances affect their health in terms of the outcomes related to disease risk. Patients are not simply walking up to the clinic with a specific pattern of health issues and health behaviors. They carry the weight of their daily lives with them, and it can be helpful to understand a patient's situation and struggles — perhaps not to succeed in the upper-middle-class sense, but rather to understand their life situation and increase their quality of care. This study intended to frame epidemiological concepts and findings into a cultural context, but let it also stand as a reminder that the individual has strong ties to the impact of culture. Though many factors are at play, it ultimately comes down to how the individual uses their culture to better their health and to enhance or inhibit the health and well-being of others.

Future Directions More research needs to be conducted to evaluate all BoDs and the top ten diseases up to date. IHME has not released new statistics or data for their tools due to the impact COVID-19 would have on their ‘burden of disease’ measurements, most specifically mortality cause and risk factor percentage. Future research should aim to use the epidemiological framework and disease-determinant pipeline to evaluate and compare different populations and their BoDs. This study aimed to view NCDs, chronic, and metabolic diseases in a cultural context to provide perspective, clarity, and importance of how culture can shape the health and well-being of any population. The importance of understanding these diseases plaguing both mainland and island communities is essential due to the predicted increases in the regional and global burden of each disease. This study can be used to make an impact on disease burdens by policy formation that assesses each disease through a cultural context within island and mainland populations while acknowledging the large threat non-communicable, chronic, and metabolic diseases pose to society moving forward.

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Moving Forward and Looking Back: Negotiating and Honoring Culture to Promote Wellness

Presented: May 20th, 2023

The essentially relational nature of human identity means that every day there is a constant negotiation going on among people, their values, and their social institutions. But too often this necessary cultural negotiation is misunderstood, mis-identified, or even ignored. With perspectives in healthcare, business, and sociology, this panel will interrogate the potentially harmful practices that can emerge in culturally insensitive interactions. Instead, we argue that understanding culture is central to all knowledge formation and therefore it is essential that policy and education are used to prevent harm to people and communities.

Appendix I. Honors Symposium Speech

Thank you, Dr. Chaney. Good morning, everyone, thank you for attending this panel today. My name is Jake Thomas Palisoc, and I am currently a Senior at Seattle Pacific University majoring in Honors and Physiology with a couple minors as well. Today, I will be talking about my independent Honors research project, Epidemiology of Island and Mainland Populations: How does culture influence health risk factors of non-communicable, chronic, and metabolic diseases? This project serves as the culmination of the skills I have learned in my four years here at SPU, but most importantly, this project addresses topics that have been affecting my life since I was a child. And now with the degree I have earned, I thought it would be fitting to address and explain these topics with scientific methods and rationale. Forewarning, this talk will contain potentially culturally sensitive topics, and I do not intend to offend anyone, but rather inform my findings I have derived from my research.

For those of you who don't know my story, I had a very different upbringing than most of my peers I have met in college. I was born and raised for the first 18 years of my life on the island of Guam, a tiny island in the West Pacific in Micronesia, and only a two-and-a-half-hour flight from Japan and a three-and-a-half-hour flight from the Philippines. Where America's Day Begins, the US island territory of Guam has been a strategic stronghold for the US military for the past 120 years. Guam is most notable for its white-sanded beaches and beautiful sunrises but also for its rich history deeply rooted in the Pacific Islander culture. Guam is home to the native Chamorro people who account for half of the population, and while Guam is a melting pot for those of Pacific Islander and Asian ancestry, these ethnic groups account for 78% of the population who are currently burdened with some form of metabolic or chronic disease. With 30% of the population being obese mostly due to specific NCDs and a drastically smaller population than the state of Washington, Guam was of interest to compare risk factors to identify any key regional

differences and effects of three specific NCDs in each population due to its strong cultural foundations.

My research aims were quite simple: I wanted to understand and explain how culture plays a role in the way a population is affected by a disease, most specifically Diabetes Type II and (CKD) chronic kidney disease in the case of my study. So, a quick overview, my study began with developing an epidemiological-based framework for determining diseases in each region with the highest mortality rates. After further data and statistical analysis, the top 3 diseases I chose to evaluate had the highest mortality and highest risk factor percentage rates. For some context, risk factor percentage is the likelihood an individual has for developing a disease based on health risk factors. A higher risk factor percentage of a particular disease indicates an individual is more likely to die from the diseases if they have high health risk factors associated with poor lifestyle habits. For example, if someone is an alcoholic or heavy smoker, then they have a higher risk factor percentage if they were to contract CKD or diabetes and a higher likelihood of dying from the disease due to their poor lifestyle habits. After studying HOW much the diseases affect each respective population, I wanted to know the WHY. Using a comprehensive literature review, I created a comprehensive summary of current research on these metabolic and chronic disease burdens to see if culture had any role in the matter for each population. I created four pillars, *Health Behavior, Clinical Access and Care, Social and Economic Factors, and Physical/Environmental Factors*, to serve as the foundation for explaining how an individual's health risk factors differ due to their associated culture. These are essential core concepts that constitute how culture can be integrated with health. Finally, I had the privilege to conduct clinical interviews at FHP Health Care Center in the Urgent Care sector in Guam to provide insights into lifestyles, challenges, barriers, and the history of how chronic, metabolic, and non-communicable diseases have been plaguing the island of Guam and Island populations. Unfortunately, due to time constraints and my very busy college and work schedule throughout this past year, I was unable to set up an interview with a nephrologist or endocrinologist here, in Seattle.

I wanted my study to be repeatable, because after all, this is a scientific paper. (*show slide 1*) My disease-determinant workflow, as you can see in the image on the left, first identified the top ten diseases with the highest mortalities in both Guam and Washington with those being: ischemic heart disease (IHD), stroke, tracheal, bronchus, and lung cancer (Lung C), chronic kidney disease (CKD), diabetes mellitus (general including type I and II), Alzheimer's disease and other dementias, chronic obstructive pulmonary disease (COPD), lower respiratory infection (LRI), cirrhosis and other chronic liver diseases, hypertensive heart disease (HTN-HD). I would also like to say it is worth noting that nine out of ten of the top ten global diseases with the highest mortality percentage are non-communicable diseases which lined up with my initial hypothesis. When I compared mortality percentage in Guam and in Washington between 1990 and 2019, diabetes, CKD, and HTN-HD have all increased exponentially in the past 30 years. CKD, Diabetes, and HTN-HD were the top 3 diseases with the highest risk factor percentage of 100%. Another

trend that I found using one of the various virtual tools provided by IHME (The Institute for Health Metric and Evaluation) at University of Washington was that mortality increased per 100000 in each population when moving away from an urban area, most specifically when leaving King County in Washington and moving towards the peninsula and counties on the Canadian border.

The right image depicts the summary for my findings regarding the heavy burden diabetes and CKD have on island and mainland populations. Guam has the highest mortality rates for diabetes mellitus and CKD, and HTN-HD. I also included high-income North America in this graph because I was interested if socioeconomic status effected the mortality rate of these specific diseases. (*show slide 2*) The left image depicts Diabetes and CKD mortality causes based on population. As you can see all 4 populations have the highest mortality rates in Diabetes type II, followed by CKD due to hypertension and CKD due to Diabetes type II. The right image is a nice little pie chart summarizing the average mortality of each disease and their causes with Diabetes type II contributing to 45% of deaths in Guam and Washington in 2019. For some perspective, diabetes and CKD-related deaths yielded 35% mortality rate with 2978401 reported deaths in 2019 alone. Noncommunicable diseases are responsible for 74% of all deaths globally killing 41 million people annually, and 86% of these deaths are linked to higher health risk factors due to poor lifestyle choices. Seeing this data was very hard for me, considering not only knowledge of how awful these diseases are but also how they can heavily impact someone's life. So my question after initial data analysis was, why do certain populations with massive amounts of individuals with these diseases continue to have these problems?

I remember my first clinic experience in Guam at FHP Healthcare center when I was 17 years old. I worked with PA-C Ed Stanley on a bright and early Saturday morning. I was only supposed to be there until noon, but I ended up staying until closing at 10 pm. Over the course of that day, there were 34 patients who came in with gout. They requested prednisone injections because they had a big fiesta coming up. Some contexts for those of you who don't know what a fiesta is in island terms, it's a big party with lots of good food. Gout is a common form of inflammatory arthritis due to uric acid crystallizations in the joints which causes very painful swellings. And what causes this you might ask, well gout is most prominent in obese patients with diabetes, CKD, and hypertension. Incidents like these drove my interest regarding this project, but why was this problem so common? It wasn't until after taking biological anthropology with Dr. Wall-Scheffler last fall that I realized the strength culture can have on shaping a population. So, I thought, how does culture shape a population's disease management?

After conducting my lit review and clinical interviews, I was able to derive an explanation how culture has a role in a population's disease management and prevention. Culture was found to have a notable impact on the way a specific population is affected by D2 and CKD. The persistence of CKD and ongoing diabetes can be attributed to societal factors that promote unhealthy behavior. CKD, Diabetes, and HTN-HD mortalities

attribute to biological, psychological, family, community, and cultural factors that are 100% more likely to influence the mortality of each disease. When comparing Guam and Washington's culture that influence their health risk factors and disease management and prevention methods, the mainland has more support, resources, and fewer obstacles to overcome. Culture overall plays a big role due to its ability to endorse specific habits that can be adopted by the individual. Personal health behavior, access to quality health care, SAS, and environmental conditions are strongly influenced by the culture you interact with. In a study I found examining the family history of diabetes, awareness of risk factors, and health behaviors, it was discovered that those with a family history of the disease were more aware of the risk factors for the disease and more likely to practice specific healthy behaviors than those without such a history. Having a family history of diabetes is linked to greater knowledge of diabetes risk factors, involvement in diabetes screenings, and adoption of a healthier and more active lifestyle. Therefore, ongoing diabetes and CKD synergetic relationship and persistence can be attributed to cultural factors increasing bad health behavior. Understanding culture in connection to disease burden might help us better understand how an individual's overall life circumstances affect their health in terms of the outcomes related to disease risk. Patients are not simply walking up to the clinic with a specific pattern of health issues and health behaviors. They carry the weight of their daily lives with them, and it can be helpful to understand a patient's situation and struggles — perhaps not to succeed in the upper-middle-class sense, but rather to understand their life situation and increase their quality of care. This study intended to frame epidemiological concepts and findings into a cultural context, but let it also stand as a reminder that the individual has strong ties to the impact of culture. Though many factors are at play, it ultimately comes down to how the individual uses their culture to better their health and to enhance or inhibit the health and well-being of others.

So, *Moving Forward and Looking Back: Negotiating and Honoring Culture to Promote Wellness*. My findings suggest a family-based education program aided by policy in each population's respective healthcare system is necessary for prioritizing patient feedback and care while also accounting for cultural foundations. This lined up very well with my panel. Something I realized after writing my project from a scientific perspective is that I addressed the problem and proposed a solution without any regards to the individual. What I mean by this is culture may have negative effects due to its interaction with an individual and the outcome of their diseases, but culture must be respected without sacrificing fundamental moral principles. This tug-of-war relationship where culture can have negative and positive effects really got my mind wondering: **“How the heck was I going to tie this in with the core of the Honors education mission: What does it mean to be human?”** The perspective I brought to my panel was in through the lenses of healthcare, and how potentially harmful practices can emerge in culturally insensitive interactions. My panel argues that understanding culture is central to all knowledge formation thus essential for policy formation and education. So, in short, from my project's perspective, healthcare can harm the individual as much as it can benefit them.

Now I will briefly integrate my project to the key questions at the heart of the liberal arts education. Information has value and its creation is a process. My project, like most scientific research, aimed to build a straightforward framework with a hypothesis, testing this hypothesis, and having a clear conclusion derived from evidence found. While all the information I just presented to you had value, it was truly the process of this project that allowed me to understand the impact it could have. Research is inquiry where asking and answering leads to more asking and answering. The evolution of my project was very drastic and grueling over this past year. I changed my mind about four different times with this project. I initially wanted to explain why there are healthcare disparities in underprivileged populations compared to higher-income urban areas. This turned into evaluating why Guam is at a disadvantage in healthcare accessibility compared to mainland United States. After many revisions and Dr. Pratt stressing the importance of specificity in your research, I landed on how three diseases affect an island and mainland population due to the culture of each respective region.

Next, authority is constructed and contextual, based on regimes of knowledge and value. For my project the regimes of knowledge explored was healthcare based. Healthcare is a culmination of implementing scientific evidence into patient-based treatment and care. The healthcare industry relies heavily on knowledge consisting of evidence-based testing, diagnoses, and treatments that are expected to be implemented in a patient's best interests. Healthcare disparities are preventable differences in the burden of disease, injury, violence, or opportunities to achieve optimal health that are experienced by socially disadvantaged populations. In the case of my study, healthcare can affect how policymaking and production regimes are organized, and policy has a very distinct effect and influence on healthcare disparities in different regions. This study helped me realize how an approach accounting for cultural influence may be the best way to utilize this regime of knowledge.

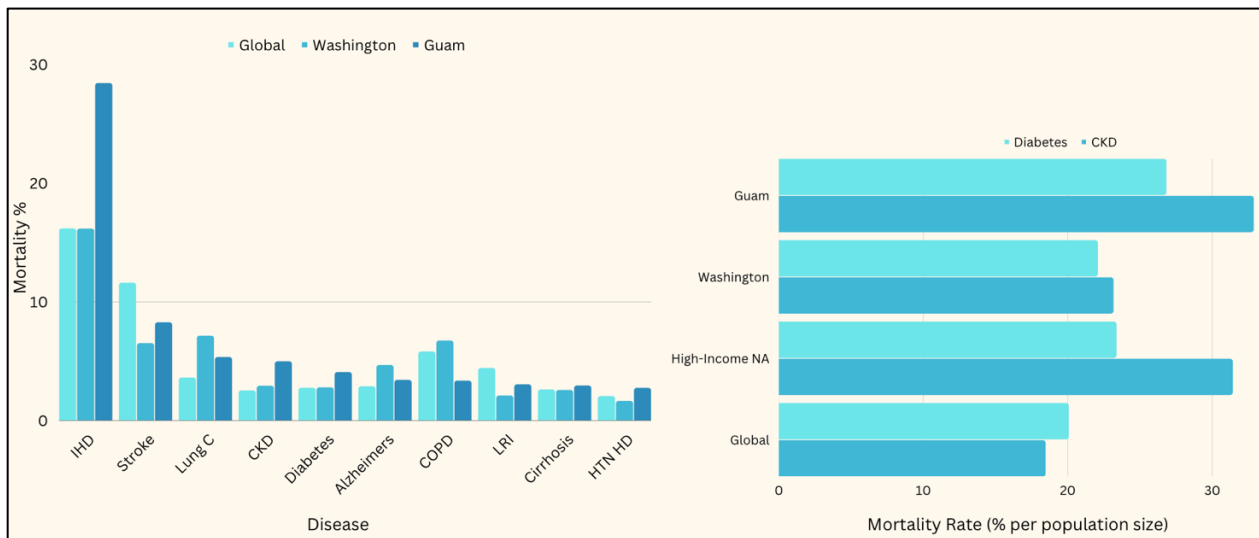
Scholarship is a conversation with the past, present, and future. To tie in with my panel, all our projects were a conversation to help explain our respective theses, but our studies are an intergenerational conversation that need to be expanded and not limited to a particular age or ethnic group. The understanding of culture needs to stem through the entire population to form policy and educational programs that can be used to prevent harm to individuals and communities.

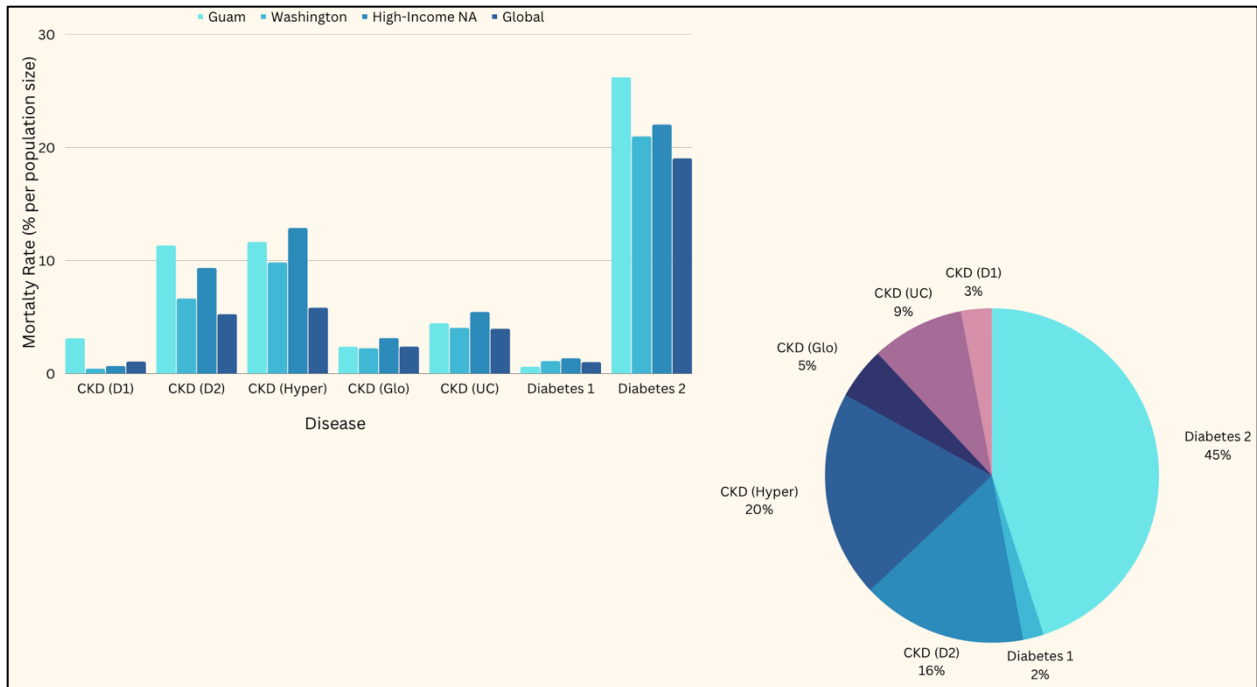
And finally, how has my research helped me answer the question, “What does it mean to be human?” My research in the context of the transcendental greater good can again, be put into context in the lenses of healthcare. As someone who intends to become a healthcare provider, the honors education at its core has provided me with the key foundations of why I want to become a medical professional. It is easy to say, “I want to be a doctor because I want to help people,” but over my four years in this program I have realized, to be human is to make mistakes, to go through many trials and tribulations, to feel pain, happiness, sadness, and anxiety. All experiences that are very familiar to a college student. Honors has

provided me with the understanding of what it means to be human, so that I can enhance the health and well-being of others to the best of my ability. This is something that no STEM class, lab, or scientific journal article could have taught me. My college experience, like my research, used information based in regimes of knowledge and value for an ongoing conversation and process between the past, present, and future of culture’s impact on non-communicable, chronic, and metabolic diseases. I want to continue my research to better understand how culture influences diseases, with the long-term goal of applying my findings in prioritizing patientcare through family-based education to promote health prosperity in island and mainland communities. Culture can uplift and bring down a population’s health, but it all starts with the individual’s decisions. At the end of the day, how you interact and engage with your culture, how you interact and impact others around you, and to exists and function on this earth, is what it truly means to be human.

Before my presentation concludes I wanted to thank Dr. Pratt and Carrie Fry for being instrumental in my creative process during the year-long development of this project. I want to thank my Guam family and FHP Healthcare mentors for providing me with the passion and insights to pursue this project. I would also like to thank Dr. Chaney and the Honors Program, here, at Seattle Pacific University for their patience and guidance, and for providing a platform for me to discuss a topic very personal and dear to my life. Lastly, I would like to thank my dear friend, Philip Galvan, who has recently passed due to his year-long battle with AML Leukemia. Thank you for the impact you made in your short 21-years on earth. You were the living definition of what it meant to be human. This one’s for you pal.

Thank you.





How does culture influence health risk factors of non-communicable, chronic, and metabolic diseases?

EPIDEMIOLOGY OF ISLAND AND MAINLAND POPULATIONS

Jake Thomas Palisoc | May 20th, 2023 | Honors Research Symposium