Kiki Tolles

Ms. Richard

STEM

8 June 2019

W.E.I.R.D. Health

A comprehensive database of population characteristics and health factors among indigenous groups

I. Introduction and Background

The term "WEIRD" has become a bit of a buzzword these days. It's an acronym that stands for western, educated, industrialized, rich, and democratic. And this specific demographic represents the group of people most often researched in human studies. For example, in behavioral science, WEIRD people make up 96% of subjects. In American psychology research, 67% of studies use college students alone as their study example (Henrich et al.). In addition, this demographic is most commonly assessed in anthropological studies, which is the field I studied during this second year of STEM. Anthropology is essentially the study of humans, with emphasis on the biological, physiology, and developmental aspects of humans. Not only is studying anthropology crucial in understanding ourselves, but also understanding our health. However, WEIRD people make up just 12-15% of the world's population, and therefore is not representative of all humankind. And in fact, a study published in 2010 revealed that WEIRD societies are "among the least representative populations one could find for generalizing about humans" (Henrich). What's more, the rise of western, educated, industrialized, rich, and democratic people has only occurred very recently in the span of human evolutionary history. There were two major historical events that enabled the birth of WEIRD people.

The first event was the Neolithic Revolution, otherwise known as the Agricultural Revolution, that began around 12,500 years ago. This was a time in history that most cultures around the world began transitioning from hunting and gathering to agriculture and settlement. Stable food production allowed for the growth of cities and populations to skyrocket. However, the Neolithic Revolution brought about massive changes in diet and lifestyle. Such lifestyle changes were later exemplified by the Industrial Révolution, beginning around 250 years ago, which further encouraged settlement and civilization. The changes in lifestyle happened very rapidly in terms of the human evolutionary scale, and many anthropologists hypothesize that these changes have happened too rapidly for the human genome to have adapted. In other words, there is a "mismatch between our ancient physiology and the western diet and lifestyle that underlies many so-called diseases of civilization, including coronary heart disease, obesity, hypertension, type 2 diabetes, epithelial cell cancers, autoimmune disease, and osteoporosis" (Carrera-Bastos). These "diseases of civilization" are rare to nonexistent in hunter-gatherer and other unacculturated populations.

Thus, there is value in researching indigenous populations with more traditional lifestyles because they represent the lifestyles of all humans for over 90% of our existence. Questions about human health require anthropologists to look at the big picture, which is not feasible if studying only the WEIRD demographic. For such reasons, my STEM project was devised. Under the mentorship of Michael Gurven, head of Anthropology at UCSB, and Thomas Kraft, postdoctoral scholar at the Gurven Lab, I worked to make health data on indigenous populations more centralized and accessible. Specifically, I was tasked with creating a comprehensive database that notated for population descriptors and health factors among these indigenous--more traditional--groups. For decades, doctors, scientists, governments have been collecting in piecemeal fashion bits of data on different populations all around the world. These health records exists in hundreds and hundreds of research papers, books, and journals dating to the late 1800's to just this year. Unfortunately, this health data does not exist all in one place. Therefore, it is very difficult for anthropologists and other scientists to not only access this existing information, but also visualize broad patterns of human health within traditional lifestyle settings. With the database I helped to design, we were able to locate and analyze these research papers, and tabulate their health statistics into a centralized location.

II. Objective

To compile a comprehensive database of population characteristics and health factors among indigenous groups in order to identify patterns and comparisons of human health.

III. Materials and Methods

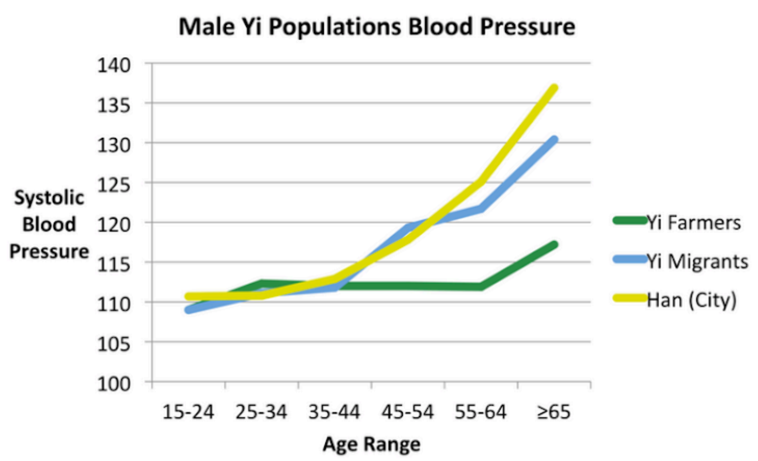
Population information and health data was sourced primarily from research papers in journals of anthropology. The first step in the process, however, was designing a database that could collect and organize certain health aspects and identifiers of indigenous populations. The database consisted of a "master spreadsheet" divided into sections. The first section included population descriptors and identifiers. These are the characteristics that define the culture and lifestyle of a population, such factors that will help draw comparison between different groups later. In this section, we identify the name and location of each population or subpopulation--specifically their latitude, longitude, country, region, and biome. We further characterize a population by taking notes on their acculturation level (level of westernized or modernized influence), sedentary level (nomadic, semi-nomadic, etc), diet staples, and smoking and alcohol habits. Specific identifiers such as study ID, publication date, time frame (when the actual study was performed), and reference source are also notated. The second section of the database is devoted to blood pressure, primarily systolic and diastolic blood pressure. Prevalence of hypertension, pulse pressure, and pulse rate are also included. In the third section, we mark for health factors related to atherosclerosis--which is the buildup of cholesterol and other substances in artery walls that can restrict blood flow and lead to heart disease and stroke. Within this category, we have both prevalence of Coronary Heart Disease and prevalence of Angina Pectoris (a symptom of Coronary Heart Disease), in addition to Maximum Oxygen Uptake. In terms of cholesterol, we notate a bunch of different components: Serum Level (total) Cholesterol, HDL (High-Density Lipoprotein) Cholesterol, Non-HDL Cholesterol, LDL (Low-Density Lipoprotein) Cholesterol, Triglycerides, Apolipoprotein A1, Apolipoprotein B, Lipoprotein (a). Apo-A1, Apo-B, and Lp(a), are all proteins carried in cholesterol that help predict risk of cardiovascular disease. The fourth section looks at diabetes, including prevalence of Glycated Haemoglobin (helps determine average glucose level of past two to three months), Fasting Glucose, 2-Hour Glucose, Insulin, Fasting Insulin, 2-Hour Insulin, Fructosamine, Albumin to Creatinine Ratio, and HOMA-IR (Homeostatic Model Assessment of Insulin Resistance, fasting serum insulin times fasting glucose). In the fifth and final section of the database, we look at anthropometrics, otherwise known as the study of human body measurements. Within this category, we notate weight, height, BMI (body mass index), weight per height ratio, body fat percentage, waist circumference, waist to hips ratio, and triceps skinfold. In each section of the database, all health data is organized by males, females, and age, with a standard deviation value for each dataset. Documentation of the method and instrument (eg. mercury sphygmomanometer) is also recorded for each population study. Once the task of creating the database was completed, the work of analyzing and tabulating the health data from research papers began!

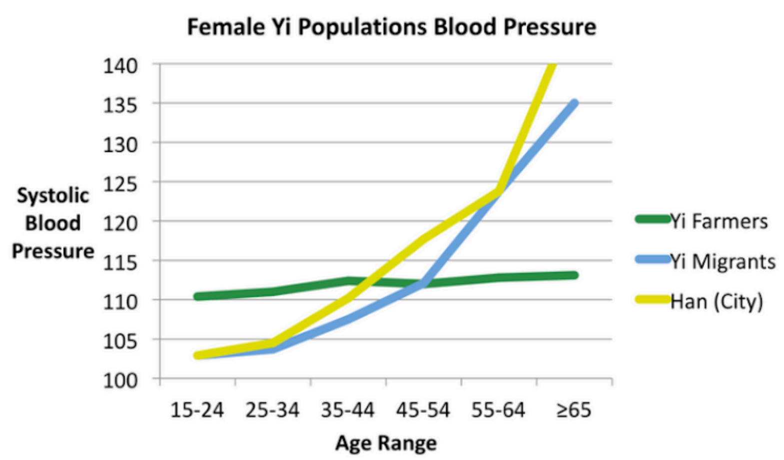
IV. Results

Given the number of existing research papers on indigenous health and given the time it takes to tabulate one paper, the database is not yet completed. So far, we've taken data of almost 100 subpopulations across all continents (excluding Antarctica) from records published as early as 1916 to 2018. While the spreadsheet is a still a work-in-progress, there are many comparisons we can draw to illustrate how the database can be beneficial in anthropological and epidemiological research.

Not only can the database compare health data across multiple groups, but it can also look at divergent health within a population. A case study of a single people can reveal how changing lifestyle habits can alter their health outcome. For example, a paper published in 1991, "Migration, Blood Pressure Pattern, and Hypertension: the Yi Migrant Study" (He et al.) contains the health data of three "subgroups" within the Yi people. The first group are Yi farmers who live in remote mountain areas at an altitude of 1,500 feet or higher. Their economic base is subsistence agriculture and their villages are "isolated from the rest of the world," such that the Yi farmers have "preserved their own language and primitive lifestyle." Based on the research, we know that the Yi farmers are an exceedingly unacculturated group. The next subgroup are the Yi Migrants--people who have migrated from the mountains to Xichang city or county seats (Butuo, Meigu, and Zhaojue) in the least 5 years relative to the study. From the research, we know that this group is at a "transitioning" level of acculturation. Finally, the third subgroup are Han people, who have been residents of Xichang city or county seats for many generations, and thus, very acculturated to a modernized lifestyle.

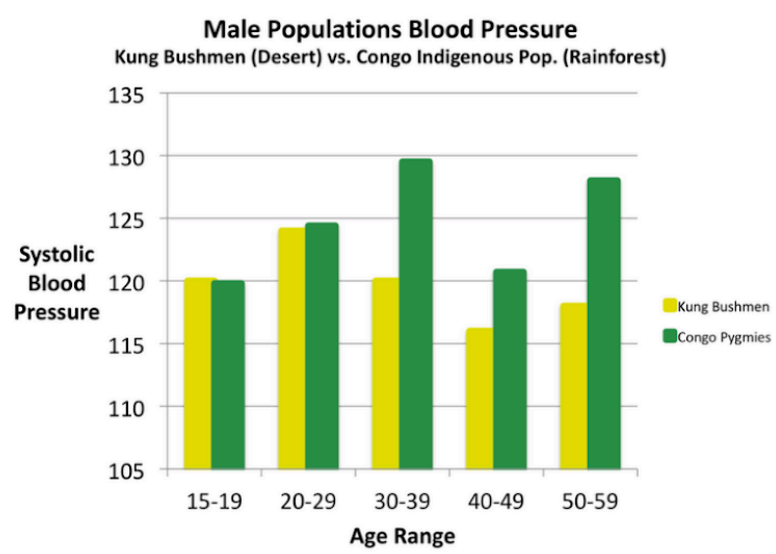
These three distinct levels of acculturation make the Yi Migrant Study a strong case study comparison. This is because all groups come from a relatively similar gene pool, while lifestyle (acculturation level) is the factor that's changing. As one measure of health, we compared the systolic blood pressure across the three groups from ages 15 to 65 years separated by gender.

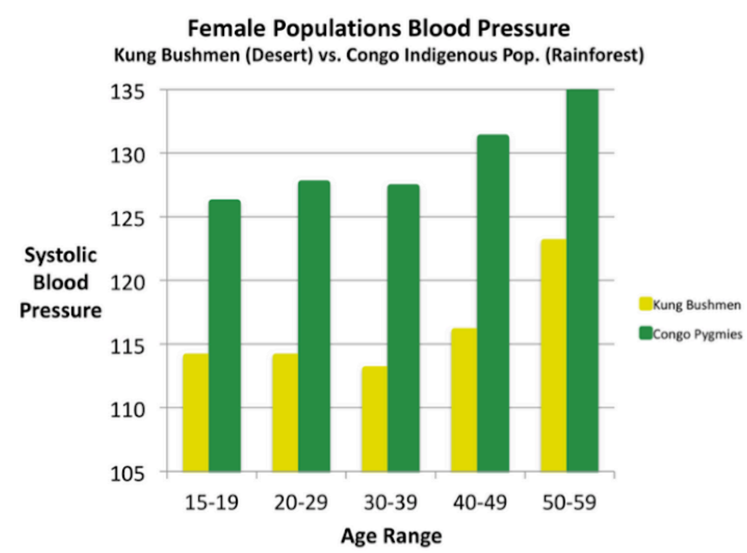




The database can also be used to look at a case study between two different populations. We can compare groups with different economic base, different climate, different dietary staples, and more. For example, a paper published in 1972, "Blood Pressure of !Kung bushmen in

Northern Botswana" (Truswell), considers the health of the Kung Bushmen, while a paper published in 1961, "Cardiovascular disease in African Pygmies: A survey of the health status, serum lipids and diet of Pygmies in Congo," (Mann) covers the health of the Congo Pygmies. Both groups live predominantly as hunter-gatherers. In addition to that, both groups are very unacculturated to modern or western lifestyles at the time of publication. Given these foundational similarities, we might assume that both populations would have near identical health outcomes, at least relative to blood pressure.





When the database is finished, we'll have access to a greater amount of health statistics, making it easier to homogenize the data in order to draw comparisons over multiple populations.

V. Discussion

In regards to graphs 1 and 2, the variance in systolic blood pressure among the Yi farmers, Yi migrants, and Han people over time is significant. Firstly, the Yi farmers (green line) have the most stable blood pressure across their lifetime. For reference, a systolic blood pressure above 120 mmHg is considered "elevated," while above 130 mmHg is considered "high," or stage 1 hypertension. The Yi farmers, the most un-acculturated group, do not even breach the 120 mark. The Yi Migrants, at a transitioning level of acculturation, have the second highest blood pressure. And the Han (city) people, the most acculturated group, have the highest rates of blood pressure, reaching the stage 1 hypertension mark (130) at earlier ages than the migrants. The graphs imply that increasing levels of acculturation lead to increasing levels of blood pressure. This conclusion helps support the notion that westernized lifestyles promote diseases of civilization like hypertension.

Concerning graphs 3 and 4, a significant difference in blood pressure between the Kung bushmen and Congo pygmies can be observed. Looking at the female graph (graph 4) in particular, both groups experience a rise in blood pressure with respect to age, however the Kung are at consistently lower levels. For both males and females, the Kung never surpass 130 mmHg (stage 1 hypertension). While the Congo pygmies (male) are close, only the Congo pygmies (female) breach the “high” blood pressure mark between 40-50 years of age. Despite the underlying similarities between the two groups, their divergent blood pressure patterns is perhaps a result of their different climates. While the Kung bushmen live in a desert biome, the Congo pygmies are in a tropical rainforest. Rather than the climate in itself affecting blood pressure, the difference in climate is influencing the kinds of foods (dietary staples) they eat, and the mobility of they lead. Specifically, the Kung bushmen are nomadic whereas the Congo pygmies are semi-nomadic. The difference in dietary staples and sedentary level are most likely the reason for blood pressure variation between the two groups. The biggest lesson we can learn is that questions about human health don't always have simple answers, as there are countless factors to consider. But, the database we're assembling gives us the opportunity to study health trends and comparisons all around the world.

VI. Reflection

I honestly don't know what to say about the STEM Research Program. I think the biggest thing I want to express is gratitude. While physics, chemistry, and environmental science have all been very interesting courses, this class gave me the opportunity to research something I'm actually very passionate about. So, I want to say thank you to the program, and thank you to Ms. Richard especially.

Some of the biggest takeaways I have from the experience of working with a mentor has been the understanding of what anthropological research might look like during and after college. And in general, it's given me a glimpse of what a career in the sciences might consist of--even though anthropology doesn't take place in a traditional "lab" per say.

The other big thing I've learned is how much work and dedication it takes to accomplish just one bit of research or one project. This understanding has come not only from my own project, but also hearing about the projects of my classmates.

Thinking about my project specifically, the experience taught me so much about anthropology. First, I had the opportunity to learn about different groups and populations around the world, some that I had never even heard of before. The research papers I read were also, in many ways, a window to the past, which was very cool. But more than that, I experienced what makes answering questions about human health so difficult. It's such a challenging area, because it draws on so many different field and it requires so much information and data. "Health" does not look the same for everyone, as factors like lifestyle and environment have major influence. That being said, I now realize the importance of how a database can be used to see greater health trends, and why that's crucial for anthropologists and other researchers.

Works Cited

https://www.dovepress.com/the-western-diet-and-lifestyle-and-diseases-of-civilization-peer-reviewed-article-RRCC

https://www.theatlantic.com/daily-dish/archive/2010/10/western-educated-industrialized-rich-and-democratic/181667/

https://www.theguardian.com/lifeandstyle/2010/sep/18/change-your-life-weird-burkeman

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1601785