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The Correlation between Poverty, Water Quality, Community Health, and Education in Guatemala and
Tanzania

An Honors College Project Presented to
the Faculty of the Undergraduate\
College of Integrated Science and Engineering
James Madison University

by Jessica Renee Besnier

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Accepted by the faculty of the Department of Engineering, James Madison University, in partial fulfillment of the requirements for the Honors College.

FACULTY COMMITTEE:

HONORS COLLEGE APPROVAL:

Project Advisor: Adebayo Ogundipe, Ph.D.
Interim Head, Department of Engineering

Bradley R. Newcomer, Ph.D.
Dean, Honors College

Reader: Justin Henriques, Ph.D.
Associate Professor, Department of Engineering

Reader: Kristen McCleary, Ph.D.
Associate Professor, Department of History

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Abstract

This paper explores the relationship between poverty, water quality, community health, and education in Tanzania and Guatemala. These metrics will allow for a thorough analysis of the relationships between the countries and will determine their impact on the other aspects in these two countries. While Guatemala and Tanzania are very different countries, they share many things in common such as inequalities among different groups, having many different groups of indigenous people, having most people living in rural areas, and are located on a coast. Also, they share similarities regarding poverty, water quality, community health, and education. By looking into these four metrics, conclusions were drawn about technologies and ways of life in these areas. Additionally, after analyzing data and comparing the similarities, differences, and unique aspects, the correlation between these five different factors inspired some ideas on ways to improve rural communities in these countries. One of the goals of this project is to help develop ways to translate lessons learned from different communities and countries to others.

1. Introduction

In this paper, aspects of life in Tanzania and Guatemala will be explored. Focusing on the rural areas in these countries, this thesis explores the relationship between poverty, water quality, education, community health, and overall quality of life in these countries. These countries were chosen because of their differences in location, means of living, lifestyle, demographics, climates, and geographies. By comparing these factors, ideas from one country could be adapted and implemented in the other. Lessons learned in one country could be translated to others with positive benefits. The first section is an overall introduction to the countries and looks into different aspects of the two countries. The second section explores poverty in both Tanzania and Guatemala and offers ideas for improvement. Following poverty, the paper discusses water quality in the two countries and explores ideas in this regard. Next, the paper talks about community health in Tanzania and Guatemala. The final metric looked at in Tanzania and Guatemala is Education. The conclusion section encompasses the paper in its entirety and explores the main points made.

Paper Structure

This paper will be split into five different sections that look into different aspects of life in Tanzania and Guatemala. Each section will have an introduction, information about Tanzania, information about Guatemala, and then ideas to improve the metric in both countries. The five sections are poverty, water quality, education, community health, and quality of life. Each section will dive into specifics and explore these areas.

Tanzania

Tanzania is a country situated along the East African coast and bordered by Uganda, Kenya, the Comoro Islands, Mozambique, Malawi, Zambia, Rwanda, Burundi, the Democratic Republic of the Congo, and the Indian Ocean. In 1964, Tanzania was formed by uniting Tanganyika and Zanzibar. Most of Tanzania is more than 200 meters (600 feet) above sea level. The highest mountain is Kilimanjaro, which is around 5,895 meters (19,340 feet) above sea level (Bryceson et. al, 2020). The capital of Tanzania is Dar es Salaam, which is located on the coast of the Indian Ocean.

Tanzania has a large land area and a population to match that. In Tanzania, as of 2018, 33.8% of the population lived in urban areas while 66.2% lived in rural areas. The population in 2020 was estimated to be 57,797,000 people and the population projection for 2030 is 71,992,000. Over 40% of the population is under 15 years old and the population growth rate remains lower than the world average (Bryceson et. al, 2020). Additionally, the life expectancy for Tanzania is 65.5 years old which is less than the worldwide average of 71 years (Human Development Report, 2021).

There are many diverse groups and languages spoken among Tanzania's large population. The lingua franca of Tanzania is Swahili, meaning that it is spoken by a majority of the country. It is also spoken in primary schools and English is used in governmental documents and higher levels of education. In terms of cultures, there are more than 120 indigenous groups in Tanzania. Sadly, due to globalization, some of these groups are disappearing. There are three religious traditions, and each is represented by about one-third of the population: Muslim, Christian, and Indigenous (Bryceson et. al, 2020).

Guatemala

Guatemala is situated in Central America, a smaller region of Latin America. Mexico lies to its north, and shares borders with Belize in the east, Honduras in the south, and El Salvador in the south. Also, it has coasts on both the Caribbean Sea and the Pacific Ocean. Currently, Guatemala City is the capital of Guatemala. Throughout the country, there are numerous volcanoes including Acatenango, Agua, and Fuego in Antigua, Guatemala. Ranging from sea level to 13,000 feet (4,000 meters), the differing elevations create diverse climates around the country as well.

Guatemala gained independence from Spain in the 1820s. For about 160 years, the country was governed by large landowners—or the oligarchy—and military regimes. It had two populist reformist governments but in the Cold War, land reform looked like communism to the United States who had increasing power in the region. The US with the help of the CIA helped overthrow democratically elected Guatemalan president Jacobo Arbenz in 1954. This was followed by more than three decades of civil war in the nation (1960-1996). During the civil war, hundreds of thousands of Guatemalans fled to Mexico, the United States, and Belize. Currently, Guatemalans continue to emigrate, and this is expected to rise throughout the 21st century (Horst, O. H. et. Al., 2020).

The current population of Guatemala is approximately 18 million and continues to fluctuate as people migrate. As of 2017, 46.2% of Guatemala's population lived in urban areas, and half of these lived around Guatemala City. The other 53.2% lived in rural areas, with most living in the southwest of Guatemala City and the sierras (Horst, O. H. et. Al., 2020). About 44% of Guatemalans identify as indigenous Mayans.

While Spanish is the official language of Guatemala and is used in official documents and formal communication, there are more than 20 Mayan languages. Some of the largest Mayan groups are the Mam, the K'iche', and the Cakchiquel. The preservation of the Mayan language and culture has not been historically valued but this is changing. With a diverse mix of ethnic groups, surprisingly there is one main religion in Guatemala, Christianity. Roman Catholicism is the dominant religion of Guatemala, with around 57% of the population identifying as Catholic. This religious tradition is especially prominent among the Mayans. Currently, Evangelical Protestantism is practiced by 40% of the population and is becoming especially prominent within impoverished communities. About 3% adhere to Guatemala's indigenous Mayan religions. These also tend to be people living in poverty (Horst, O. H. et. Al., 2020).

Guatemala faces incredible economic and humanitarian challenges at present. More than 50% of citizens living under the poverty line which means that they live on less than \$1.90 per day (Horst, O. H. et. Al., 2020). Currently, climate change and drought are also issues that Guatemalans face. The economy of Guatemala is dependent on crops such as coffee, sugar, and bananas, and around 40% of the population works in agriculture. Additionally, about 40% of the population works in the service sector and the remaining 20% works in construction and manufacturing. Since the 1990's more women are beginning to enter the labor force with one contributing factor being urbanization (Horst, O. H. et. Al., 2020).

Human Development Index

The Human Development Index (HDI) is a measure that takes into consideration life expectancy at birth, expected years of schooling, mean years of schooling, and Gross National Income (GNI) (PPP \$). This measurement is used to rank countries into different levels of human development, and the higher the score, the higher life expectancy, years of schooling, and GNI. An HDI greater than 0.8 is considered very high, 0.7-0.79 is considered high, 0.55-0.69 is medium, and under 0.549 is low (Human Development Report, 2021). One downside of the HDI measurement is that it only takes into consideration part of development, and to understand a country better, one should look into more about a country, especially its inequalities.

The Human Development report of 2021 shares a lot of data about the HDI values around the world. The data from this report is also seen in Table 1 below.

Table 1

Tanzanian and Guatemalan Statistics and Comparison from the Human Development Report of 2021 and Global Gross Domestic Product Reports

Metric	Tanzania	Guatemala	Difference
HDI	0.529	0.663	+0.134 (Guatemala)
HDI Rank	163	127	+36 (Guatemala)
HDI increased from 1990	0.16	0.14	+0.2 (Tanzania)
Classification	Low	Medium	
Life Expectancy	65.5 years	74.3 years	+9.8 years (Guatemala)
Moderate or Severe Malnutrition of Children under 5	31.8%	47%	+14.9% (Guatemala)
Expected Years of Schooling	8.1 years	10.8 years	+2.6 (Guatemala)
Mean Years of Schooling	5.8 years	6.6 years	+1.1 years (Guatemala)

School-aged children enrolled in Primary schools	94%	100%	+6% (Guatemala)
School-aged children enrolled in Secondary schools	29%	53%	+24% (Guatemala)
School-aged children enrolled in Tertiary schools	4%	22%	+18% (Guatemala)
Population in Multidimensional poverty	55%	29%	+26% (Tanzania)
Population living with HIV/AIDS	4.6%	0.4%	+4.2% (Tanzania)
Population classified as obese	8.4%	21.2%	+12.8% (Guatemala)
GDP	\$63.18 billion	\$85.3 billion	\$22.12 billion (Guatemala)
GDP Spent on Education	3.7%	2.9%	+0.8% (Tanzania)
USD Spent on Education	\$2.34 billion	\$2.47 billion	+ \$ 0.13 billion (Guatemala)
GDP per capita PPP	\$985.50	\$8,637.56	+\$7652.06 (Guatemala)
Population	59,734,218	18,139,148	+41,595,070 (Tanzania)

In Tanzania, the HDI is 0.529, and it is ranked at 163 out of all the countries (with data) in the world. Even though this is ranked as low, their value has increased by 0.16 since 1990, meaning that there has been an increase in Human Development. Their ranking is low for many reasons including, but not limited to low life expectancy, child malnutrition, low mean years of schooling, low rates in higher education, and overall poverty. Of kids under the age of 5, 31.8% have moderate or severe malnutrition, meaning a lot of children do not get enough nutrients to survive. While there is an average of 8.1 years of expected schooling, the mean years of schooling is 5.8 years, showing that most do not complete the expected education. Of school-aged children, 94% are enrolled in primary schools, 29% are enrolled in secondary schools, and

4% are enrolled in tertiary schools. Children are expected to work and provide for their families after primary school. Over 55% of the population is in multidimensional poverty. (Human Development Report, 2021) Multidimensional Poverty is used instead of traditional poverty, because not only is monetary poverty a significant factor, but also relational, spiritual, communal, and other types of poverty (Bourguignon and Chakravarty, 2019).

Guatemala's HDI is 0.663 and ranks at 127. Since 1990, their HDI has increased about 0.14, showing that they are also improving in their Human Development. Currently, in Guatemala, the life expectancy is 74.3 years, which is higher than the world average. For children under the age of 5, about 47% of the population has moderate or severe malnutrition. The expected years of schooling in Guatemala is 10.8 years and the mean years of schooling is 6.6. For school-aged children, 100% are enrolled in primary schools, 53% in secondary schools, and 22% are in tertiary schools. In Guatemala, 9% of primary schools have access to the internet. About half of the population lives in urban areas and around 29% are currently in multidimensional poverty (Human Development Report, 2021).

When comparing overall metrics between Tanzania and Guatemala, some are similar, and others are drastically different. Overall, the human development index is 0.134 higher in Guatemala (0.663) than Tanzania (0.529) and ranks 36 places higher (127 and 163 respectively). Guatemala has great human development metrics than Tanzania, according to this index. The life expectancy in Guatemala is around 9.8 years longer than the life expectancy in Tanzania. In Guatemala, it is 74.3 years old, and it is 65.5 years old for Tanzania (Human Development Report, 2021).

In Tanzania, people are a lot more likely to die due to disease, poverty, food access, and health care (Human Development Report, 2021). Life expectancy is not the only metric that is higher in Guatemala. People who live in Tanzania are 11.5 times more likely to be living with HIV/AIDS, for 0.4% live with it in Guatemala compared to 4.6% in Tanzania. In contrast, obesity is significantly more prominent in Guatemala with 21.2% of the population being classified as obese and only 8.4% in Tanzania. This is due to the diets of Guatemalans, which consist of primary rice, beans, and tortillas. Although this has been considered a healthy diet in the past, this diet and lack of exercise contribute to obesity. Interestingly, in children under five years old, malnutrition (moderate or severe) is 14.9% higher in Guatemala (46.7%) than in Tanzania (31.8%) due to the difference in nutrients in the diets.

The Guatemalan GDP was 85.3 billion USD in 2019 and 63.18 billion USD from Tanzania (Guatemala GDP, 2020, and Tanzania GDP, 2020). In 2020, the Tanzania population was recorded to be 59,734,218 compared to 18,139,148 in Guatemala. (Guatemala GDP, 2020, and Tanzania GDP, 2020) The GDP per capita PPP in 2020 is as follows for Tanzania and Guatemala respectively: \$985.50 and \$8,637.56 (Guatemala GDP, 2020, and Tanzania GDP, 2020).

The expected years of schooling are 2.9 years higher in Guatemala than Tanzania, with 10.8 years expected in Guatemala and 8.1 years in Tanzania. More students are expected to stay longer in Guatemala, and this is due to better schools, less need for children to work to provide income for the family, and resources available to people. In further regard to education, the Tanzanian government spends 3.7% of their Gross Domestic Product (GDP) on education compared to 2.9% from the Guatemalan Government (Human Development Report, 2021).

Although this may look like Tanzania is spending more on education than Guatemala's GDP is significantly higher as seen in the previous paragraph. In Guatemala, the gross enrollment in primary, secondary, and tertiary schools is 100%, 53%, and 22% respectively. In Tanzania, the gross enrollment rates are 94%, 29%, and 4%. These reveal that more of the school-aged children in Guatemala attend and stay in school longer than their Tanzanian counterparts.

2. Poverty

Introduction

Those who are impoverished are defined as "those whose consumption is below the national poverty line and who therefore are not able to meet their basic consumption needs" (World Bank Group, 2020, p6). When most people think of poverty, they usually discuss it regarding dollar amounts and quality of life. Some other criteria for poverty assessment include access to education, access to medical treatment, electricity, food availability, and access to clean water and sanitation. Multidimensional poverty considers all of these other factors and recognizes that poverty is not just about income. By looking at education, healthcare, and living standards, along with income, multidimensional poverty works to properly assess different conditions.

Today, there are a significant number of people in multidimensional poverty: around 1.3 billion people, or 22% of the world's population (Peer, 2021). According to the Human Development Index in Guatemala and Tanzania, they both have high rates of poverty. As stated in the introduction, 28.9% of the population of Guatemala and 55.4% of the population of Tanzania are in multidimensional poverty (Bourguignon and Chakravarty, 2019).

Around the world, around 10% of the world is in extreme poverty, meaning people live on less than \$1.90 per day. Although this has significantly improved since 1990 when the rate was 36%, it is still around 700 million people that live in extreme poverty today. Most of this poverty is in Africa and the Middle East (Peer, 2021). Sadly, as a result of the COVID-19

pandemic that started in 2020, poverty rates around the world are likely to increase. This will be the first increase in these rates since 1990.

Tanzania

Although there has been incredible economic growth and a decline in poverty in Tanzania in the past ten years, the population grew much more than the poverty rate declined. Therefore, although the percentage of the population that is impoverished decreased, the number of people in poverty increased. In 2007, the poverty rate was 34.4% and in 2018, it was around 26.4%. During this time, extreme poverty fell as well, from 12% to 8%. Over this time, rural poverty decreased quicker than urban poverty, which is understandable because there is a significantly higher amount of the impoverished living in rural areas (World Bank Group, 2020, p4).

Those who are impoverished do not have the necessary resources to provide for improved living conditions, electricity, or clean water. Once a person is in poverty, they struggle to get out and are not able to provide for themselves or their families. There are many contributing factors to the reduction of poverty in Tanzania. One of these is the improvements in living conditions. While a majority of the country does not have access to electricity, access to electricity in Tanzania has increased. Around 29% of Tanzanians have access to electricity. In rural areas, this number drops to 10% and only 7% of poor households. If electricity around the country was improved, poverty would most likely decrease. Another factor to improve poverty is improving access to clean and safe drinking water, especially in rural areas. Sanitation has also improved drastically in urban areas but is still an issue in other locations. Household living standards have increased due to the increased access to roads and public transportation (World Bank Group, 2020, p8-16).

In 2018, around 49% of the population (26 million people) made under \$1.90 per person per day, which is the international poverty line. Currently, there are a significant number of people living just above \$1.90 per person per day that are at risk of falling below the poverty line. According to the World Bank Group, a 10% increase in GDP growth per capita is supposed to reduce the proportion of the poor by 4.5% in Tanzania, which is very low compared to other developing countries. A main contributing factor to this is that the quickest growing subsectors employ less than 3% of the entire population. Additionally, these companies only employ those who have finished and passed their secondary education. Only 29% of students this age are enrolled in secondary school (Human Development Report, 2021). As a result, it is nearly impossible for those stuck in poverty to gain upward mobility and break the cycle for future generations (World Bank Group, 2020, p4).

Even with remarkable economic growth, inequality across the country has gotten worse. Similarly, much of the population stays around the poverty line— some right below and some right above. Both of these groups have the chance to fall above and below the poverty line. For those that can escape poverty and stay above the poverty line, agriculture and trade provide the main routes (De Weerd, 2009).

As previously mentioned, inequality across the country has proven to be a large issue. For example, there has been poverty "as high as 45% in Rukwa to as low as 8% in Dar es Salaam" (World Bank Group, 2020, p34). This shows that the urban-rural divide is significant, as Rukwa is rural and Dar es Salaam is urban. Those who live in rural areas are more likely to experience poverty than those who live in urban areas. As previously stated, this divide continues to grow, and the lack of resources available to most rural areas contributes to this inequality. Additionally,

climate across the country has proven to be a driver of inequality. Poverty is more prevalent in tropical savannah zones because of the quality of the soil in that area which leads to low agricultural yield and subsequently fewer means for income.

One reason it is hard for the poor to get out of poverty is because they tend to have lots of dependents. Of households with five or more children, 44% are considered under the poverty line. Additionally, in urban areas, households with a man in charge are less likely to be poor than those with women as the head of the household. It is more likely for women to be poor due to less education and access to jobs than men. Subsequently, there is less access to jobs for those who are poor, usually because of a lack of education from an early age. Children usually have to stop going to school to help generate income for their families. Even when they do go to school, they tend to be very distracted and fall behind on schoolwork. The poor have substantially fewer resources than those who are not. The poor do not have as much access to community services, such as clean water supply, health clinics, roads, and electricity. Based on this, 90% of poor households use firewood and charcoal for cooking, and 90% have either no sanitation facilities or do not have improved sanitation facilities (World Bank Group, 2020, p4). All of these are reasons that there are high poverty levels in Tanzania and why those in poverty have a difficult time escaping it.

Guatemala

The poverty rate in Guatemala is over 50%, meaning that over half of the population does not have sufficient resources to provide for its needs. There are two main categories of poverty in Guatemala: poor and extremely poor. Those that are in extreme poverty live on less than \$1.90 a day. Poverty is very difficult to escape, for the same patterns happen year after year (Mangrum, 2019).

In Guatemala, there is a large divide between the indigenous and nonindigenous people in earnings within the labor market. This is largely due to the resources available to these two different groups and historical discrimination against indigenous peoples there. Some resources include electricity, roads, clean water, good infrastructure, job centers, and factories. Additionally, the indigenous Mayans and those that do not speak Spanish have very limited access to education. A large majority of the indigenous population lives under the poverty line (Mangrum, 2019). Although there are many differences within the indigenous groups, they are grouped in this divide because of the inequality between the two large groups (indigenous and non-indigenous). A case study (Patrinos, 2002) was conducted to determine the returns of schooling among different indigenous groups and non-indigenous people. In this case study, they determined that one of the indigenous groups, Mam, had very high returns to their schooling and investments at "10.4%, which is very close to the estimate for Ladinos, at 10.5%," thus showing that not all of the indigenous groups had significantly lower returns (Patrinos, 2002, p. 815). On the opposite side, the Quiche had low returns at 5.4% (Patrinos, 2002, p. 815). One of the explanations for this divide is discrimination among different indigenous groups. Secondary education in Guatemala is seen as a luxury. Primary school enrollment is fantastic, at 100%, but the rate of those in secondary education falls drastically. Lots of youth and young adults work to

help provide for their families, and a majority of them cannot get a stable job because of a lack of technical skills and education (Mangrum, 2019).

One distinct group that struggles with poverty is those with a disability. In the world, about 15% of the population has a disability. Based on this, 80% of those with a disability live in low- and middle-income countries (Pinilla-Roncancio, et al., 2020). Individuals with disabilities have a greater chance of becoming impoverished due to the limited employment options, little opportunity for socialization, and little opportunity for proper education. Those who have disabilities or are in a family with someone who does have a more difficult time getting out of poverty. A result of being impoverished is that those with disabilities are deprived of employment, social benefits, and school attainment. Some additional issues that Guatemalans with disabilities face include discrimination, transportation barriers, social opportunities, occupation, school attainment, proper housing, access to sanitation.

Another aspect that plays into poverty is the overall economy of the nation. In Central America, Guatemala has one of the lowest national budgets. With this, there is a lack of funding for services such as hospitals, police, housing, schools, and government-subsidized loan programs (Sica, 2019). The national budget is determined by a lot of different factors, including their GDP. As the US is the main importer of Guatemalan goods, a lot of the Guatemalan economic well-being depends on this relationship. Some of these exports include coffee, tea, spices, fruits, nuts, clothing, sugar, minerals, and oils. There is an increasing reliance on exports for their overall economic performance. As a result of most of the top exports being from the agriculture industry, farming is a livelihood for many Guatemalans. Their farms are the sole source of their income, for farms are passed down in families. Those who do farm have limited opportunities for other jobs and "those whose parents lived in poverty remain trapped in poverty"

(Mangrum, 2019). Although it is a cycle, farming does prove to be a way of life for lots of the population, especially in rural areas.

Wealth across Guatemala is distributed unequally, with cities much wealthier than the rural areas. Large cities such as Guatemala City, Antigua, and Xela are significantly better off than small towns and villages across the country (Mangrum, 2019). This urban-rural divide plays a large role not just in poverty, but in other aspects such as education, health, and water quality as well. Not only are those in rural areas often overlooked, but they also do not get to experience the same opportunities that their fellow Guatemalans do in cities and towns. Overall, poverty in Guatemala is an issue and the root issue of numerous other problems.

Ideas for Improvement

To eradicate poverty, structural transformation is needed. More jobs are needed to create productive work for the impoverished. In terms of productivity, miners, transport, and trade prove to be some of the best jobs and sectors in Tanzania. There is a lot of opportunities to create more jobs in larger companies. Something that remains an obstacle is not enough access to finance. People who are trying to start businesses rely on familial and informal funding which has created barriers to entry. There is also very little availability of loans for informal businesses which makes it difficult for families to start businesses. To improve economic opportunities for everyone, economic growth is needed (World, 2003). For individuals to get out of poverty, they need opportunities provided to them. Some of these opportunities include work, education, health, housing, land, social capital, and financial assets. Usually, these resources are unequally distributed and those who are impoverished get less than those who are not. Opportunities and wealth congregate where the other is present. To make opportunities and wealth more spread evenly, it is important to focus on creating opportunities in rural and impoverished communities.

There are many options for policy to improve in both countries. One example of this is to work with larger families and work with them to educate and provide them with resources to equip their families. Education for girls is another area that needs to be improved to diminish poverty. Access to education from girls past the primary level is not provided across both nations. Resources such as electricity, clean water, proper sanitation, and roads can reduce poverty, but they are currently rarely available in rural, impoverished areas. If access to these resources was improved, rural poverty would decrease.

Another idea for Tanzania and Guatemala is the idea of microfinance. Microfinance is an attempt to eradicate poverty that is utilized around the world in attempts to provide loans to individuals in poverty (Sica, 2019). In general, larger corporations have more access and an easier time getting loans than small businesses. In Guatemala, more than 60% of the economy is made up of small businesses (Babb, 2019). The goal of microfinancing is to break the cycle of poverty by providing people with a loan to get a business started. There are many ways to do this. One way is through community circles where everyone brings a few dollars and each month or year they give it to one person and that person uses the money to invest in products to create a business to generate revenue for themselves. Another way microfinance loans can work is through Non-Governmental Organizations that provide these loans and payment plans to individuals in need. Banks could provide loans, but the interest rates on the loans are usually hard to pay back (Babb, 2019).

Empowerment is beneficial for everyone, especially for those who are in poverty. People in these situations have no voice and are often overlooked. In society, they are ostracized, discriminated against, and ignored. Even if their opportunities are provided to them, workers usually alienate them. Therefore, equality must be enforced by strengthening the democratic process.

3. Water Quality

Introduction

Clean water is a problem around the world. Hundreds of thousands of people die every year from poor water, more specifically, "every two minutes a child dies from a water-related disease" (Water Crisis, 2021). Water quality is measured by using different measurements such as bacteria levels, the concentration of dissolved oxygen, amount of salt, amount of material in the water, and other measurements (Water Crisis, 2021). Poor water quality occurs when any of the measured levels are above the safe range. Water quality continues to deteriorate due to an increase in industrial and agricultural production and climate change. One of the biggest water quality issues is eutrophication, which results from agricultural runoff, sewage, affluence, and fires. Interestingly, more people die from contaminated and unsafe water than from war every year. The largest number of people without clean drinking water is in sub-Saharan Africa.

In 2017, over 785 million people did not have water service, meaning a way to treat water from contaminants. In this same year, over 2 billion people drank from a water source that was contaminated with feces because of this lack of water services. The main issue with contaminated water is that it can transmit and cause diseases. Some of these diseases are typhoid, dysentery, diarrhea, and cholera. Every year, 485,000 deaths are caused by diseases from contaminated drinking water. Even if there are water services currently in place, if they are not managed correctly, diseases can still be present in the water. Poor water quality is a large issue. When poor hygiene is added to the mix, more diseases and infections are

present. Unsafe hand hygiene, sanitation, and water lead to even more deaths with around 829,000 people dying from unsafe practices (Yamaguchi, 2019).

Another issue is that in less-developed countries, over 1/5th of health care facilities have no waste management, sanitation, or water services (Yamaguchi, 2019). With improper sanitation measures, thousands of people are getting diseases from those who are already sick. These infections could be prevented by proper hygiene and sanitary measures.

Tanzania

Historically, Tanzania has struggled with water quality. The Tanzanian government first created a Rural Water Supply Program in 1971 that was a response to bad water quality in poor and rural areas of the country. This program did not work because of the lack of enforcement and another policy, The National Water Policy, which was implemented in 1991 but was unsuccessful. The water issue got so severe that the World Bank came into Tanzania and threatened to take away the country's funding if it did not work to improve its water. As a result of this threat, there have been significant improvements in providing access to clean and safe water. Since 2000, the percentage of those without this access has been halved and continues to decrease. Although it has improved, over 4 million people in Tanzania lack access to safe water, and over 30 million people lack access to improved sanitation. In a country where the population is 57 million, these statistics are astounding. That is over 1/2 of the population that do not have access to improved sanitation (W, n.d.). Without improved sanitation, diseases and illnesses are more likely to spread quickly.

Waterborne illnesses spread rapidly across the country because of the low water quality and the lack of toilets. Having a lack of toilets means an increase in those who use the bathroom outside or open defecation. In Tanzania, around 12% of the population practices open defecation (WASH, 2020). This lack of toilets and open defecation has caused lots of contamination to the water supply (Snyder, 2019). The fecal matter from these actions gets washed into bodies of water where people get their drinking water from. Even when there are latrines or improved sanitation, sometimes the water and bacteria still get into the water table because of inadequate construction. This is one of the main contributing factors for waterborne disease and illness.

To collect water, most people in communities must walk to bodies of water. Women and children can spend hours a day walking to and from water sources to collect water. Most of them spend at least 30 minutes one way walking to a water source. This time spent getting water for daily use impairs school-aged children, for they are not attending classes and getting a proper education. Not only does collecting this water prevent the children from escaping poverty through education, but the water they collect may also be contaminated and unsafe to drink.

Although access to clean water is a significant issue, so is practicing proper sanitation. Almost the entire population does not currently practice proper sanitation. Hand washing, for example, is critical to staying healthy and it is impossible to properly wash your hands without water and soap. Over half of the population of Tanzania does not have a reliable source of clean water, soap, or a place to wash their hands (WASH 2020). In Ethiopia, families are building "tippy taps" as a means of handwashing which is slowly being brought to Tanzania. By having a simple and cheap design, tippy taps are easy to make and use. All that is needed is a plastic container, a candle, a nail, a string, a tin can, a net, and water (CDC, 2003). There is potential to spread this technology across the country and drastically improve the access to sanitation.

Guatemala

In Guatemala, tap water is unsafe to drink. Access to clean water and improved sanitation is a luxury. In order to drink water, it needs to be filtered to prevent parasites and disease. Flush toilets are also not common, especially in rural communities. According to Water for People, a majority of Guatemala's water systems are considered in partial or complete failure, meaning that even though they have the infrastructure, it is not adequately working (Mangrum, 2019).

Currently, Guatemala has been struggling with its water quality due to droughts. The drought has caused lots of issues with water quality including less access to clean water and waterborne illness spreading rapidly around the country. The drought has the largest effect in rural areas, for there are lots more stagnant bodies of water which unfortunately increase the spread of disease. People are also open defecating in Guatemala which is negatively impacting the bodies of water by spreading these diseases.

Diseases are prevalent in water in Guatemala. A study was conducted in 2019 that assessed household water quality through different Peace Corp volunteers in Guatemala. This study was conducted because the most common health concern with Peace Corp Volunteers in Guatemala has been Gastrointestinal illness. In most houses that Peace Corp Volunteers stay in, there are different types of water: primary drinking water and secondary drinking water. The study found that when people consumed water from the primary drinking water source, the rate of Gastrointestinal disease decreased. One reason for this was that "nearly one-third of all secondary water samples tested contained E. coli and nearly all (93%) had an FCR <0.2 mg/L" which shows that the waters are not up to Guatemalan Governmental Standards and provides a

reason for why disease and illness are high (Murphy et al. 2019). It was also found that the chlorine levels and other elemental levels were not up to the country's health standards.

While there are still significant issues in water quality, in the past 10 years, Guatemala has been making incredible strides in improving access to clean drinking water (Yamaguchi, 2019). Many NGOs and other organizations are putting in place different measures and resources to work on improving the quality and safety of drinking water. These measures include installing proper water filters in the home, educating the community about water quality, and working on improving the overall water infrastructure of the company.

One issue that remains is the political drive to change the water issues. Currently, there is low political will, poor investment in water infrastructure, low community participation, and a lack of institutional development. Another large issue is the upkeep and maintenance of current water systems, for, as previously stated, most systems are outdated and damaged. Another issue is that impoverished families are unable to afford proper water infrastructure. With the country not prioritizing fixing the infrastructure and the high cost of personal water filters, there is a lot that needs to be done to combat this water quality issue.

Ideas for Improvement

In Guatemala specifically, one way to make sure that municipalities have proper upkeep for their systems is by creating firmer regulations and regulatory frameworks through improving government policies and regulations. An issue with this tends to be funding and enforcement in both countries. To improve water quality all over Guatemala, the water institutions need to be reformed and improvements need to be made. When creating new infrastructure, it is important that it is sustainable and will last through normal wear and tear. Creating standards that are sustainable and universal is paramount to the success of these structures. Tanzania can also benefit from creating better infrastructure around the country. In most of Guatemala, these services are in place, but in Tanzania, they are only in place in urban areas.

Some practices that could help improve water quality and sanitation would be implementing and practicing hand washing. Especially in Tanzania, Tippy taps are easy, cheap, and an effective technology that can be built and used to wash hands. Also, latrines and other toilets must be built and used to stop the open defecating that has been happening. Some communities do not have adequate water filters so potentially creating different methods or a way to filter an entire section of a river or lake would be useful. Proper sewage treatment facilities could also drastically improve water quality in bigger cities.

In both countries, there are huge markets for different water products. With this, there is a strong opportunity to open businesses and work in this sector. By capitalizing on the expansion of these sectors, community members can create markets for this and work to make different products affordable and widespread. Although this would take a considerable amount of work, those who decided to get into this industry could reap the reward. Additionally, this could also

help reverse the cycles of poverty by providing income to those who need it while also working to improve another important issue: water quality.

4. Community Health

Introduction

Every year, paying for health care causes over 100 million people to fall into poverty (Shah, 2009). There are many issues in health care around the world, and most of these revolve around inequality, including education, poverty rates, and gender. In all countries, those who are poor often either do not have access to proper health care or if they do, it is most likely going to be severely under-resourced. Over one billion people around the world do not have health care (Shah, 2009). Developing countries work to provide universal health care but cannot usually do so. Those who are in poverty cannot afford proper health care and usually, the facilities they go to, especially in rural areas, are inadequate and do not aid them in getting better or preventing them from getting diseases.

In addition to the lack of health care, poor system design and lack of attention or care in creating facilities and systems have led to poor safety and hygiene standards. Especially in low-income countries, there are high rates of hospital-acquired infections and other avoidable errors. Hospital-acquired infections result from improper sanitation techniques and practices. These infections cause death and poor health to many.

Another common health issue is malnutrition. One way to look at the health of a country is to look at its child mortality rate. In low-income countries, the child mortality rate is significantly higher than those of middle- and upper-income countries. These high child mortality rates come from a lack of nutritious food that is being fed to children. A majority, if not all, of those who are malnourished, are impoverished and do not have adequate money to purchase good, nutritious food. In both Tanzania and Guatemala, malnutrition in children is a large issue. Those who are

impoverished focus on getting food for their families, not about what is in the foods or the nutrients they need. Just like in the United States, nutritious food costs more money.

Malnutrition is not the only health issue that has profound negative effects. Around the world, millions of people die each year from different diseases. The number one deadliest disease in the world is heart disease, followed by stroke, and respiratory infections (Healthline, 2017). Without immunizations, people around the world can get the same diseases multiple times. Developed countries have more access to proper preventative measures, hospitals, proper treatment, and educated doctors. On the other hand, developing countries lack basic access to these resources. Most of the diseases in developing countries could be prevented with adequate resources.

Tanzania

Recently, Tanzania has seen some improvements in its healthcare system. Even with these improvements, the healthcare standard in Tanzania is still poor. There are few medical workers and many of the facilities are underfunded and do not have adequate resources or technology. Outside of urban areas, medical facilities are limited, leading to a division in health care between public and private. Public health care is often far below the standards, so those who can afford it always choose private. Even pharmacies in major cities are in short supply of a lot of medicines, further revealing that the country lacks adequate medical resources (Expat Arrivals, n.d.).

While there are shortages of adequate medical help and treatment, disease and illness are apparent throughout the country. Parasites and water-borne illnesses are prevalent throughout communities in Tanzania. A study was conducted that looked at the health of children in a rural Tanzanian community. It focused on parasites. 170 children were followed for three years and less than 11% of the children were parasite-free every year. None of the children in the study stayed free of parasites throughout the entire three-year study period. By looking at this study, one can begin to understand the severity of illness and diseases in Tanzania (Tanner et al., 1987).

In Tanzania, some of the top causes of death are neonatal disorders, respiratory infections, HIV/AIDS, heart disease, tuberculosis (TB), and malaria. According to the world atlas, in 2017 the leading cause of death was HIV, which was responsible for 17% of deaths. HIV is more prevalent in women for many reasons. One is gender inequality and females are sometimes unable to ask for safer sex with their partners. On the flip side, around 90% of the population knows where they can go to get tested for HIV (Sawe, 2017). Another leading cause of death is respiratory infections. Lower respiratory infections accounted for around 11% of deaths and

malaria accounted for around 7%. Being the leading cause of death in children under five years old, malaria poses a huge risk. One reason why is that Tanzania is geographically in a tropical region where mosquitos are present. Some of the main diseases and areas that people are working to improve in Tanzania are HIV/AIDS, malaria, and tuberculosis. Malaria, TB, HIV/AIDS have all improved over the last decade due to increased awareness and prevention measures.

When looking at food consumption, maize, rice, and cassava are some of the main foods eaten by the Kikwawila village in Tanzania. Fish is also eaten. Based on the eating habits, it was noted that Men ages 10-60 had large energy deficits (Tanner et al., 1987). This is due to the nutrient deficiencies in the common cuisine of Tanzania.

Guatemala

Healthcare in Guatemala theoretically is universal yet, many people around the country fail to get the help and treatments they need. In 2020, Guatemala "had the fourth-highest rate of malnutrition" out of every country person (Philipp, 2020). For Healthcare, the Guatemalan Government spends around \$97 per person whereas the United States spends about \$7,825 per person (Philipp, 2020). A significant difference between the two countries is that in the United States, healthcare is not a right whereas in Guatemala it is considered something everyone has. Around the country, Guatemalans do not have adequate resources to provide for the needs of their country. There are not enough medical staff, medical supplies, facilities, or enough resources to fund the existing healthcare workers. With over 80% of doctors and medics being centralized in Guatemala City, those who live in rural areas must travel if they need specialized care. A majority of the people that need these services cannot afford to travel to the city and potentially miss out on a day or two of work. As with any country, rural areas do not have nearly as many resources, if any, as centralized urban locations.

In Guatemala, the most common causes for death are lower respiratory infections, heart disease, diabetes, interpersonal violence, and kidney disease. Some risk factors that contribute to these diseases (and ultimately death) are malnutrition, high fasting plasma glucose, alcohol use, air pollution, and high body mass index. Some of these risk factors are due to diet and obesity, resulting from lack of exercise and unhealthy diets.

Increasing gang violence might also be understood as a health risk in Guatemala. When one gets involved with a gang, there is a much higher likelihood that they will get injured or killed. Additionally, Guatemalans have a patriarchal, male-dominated society where women do not

have a lot of power. Gender inequality is prevalent in domestic abuse and rape, which are both widespread throughout the country.

In Guatemala, type two diabetes is one of the biggest health issues. Being overweight, obesity, and physical inactivity are all large concerns in Guatemala that contribute to the rising number of people that have diabetes (Mangrum, 2019). There are many obstacles to having proper nutrition and exercise in Guatemala.

While poor nutrition affects more than just adults, the child mortality rate has significantly decreased, over 40%, in the last 30 years (Guatemala, 2017). Some of this is due to discoveries and changes in educating mothers about properly taking care of their babies. Malnutrition is also improving, and this also contributes to the decreasing of child mortality rates. Although they are improving in this area, there is still a long way to go.

Ideas for improvement

For both countries, attention and money need to be invested in the healthcare systems. Without adequate doctors, nurses, and medical personal, no facilities can run. Investing in education is one of the first steps to making this change. By getting more school-aged kids the necessary education to become a doctor, nurse, or other healthcare personal, there will be more of these professions. Educating people also allows them to take preventative measures to avoid spreading or contracting contagious diseases. The next step is to increase governmental and NGO funding for these facilities. It is important to place them in rural and accessible areas, for that is where the most need seems to be in both countries. Without adequate resources, people will not be able to care for or provide care for others.

Vaccines and immunizations need to continue in both countries. For some diseases, this is the best way to protect people from them. These preventative measures cost lots of money but are one of the best ways to ensure health and safety to the masses. Everyone should have access to essential health care services. Some things included under this are clean water, better sanitation practices, and vaccine coverage.

As a result of the unequal distribution of resources, the poor have significantly fewer health benefits. They also have a higher likelihood of getting different diseases. One way to improve this is to target those who could be eligible for cheaper healthcare and provide proper education about it.

5. Education

Introduction

Education is necessary and used around the world. Through education, people, usually children and young adults, are taught academic knowledge, skills, and information. Every country has some type of education system, but these different systems vary. Resource allocation in different countries plays a key role in why there are different systems worldwide. One key factor is how much money the country is and what resources the country has. For countries that have high poverty rates, education is not their primary concern and that is noticeable with the money and time spent on this system.

Education accesses and involvement has been and still is an issue around the world. Currently, over 72 million children that should be in primary school are not (Humanium, 2018). The reasons for this vary, but poverty and resource access play a key role. The most impacted area in the world is Sub-Saharan Africa, where over 32 million children that are primary school ages are not educated (Humanium, 2018). Additionally, there are over 759 million illiterate adults (Humanium, 2018). While poverty and inequalities about income play a role in this, other inequalities such as sex, health, and culture also impact this. Some other factors that also matter are illness, parent's illiteracy, unemployment, and these contribute to students' dropout rate. Adequately training teachers influences the quality of teaching and in turn, the quality of education for the children.

Educational poverty is defined as when a child is educated for less than 4 years and extreme educational poverty is when a child is educated for 2 years or less (Humanium, 2018). Not only does lack of education hurt those children and their families, but it also has negative impacts on the economic and social development of these countries.

There is inequality within education. Around the world, 54% of the non-schooled population is girls (Humanium, 2018). This is due to different cultural and traditional practices that emphasize educating males. This tradition usually being girls work for the family and boys are to work and receive an education. Specifically, over 12 million girls will never receive an education in Sub-Saharan Africa (Humanium, 2018). When further addressing inequalities in education, those who live in rural areas are two times more likely to not be going to school than urban children. Overall, these inequalities in education have contributed to poverty around the world.

Tanzania

Education in Tanzania is an issue. Lots of primary school-aged kids are not in school and if they are, they are not retaining information. One of the main issues in Tanzania for giving children a proper education is having adequate resources. Over 2/3 of teachers reported that they do not have enough resources to properly supply their classrooms. Also, over 89% of students do not have books for them to read while in school (USAID, 2020). In 2007, universal access to primary education was achieved. However, since this, the rate of enrollment in primary school has been dropping. At the pre-primary level, the student to qualified teacher ratio is 131:1. Access to pre-primary education is extremely low and children entering primary school are often ill-equipped. Almost 3/4's of teens aged 14-17 are not enrolled in secondary education (UNICEF, 2016).

In a study by Ruth Wedgwood (Wedgwood, 2005), Post-Basic Education and Poverty in Tanzania were studied. In Tanzania, the education was structured as 7 years of primary school, 4 years of secondary school, 2 years of tertiary, and 4 years at university. Primary schools are governmentally run whereas 40% of secondary schools tend to be funded by seminaries, faith-based schools, and run by businesses (Wedgwood, 2005).

Other barriers and challenges for providing children with an adequate education include high student-to-teacher ratios, quality of education, retaining teachers, and retention rates for girls. Regarding education retention, the most at-risk groups are impoverished children, girls, those with disabilities, and children living in very rural and poor communities.

As previously stated, children in poor families are 2-4 times less likely to attend primary school (UNICEF, 2016). Those with disabilities are also not going to school. The percentages of children with disabilities are disproportionate to those who are in school with disabilities. Even

with students in school, they are not able to learn well. From the 2014 primary school examinations, only 8% of second-grade students could read, 8% could do basic math, such as add and subtract, and less than 1/10th of a percent showed any life skills (UNICEF, 2016).

With gender equality in education, there is the same number of girls and boys that enroll in primary school. On the contrary, only one and three of the girls that begin primary school ends up finishing their lower secondary education (USAID, 2020). The reasons for this vary but include poverty, early marriage, teen pregnancy, and gender-based violence.

Guatemala

Over the past 20 years, the enrollment rates in primary schools have improved drastically in Guatemala (USAID, 2020). However, there are still inequalities in education. Regarding education structure, the first six years of education are free in Guatemala. While this education is free and required, the average years of actual schooling are less than this. As of 2011, around 1/4 of Guatemalans were illiterate and this number increases within the indigenous populations (Galvin, 2017). Some groups that have lower enrollment rates in Guatemala include girls, rural communities, and indigenous communities. All three of these have disparities between their counterparts: boys, urban cities and towns, and ladinos (acculturated indigenous peoples, or of mixed race, or of European descent).

There are also inequalities in education. Those who are in rural communities are more likely to drop out because of a lack of resources and inadequate facilities. In addition to economic inequality, gender inequality is prevalent throughout the country. Literacy rates, school enrollment, and performance in school are all significantly higher in males than in females. This is because of a male-dominated society and traditional roles that many families enforce. Parents are more likely to send a son to school rather than a daughter. Out of the primary aged children that are in school, most of those are impoverished, indigenous, and/ or female.

Retaining and recruiting good teachers is a challenge in rural areas. Teachers do not receive good pay and most teachers come from larger towns and cities, so they must commute for hours every day. Larger cities and towns are where teachers look for employment first. Other resources are also lacking in rural areas that make it a lot more difficult for students to get a quality education. Schools around Guatemala are significantly underfunded, and classrooms do

not meet the standards in many categories. Some of these categories are space, materials, equipment, and sanitation.

Not only are schools and teachers underfunded, but also, with a majority of Guatemalans living under the poverty line, it is prohibitive to afford the cost of uniforms, transportation, and supplies. Additionally, many poor families would argue that the time that students spend in the classroom would be better spent working and generating income for the family. One reason people emigrate from Guatemala is the lack of upward mobility. Keeping kids in school and providing them with opportunities will help to decrease the number of illegal migrants.

Ideas for improvement

To improve education in Tanzania and Guatemala, structural changes need to be made. Primarily, improving poverty would directly improve the number of children getting an education, but it is not that simple. The changes need to start with the teachers and reforms in the process need to happen. For example, teachers need to be coached about how to keep kids in schools and how to improve retention rates. By equipping teachers with the necessary skills and training more people to be teachers, then there will be more trained professionals to teach children. In addition to this, teachers need to be given resources and funding to improve retention and dissemination of knowledge.

Not only will better-equipping teachers help them in their professional lives, but it will also aid the students. With proper funding or even improved funding, teachers will be better able to provide their students with resources to succeed. Additionally, with more teachers, classrooms can be smaller and more focused on the students' individualized learning.

Without education, those who are stuck in the cycle of poverty will continue to be there. By getting an education, impoverished children could learn skills that will equip them for future jobs. If public schools are not available, more of the GDP from these countries should go to education to ensure adequate funding for them. Education should be something that every child has no matter their financial status, gender, background, or abilities.

6. Conclusion

After looking into poverty, water quality, community health, and education between Tanzania and Guatemala, it is evident there is much that these countries have in common. Some aspects that the countries share are the inequalities that are present in poverty, water quality, education, and community health. These inequalities include the divide in rural and urban, disabled and able-bodied, female and male, non-educated and educated, and indigenous and non-indigenous. In rural areas compared to urban areas, there is more poverty, lower water quality, more disease, high rates of malnutrition in children, less access to healthcare, and less access to education. These distinctions and inequalities between groups are prevalent in countries around the world, both developing and developed alike, but are even more divided in developing countries, such as Tanzania and Guatemala.

Additionally, after examining these different aspects in these countries, poverty seems to be the root factor for the other three. It also appears that poor water quality, community health, and lack of education all contribute to people staying in the cycle of poverty. If water quality, health, and education were improved, then the poverty rate would also improve.

Numerous improvements could be made to improve these four aspects. From improving education to allocating more money to the healthcare sector, many things need to be done to improve the livelihoods of those living in these countries. As previously stated, focusing on eradicating poverty, will help improve the quality of the water, health of those in the countries, and education.

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