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MEASLES AND MIGRATION IN COLOMBIA AND BRAZIL:
DETERMINANTS OF DIFFERENTIAL DISEASE IMPACT RESULTING FROM THE
VENEZUELAN CRISIS

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By Kaylen Hisle

A thesis presented in partial fulfillment of the requirements for completion
Of the Bachelor of Arts degree in International Studies
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ABSTRACT

This thesis investigates the 2018 measles outbreaks that occurred in Colombia and Brazil as a result of importation from Venezuela, seeking to uncover underlying factors contributing to significantly greater case numbers in Brazil than in Colombia. It analyzes vaccination coverage, migrant integration, and migration policy, using a mixed-methods approach to compare the two countries. Qualitative analysis of the border zones, migration policies, health systems, and progression of the outbreaks in each country reveals that geographical and socioeconomic differences at the borders, heterogeneity of vaccination coverage, timeliness of policy responses, and disease tracing capabilities could all be possible contributors to greater disease burden in Brazil. Quantitative analysis using public opinion surveys finds differences in attitudes towards Venezuelan migrants and access to health services that may have contributed to the experiences of the Venezuelan population of each country and led to greater disease spread in Brazil. As a whole, this thesis aims to demonstrate the multi-faceted nature of cross-border disease transmission and the varied methods that may be used to combat disease spread resulting from migration crises.

TABLE OF CONTENTS

List of Figures and Tables.....	vi
Chapter One: The Border Health Crisis.....	1
Measles in Colombia and Brazil: Why it Matters	1
Case Selection	2
Methodological Overview & Limitations.....	4
Chapter Two: Background & Framework	8
Background	8
Framework	12
Chapter Three: Qualitative Analysis	17
The Borders	17
Migration Policy.....	24
Health Systems	30
Progression of the Measles Outbreaks.....	38
Chapter Four: Quantitative Analysis	45
Attitudes toward Venezuelan Migrants and Migration Policies	45
Attitudes toward Access to Government Provided Public Benefits.....	48
Summary of Findings.....	50
Chapter Five: Conclusions and Interpretations	51
Vaccination Coverage.....	51
Migrant Integration.....	52
Migration Policy.....	53
Discussion	53

LIST OF FIGURES & TABLES

Figure 1	Venezuelan migrants and measles cases in Colombia and Brazil, 2017-2019
Figure 2	Colombia: Measles-containing vaccine coverage, 2010-2020
Figure 3	Brazil: Measles-containing vaccine coverage, 2010-2020
Table 1	MCV coverage in Roraima, Amazonas & Northern Brazil, 2017
Figure 4	MCV-1 coverage, 2018: Percent of districts within each range by country
Figure 5	Progression of the measles outbreaks in each country
Figure 6	Attitudes toward Venezuelan migrants
Figure 7	Attitudes toward access to social services for Venezuelan migrants
Figure 8	Attitudes toward access to government provided public benefits

Chapter One: The Border Health Crisis

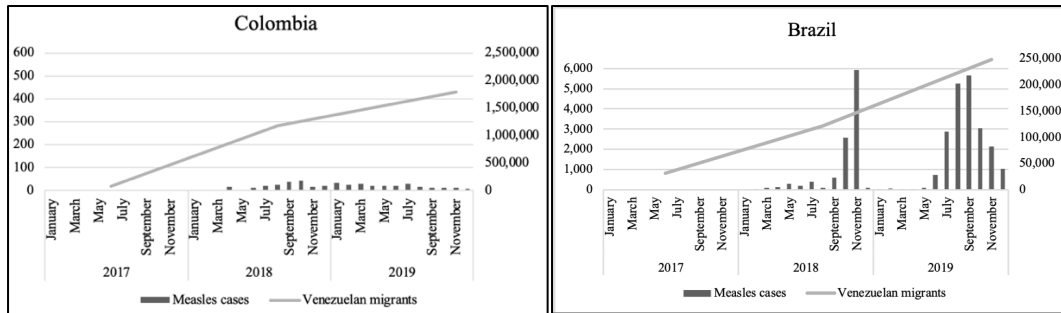
Measles in Colombia and Brazil: Why it Matters

The resurgence of measles in Colombia and Brazil is closely related to the recent and ongoing Venezuelan crisis. Hyperinflation, corruption, food shortages and a lack of medications, along with other factors, have driven large numbers of Venezuelans from their home country. Many Venezuelan migrants come from areas with health care infrastructure in disarray, leaving them in poor health when they enter their countries of destination. This results in transmission of diseases between countries in the region and the creation of major public health concerns that extend far beyond Venezuela's borders.

In 2016, after a 22 year-long effort, measles was declared eliminated in the region of the Americas (PAHO/WHO, 2016). However, beginning in 2017, measles cases burgeoned; Venezuela reported 727 measles cases in 2017, then 5,667 in 2018 (WHO, 2021). A subsequent resurgence of measles was seen in both Colombia and Brazil in 2018. The cause of resurgence is largely attributed to transmission from Venezuelan migrants; genotype D8, of identical viral lineage to the cases reported in Venezuela, was identified in both Colombia and Brazil (PAHO, 2018). As an estimated 1.2 million Venezuelan migrants had entered Colombia by 2018, while an estimated 151,000 had entered Brazil, it could be logically expected that measles cases in Colombia would outnumber measles cases in Brazil; nevertheless, Brazil reported 10,326 measles cases in 2018, while Colombia reported only 208 (UNHCR, 2021; WHO, 2020). Figure 1 below shows the trends in Venezuelan migration and measles cases in Colombia and Brazil from 2017-2019 – note the differences in scale.

Figure 1

Venezuelan migrants and measles cases in Colombia and Brazil, 2017-2019



Sources: UNHCR. (2021). Refugee Data Finder. In *United Nations High Commissioner for Refugees UNHCR*. <https://www.unhcr.org/refugee-statistics/download/?url=HL1f82>. WHO. (2020). WHO Vaccine-preventable Diseases: Monitoring System. In *World Health Organization*. https://apps.who.int/immunization_globalsummary

This paradox brings forward a number of questions: what factors allowed Colombia to have greater success in controlling measles outbreaks? Additionally, what can we learn from the comparison of these two countries in measles control in order to inform future cross-border disease control efforts?

The above questions are worth answering for a multitude of reasons, particularly because the relevance of the spread of disease extends beyond individual countries, regions, and continents. We live in a globalized world that generally shies away from isolation – we incessantly interact, collaborate, and travel across borders. With all of the benefits that come from this cooperation also come the downfalls of spreading communicable disease. Breakdowns in the health care and vaccination capabilities of one country can result in the rapid rise of health problems throughout an entire region if the neighboring countries are not equipped to handle disease control and prevention. Studying the successes and failures of Colombia and Brazil in controlling measles importation, as well as the contributing factors, may reveal strategies that could be applied in other countries throughout the world to lessen the threat of large-scale disease outbreaks in the future.

Case Selection

I elected to study measles importation specifically for three reasons. First, measles was declared eliminated throughout the Region of the Americas (spanning from North America to South America, including the Caribbean) only a year before the disease began recirculating throughout Venezuela, and only two years before it spread to other countries in South America. This provides a unique opportunity to study measles control methods in elimination settings – what went wrong to allow this disease to almost immediately resurge after decades were spent on achieving elimination? Second, it is a well-studied vaccine-preventable disease. Theoretically, as long as a population has a vaccination rate of at least 95%, outbreaks should not occur. The resurgence of measles in Venezuela and the subsequent outbreaks that followed throughout the region demonstrate, however, that distribution of vaccinations and targeting of at-risk populations is of great importance in meeting that 95% threshold throughout a country. The final reason for the selection of measles for this study is the pathology of the virus itself. Measles is highly contagious, which makes the disease easily spread throughout susceptible populations. Additionally, contracting the measles virus can cause seemingly non-measles related health complications long after the initial infection period has subsided. This means that the reestablishment of measles within a population can cause long term impacts, from increased health care costs, burdens on health systems, and increased childhood and infant mortality rates. The pathology of measles virus will be addressed and explained further in Chapter Two.

In terms of country selection, I elected to study Colombia and Brazil primarily based on their geography. They both share borders with Venezuela, which means that Venezuelan migrants entering each country through land crossing points are coming directly from Venezuela, not through any intermediary country. This allows for the assumption that outbreaks with identical lineage to the virus circulating from Venezuela did in fact occur as a result of

importation directly from Venezuela. Additionally, the selection of Colombia and Brazil for study allows for the comparison of two countries that faced similar circumstances (i.e. achieved measles elimination in 2016 and saw a resurgence of measles in early 2018), but that had different outcomes resulting from measles importation.

Methodological Overview & Limitations

The purpose of this project is to uncover the underlying differences between Colombia and Brazil that may have contributed to successes and/or failures in cross-border disease control. It is a comparative, mixed-methods study. Rather than approach this question from a strictly epidemiological perspective, I widen the scope of the project to include underlying political, economic, social, and institutional differences.

After providing background information and a theoretical framework for the study in Chapter Two, qualitative analysis begins in Chapter Three. It begins with a comparison of border relations and relevance, then moves to a discussion of migration policy and programs aimed at discerning differences in approach and execution. Next is a comparison of the health systems in each country, investigating accessibility to health services for both citizens and non-citizens of each country. Finally, the chapter concludes with a comparison of the course of the outbreaks as well as a comparison of the demographic makeup of the Venezuelan population of each country. This section contributes to an understanding of the epidemiological aspect: it analyzes what happened during the outbreaks and which groups were most affected. The bulk of the analysis relies upon reports published by government agencies, non-governmental organizations (NGOs) and multilateral agencies.

Through qualitative analysis, I find that heterogeneous vaccination coverage in Brazil may have played a large role in some of the differences in measles spread. I also find that the

proactive and timely responses of the Colombian government, as well as thorough disease tracing and surveillance capacity, could have been factors allowing for greater success in measles control. Lastly, I demonstrate that the high concentration of Venezuelan migrants in northern Brazil likely contributed greatly to the differences in impact of measles importation between the two countries.

Quantitative analysis is conducted in Chapter Four, utilizing survey data collected by the Latin American Public Opinions Project (LAPOP). In this chapter, public opinion towards Venezuelan migrants and access to social services for native and non-native populations is analyzed in order to discern factors that contribute to differing opinions in each country. I compare survey responses in each country as a whole to survey responses in areas most affected by measles outbreaks, which allows for analysis of differing responses both within and between countries. Additionally, crosstabulation is performed using the survey data in order to discern specific factors that may impact public sentiment.

I find that in Colombia, the areas of the country most impacted by measles outbreaks tended to be more welcoming of the Venezuelan population when compared to the country as a whole. In Brazil, I found the opposite to be true. In addition, the areas most affected by measles outbreaks in Colombia perceived better access to government provided social services than did the country as a whole, while the opposite trend was observed in Brazil.

As a whole, this thesis highlights the importance of sustainability in disease elimination strategies. The breakdown of vaccine distribution and health infrastructure in Venezuela resulted in the spread of measles across borders, making it a renewed problem in countries throughout the Americas. Furthermore, it demonstrates that the health and ill-health of populations is almost

always deeply embedded in larger political, economic, and social frameworks, especially in the case of humanitarian crises.

Limitations

The mixed-methods design of this study allows for in-depth investigation of factors contributing to the impact of disease importation that cannot necessarily be quantified, which introduces certain limitations. Data availability is a notable limitation of this study. Although a wealth of reports and publications about the Venezuelan crisis and its effects on Colombia and Brazil exist, many do not provide statistical information that is collected the same way or within the same time period in both countries, making comparison through quantitative analysis methods difficult to accomplish with accuracy. It is for this reason that I elected to qualitatively, rather than quantitatively, compare aspects like border relations, migration policy and health systems, along with the course of the outbreaks and migrant demographics. I later employ quantitative analysis using the LAPOP AmericasBarometer survey data from Colombia and Brazil. These surveys provide an opportunity to make statistical comparisons, as the survey is standardized across countries and collected along similar time frames.

An additional limitation to the study as a whole is the differing border situations of Colombia and Brazil. As will be further described in Chapter Three, Colombia has many formal entry points throughout seven states along its border with Venezuela, while Brazil has only one into the state of Roraima. This results in disproportionate pressure being put onto the state of Roraima to accommodate the entry of Venezuelan migrants when compared to the 5 states accommodating the entry of migrants into Colombia. This provides an additional reason to address this question from a qualitative, comparative standpoint. It is important to acknowledge that much of the cause of the disproportionate impact of disease importation into each country

could be accountable to this notable difference between the countries – statistical comparisons at the national level would be inaccurate and could lead to the mischaracterization of the actual situation along the border zones.

The use of reports published by governmental agencies, NGOs, and multilateral agencies prevents precise comparisons from being made in some situations, as equivalent information is not always made available for each country. There is also potential for bias on behalf of the publishing entities. These actors may have vested interests in presenting the Venezuelan crisis and subsequent humanitarian crises in Colombia and Brazil in a way that would be to their individual benefit. This sort of bias is rather unavoidable, as I must work with the statistics and metrics that are made available. However, I hope that by using information published by a combination of varied organizations, I will mitigate some distortions that may be present within each individual source.

Furthermore, the use of the LAPOP survey results presents its own limitations. The study relies upon responses being representative of the overall sentiments in the area investigated. Additionally, it is limited by the questionnaire. The survey included few questions related to health and migration specifically, preventing comprehensive analysis of interconnected factors.

If I were able to conduct my own survey for this study, I would include more questions directed toward access to vaccinations and availability of health services, as well as questions relating to specific factors that prevent individuals from accessing health services. Moreover, I would include Venezuelan migrants in each country in the survey and incorporate questions about instances of discrimination within the community, specifically in government offices and health facilities. This would allow for a better understanding of public opinion for both groups, rather than solely the opinions of the receiving population.

Chapter Two: Background & Framework

Background

The Venezuelan Crisis

Venezuela is currently facing an economic collapse resulting in one of the most extreme migrant crises in recent history. The effects of instability and poor economic conditions on the Venezuelan population have been drastic. The country faces unprecedented hyperinflation and extreme shortages of food, medical supplies, and other basic necessities (Tuite et al., 2018). The Venezuelan government initially failed to recognize the extent of the crisis or implement effective strategies to alleviate it, even blocking international aid and assistance. They instead focused on creating a narrative claiming that foreign powers and the political opposition were waging an “economic war” meant to destabilize Venezuela. These claims are unsubstantiated, as drops in oil prices, in combination with the government’s own policies, are cited by analysts as the main contributors to the economic collapse. This did not stop the use of intimidation tactics to quell dissent and criticism. Doctors, nurses, and other health care providers are threatened with the loss of their jobs for speaking out on the shortages of drugs and medical supplies. Those who participate in protests and demonstrations risk beatings, arrest, and prosecution in military courts. Essentially, health care in Venezuela was politicized to the point that noncompliance, or even open disagreement, with the government significantly lessened the already poor chances one had at receiving or providing sufficient medical care or treatment (HRW, 2016).

Based on the state of health care in Venezuela, it is unsurprising that many previously eradicated or well-controlled infectious diseases have made a comeback in recent years. Numerous forces have combined to create the perfect environment for such a syndemic, most notably shortages of adequate nutrition and medical supplies, low access to healthcare and vaccinations, and interruptions of immunization programs (Rodríguez-Morales et al., 2019). A survey conducted in 2016 revealed that 76% of public hospitals in Venezuela lacked the basic medications and medical supplies necessary for the proper functioning of a health care facility. Unsanitary conditions due to lack of cleaning and sanitation supplies contributed to spread of infections between patients. Doctors resort to asking patients to purchase their own medicines and supplies to bring with them to the hospital, but they are difficult to obtain even from private pharmacies. This prevents medical providers from performing even the most basic procedures, and leaves patients with chronic conditions unable to obtain life-sustaining medications (HRW, 2016).

Due to the corruption and lack of transparency of the Venezuelan government, it is difficult to determine the true extent of the situation. Data reporting by the Venezuelan Health Ministry over recent years demonstrates how this has impacted the public health sector. In July of 2015, the Venezuelan Health Ministry stopped releasing data; two years later, a publication released by the Health Ministry showed drastic increases in maternal and infant mortality as well as significant rises in cases of various illnesses. The health minister that published the report was dismissed in the days following the publication, highlighting the corruption and unchecked power of the administration (Gupta, 2017).

The status of health within the country has implications far beyond Venezuela – the mass exodus of Venezuelans in recent years makes the public health in the country of even greater

importance. With sharply declining vaccination coverage, it is likely that many Venezuelan migrants are arriving at their host countries susceptible to, and possibly carriers of, various vaccine-preventable diseases. The health problems that plague the Venezuelan population do not cease to exist once a border is crossed – Venezuelans carry the weight of a failing health care system into their receiving communities.

Measles & the Americas

The measles virus has seen a marked revival since the onset of the Venezuelan crisis. Prior to immunization campaigns and efforts at eradication, measles was known as a common childhood illness (Mina et al., 2019). In the 1960s, 600,000 cases of measles were reported annually in the Americas. Case numbers only began to decrease in 1977, after the introduction of the World Health Organization Expanded Program on Immunization (Leite & Berezin, 2015). The Pan American Health Organization (PAHO) was finally able to declare the region of the Americas free of measles in 2016, a major accomplishment for the public health of the region (PAHO/WHO, 2016). This success was short-lived, however, as measles returned to the region in 2017 via large outbreaks in Venezuela that spread across borders. In total, 16,822 cases of measles were reported in the Americas in 2018; 19,530 were reported in 2019. The PAHO has since undertaken efforts to control the measles outbreak in Venezuela, focusing on a nation-wide vaccination campaign that successfully provided measles vaccination to over 8.8 million children. While this will be effective in preventing more outbreaks in the short-term, it is essential that vaccination coverage remains above 95% in order to avoid future outbreaks (PAHO, 2020). Countries in Latin America should be prepared for the possibility that measles returns once again to Venezuela and have effective strategies to combat large-scale spread similar to what occurred in 2018.

Measles Pathology & Epidemiology

Measles is one of the most contagious known infectious diseases. Its R_0 , or the expected number of secondary cases resulting from a single case of a disease, ranges from 12-18 (Laksono et al., 2016). The pure transmissibility of the measles virus is enough to justify its public health importance; its pathogenesis and long-term effects only solidify its significance.

The prodromal stage of measles is marked by the 3 C's: cough, coryza, and conjunctivitis. Koplik's spots in the mouth follow, along with the development of a maculopapular skin rash that eventually envelops the entire body. Recovery provides lifelong immunity to measles, but also a transient immunosuppression that may last over 2 years – a high price to pay for protection from a disease that could be successfully gained through vaccination. Not all patients recover, as a number of complications could arise. These range from respiratory infections like pneumonia, to more severe central nervous system infections like encephalitis (Laksono et al., 2016).

The lasting immunosuppression following infection with the measles virus is a relatively recent finding. It highlights the importance of understanding the full scope of consequences that could result from an infectious disease outbreak beyond case numbers and mortality rates. In the pre-vaccine era, it is estimated that measles virus infections could have been associated with up to 50% of all childhood infectious disease deaths, either directly or indirectly. The mechanism for this has been termed “immune amnesia” – the measles virus is associated with reductions in antibody diversity, as well as reductions in the magnitude of antibody binding signals, essentially destroying built up immunity to various pathogens (Mina et al., 2019). Ultimately, this means that the measles vaccine provides a degree of herd immunity to non-measles infections (Mina et al., 2015). The World Health Organization reported that between 2000 and 2017, measles virus

vaccinations prevented over 21 million deaths without accounting for this phenomenon; the actual number of deaths prevented through vaccination are likely much higher (Mina et al., 2019).

Framework

The control and eventual eradication of the measles virus could have a multiplied positive impact on society as a whole. The burden which it places on the functioning of the communities it affects, as well as the health care systems within said communities, is almost unmeasurable. There are various avenues to investigate when determining factors relevant to measles control in Colombia and Brazil. This section sets up the theoretical framework that guides this study. It focuses on the interconnectedness of vaccination coverage, migrant integration, and migration policy in determining disease control capabilities in the case of large-scale migration.

Vaccination Coverage

The importance of the measles-containing vaccine (MCV) cannot be overstated in the discussion of measles control. The measles vaccine is safe and highly effective at preventing infection with the measles virus, but an overall MCV coverage rate of 95% is necessary to establish and maintain herd immunity (PAHO, 2020). Vaccination coverage is dependent upon a multitude of factors that can be synthesized into three categories: intent to vaccinate, health facility readiness, and community access. These factors were laid out in a frequently cited systematic review investigating the determinants of vaccine coverage in low and middle-income countries (Phillips et al., 2017).

The contributing factors for intent to vaccinate were identified by Phillips et al. (2017) from the Theory of Planned Behavior, a highly regarded and long-standing behavioral model. These factors include attitude toward the behavior, subjective norm, and perceived behavioral

control, each of which can be directly associated with vaccine hesitancy and anti-vaccination movements (Ajzen, 1991; Phillips et al., 2017). Vaccine hesitancy is not a novel concept: since the inception of vaccination, people have held sentiments of distrust and skepticism. Generally, reasons for vaccine hesitancy stem from uncertainty and lack of confidence, not from analysis of empirical evidence (Brown et al., 2018; Guzman-Holst et al., 2020; Sato, 2018). By applying the aforementioned behavioral model, certain questions are raised in the discussion of the source or causes of vaccine hesitancy within a community: Is the importance of vaccination promoted by health care professionals within communities? Are the positive impacts of vaccination made clear so that vaccine hesitancy does not become the perceived norm? Do health care providers prioritize thorough communication in order to provide parents with a sense of agency over their children's well-being? Answering each of these questions can provide insight into gaps in vaccination coverage that exist within a country or region (Phillips et al., 2017).

Nonetheless, if vaccines aren't made available, intent to vaccinate holds little importance. This highlights the relevance of the remaining two factors outlined in Phillips's study: health facility readiness and community access. Health facility readiness refers more specifically to the physical availability of vaccines and the necessary supplies needed for their administration. It is based on the WHO Health Systems Building Blocks framework, which describes health systems as set of 6 components: service delivery, health workforce, health information systems, access to essential medicines, financing, and leadership/governance (WHO, 2010).

Community access refers to the barriers that may or may not be in place that hamper the connection between intent and readiness (Phillips et al., 2017). There are many barriers to vaccination; among those most commonly cited as reasons for delayed or missed vaccinations are living in rural areas far from a health facility, having a large family or a large number of

children in a household, and having a forgetful caregiver. Among factors found to favor vaccine uptake were higher socioeconomic status and steady employment (Guzman-Holst et al., 2020). Thus, increasing vaccine accessibility does not simply imply increasing the number of vaccinations available, but removing or mitigating the effects of certain circumstances leading to lower demand for a vaccine. An additional impediment to effective vaccination coverage is the existence of an under-skilled health care workforce (Tapia-Conyer et al., 2013). While vaccines may be available, without proper promotion and administration on behalf of health care professionals they remain inaccessible. These findings highlight the multi-sided nature of the vaccine accessibility dilemma; all of the blame cannot be placed on a single actor, nor can a single policy or infrastructure change eliminate all barriers in place.

The next major factor relevant to measles control through vaccination coverage is surveillance capabilities within and between countries. Not only does proper surveillance of disease and vaccination rates provide valuable data for the tracking of epidemics, but it also allows monitoring of high-risk groups and areas that need targeted reform, facilitates estimation of the burden of vaccine preventable diseases, and expedites the evaluation of the effectiveness of previous reforms (Tapia-Conyer et al., 2013). Hence, high quality and reliable surveillance capabilities are vital in isolating areas with suboptimal vaccination coverage or high disease rates and informing future efforts for disease control and vaccine distribution.

The final factor to consider is heterogeneity of vaccinated and unvaccinated populations, or the spatial distribution of vaccinated individuals. An overall vaccination rate of 95% is necessary to protect a population from a measles outbreak. However, when there are localized pockets of under immunization despite an overall coverage of 95%, the measles virus is given the opportunity to proliferate. Areas with localized low vaccine coverage have been found to

become hotbeds for infection with more extreme outbreaks and a lower average age of infection (Doocy et al., 2019). These pockets of under immunization can come into existence via a multitude of mechanisms; for example, anti-vaccination movements may cause geographic clusters of parents to refuse vaccination for their children. Additionally, the previously discussed barriers to vaccination may isolate certain populations: those of lower socioeconomic status, those living in rural areas, or those who are unemployed could tend to aggregate in certain neighborhoods or localities.

Migrant Integration

The effects of localized pockets of under-vaccination calls attention to the importance of the dispersal and integration of Venezuelan migrants throughout their host populations. Xenophobic sentiments often prevent integration within host countries by promoting exclusion and discrimination against immigrant populations. At an individual level, experiences of xenophobic sentiments have been found to be associated with difficulties integrating into the host community and social stress. At the community level, it has been found to promote violence and serve as a barrier to health care access (Suleman et al., 2018).

A study conducted by Bosetti, et al. (2020) investigating measles outbreaks that occurred in Turkey as a result of a massive influx of Syrian refugees concluded that maximal dispersal of unvaccinated refugees into the vaccinated Turkish population served to impede, rather than favor, the spread of measles. This finding supports existing evidence on vaccine heterogeneity. Essentially, with sufficient levels of mixing, the vaccinated host population shields the unvaccinated migrant population from exposure to infection. This simultaneously reduces sources of infection, preventing a full-blown outbreak from ever beginning (Bosetti et al., 2020). Some comparisons can be drawn between Syrian refugees in Turkey and Venezuelan migrants in

Colombia and Brazil. Both Syrian refugees and Venezuelan migrants are likely to arrive in their recipient countries in poor health, having had little access to medical care in their home countries. This makes them less likely to be vaccinated, and more likely to be carrying infectious diseases. Moreover, because both Syrians and Venezuelans are mass-emigrating due to crises and collapses in their own home countries, the countries they flee to are under great pressure and strain to accommodate the large influx of people.

Migration Policy

As neighboring countries to a country in crisis, the governments of Colombia and Brazil have many key responsibilities. There are a number of measures governments can take to prevent infectious disease outbreaks in response to a large influx of migrants that come from countries with failing health care systems. A study conducted by Gastañaduy, et al. (2018) identifies strategies and challenges for maintenance of measles control in elimination settings. The study highlights the importance of designating a committee tasked with responding to outbreaks, isolation of infectious cases, vaccination of non-immune individuals, and maintaining laboratory capabilities for confirmation of measles cases (Gastañaduy et al., 2018). Under this framework of proven strategies, the responses of Colombian and Brazilian governments can be compared in order to pinpoint shortcomings.

Before an outbreak ever occurs, National Immunization Programs (NIPs) should be working to provide vaccinations to their population, targeting those who are most vulnerable. With an effective NIP, a country should be relatively prepared for the introduction of infectious disease before a single case is ever identified. By targeting populations that are more difficult to reach, inequalities can be reduced and potential for disease proliferation can be mitigated. For this task, quality government surveillance programs are critical (Andrus, 2020).

Chapter Three: Qualitative Analysis

This chapter focuses on the qualitative analysis of factors related to the measles outbreaks in each country, concentrating on the borders, migration policies, and health systems. It concludes with analysis of the progression of the measles outbreaks as well as an investigation into the age makeup of the Venezuelan population in each country.

The Borders

The borders Venezuela shares with Colombia and Brazil are of great relevance to this discussion. Why and how Venezuelans are crossing, what conditions they find upon entry into the recipient country, and what that country is doing (or not doing) to facilitate their integration can have an immense impact on the importation of disease. This section explores the context of each border zone, highlighting important points of contrast between Colombia and Brazil.

Historical Trends

The roughly 1,400-mile-long border between Colombia and Venezuela has often seen great activity. Between the two countries, political, economic and social crises, along with differences in living conditions and opportunities, have at times driven Colombians and Venezuelans in one direction or the other. In recent years, the movement has favored the direction of Colombia. Venezuelans, fleeing political unrest and economic uncertainty, have been traveling in large numbers across the border in hopes of finding greater stability and improved livelihoods.

Despite recent trends, migratory movement has not always favored Colombia. Between 1970 and 2014, during the period of internal armed conflict between the Colombian government and various paramilitary and guerilla groups, large numbers of Colombians – an estimated 1.5 million – emigrated to Venezuela, a country that at the time offered relative stability and economic opportunity (Durán & Cuevas, 2020). The migratory trends changed direction as conditions in Venezuela fell deeper into crisis. In 2015, Venezuelan President Nicolás Maduro deported around 17,000 Colombians residing illegally in Venezuela along with 22,000 Colombians who “voluntarily” returned following pressure from the Venezuelan government. At the same time, Venezuelans began to flee their own country in search of better opportunities in Colombia (Castillo et al., 2018; Durán & Cuevas, 2020).

The border between Brazil and Venezuela holds less historical and geopolitical relevance in terms of migration. The border between the two countries is around 1,366 miles long, but much of the borderland is covered in dense wilderness areas that are inaccessible. Moreover, the migratory and economic ties between the countries may be better described as links between the state of Roraima and Venezuela rather than between Brazil and Venezuela. Because Roraima is geographically closer to urban centers in Venezuela than to its own nation’s capital, extensive economic and political ties link them together. Roraima is even connected to the electricity grid of Venezuela (Ebus, 2019).

The differences between Colombia and Brazil in past migratory trends helps contextualize some of the problems that exist at the borders. Colombians and Venezuelans share a somewhat more intimate migratory relationship, as Venezuela offered stability and opportunity during tumultuous periods of Colombian history. In contrast, the border between Brazil and Venezuela did not experience similar migratory patterns prior to the Venezuelan crisis.

Furthermore, Venezuela is more closely associated with the state of Roraima than it is to Brazil as a whole. The next sub-section details the manners in which Venezuelans cross the borders into each country and further investigates the conditions they find upon entry.

Points of Entry & Xenophobia in Colombia

Colombia and Brazil are remarkably different in the presence and distribution of formal entry points along their borders with Venezuela. Seven of Colombia's 32 departments, share a border with Venezuela: La Guajira, César, Norte de Santander, Boyacá, Arauca, Vichada, and Guainía. Prior to 2016, there were five formal entry points distributed among these departments. However, after the closing and then re-opening of the border by the Venezuelan government, Colombia opened two additional entry points in Norte de Santander in response to the high migration flow, increasing the number of formal entry points along the border to seven.

Not all migrants cross through formal entry points, however. Illegal trails between Colombia and Venezuela, called *trochas* facilitate the clandestine crossing of people and goods (Venezuela Investigative Unit, 2019). These border zones are far from peaceful – many areas are occupied by various criminal groups seeking to profit from the use of informal border crossing points (Crisis Group Latin America, 2020). Guides along the trails, called *trocheros* collect fees from Venezuelans seeking to cross the border, and frequent conflicts between criminal groups as well as between criminal groups and security forces often result in violence (Crisis Group Latin America, 2020; Venezuela Investigative Unit, 2019). In late September of 2018, Colombia's migration authority estimated that there were around 80,000 Venezuelan migrants living in the country that entered through unauthorized border points (Migración Colombia, 2018c).

Large-scale migration from Venezuela has certainly caused changes within Colombia and its municipalities. Economically speaking, Venezuelan migration has been correlated with some

negative effects on Colombia as a whole. The World Bank reports that every 1% increase in immigration rate corresponds with a 2% increase in poverty rate and a 3% increase in unemployment rate. However, because the majority of Venezuelans view Colombia as a long-term place of residence and are educated to an equal or greater level as Colombians, it is possible that they will begin integrating into the formal, skilled labor market to a greater degree and contributing to the economy of Colombia in a positive manner (World Bank, 2018).

In terms of discrimination and xenophobia, there have been shifting dynamics in how the Colombian population generally views Venezuelan migrants. From the early 2000's to 2010, Venezuelan migratory movement was characterized by the entrance of Venezuelan businesses and the entrance of professionals, which led to public perception of Venezuelan migrants being generally favorable. The entrance of Venezuelan companies and skilled workers aided the economy and created more opportunities for Colombians (Castillo et al., 2018).

As Venezuela slipped further into crisis, however, perceptions began to change. With the 2015 expulsion of thousands of Colombian nationals residing in Venezuela and the beginning of a migrant crisis, perceptions of Venezuelan migration took a turn for the worse. News and media coverage depicted Venezuela in a more negative light, fueling sentiments that the entrance Venezuelans (and even the re-entrance of Colombians from Venezuela) contributed to crime and illicit activity, posing a threat to public safety. However, as the crisis in Venezuela worsened, some news coverage and public addresses came to embody a more humanitarian perspective. Venezuelans came to be seen, in general, as victims in vulnerable situations and in need of assistance rather than criminals (Castillo et al., 2018).

The presence of anti-Venezuelan sentiments varies in Colombia. The historical ties between Venezuela and Colombia has created a fairly welcoming and hospitable environment for

some Venezuelans, as evidenced by the street sign hanging near the border crossing point between Villa de Rosario (near Cúcuta in the department of Norte de Santander, Colombia) and San Antonio del Táchira in Venezuela that reads (in Spanish) “*Colombia and Venezuela united forever: Welcome to COLOMBIA*” (Proyecto Migración Colombia, 2018). However, in border areas with greater presence of criminal groups there have been some instances of xenophobia and discrimination against Venezuelans. Pamphlets threatening the Venezuelan population have circulated through some municipalities, notably Cúcuta, Arauca and Subachoque. In addition, there have been reports of targeted killings of Venezuelans in shelters in Cúcuta and Arauca. Many of the negative views toward Venezuelans tend to stem from the expulsion of Colombians in Venezuela in 2015 and the perceived impacts they have had on the economy and personal security. In reality, however, criminal statistics suggest that Venezuelans commit crimes and are victims of crimes at the same rate and frequency as their Colombian counterparts (World Bank, 2018). Thus, the feelings of insecurity are not supported statistically and are more often a result of prejudice and fear.

Points of Entry & Xenophobia in Brazil

Brazil’s border entry situation can be drawn in sharp contrast to Colombia’s. Of the 26 states in Brazil, only two share a border with Venezuela – Roraima and Amazonas. Much of the border region is impassable by land, and there is only one main formal entry point into the city of Pacaraima, located in the state of Roraima. Brazilian government estimates suggest that around 50% of the migrants who enter Brazil remain in Roraima, while 19% settle in the neighboring state of Amazonas (Shamsuddin et al., 2021). Although Brazil did initiate interiorization efforts to spread out the migrant population (as will be further discussed later in this chapter), more Venezuelans arrive than the amount able to be transferred to alternative destinations, and some

prefer to remain in the northern region so that they have the option to eventually return home or visit family members (Ebus, 2019).

Informal crossing points along the border operate similarly to those located along the Colombian border, and pose similar dangers. Criminal groups, along with Venezuelan government guardsmen, charge fees to Venezuelans seeking to use unauthorized trails to cross the border. They also participate in the smuggling of goods, as well as human trafficking (Ebus, 2019).

Along with having only one main entry point for a massive flow of people entering the country, Brazil's northern region has historically been the poorest, least populous and worst-off in terms of resource availability. In 2016, the northern region of Brazil contributed only 4.7% to the Brazilian GDP. The state of Roraima, where most Venezuelan migrants enter and remain, contributed only 0.2% to Brazilian GDP in 2016 and has one of the lowest state populations in the country at around 500,000 (Shamsuddin et al., 2021). Public service quality in the state of Roraima, as well as the northern region as a whole, is generally poor. It is difficult for those in the northern region to travel to more populated areas of the country due to long distances and transport options that are limited and come with high costs (Silva & Jubilut, 2018).

The pressure being put on the poor and isolated state of Roraima to facilitate the entry of Venezuelan migrants has led to Venezuelan migrants being blamed for the collapse of public services by state and local authorities throughout the region. This has led to both xenophobic actions and sentiments within the population, as well as attempts to prevent Venezuelan migrants from entering the country.

In August 2018, attacks on squatter camps and shelters in Pacaraima caused 1,200 Venezuelans to flee back into the country that they had just recently managed to escape. The

attack was prompted by a report made by a local Brazilian business owner claiming assault by a group of Venezuelans. The demonstration began to draw attention to the strain the migration crisis had put on the city, blaming government officials for failing to control the situation, but quickly devolved into “intense violence and xenophobia” (Andreoni, 2018). These xenophobic attacks are not isolated to the border town of Pacaraima. In February 2018, a shelter housing Venezuelan migrants in the capital city of Boa Vista was covered in gasoline and set on fire. In September, an incendiary device was thrown into another shelter in the city (Conectas Human Rights, 2018).

The blaming of Venezuelan migrants for the collapse of public services was exemplified in July of 2018 when the governor of Roraima, Suely Campos, attempted to close the border entry point with Venezuela (Armendáriz, 2018). She called for the border closure claiming that migration from Venezuela had put too much pressure on the health system within the state and contributed to increased crime. She later reported to Brazilian media that the president of Brazil, Michel Temer, had not provided sufficient aid to the state to help them with the humanitarian crisis (AP News, 2018). Campos only succeeded in closing the border for a few hours before the order was overturned by the Supreme Court (BBC News, 2018). While the effort to prevent the entry of migrants was ultimately unsuccessful, it brings to light the dire nature of the situation, as well as the desperation of government officials in the state. The state of Roraima was simply unequipped to handle migration flow at such a great magnitude, and the federal government was failing to provide the resources that were urgently needed.

Conclusions: The Borders

Two major points to consider in the discussion of the Venezuelan border zones in Colombia and Brazil are differences in historical relations and geography. Colombia and

Venezuela share a history of major migration movements between the countries. Brazil and Venezuela do not share the same historical ties.

Additionally, Colombia's border with Venezuela spans across many different states, spreading the impact of migration flows among different state and local governments. This also makes the impact of the migratory crisis more visible. In Brazil, Venezuelans enter into one of the poorest and least-connected states in the entire country, which could be an explanatory factor for delayed response times and lower prioritization of the migratory crisis by the Brazilian federal government. Additionally, much of Brazil's population outside of the northern region might not be quite as aware of or affected by the situation, giving the federal government even more leniency—in terms of political repercussions—in its handling of the crisis along the border.

Migration Policy

This section details migration policies and domestic government responses to the Venezuelan crisis in Colombia and Brazil. First is a discussion of the regularization pathways available to migrants seeking to enter each country. A timeline of government responses to the migratory crisis follows.

Pathways available to Venezuelan migrants seeking to enter Colombia or Brazil

In response to the Venezuelan crisis, many countries in Latin America have altered or created legal pathways to facilitate the entrance and integration of Venezuelan migrants. Colombia and Brazil are similar in that neither requires a visa for entry for those of Venezuelan nationality. However, they differ in that Colombia requires a passport, while Brazil does not. This can be a barrier to regular entry for Venezuelans as it is difficult to obtain and renew passports in Venezuela due to a combination of cost, government inefficiency and retaliation by the government against the opposition (Selee et al., 2019). However, Colombia does have two

options available for Venezuelans without a passport: they may obtain a Border Mobility Card (Tarjeta de Movilidad Fronteriza or TMF) or a transit permit. The TMF was created in 2016 as a response to increased flow of migrants across the Colombian-Venezuelan border after its reopening by the Venezuelan government after 8 months of closure on August 13, 2016 (Migración Colombia, 2018b). It allows Venezuelans with a national identity document and proof of residence in Venezuela the opportunity to cross the border freely while maintaining permanent residence in Venezuela. The transit permit is valid for 15 days and allows migrants to legally pass through Colombia on their way to a different country of destination without providing a passport (Migración Colombia, 2018c). Both of these options allow for the regular crossing of persons who may have otherwise resorted to the use of illegal and dangerous measures to enter the country without a passport.

For those who wish to gain regular status in Colombia, the government created the Special Stay Permit (Permiso Especial de Permanencia, or PEP) in August of 2017. This permit is available to only Venezuelan migrants, is free, and provides two years of work authorization, and access to public services like health care, education, and childcare (Migración Colombia, 2018b). The PEP is offered in phases and each is slightly different. The first phase of the permit was available to those who entered the country with a passport before July 28, 2017. The second phase was available to those who entered regularly before February 2, 2018, as well as those who entered irregularly but registered with the government through the Administrative Registry of Venezuelan Migrants (Registro Administrativo de Migrantes Venezolanos, or RAMV) in the Spring of 2018 (Selee et al., 2019). A third and fourth phase of PEP were also created and instituted. As of December 2018, an estimated 453,000 Venezuelans held this status, which was around 40% of the Venezuelan population in the country at the time. In February of 2021 the

Colombian government went even further in its attempts to regularize the status of its Venezuelan migrant population by granting temporary protection status to all Venezuelan migrants in the country (GIFMM & R4V, 2021). While this is outside the scope of this project and would not have contributed to the control of measles outbreaks in 2018 and 2019, it is an example of the magnitude of the efforts being made on behalf of the Colombian government to mitigate issues that have arisen as a result of the Venezuelan crisis and ensure that the Venezuelan population has access to the means required to improve their situations.

Venezuelan migrants seeking to obtain regular status in Brazil may apply for a temporary residence permit, which is valid for two years. This pathway was made available in March of 2017. During the first few months in which these permits were available, they were not widely utilized. However, once the fee was waived, the number of applications began to rise. In December of 2018, 23,000 permits had been issued (Selee et al., 2019).

The final pathway to consider for both countries is the process of obtaining refugee status. Despite Colombia receiving 10 times more Venezuelan migrants than Brazil, Brazil received 56,000 asylum applications by December of 2018, while Colombia received only 1,600. This may be the result of Colombia having migration processes available that provided better benefits and could be obtained more quickly than refugee status, which would often take up to two years to process. Those who applied for asylum in Brazil are granted access to health care, education, and work permits while their cases are pending, but there was extreme backlog in the asylum system as well as delays in granting documents that would allow access to services. As a way to combat the accumulation of asylum claims in processing, Brazil announced in December of 2018 that those who had a pending asylum application and a job in the formal labor market before November 21, 2017 could apply for the two-year temporary residence visa, which would

withdraw their asylum application (Selee et al., 2019). In December of 2019, the Brazilian government went a step further in its decision to accelerate the processing of asylum claims by simplifying the steps and requirements, which led to the granting of refugee status to around 21,000 Venezuelans during the month (ACSG/UNHCR, 2019).

In comparing the migration pathways available in each country, a few differences can be highlighted. First is the speed of response by each government. The first legal pathway created by Colombia in response to the Venezuelan crisis was implemented in August of 2016 compared to Brazil's first response in March of 2017. Additionally, Colombia's creation of many phases of PEP may show that the Colombian government was somewhat more proactive and determined to handle the crisis in a way that would benefit both the Venezuelan migrant population and the host communities. In contrast, Brazil had fewer responses, implementing one new pathway in March of 2017 (that initially came with a cost that was too high for most Venezuelans to pay) and then only later responding to backlog in asylum claims within the bureaucracy. Brazil is more lenient in terms of passport requirements, but the pathways available for those who entered the country legally often take longer to obtain. In addition, those who enter without documentation are not readily offered pathways for regularization in Brazil, while there are regularization options in Colombia.

Responses to the Venezuelan crisis

While providing Venezuelan migrants with access to social services and work permits is certainly important, ensuring that these benefits are actually able to be utilized by the migrant population is also necessary. The governments of both Colombia and Brazil created programs and entities aimed at resolving some of the strain brought about by the Venezuelan migratory crisis.

In January of 2017, the Colombian government, in conjunction with the CDC, began developing a public health emergency operations center (Centro de Operaciones de Emergencia en Salud Pública, or COE-ESP) (CDC, 2021). Having this public health response structure established allowed measures to be taken immediately upon the identification of the first measles case within the country. Among the measures implemented by districts that reported measles cases were contact tracing, transmission chain mapping, and surveillance in health care facilities. They also began vaccination campaigns in at-risk areas, including the border zone (Schluter & Knight, 2019).

In addition to the use of the COE-ESP in response to Venezuelan migration, Colombia also reacted to the crisis by creating the Special Migration Group (Grupo Especial Migratório, or GEM) in 2018. This group aims to implement measures to control irregular migration, guarantee the protection of the rights of children, provide security, and fight against smuggling (Migración Colombia, 2018a). An additional effort implemented by Colombia was the creation of the Administrative Registry of Venezuelan Migrants (Registro Administrativo de Migrantes Venezolanos, or RAMV) also in 2018. The RAMV was a system designed to collect data on the sociodemographic characteristics of the Venezuelan population in Colombia in order to analyze and direct policy responses (Migración Colombia, 2018c).

In Brazil, the largest and most overarching program initiated to help Venezuelan migrants entering the country was termed Operation Welcome, or Operação Acolhida. This program has three main purposes: to manage the border and documentation, to provide humanitarian service, and to facilitate voluntary relocation throughout the country (Shamsuddin et al., 2021). The program was created in March 2018 and was able to relocate an estimated 10,000 Venezuelan migrants to shelters or relatives' homes throughout the country by September of 2019 (HRW,

2019). Basic health care services were also provided by Operation Welcome. In a collaboration between the Brazilian government and many nongovernmental organizations, teams of health professionals were deployed in Bôa Vista to provide care in shelters. Additionally, six doctors were sent to Pacaraima in order to screen and vaccinate at the border crossing point (Doocy et al., 2019).

Conclusions: Migration Policy

The most notable difference in the responses to the Venezuelan crisis by Colombia and Brazil is not necessarily what policies and programs were implemented, but how they were executed. Both countries established task forces with similar goals, but Colombia did so by designating different groups with specific purposes rather than establishing a single group with a multitude of various purposes. By doing this, the COE-ESP could focus on public health responses, the GEM could focus on migration and security responses, and the RAMV could focus on data collection and registration. In contrast, Brazil used Operation Welcome for all of these purposes, which may have led to diminished returns. A similar trend can be observed in migration pathways available to Venezuelan migrants seeking to cross each border. Colombia implemented policies specifically for the Venezuelan migrant population, while Brazil altered existing pathways.

Ultimately, both Colombia and Brazil attempted to alleviate strain resulting from the Venezuelan crisis through the creation or alteration of migration pathways and designation of task forces to respond to crises at the border. However, Brazil's efforts tended to be highly reactive to problems that already existed, while Colombia's efforts showed greater proactivity. The evidence presented in this section is not enough to identify migration policy and response as

the sole reason for differential impact of measles importation, but does provide justification for the consideration of these topics as possible contributing factors.

Health Systems

This section analyzes the health care systems of Colombia and Brazil through comparison of the structure and history of each system, along with their respective national immunization programs (NIPs). It aims to bring forward important distinctions that may have contributed to the ability of each country to control measles importation.

Health System Structure and History: Colombia

Colombia's health care system is organized by the General System of Social Security in Health (Sistema General de Seguridad Social en Salud, or SGSSS), which is split into two different insurance schemes: the contributory scheme for those employed in the formal sector and able to pay, and the subsidized scheme for those unable to pay (Garcia-Subirats et al., 2014).

Access to health care for Venezuelans in Colombia is determined by immigration status. Emergency care and public health interventions were made available at no cost to Venezuelans in May of 2017 (Departamento Nacional de Planeación, 2018; Doocy et al., 2019; Torres, 2019). This includes treatment for diseases (like measles), complete health coverage for pregnant women, and free vaccinations for children (Torres, 2019; Doocy et al., 2019). Between August of 2017 and August of 2018, 515,622 doses of vaccinations on the national vaccination schedule were given to Venezuelan migrants with 83% of the doses given to children under 5 years of age (Departamento Nacional de Planeación, 2018). In order to receive non-urgent health care, Venezuelan migrants have to enroll in insurance through the SGSSS, which requires a regular immigration status, or pay out of pocket.

The Colombian Ministry of Health reported that between 2017 and 2018, health care provision to the Venezuelan migrant population country-wide increased by 202.6% (Departamento Nacional de Planeación, 2018). Erasmo Meoz University Hospital in Cúcuta, Norte de Santander received the most Venezuelan patients in 2018 and saw a 248% increase in the number of Venezuelan patients between the first quarter of 2017 and the first quarter of 2018. Among the Venezuelan patients attended to by public health facilities in Norte de Santander, 40% were children and 7% were infants (Doocy et al., 2019).

The major concern for the Colombian government and health officials at the time was not necessarily the capacity of the health system to attend to the needs of the Venezuelan population, but more the sustainability of funding (Doocy et al., 2019; Fernández-Nino & Bojorquez-Chapela, 2018). The cost of attending to Venezuelan patients at just the aforementioned hospital in Cúcuta amounted to over US\$720,000 in 2018 (Doocy et al., 2019). For the vaccinations given between 2017 and 2018, the cost amounted to over US\$1.85 million, not accounting for the costs accrued by paying medical workers to distribute the doses (Departamento Nacional de Planeación, 2018). This came at a time when the health care system in Colombia was already under some financial stress. In June of 2017, Colombian insurance companies owed US\$2.5 billion to hospitals and medical facilities across the country (Torres, 2019).

Vaccines in Colombia

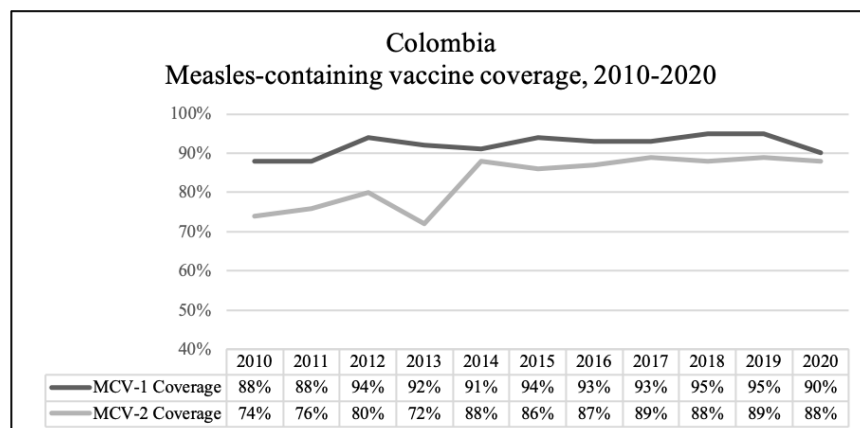
Colombia has an extensive national immunization program. The schedule includes 22 vaccines that protect against 26 different diseases. Funding for the program comes from the Ministry of Health and Social Protection (Ministerio de Salud y Protección Social, or MSPS), municipalities, and health promotion entities (Empresas Promotoras de Salud, or EPS), which are private companies operating under the supervision of the MSPS. Immunization delivery to both

the insured and uninsured populations is provided at no cost to those receiving the vaccinations. Municipalities are incentivized to maintain high vaccination rates by receiving a 10% bonus payment in the public health budget if they reach 95% coverage (Coe & Madan, 2018).

Since the NIP is federally funded, investment in the health system fell during the recent economic recession, reaching a low of 5.9% of the public budget in 2015. However, as the economy began to improve, funding rose to 10.9% in 2018. Despite the recession, the immunization program has been seen as a priority under recent administrations. Since the Uribe administration from 2002-2010, the national immunization program has been given its own budget line, which increases its visibility and financial stability. The Santos administration (2010-18) continued the prioritization of the immunization program by including six new vaccines in the recommended vaccination schedule (Coe & Madan, 2018).

Figure 2 below shows national vaccination coverage for the first and second doses of the measles-containing vaccines in Colombia. In 2018, the year of the recent measles outbreak, first dose coverage was at 95%, the threshold for establishing herd immunity, but second dose coverage was below this threshold at 88%.

Figure 2



Source: WHO/UNICEF. (2020). Measles vaccination coverage. World Health Organization/United Nations Children’s Fund. <https://immunizationdata.who.int/pages/coverage/mcv.html>

Health System Structure and History: Brazil

Brazil's 1988 constitution created the Unified Health System (Sistema Único de Saúde, or SUS) which guarantees universal right to free health care (Columbia Public Health, 2020). This right is granted to all residents of the country, including those who are foreign-born, and includes all types of health services – from emergency care to primary care to medications (Doocy et al., 2019). Those seeking access to health care must obtain a national health card (Cartão do SUS), which they can do at any hospital, clinic, or health center by providing an identification card, tax payer's number and proof of residence (Columbia Public Health, 2020). While most Venezuelans are eligible for this identification card, they sometimes face barriers due to discrimination, trouble securing the necessary documents or language barriers (Doocy et al., 2019). There are some private health care providers and private health insurances in Brazil that are available at an extra cost and can be used as a supplement to the SUS. The public health facilities in general offer high quality care, but are often overcrowded and have long wait times. They also tend to have lower quality conditions (no air conditioning or missing certain types of equipment) and face organizational challenges with their lack of autonomy, insufficient funding, and inefficient use of resources (Castro et al., 2019; Columbia Public Health, 2020).

Although the introduction and expansion of a universal health system in Brazil has improved the health of the country overall since its inception, it is threatened by inadequate funding and austerity measures meant to limit social spending. Additionally, regional disparities in the presence and incidence of health problems have lingered (de Souza, 2017). Tracing the recent economic and political history of Brazil reveals instability that contributes to the cutbacks on health spending.

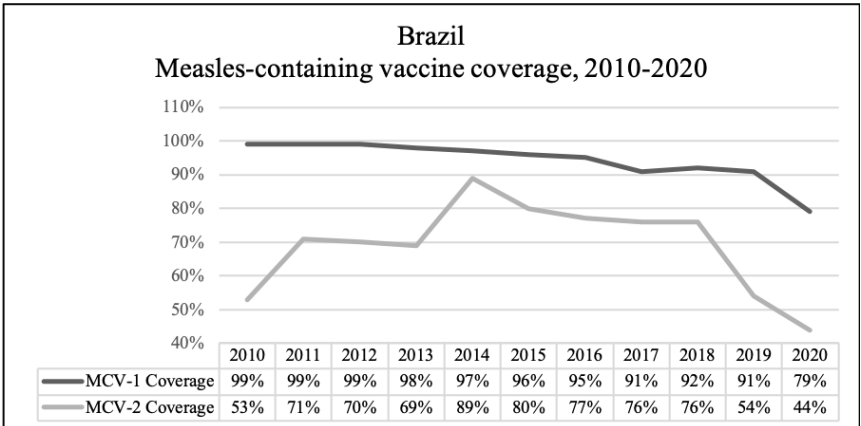
Between 2004 and 2010 the economy of Brazil was doing relatively well. Primary health care programs and emergency services were expanded under SUS and new oral and mental health initiatives were enacted. However, around 2011 the economy began to worsen. During 2015 and 2016, a series of policies enacted with the goal of decreasing government spending undermined the systems in place to guarantee the funding of the SUS and other social programs. First, amendment 86, enacted in March of 2015, reduced the level of federal funds spent on health. Then, in September 2016, Congress approved a bill that allowed the government to override the constitutional rules that set minimums for the amount of spending allocated to areas like health and education. This bill also extended to states and municipalities. Later, the National Congress approved amendment 95, which established a ceiling for government spending for the following 20 years. In effect, this would reduce federal health spending from comprising 1.7% of GDP in 2016 to comprising an estimated 1.2% of GDP in 2036 (de Souza, 2017). These austerity measures implemented by the Brazilian government effectively decreased funding for social programs at the federal level as well as at the state and municipal levels.

The largest public hospital in Roraima, located in Bôa Vista saw a 253% increase in the number of Venezuelan patients in the first half of 2018 compared to the first half of 2017. Emergency visits increased by 366%. Researchers found that the hospital was facing many challenges as a result, including shortages of antibiotics and medical supplies. A smaller hospital located at the border in the municipality of Pacaraima reported that Venezuelans made up 70% of their patient base and that they were facing similar shortages at the time of study in August of 2018. The director stated that the severity of the ailments of Venezuelans upon presentation was contributing to the strain on the health system, causing Venezuelans to have longer hospitalizations (Doocy et al., 2019).

Vaccines in Brazil

The national immunization program (NIP) of Brazil is coordinated by the Ministry of Health in cooperation with health departments of states and municipalities. It has the same basic goals and principles as the SUS – to provide universal and equitable care to all. Brazil’s NIP offers 15 vaccines for children, 9 for adolescents, and 5 for adults and the elderly at no cost, and has made some significant achievements since its creation in 1973. However, the program faces some major challenges. In 2016, a drop in vaccination coverage rates was observed among nearly all vaccinations on the national calendar. From 2016-2018, the tuberculosis vaccine (BCG) was the only vaccine to meet the target coverage rate. The decreased coverage of measles-containing vaccines can be observed in Figure 3 below.

Figure 3



Source: WHO/UNICEF. (2020). Measles vaccination coverage. World Health Organization/United Nations Children’s Fund. <https://immunizationdata.who.int/pages/coverage/mcv.html>

The lowered vaccination rates from 2016 forward can be attributed to drops in federal funding of the health system, but other factors may have also played a role. First is the increase of vaccine hesitancy and circulation of misinformation on social media platforms. The Brazilian Ministry of Health reports that in 2018, 89% of published misinformation relating to health attacked the credibility of vaccines (Domingues et al., 2020). It is difficult to pinpoint an exact

reason for the increased spread of anti-vaccination rhetoric. However, a possible explanation could be a rumor that was spread in northeast Brazil in 2016 claiming that upticks in the number of babies born with microencephaly was attributable to expired MMR vaccines. Even though the government and health officials published statements disproving this and citing the Zika virus as the cause, people's mistrust of the government led them to believe that vaccines were to blame (Worth, 2016).

An additional cause for lowered vaccination rates could be the inadequate training of medical professionals. Domingues et al. (2020) finds that some children are going to health centers but are not being vaccinated according to national recommendations. This may be a result of the vaccine calendar becoming more complex and requiring more extensive knowledge or a result of irregular supply issues due to production problems (Domingues et al., 2020).

While national data is important for understanding overall vaccination coverage, considering the homogeneity of coverage can help to uncover any geographical gaps in vaccine protection. A 2020 study investigating the homogeneity of coverage of MCVs in Brazil finds that the North region of Brazil had the lowest coverage of the first dose of the vaccine in 2017 and the lowest estimate for homogeneity of coverage (determined by dividing the number of municipalities that reach the 95% target by the total number of municipalities in the region or state) (Pacheco et al., 2020). Table 1 below outlines the vaccine coverage and homogeneity estimates for the North region, as well as for the states of Roraima and Amazonas. The data was collected in 2017 from the Brazilian National Immunization Program. As the number of entries of Venezuelan migrants increased drastically between 2017 and 2018 (from ~30,000 to ~120,000), the information presented can be seen as indicative of the situation in which Venezuelans were entering.

Table 1*MCV coverage in Roraima, Amazonas & Northern Brazil, 2017*

	MCV 1 st dose	MCV 2 nd dose	Homogeneity 1 st dose	Homogeneity 2 nd dose
North region	80	64.8	46.4	23.6
Roraima	89	89.2	40	40
Amazonas	84.6	65.4	43.5	6.5

Source: Pacheco, F. C., França, G. V. A., Elidio, G. A., Leal, M. B., de Oliveira, C., & Guilhem, D. B. (2020). Measles-containing vaccines in Brazil: Coverage, homogeneity of coverage and associations with contextual factors at municipal level. *Vaccine*, 38(8), 1881–1887.

Conclusion: Comparing Health Systems

In comparing the health systems of Colombia and Brazil, a number of differences can be noted. First is the overall structure. While Brazil’s system offers universal care at no cost to all, Colombia has a more pluralistic system that requires individuals to choose their insurance and service providers and pay according to their income. This differing structure changes the way Venezuelan migrants are able to access health care in each country. Colombia provides emergency services and public health interventions to all Venezuelans at no cost, but in order to receive any other type of care Venezuelans must enroll in an insurance plan or pay out of pocket. In contrast, Venezuelans in Brazil are able to access the full menu of health care services at no cost, but must first obtain a national health card.

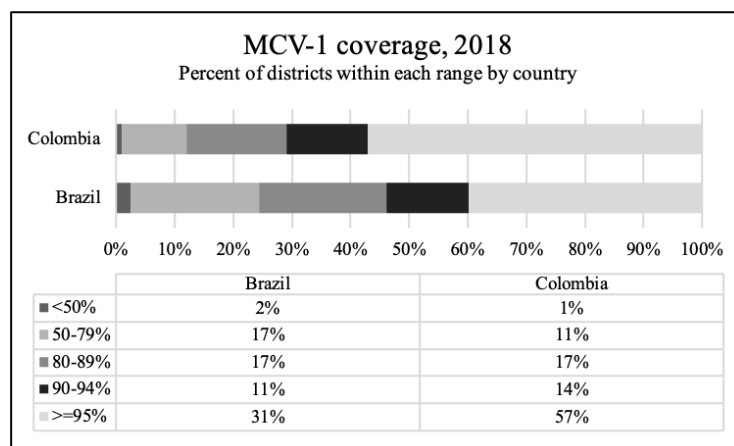
In terms of immunization programs, both countries offer vaccines at no cost to all members of the population, regardless of insurance status. Both countries have both doses of the measles vaccine on their national vaccination calendar. The programs do, however, differ in that Colombia’s immunization program has its own budget line under the Ministry of Health and Social Protection, giving it more visibility and designated funding within the budget. Both immunization programs faced funding issues during economic recessions, but in Colombia,

funding was restored as GDP grew, while Brazil implemented austerity measures to decrease social spending, including caps on the health budget.

In looking at measles-containing vaccine coverage in each country, differences can be seen in the uptake of vaccinations in the years leading up to the 2018 outbreak. While Colombia’s vaccination rate remained fairly steady, showing slight increase, Brazil’s shows slight decrease since 2012. Moreover, differences can be seen in homogeneity of coverage.

Figure 4 below shows the percent of districts in each country that reported coverage within each range in 2018. Colombia’s national MCV1 coverage in 2018 was 95%, and 57% of districts within the country reported coverage of 95% or greater. In contrast, Brazil’s national coverage was 92% in 2018, but only 11% of districts reported coverage within the range of 90-94% (WHO, 2020). This shows greater variation in coverage by district, highlighting a greater range in coverage rates between districts. Because northern states and municipalities in Brazil tend to have the lowest rates of coverage, chances of measles outbreaks are even greater within the region.

Figure 4



Source: WHO. (2020). WHO Vaccine-preventable Diseases: Monitoring System. *World Health Organization*. Available at https://apps.who.int/immunization_monitoring/globalsummary

Progression of the Measles Outbreaks

This section compares the age distribution of the Venezuelan migrant population in Colombia and Brazil, as well as the course of the measles outbreaks in each country. The age makeup of Venezuelan populations is important to this study because (1) the measles vaccine is typically administered during childhood (the first dose is recommended to be given at 12-15 months and the second at 4-6 years of age), and (2) 89% of the measles cases reported in Venezuela in 2017 were among children under the age of 15 (Gastañaduy et al., 2019; PAHO/WHO, 2018a). The course of the outbreaks helps to shed light on differences in how each outbreak progressed that goes deeper than national case numbers.

Age Distribution of Venezuelan Migrants

As many Venezuelan migrants cross the borders into each country without documentation, it is difficult to capture the true age makeup of the Venezuelan migrant population. It is for this reason that demographic data is collected from official government registries as well as surveys conducted by the International Organization for Migration (IOM).

The Displacement Tracking Matrix (DTM), a system created under the IOM, tracks population mobility in order to collect information on the needs of displaced populations. The survey conducted by IOM Colombia from October 28th to November 18th of 2019 interviewed 22,430 Venezuelan individuals and included their family members in the survey questions, allowing for a greater sample size for each measure. The DTM survey in Colombia estimated that children and adolescents make up around 31% of the migrant population – 14% between the ages of 0 and 5 years of age, 10% between 6 and 11 years of age, and 7% between 12 and 17 years of age (IOM Colombia, 2020). The official registry kept by Migración Colombia shows that those ages 0 to 17 made up 17.5% of the population in 2019 (Migración Colombia, 2019). Thus, the percentage of the population of Venezuelan migrants under the age of 18 in Colombia

can be estimated to have been somewhere between 17.5% and 31% of the migrant population in 2019.

The DTM survey conducted in Brazil along the same timeframe of that used for Colombia did not include the ages of family members, so the age makeup of the population is unable to be gleaned from that particular survey. However, the DTM survey conducted between April 13 and April 17 of 2019 did include this information. In this survey, 636 individuals were interviewed and data was collected from 761 of their family members in 14 different municipalities of Roraima. The DTM found that 53% of Venezuelans in Roraima were under the age of 18 during the time of this survey (IOM Brazil, 2019). The government entity equivalent to Migración Colombia in Brazil, OBMigra, estimated that 29% of its Venezuelan migrant population in 2019 was under the age of 18 (OBMigra, 2020). Thus, using these estimates, the percentage of the Venezuelan population under the age of 18 in Brazil in 2019 can be estimated to have been between 29% and 53%.

The higher percentage range for Brazil may have implications for measles outbreaks within the country. With the Venezuelan migrant population in Brazil being slightly younger comes a greater chance that individuals had not been vaccinated against the measles virus. This could serve as an additional possible explanation for the differential impact of measles importation. Even though Brazil received less Venezuelan migrants overall than did Colombia, they could have received a greater proportion of individuals susceptible to the virus.

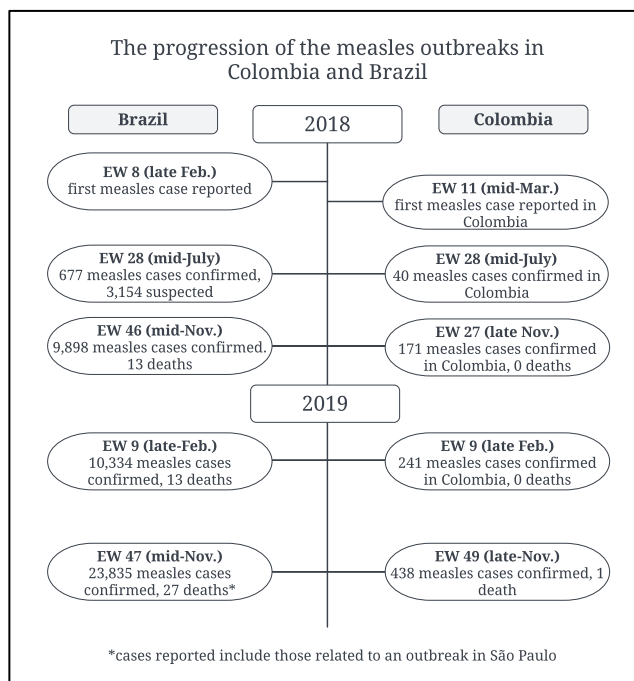
Tracing the Outbreaks

The measles outbreaks that occurred across the Region of the Americas were thoroughly surveilled by the WHO and PAHO. In conjunction, these two organizations provided regular publications on the situations unfolding in their Epidemiological Update reports. The following

section contains information gleaned from the reports published between 2018 and 2020 relevant to outbreaks in Colombia and Brazil (PAHO/WHO, 2018a-g 2019a-f, 2020a-d). These reports rely on government reporting, which comes with constraints in that the scope and accuracy of the information provided is limited by the surveillance capabilities of the governments in each country.

The first measles case in Venezuela was reported in epidemiological week (EW) 26 (mid-July) of 2017. Between EW 26 of 2017 and EW 4 (late January) of 2018, 952 cases of measles were confirmed. The epicenter of the outbreak was in Caroní, Bolívar state, but cases were reported in 7 other states and the capital district. Figure 5 below provides an overview of the progression of the subsequent measles outbreaks in Colombia and Brazil in 2018 and 2019.

Figure 5



Source: PAHO/WHO. (2018a-g) (2019 a-f). *Epidemiological Update Measles*. Available at <http://www.paho.org>

The first case identified in Brazil was reported in EW 8 of 2018 in Roraima State. By April 6th, 316 suspected cases were reported in Brazil – 103 in the state of Amazonas and 213 in

the state of Roraima. At the time of the report, only 4 cases had been confirmed in Amazonas. All 4 cases were among Brazilians, one that had been recently vaccinated and 3 not vaccinated. In Roraima, 42 cases had been confirmed by April 6th, 34 among Venezuelans and 8 among Brazilians. There were also two reported deaths, both were Venezuelan children.

The first case identified in Colombia was reported in EW 11 of 2018 in a 14-month-old Venezuelan child in Medellín, Antioquia Department. By April 6th, there were 5 cases reported, all among children from Venezuela aged 10 months to 2 years. All five children crossed the border during the communicable period of disease and all were hospitalized. The cases were reported in 5 different municipalities within 4 different departments.

By mid-July (EW 28) of 2018, 677 measles cases were confirmed among 6 states in Brazil: Amazonas (444), Roraima (216), Rio Grande do Sul (8), Rio de Janeiro (7), Rondonia (1), and São Paulo (1). In Roraima, the cases were reported from 11 out of the 15 municipalities in the state, but the municipalities of Amajari, Boa Vista and Pacaraima accounted for 94% of confirmed cases.

By mid-July of 2018, there were 40 confirmed cases in Colombia. Of the 40 confirmed cases, 23 were known to be directly imported from Venezuela, 16 were import related, and 1 had an unknown source. The cases were spread throughout 9 departments and 4 districts.

By EW 46 (mid-November) of 2018, Brazil reported 9,898 confirmed measles cases and 13 deaths. At the time of the report, Amazonas had an incidence rate of 2,080.9 cases per 100,000 population among children under the age of 1. The incidence rate for children under the age of 1 in Roraima was 78.2 cases per 100,000 population.

By EW 47 (late November) of 2018, Colombia had 171 confirmed measles cases and no deaths among 12 departments and 4 districts. 71% of the total confirmed cases were reported in

Cartagena, Barranquilla, and Norte de Santander. The country-wide incidence rate for children under 1 year of age was 5.9 cases per 100,000 population in 2018.

A total of 10,274 confirmed cases were reported in Brazil by EW 2 of 2019 among 11 federal units. All cases, with the exception of one in São Paulo and one in Rio Grande do Sul, had identical lineage to the virus circulating in Venezuela. Amazonas accounted for 9,778 cases and 6 deaths, Roraima accounted for 355 cases and 4 deaths. The highest incidence rates per 100,000 population were as follows: >1 years of age 812.1 cases; 1 to 4 years of age 245.7 cases; 5 to 9 years of age 106.9 cases; 10 to 14 years of age 66.6 cases; 15 to 19 years of age 51.0 cases.

Confirmed measles cases in Colombia totaled to 212 in EW 2 of 2019 among 17 federal units. All cases were reported to have identical lineage to the virus circulating in Venezuela. The highest incidence rate among Colombians was among those under 1 year of age (6 cases per 100,000 population), followed by those from ages 1-4 (1.7 cases per 100,000 population).

By mid-2019 in Brazil, the number of cases began to subside in the states of Amazonas and Roraima while simultaneously rising in other states like Pará and São Paulo. These cases had different viral lineage and resulted from a cruise ship outbreak in São Paulo. The introduction of additional lineages makes it difficult to discern further information relevant to measles importation from Venezuela from this point forward.

From the start of the outbreak in 2018 to the end of 2019, Colombia reported a total of 450 cases (208 in 2018 and 242 in 2019) and 1 death. Of the 450 cases, 346 were attributed to 65 different transmission chains. Isolation prevented 104 of the cases from generating any secondary infection. Genotyping of 119 of the cases revealed all genotype D8; 91 of the cases had identical lineage to cases from Venezuela, 1 was linked to importation from São Paulo and 1 was linked to importation from Europe. The highest incidence rate in Colombia was among those

under 1 year of age at 5.0 cases per 100,000 population in 2019. In 2020, only 1 case was reported.

In the Region of the Americas overall, 12 countries reported measles cases in 2018. The highest proportion of confirmed cases was reported in Brazil (62%) followed by Venezuela (34%). In 2019, 85% of the 15,082 confirmed cases reported in the region were from Brazil.

In analyzing the course of the outbreaks in each country, a couple of differences are highlighted aside from purely numerical dissimilarities. First is the rate at which case numbers increased. From the first reported case (EW 8 in Brazil and EW 11 in Colombia) to mid-April, 316 cases were reported in Brazil compared to 14 in Colombia. In Colombia, all cases reported during this time frame were among Venezuelan children, while in Brazil, both Brazilian citizens and Venezuelans had contracted the virus.

The scope of the information provided also differs between the two countries. The reports on Colombia often included information on hospitalizations and transmission chains. No such information was reported on Brazil. As the information published in these reports is largely obtained through reporting to the PAHO by the governments in each country, the lack of information reported on the situation in Brazil may indicate lesser disease tracing and isolation capacity. This cannot be known with certainty, however, as Brazilian government agencies may have this information and chosen not to report it to the PAHO.

Chapter Four: Quantitative Analysis

This section quantitatively investigates public opinion toward Venezuelan migrants and public service access in Colombia and Brazil. The LAPOP Americas Barometer survey is the primary data source analyzed. This survey investigates individual opinions and perspectives on a wide variety of subjects pertaining to political, economic, and social concerns throughout the Americas. Of particular interest to my study are the questions targeted toward understanding attitudes toward migrants, immigration policies, and government social assistance. I chose to analyze survey results from the study in 2018/2019 because it marks the beginning of great increases in both measles outbreaks and Venezuelan migration within Colombia and Brazil.

Venezuelan migrants and measles cases were not uniformly distributed across each country during the outbreaks. For this reason, each section will begin by comparing country-wide survey response frequencies to survey responses from areas that reported the greatest numbers of confirmed measles cases in 2018 (according to epidemiological reporting by the PAHO). For Colombia, these areas were the districts of Barranquilla and Cartagena and the department of Norte de Santander. For Brazil, these areas were the states of Roraima and Amazonas. Analysis in each section will then continue into cross tabulations with responses to other survey questions, allowing associations between factors to be highlighted.

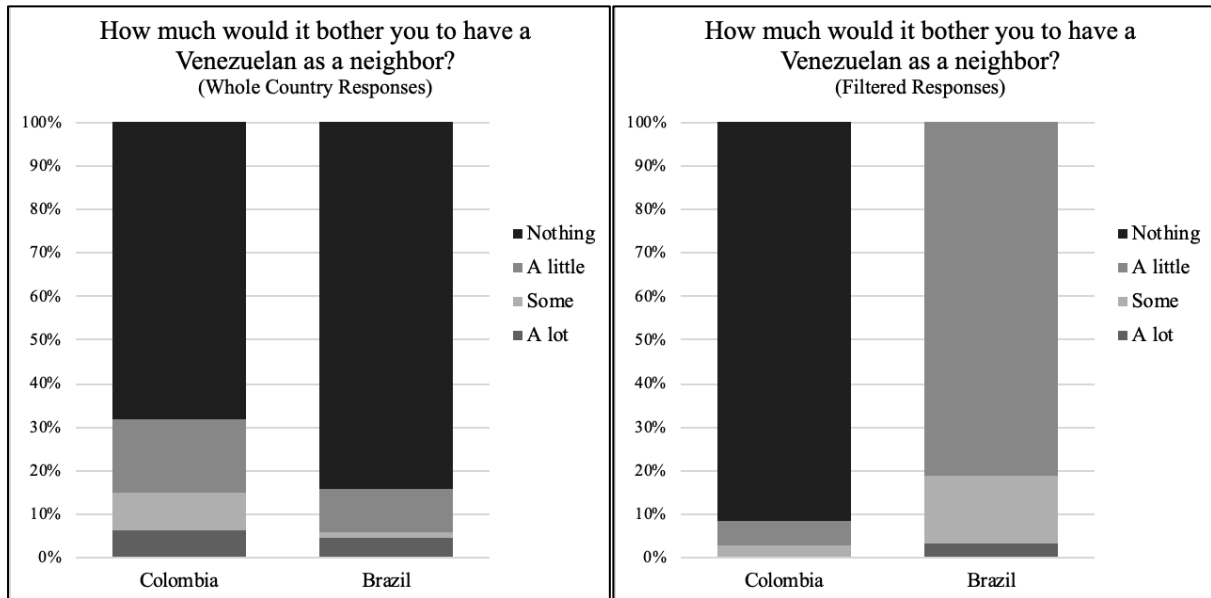
Attitudes toward Venezuelan Migrants and Migration Policies

The first survey question analyzed is “How much would it bother you to have a Venezuelan as a neighbor?” Survey respondents were given the choice to select from the following answer choices: (1) a lot, (2) some, (3) a little, or (4) nothing. As evidenced by Figure

6 below, the differences between responses in areas most affected by measles outbreaks compared to the countries as a whole are drastic. Colombian respondents in areas most affected by measles outbreaks were less likely to find having a Venezuelan neighbor bothersome, while Brazilian respondents in the most affected areas were less tolerant than the country as a whole.

Figure 6

Attitudes toward Venezuelan migrants in Colombia and Brazil



Sources: LAPOP. (2019a,b). AmericasBarometer 2018/2019: Brazil & Colombia. In *Latin America Public Opinion Project*. Available at <http://datasets.americasbarometer.org>

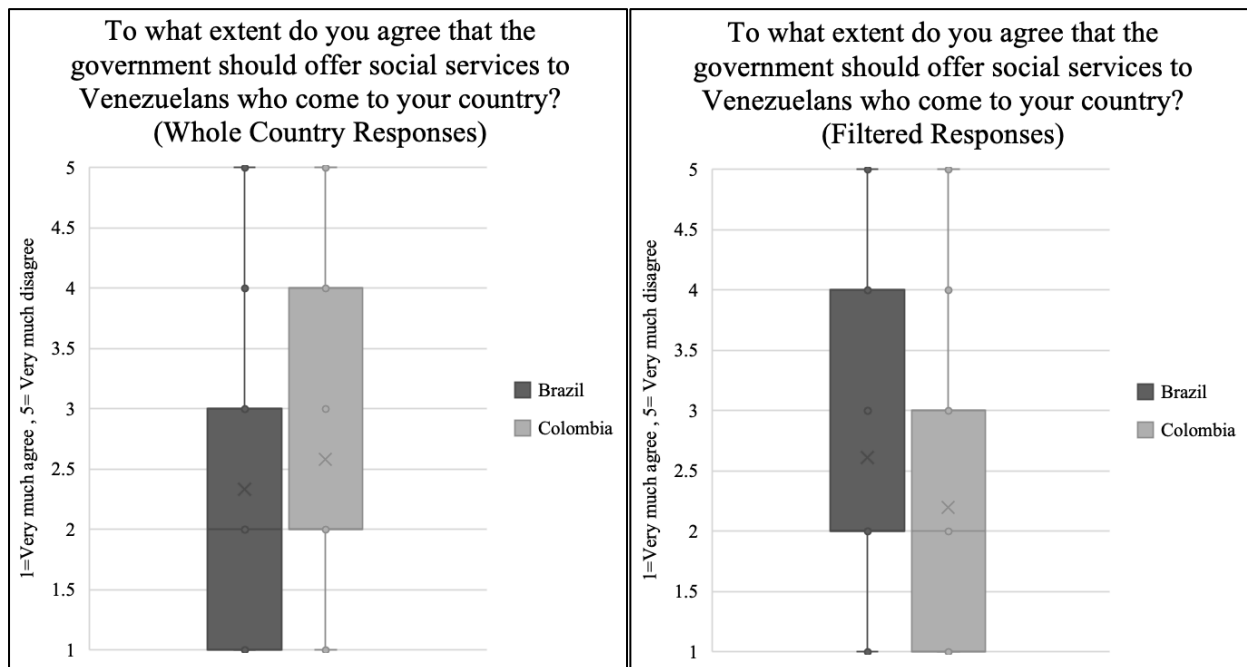
Running cross tabulations for the responses to this survey question reveals that, in only Brazil, respondents who receive government assistance are more likely to find it bothersome to have a Venezuelan neighbor than those who do not [$X^2(2, N=32) = 11.266, p = .004$]. This could be a result of use of Venezuelans as scape goats by politicians and government officials, blaming them for collapse of public services (as was explained in Chapter Three). Because northern Brazil is already a poor region, many of those living on extremely low incomes may feel that Venezuelans are causing their already poor situations to become worse.

The LAPOP survey also asked respondents to what extent they agree that the government of their country should offer social services to Venezuelans who come to live or work in their

country. Health assistance, education, and housing were given as examples of social services, and the respondents were asked to choose from the answer choices (1) strongly agree, (2) somewhat agree, (3) neither agree nor disagree, (4) somewhat disagree, and (5) strongly disagree. As can be seen in Figure 7 below, the median for both datasets (whole country and filtered) and for both countries is 2, which corresponds to the answer choice “somewhat agree.” However, the upper and lower quartiles differ between countries and datasets. Utilizing responses from the entire country reveals that Brazilians are more likely to be in favor of the government providing social services to Venezuelan migrants than are Colombians. However, filtering the datasets to include only the areas most affected by measles outbreaks shows that the relationship inverts – Colombians are more likely to agree that the government should offer social services to Venezuelan migrants than are Brazilians in the areas most affected by measles outbreaks.

Figure 7

Attitudes toward access to social services for Venezuelan migrants



Sources: LAPOP. (2019a,b). AmericasBarometer 2018/2019: Brazil & Colombia. In *Latin America Public Opinion Project*. Available at <http://datasets.americasbarometer.org>

Two possible explanations for this relationship are the differences in health system structure and the differences in migrant flows between Colombia and Brazil. Brazil provides universal health care to all, while the Colombian government provides health assistance only to those who are unable to afford insurance on their own. As a result of these differences, Brazilians may be more likely to view government provision of health care as normal or expected whereas Colombians may view it as more of a safety net available as a temporary solution to help citizens in need. Moreover, as noted previously, Colombia and Brazil are drastically different in terms of migrant flows. While Colombia has multiple border entry points along its border with Venezuela, Brazil has only one main crossing point into the state of Roraima in the northern region. Because the northern region of Brazil has been historically poorer and more resource depleted than the rest of the country, people living in Roraima and Amazonas may be more likely to oppose the government extending social services to Venezuelan migrants, as they may not receive sufficient government assistance themselves.

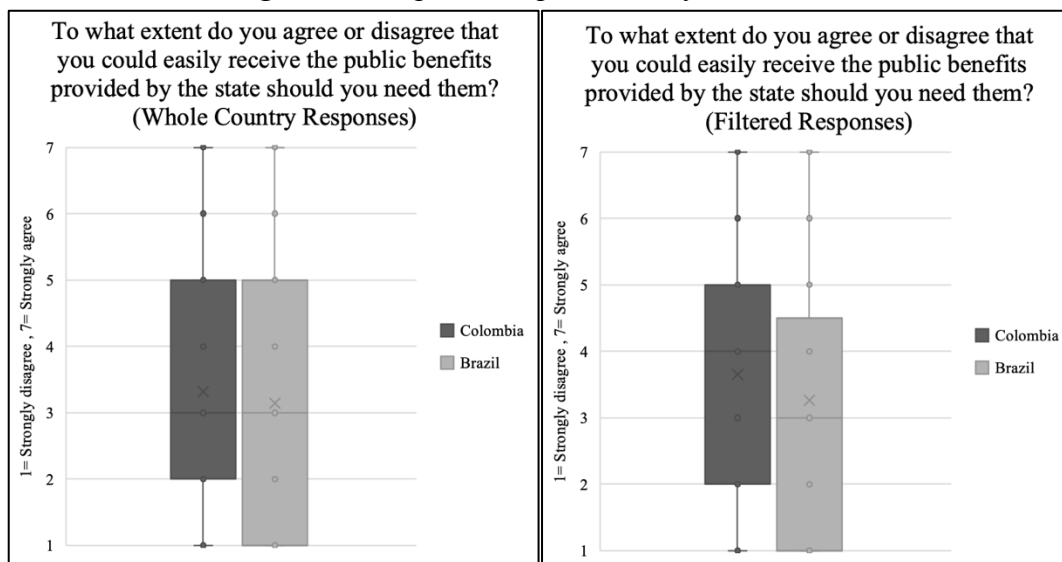
Attitudes toward Access to Government Provided Public Benefits

Survey respondents were also asked about their perceived access to public benefits provided by the state. They were given the option to select an answer between 1 (strongly disagree) and 7 (strongly agree) in order to represent the extent of their agreement with the statement “You believe you could easily receive the public benefits provided by the state should you need them.” Colombia’s interquartile range remains the same in both datasets. However, the median is one point greater in the filtered dataset. This indicates that those living in the areas with the greatest number of measles cases generally perceive slightly better access to public benefits. Conversely, Brazil’s median remains the same in both datasets while its upper quartile value decreases by a half point. This signals that access to public benefits may be perceived as

slightly worse in the areas most affected by measles outbreaks in Brazil. Additionally, Brazil's responses show a larger interquartile range in both cases. These findings highlight how Brazil's regional inequality may have impacted the degree to which imported measles cases were able to spread and proliferate in each country. As a whole, the responses given in Brazil were more varied than they were in Colombia. Furthermore, the areas that were more impacted by measles importation and spread in Colombia had relatively greater perceived accessibility of government benefits compared to the rest of the country, in Brazil, these areas had relatively worse access to government benefits.

Figure 8

Attitudes toward access to government provided public benefits



Sources: LAPOP. (2019a,b). AmericasBarometer 2018/2019: Brazil & Colombia. In *Latin America Public Opinion Project*. Available at <http://datasets.americasbarometer.org>

Crosstabulation reveals two factors significantly associated with responses to this survey question for both Colombia and Brazil. First is protection of basic rights. Respondents were asked to what extent they felt that their basic rights were protected by the political system of their country by selecting a response between 1 (indicating no protection) and 7 (indicating full protection). In both countries [Colombia $X^2(36, N=99) = 97.986, p=.000$] [Brazil $X^2(36, N=82) = 76.257, p=.000$] respondents that felt that their basic rights were more protected agreed to a

greater extent that they would be able to easily receive public benefits if needed. As both of these questions are different measures that could indicate an individual's level of trust in their government, the association between these factors is not unexpected. Political systems that are more stable allow their populous to feel greater levels security and protection, which leads respondents to have greater confidence that their government would provide support if they found themselves in a position of need.

Summary of Findings

Overall, this section of analysis both gives an overview of public opinion and perspective relating to immigration and government service accessibility as well as highlights how the areas that were most affected by measles importation may have different views than the population of the country as a whole. While the areas that experienced the greatest numbers of measles cases in Colombia tended to be more welcoming toward the Venezuelan population, the opposite was true of Brazil. Additionally, government benefits were perceived as being more readily available in the most affected areas of Colombia, but less readily available in the most affected areas in Brazil.

Chapter Five: Conclusions and Interpretations

This thesis investigates measles outbreaks that occurred in Colombia and Brazil as a result of disease importation from Venezuela. In comparing these apparently similar situations that had drastically different outcomes, it is possible to glean some key differences that could inform not only disease outbreak response following importation, but also proactive capacity building and prevention measures.

The framework of this thesis laid out three distinct but interconnected topics of relevance in investigating the measles outbreaks in Colombia and Brazil: vaccination coverage, migrant integration, and migration policy. Specific findings from each topic are outlined below.

Vaccination Coverage

It goes without stating that vaccination coverage is essential to the control of vaccine-preventable diseases, especially in the case of measles. While at first glance the differences between MCV-1 coverage in Colombia and Brazil may not seem to be disparate enough to illicit such divergent outcomes, further investigation reveals key points of contrast that could serve as explanatory factors. Brazil's regional disparities in vaccine coverage are a probable contributing factor to the differential impact of disease importation. The reasons for these disparities, aside from socioeconomic explanations, can be organized into the previously cited categories: intent to vaccinate, health facility readiness, and community access. The study demonstrates that lower coverage of the measles containing vaccines in northern Brazil cannot be attributed entirely to lack of access – a multitude of explanations ranging from vaccine hesitancy to complacency on behalf of the public as well as health care providers may also be at play throughout the region.

Also important in the discussion of vaccination coverage is disease surveillance capabilities. Colombia's public health emergency operation center seems to have had a major impact on their ability to detect, treat and isolate infectious cases, as evidenced by their enhanced detail in reporting to the PAHO. Having the capacity for these type of in-depth and thorough responses at a moment's notice cannot go unrecognized as important to disease control.

Migrant Integration

The level of integration of Venezuelan migrants into their host communities is not only beneficial for access to social services and opportunities for increased livelihood, but also for the control of imported infectious disease. Qualitative analysis of the presence of xenophobic sentiments in Colombia and Brazil yields somewhat similar results. The migratory history between Colombia and Venezuela does factor into the creation of a welcoming environment in some ways, but it in no way can be seen as quelling all xenophobic attitudes. However, quantitative analysis reveals that in the areas in each country most affected by measles outbreaks, Brazilians are considerably less tolerant of the Venezuelan migrant population. This is another instance where geographic differences take effect; the disproportionate concentration of Venezuelan migrants in northern Brazil compared to the more diffuse migrant population in Colombia is incredibly relevant to this aspect of the discussion. Northern Brazil already had lower vaccination coverage, so the effects of herd immunity could not be readily gained by spreading susceptible individuals throughout the population, even if it were possible.

Furthermore, analysis of the age distribution of the Venezuelan population in each country revealed that Brazil may have received a slightly younger immigrant population, which may have impacted the rate of importation and proportion of susceptible individuals that entered

the country. This serves as an additional possible explanation for the greater number of measles cases reported in Brazil.

Migration Policy

In the case of imported disease, migration policy and government responses are of great relevance. The proceeding analysis demonstrates that while Colombia and Brazil did both act in response to the migratory crises at their borders, their methods were not always similar.

Colombia's efforts were often timelier and more direct, while Brazil's tended to be more reactive and less targeted to the specific issues at hand. Additionally, in public health response, the countries once again took similar approaches, but with different execution. Both attempted to relieve the strain on the health care systems by providing health services and vaccinations near border zones. However, Colombia employed the use of their previously established public health emergency response entity, while Brazil developed a new operation whose response can be seen as less robust.

Discussion

As a whole, this study finds that while the overarching themes of vaccination coverage, migrant integration, and migration policy are each probable contributors to the differential impact of measles importation in Colombia and Brazil, they cannot be considered as separate from their underlying contexts, nor can one be considered as more impactful than another.

The proceeding analysis does nothing if not highlight the importance of a multifaceted approach when investigating global health issues resulting from humanitarian crises. Instances of resurgence of previously controlled or eliminated diseases are almost never a result of a single flaw in an otherwise unblemished system. The case of resurgence of the measles virus in Colombia and Brazil as a result of the Venezuelan crisis demonstrates that while maintaining

vaccination coverage is extremely important in maintaining elimination status, so too is having the capacity for public health emergency response when crises arise.

Disease resurgence throughout the Americas following the collapse of Venezuela is evidence that the health of our neighboring nations is as important as the health of our own. There is no simple way to prevent similar situations from arising. However, by analyzing the case of measles resurgence in Colombia and Brazil, we are able to learn from their failures and build on their successes, working toward the development of sustainable and effective strategies to mitigate the impact of cross-border disease transmission in the future.

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APPENDIX

Table of Contents

SPSS Frequencies

Attitudes toward Venezuelan Migrants: Brazil.....	A
Attitudes toward Venezuelan Migrants: Colombia.....	B
Attitudes toward Access to Public Benefits: Brazil.....	D
Attitudes toward Access to Public Benefits: Colombia.....	E

SPSS Crosstabs

Attitudes toward Venezuelan Migrants	E
Attitudes toward Access to Public Benefits	F

SPSS Frequencies

Attitudes toward Venezuelan Migrants: Brazil

Brazil (whole country): Es molesto tener un vecino venezolano

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Mucho	24	1.6	4.7	4.7
	Algo	7	.5	1.4	6.1
	Poco	50	3.3	9.8	15.9
	Nada	428	28.6	84.1	100.0
	Total	509	34.0	100.0	
Missing	System	989	66.0		
Total		1498	100.0		

Brazil (filtered): Es molesto tener un vecino venezolano

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Mucho	1	1.2	3.1	3.1
	Poco	5	6.0	15.6	18.8
	Nada	26	31.0	81.3	100.0
	Total	32	38.1	100.0	
Missing	System	52	61.9		
Total		84	100.0		

Brazil (whole country): De acuerdo con ofrecer servicios sociales a los venezolanos

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Muy de acuerdo	173	11.5	34.1	34.1
	Algo de acuerdo	154	10.3	30.4	64.5
	Ni de acuerdo ni en desacuerdo	77	5.1	15.2	79.7
	Algo de desacuerdo	44	2.9	8.7	88.4
	Muy en desacuerdo	59	3.9	11.6	100.0
	Total	507	33.8	100.0	
Missing	System	991	66.2		
Total		1498	100.0		

Brazil (filtered): De acuerdo con ofrecer servicios sociales a los venezolanos

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Muy de acuerdo	7	8.3	22.6	22.6
	Algo de acuerdo	11	13.1	35.5	58.1
	Ni de acuerdo ni en desacuerdo	4	4.8	12.9	71.0
	Algo de desacuerdo	5	6.0	16.1	87.1
	Muy en desacuerdo	4	4.8	12.9	100.0
	Total	31	36.9	100.0	
Missing	System	53	63.1		
Total		84	100.0		

Attitudes toward Venezuelan Migrants: Colombia

Colombia (whole country): Es molesto tener un vecino venezolano

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Mucho	34	2.0	6.2	6.2
	Algo	47	2.8	8.6	14.8
	Poco	92	5.5	16.8	31.7
	Nada	373	22.4	68.3	100.0
	Total	546	32.8	100.0	
Missing	System	1117	67.2		
Total		1663	100.0		

Colombia (filtered): Es molesto tener un vecino venezolano

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Algo	1	1.0	2.8	2.8
	Poco	2	2.0	5.6	8.3
	Nada	33	33.0	91.7	100.0
	Total	36	36.0	100.0	
Missing	System	64	64.0		
Total		100	100.0		

Colombia (whole country): De acuerdo con ofrecer servicios sociales a los venezolanos

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Muy de acuerdo	126	7.6	23.0	23.0
	Algo de acuerdo	197	11.8	35.9	58.8
	Ni de acuerdo ni en desacuerdo	73	4.4	13.3	72.1
	Algo de desacuerdo	69	4.1	12.6	84.7
	Muy en desacuerdo	84	5.1	15.3	100.0
	Total	549	33.0	100.0	
Missing	System	1114	67.0		
Total		1663	100.0		

Colombia (filtered): De acuerdo con ofrecer servicios sociales a los venezolanos

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Muy de acuerdo	12	12.0	33.3	33.3
	Algo de acuerdo	15	15.0	41.7	75.0
	Ni de acuerdo ni en desacuerdo	3	3.0	8.3	83.3
	Algo de desacuerdo	3	3.0	8.3	91.7
	Muy en desacuerdo	3	3.0	8.3	100.0
	Total	36	36.0	100.0	
Missing	System	64	64.0		
Total		100	100.0		

Attitudes toward Access to Public Benefits: Brazil

Brazil (whole country): Es fácil obtener beneficios públicos cuando sea necesario

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Muy en desacuerdo	440	29.4	29.6	29.6
	2	253	16.9	17.0	46.6
	3	216	14.4	14.5	61.1
	4	197	13.2	13.2	74.3
	5	148	9.9	9.9	84.3
	6	86	5.7	5.8	90.1
	Muy de acuerdo	148	9.9	9.9	100.0
	Total	1488	99.3	100.0	
Missing	System	10	.7		
Total		1498	100.0		

Brazil (filtered): Es fácil obtener beneficios públicos cuando sea necesario

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Muy en desacuerdo	22	26.2	26.2	26.2
	2	17	20.2	20.2	46.4
	3	8	9.5	9.5	56.0
	4	15	17.9	17.9	73.8
	5	7	8.3	8.3	82.1
	6	4	4.8	4.8	86.9
	Muy de acuerdo	11	13.1	13.1	100.0
	Total	84	100.0	100.0	

Attitudes toward Access to Public Benefits: Colombia

Colombia (whole country): Es fácil obtener beneficios públicos cuando sea necesario

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Muy en desacuerdo	327	19.7	19.9	19.9
	2	293	17.6	17.8	37.7
	3	306	18.4	18.6	56.3
	4	289	17.4	17.6	73.9
	5	220	13.2	13.4	87.2
	6	105	6.3	6.4	93.6
	Muy de acuerdo	105	6.3	6.4	100.0
	Total	1645	98.9	100.0	
Missing	System	18	1.1		
Total		1663	100.0		

Colombia (filtered): Es fácil obtener beneficios públicos cuando sea necesario

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Muy en desacuerdo	18	18.0	18.2	18.2
	2	15	15.0	15.2	33.3
	3	13	13.0	13.1	46.5
	4	19	19.0	19.2	65.7
	5	15	15.0	15.2	80.8
	6	10	10.0	10.1	90.9
	Muy de acuerdo	9	9.0	9.1	100.0
	Total	99	99.0	100.0	
Missing	System	1	1.0		
Total		100	100.0		

SPSS Crosstabs

Crosstab

País				Recibe asistencia del gobierno		Total
				Sí	No	
Colombia	Es molesto tener un vecino venezolano	Algo	Count	0	1	1
			% within Es molesto tener un vecino venezolano	0.0%	100.0%	100.0%
		Poco	Count	0	2	2
	% within Es molesto tener un vecino venezolano		0.0%	100.0%	100.0%	
	Nada	Count	5	28	33	
		% within Es molesto tener un vecino venezolano	15.2%	84.8%	100.0%	
Total		Count	5	31	36	
		% within Es molesto tener un vecino venezolano	13.9%	86.1%	100.0%	
Brazil	Es molesto tener un vecino venezolano	Mucho	Count	1	0	1
			% within Es molesto tener un vecino venezolano	100.0%	0.0%	100.0%
		Poco	Count	1	4	5
	% within Es molesto tener un vecino venezolano		20.0%	80.0%	100.0%	
	Nada	Count	1	25	26	
		% within Es molesto tener un vecino venezolano	3.8%	96.2%	100.0%	
Total		Count	3	29	32	
		% within Es molesto tener un vecino venezolano	9.4%	90.6%	100.0%	

Crosstab

País				Los derechos básicos están protegidos						Total	
				Nada	2	3	4	5	6		Mucho
Colombia	Es fácil obtener beneficios públicos cuando sea necesario	Muy en desacuerdo	Count	11	1	3	2	0	1	0	18
			% within Es fácil obtener beneficios públicos cuando sea necesario	61.1%	5.6%	16.7%	11.1%	0.0%	5.6%	0.0%	100.0%
		2	Count	2	7	3	2	1	0	0	15
			% within Es fácil obtener beneficios públicos cuando sea necesario	13.3%	46.7%	20.0%	13.3%	6.7%	0.0%	0.0%	100.0%
		3	Count	0	1	4	6	0	2	0	13
			% within Es fácil obtener beneficios públicos cuando sea necesario	0.0%	7.7%	30.8%	46.2%	0.0%	15.4%	0.0%	100.0%
		4	Count	3	2	2	2	7	2	1	19
			% within Es fácil obtener beneficios públicos cuando sea necesario	15.8%	10.5%	10.5%	10.5%	36.8%	10.5%	5.3%	100.0%
		5	Count	2	1	4	1	5	0	2	15
			% within Es fácil obtener beneficios públicos cuando sea necesario	13.3%	6.7%	26.7%	6.7%	33.3%	0.0%	13.3%	100.0%
		6	Count	0	2	2	0	2	1	3	10
			% within Es fácil obtener beneficios públicos cuando sea necesario	0.0%	20.0%	20.0%	0.0%	20.0%	10.0%	30.0%	100.0%
Muy de acuerdo	Count	0	0	0	3	2	1	3	9		
	% within Es fácil obtener beneficios públicos cuando sea necesario	0.0%	0.0%	0.0%	33.3%	22.2%	11.1%	33.3%	100.0%		
Total	Count	18	14	18	16	17	7	9	99		
	% within Es fácil obtener beneficios públicos cuando sea necesario	18.2%	14.1%	18.2%	16.2%	17.2%	7.1%	9.1%	100.0%		
Brazil	Es fácil obtener beneficios públicos cuando sea necesario	Muy en desacuerdo	Count	6	7	2	3	1	0	2	21
			% within Es fácil obtener beneficios públicos cuando sea necesario	28.6%	33.3%	9.5%	14.3%	4.8%	0.0%	9.5%	100.0%
		2	Count	5	2	8	1	1	0	0	17
			% within Es fácil obtener beneficios públicos cuando sea necesario	29.4%	11.8%	47.1%	5.9%	5.9%	0.0%	0.0%	100.0%
		3	Count	3	0	2	1	0	2	0	8
			% within Es fácil obtener beneficios públicos cuando sea necesario	37.5%	0.0%	25.0%	12.5%	0.0%	25.0%	0.0%	100.0%
		4	Count	0	0	6	5	1	2	1	15
			% within Es fácil obtener beneficios públicos cuando sea necesario	0.0%	0.0%	40.0%	33.3%	6.7%	13.3%	6.7%	100.0%
		5	Count	0	1	1	2	3	0	0	7
			% within Es fácil obtener beneficios públicos cuando sea necesario	0.0%	14.3%	14.3%	28.6%	42.9%	0.0%	0.0%	100.0%
		6	Count	1	0	1	0	0	0	2	4
			% within Es fácil obtener beneficios públicos cuando sea necesario	25.0%	0.0%	25.0%	0.0%	0.0%	0.0%	50.0%	100.0%
Muy de acuerdo	Count	1	2	0	1	1	0	5	10		
	% within Es fácil obtener beneficios públicos cuando sea necesario	10.0%	20.0%	0.0%	10.0%	10.0%	0.0%	50.0%	100.0%		
Total	Count	16	12	20	13	7	4	10	82		
	% within Es fácil obtener beneficios públicos cuando sea necesario	19.5%	14.6%	24.4%	15.9%	8.5%	4.9%	12.2%	100.0%		