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Ana Maria Ibanez
Sandra Rozo
Maria J. Urbina

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Ana María Ibáñez † Sandra V. Rozo‡ María J. Urbina§

Abstract

We examine the role of Venezuelan forced migration on the propagation of 15 infectious diseases in Colombia. For this purpose, we use rich municipal-monthly panel data. We exploit the fact that municipalities closer to the main migration entry points have a disproportionate exposure to infected migrants when the cumulative migration flows increase. We find that higher refugee inflows are associated with increments in the incidence of vaccine-preventable diseases, such as chickenpox and tuberculosis, as well as sexually transmitted diseases, including AIDS and syphilis. However, we find no significant effects of migration on the propagation of vector-borne diseases. Contact with infected migrants upon arrival seems to be the main driving mechanism.

JEL Classification: F22, O15, I15.

Keywords: Forced Migration, Infectious Diseases, Health Outcomes.

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†Inter-American Development Bank. Email: anaib@iadb.org
‡University of Southern California. Corresponding author. Email: sandra.rozo@marshall.usc.edu
§Email: mj.urbina2100@gmail.com

I Introduction

Forced migration can play a relevant role in the spread of infectious diseases within hosting locations. Forced migrants, for instance, commonly experience risky journeys with limited access to health services, inadequate rest, and insufficient supplies to meet their basic needs. Additionally, this population consistently reports having had limited access to any health services, pharmaceutical and health preventive supplies, and adequate food and water within their country of origin for extended periods of time before migrating.[1] As such, forced migrants arrive at their hosting locations in extremely poor health, which can facilitate the spread of infectious diseases.

Our purpose in this paper is to study the role of forced migration in the spread of infectious diseases and explore some of the main transmitting channels. We make several contributions to the understanding of the role of social interactions in the spread of infectious diseases. First, we focus on the effects of forced migration. Previous studies have analyzed the role of trade (Oster, 2012), school, and public transportation closures (Adda, 2016). As of today, however, the incidence of involuntary migration on disease remains largely unstudied[2] despite the increased growth of involuntary migration flows—which by 2019 reached almost 80 million individuals (UNHCR, 2019). Montalvo and Reynal-Querol (2011) and Baez (2011) are two noteworthy exceptions, documenting that forced migration caused by civil wars increased the spread of malaria, diarrhea, and fever in hosting locations. Understanding the role of forced migration in the spread of a more comprehensive list of infectious diseases is key for the adequate formulation of control and preventive public policies in the hosting communities. It is also relevant for many developing countries that host large flows of forcibly displaced populations but may not have comparable data to carry out similar analyses.

Second, we use unique and rich monthly municipal data on the incidence of 15 infectious dis-

[1] See OEA (2019) or Human Rights Watch (2019) for recent reports on the Venezuelan case.

[2] Most literature has focused on examining the effects of macroeconomic conditions, individual income, or unemployment on health outcomes (e.g., Ruhm, 2000; Dehejia and Lleras-Muney, 2004, Adda et al., 2009; Evans and Moore, 2012). In general, this literature has documented a pro-cyclical relation between economic conditions and health outcomes such as mortality or child outcomes that is largely associated with changes in individual risky behaviors and time availability.

eases within a developing country. The data span the period between January 2012 and December 2018. In contrast to Montalvo and Reynal-Querol (2011) and Baez (2011), we are able to examine all the infectious diseases of interest for the refugee population and distinguish between age groups by type of disease. This age-based analysis is important given that children and elderly are typically more vulnerable to infectious diseases and can show different transmission patterns. Examining the spread of a broad range of infectious diseases is novel in the economics literature, which has mostly studied the incidence of AIDS (Oster, 2005; Dupas, 2011; Lakdawalla et al., 2006; Oster, 2012), influenza, chickenpox, and gastroenteritis (Adda, 2016).

Third, we provide suggestive evidence on which stage of the migration process may drive the incidence and subsequent spread of a large number of infectious diseases. The vulnerability of migrants to infectious diseases depends on the epidemiological profile of the country of origin, the migration process, and the conditions at the destination (Montalvo and Reynal-Querol, 2011; Barnett and Walker, 2008; Baez, 2011; Castelli and Sulis, 2017; Kluge et al., 2020). The type of infectious disease acquired varies for each of these stages. For example, poor travel conditions may increase the incidence of tuberculosis, while a collapse of the health system in origin may explain the incidence of vaccine-preventable diseases. In addition, the spread of diseases on the local population may result from contact with migrants that arrived infected to the destination country or an overflow of health services due the increasing pressures from the arriving migrants. Identifying the spread of particular infectious diseases and the main transmitting channels is important to provide more fine-grained policy recommendations on the stage of the migration process at which policy-makers should intervene (e.g., vaccination of newly arrived migrants, increase access to health services in destination).

Fourth, we examine the effects of forced migration on the health of natives and exclude migrants. This is important as we are able to cleanly measure the added effect of migration on the native's health as opposed to the displacement of health problems from one country to another. For instance, the health of migrants may improve upon arrival to Colombia as they have better access to health services. This is a relevant dimension in which our paper is different from Montalvo and

Reynal-Querol (2011) and similar to Baez (2011). However, relative to Baez (2011), we study the effects of migration on a larger population, more health outcomes, and different age categories.

We examine the role of Venezuelan forced migration in the spread of 15 infectious diseases in Colombia. As a consequence of the intense political, social, and economic crises in Venezuela, out-migration from that country has been endemic since early 2016. The United Nations Refugee Agency estimates that by 2020, 5.0 million Venezuelans, over 17.4% of the country's population in 2018, left and were being hosted by regional neighbors in Latin America (see UNHCR, 2019). Data from Migración Colombia, the Colombian migration agency, suggests that by December 31, 2018, 1.26 million Venezuelans had migrated to Colombia with the intent to stay there. However, the actual number is likely higher because many forced migrants refrain from reporting their status due to their fears of being deported.

The 15 diseases that we study are the most predominant within Venezuelan migrants according to several health local authorities, and some of these diseases have also been identified as diagnoses of national interest by the Colombian Ministry of Health due to recent increments in their incidence (see CHM, 2019a; CHM, 2019b; Grillet et al., 2019; Human Rights Watch, 2019; and WHO, 2019). We classified the diseases into three groups as follows: (i) vector-borne, which includes malaria, dengue, leishmaniasis, chagas disease, and yellow fever; (ii) vaccine-preventable, which includes chickenpox, measles, rubella, tuberculosis, diphtheria, and whooping cough (pertussis); and (iii) sexually transmitted diseases (STDs), which include HIV, syphilis, hepatitis B, and chlamydia. The data that we use on the prevalence of these disease are predominantly based on Colombian patients with access to the subsidized or contributory health regimes, which cover 95.5% of the population (Ministry of Health, 2020).

Our empirical strategy exploits the fact that municipalities closer to the five migration points face a greater level of exposure to infected migrants when the total monthly inflows of Venezuelans increase. More formally, as data on forced migration flows are not available at the municipal level, we construct a monthly municipal measure of *predicted migration inflows* based on the interaction

of the inverse distance to the main migration points and the total monthly migration flows from Venezuela to Colombia. We use the population census of 2005 and 2018, the last two census with micro data available, to verify that our *predicted migration inflows* measure performs well in predicting the location of Venezuelan migrants in Colombia.

We find that larger forced migration flows cause a higher incidence of vaccine-preventable (including chickenpox and tuberculosis) and sexually transmitted diseases (including HIV and syphilis), but no significant changes in the incidence of vector-borne diseases. For vaccine-preventable diseases, our preferred point coefficients suggest that when our measure of *predicted migration inflows* increases by one standard deviation, chickenpox and tuberculosis incidence increase by 0.27 and 0.32 cases per 100,000 individuals, respectively. These increases represent sizable effects considering that the mean incidence of chickenpox and tuberculosis during the period of study was 5.58 and 6.57 cases per 100,00 individuals, respectively.

Concerning the effects of migration on STDs, our estimates suggest that when *predicted migration inflows* increase by one standard deviation, HIV and syphilis incidence increase by 1.64 and 0.12 cases per 100,000 individuals, respectively. Both increases correspond to alarming effects given that the mean incidence of HIV and syphilis during the period of study was 14.03 and 1.73 cases per 100,00 individuals, respectively.

When examining the effects of forced migration by age group, we find that the effects of forced migration on chickenpox incidence are disproportionately concentrated in minors (individuals 18 years of age or less). The result makes sense because almost all individuals in the Colombian population should be immunized against chickenpox after their first birthday. We also find that tuberculosis is more prevalent in seniors (ages 65 or more), while STDs are concentrated in adults (ages 19 to 64), the population that is typically more sexually active.

We also explore two potential transmitting mechanisms: contact between migrants and locals between arrival, and the overflow on the demand for health services. The results suggest that contact with infected migrants is the main potential driver. First, chickenpox, tuberculosis, AIDS, and

syphilis spread between three to five months upon the arrival of migrants. Second, the incidence of chickenpox occurred in municipalities in which the disease had been already eradicated.

Our estimates include fixed effects for municipality, month-year, and department-year, and as such, they are not sensitive to time-invariant differences between municipalities, aggregate time trends, or regional time trends. We also include controls for multiple weather proxies and interactions of year time trends and a rich set of pre-existing municipal characteristics. These municipal characteristics include proxies of economic growth, GDP composition, inequality, informality, public income, public expenditures, central government transfers, homicide rates, conflict-related variables, and institutions. Our estimates are consequently only threatened by unobservable differences (not controlled for) between municipalities closer and farther away from the migration points of entry, which are also correlated with the time variation in Venezuelan total migration inflows.

To assess this possibility we perform several robustness exercises. First, we test for the effects of forced migration on the incidence of chronic diseases, such as diabetes and hypertension. These diseases are not infectious, and as such, they should not be affected by forced migration. We find no effects of forced migration on these health diagnoses. Second, we examine the effects of migration on malnutrition, a condition that is not infectious and could be indirectly affected by forced migration through the economic impacts of migrants in local communities. We find no significant effects of Venezuelan migration on that particular diagnosis.

Our results underline the urgency of implementing massive vaccination campaigns in regions with a high density of migrants and offering full health service access to forced migrants when they arrive at their hosting locations. Importantly, health access may not be effective if it does not go hand in hand with regularization of migrants to ensure that they will not refrain from using health services out of fear of facing deportation. For example, the Colombian government has maintained a generous policy of granting free access to emergency and preventive health services to all Venezuelan refugees in the country, independent of their migratory status. [3] However, quali-

[3]Full access to the health system, however, is restricted to migrants with a legal migratory status, which typically includes individuals with greater economic means. Full health access is funded through payroll taxes for formal

tative evidence from focus groups of irregular migrants in Colombia suggests that Venezuelans are afraid to use health services in Colombia out of fear of being identified as irregular migrants (IPA, 2020).

II Context: The Collapse of the Venezuelan Health System

The economic and political crisis in Venezuela, unleashed when Hugo Chávez became president in 1998, has worsened significantly during the last several years due to the decline in oil revenues, the increasing political repression imposed by the regime of Nicolas Maduro (Chavez's successor), and the steep decline of economic production caused by ill-defined policies controlling the private sector. By 2018, the Venezuelan GDP contracted by 52.3% relative to 2013 (El País, 2019 using data from the Venezuelan Central Bank) and poverty rates increased to 92% (from 24.8% in 2014) (Universidad Católica Andrés Bello, 2018a; Universidad Católica Andrés Bello, 2018b). The worsening conditions led to a full-blown humanitarian crisis. Related to public health conditions in Venezuela, three situations represent critical issues.

First, malnutrition has become endemic in the Venezuelan population. Severe food shortages, paired with falling household income, have caused the nutritional status of the population to deteriorate. In 2017, 80% of households suffered from food insecurity (Universidad Católica Andrés Bello, 2018a). Thirteen percent of children below five years of age and 49% of pregnant women suffer from moderate or severe levels of malnutrition (Caritas Venezuela, 2018).

Second, the health system has collapsed, leaving a large percentage of the population (64%) without health coverage (Universidad Católica Andrés Bello, 2018b). Meanwhile, hospitals and other health providers are operating below their full capacity. For example, in 2019, one-third of hospital beds were not available and 43% of diagnostic laboratories were closed (Organización Médicos por la Salud, 2018). Provision of essential health services, such as immunization, is

workers (regularly known as the contributory regime) and through the subsidized regime for informal or low-income workers. To get access to the subsidized health services, Venezuelan refugees must have their economic situation scored by SISBEN, the instrument used by the Colombian government to target social programs.

limited and the population is susceptible to infectious diseases that had previously been eradicated from Venezuela.

Third, the incidence of infectious diseases and the spread of epidemics in Venezuela have risen significantly during the last several years. After having virtually eradicated malaria, Venezuela is now, with Nigeria, South Sudan, and Yemen, one of the only countries with sharp increases in this vector-borne disease (Grillet et al., 2018). In 2017, a measles epidemic that originated in Venezuela spread to 11 countries in Latin America. By October 2018, there were more than 8,000 confirmed cases and 85 people had died (PAHO and WHO, 2018). STDs have also increased sharply, and deaths related to HIV rose to 5,000 in 2018 from 1,800 in 2014 (PROVEA, 2018).

In addition to these problems, the migration process may have worsened the already poor health of some migrants. Many migrate at illegal crossings and lack access to basic care, food, and health services. Once at their destination, a large percentage of migrants live in overcrowded houses with poor sanitary conditions, insufficient food, and no access to health care (WB, 2018). These circumstances are favorable for the spread of infectious diseases among migrants and the local population. Although the epidemiological profiles of Colombia and Venezuela are similar, which implies that the host population has strong immunity to vector-borne diseases, some groups, such as children that have not completed their vaccination schedule [4] and the elderly, might be prone to some diseases.

III Data

To conduct our analysis, we use Colombian monthly municipal data between January 2012 and December 2018. The data are grouped into four categories described below.

[4]The first dose of the vaccination schedule in Colombia is completed by one year of age, with the exception of the yellow fever vaccine (18 months) and VPH for girls (9 years of age). The full schedule, with all the multiple doses, should be completed by 5 years of age. The influenza vaccine should be given each year starting at six months of age. This link has the official Colombian vaccination schedule https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/VS/PP/ET/ficha-esquema-vacunacion-vf2.pdf

III.1 *Infectious diseases*

Municipal-monthly data on the number of individuals with infectious diseases come from the Colombian Ministry of Health. As mandated by law, the ministry receives regular reports from the institutions responsible for paying for any health service provided[5] during health-related doctor visits (including hospitalizations, emergency care, preventive, or wellness visits). All health-related doctors visits are classified using the *International Classification of Diseases* (10th version) of the World Health Organization and then reported to the Ministry of Health, which centralizes and processes the data. The data available for this study include the total number of cases reported for each diagnosis by month and municipality.[6] The data can also be grouped by age. These data only include information on patients subscribed under the Colombian subsidized or contributory health regimes; as such, the data set predominantly focuses on Colombian nationals and individuals who have access to formal health care services. In fact, the share of individuals in the sample with foreign identity documents is less than 0.2%.

Our analysis centers on 15 infectious diseases, selected in two stages. In the first stage, we consulted with epidemiologists, nurses, and internal medicine doctors in Colombia to identify the infectious diseases that could be of interest for our study. In the second stage, we reviewed all the reports produced by SIVIGILA, the surveillance system of the Ministry of Health in Colombia, to identify the diseases considered to be of "national interest" because they were prevalent in the migrant population or they presented abnormal increments or unusual alarming shifts in prevalence.

The diseases that we identified include malaria, Chagas disease, leishmaniasis, dengue, yellow fever, chickenpox, measles, rubella, tuberculosis, diphtheria, whooping cough, HIV, syphilis, hepatitis B, and chlamydia.[7] Appendix A includes a detailed description of the causes, means of transmission, and symptoms of each disease. It also indicates if a vaccine is available, whether an

[5] That is, local governments are responsible for payments for individuals subscribed in the health subsidized regime, or EPS [Entidades Proveedoras de Salud] is responsible for payments for individuals subscribed under the contributory health regime.

[6] The municipality of report corresponds to the patient's municipality of residence.

[7] See CHM, 2019a; CHM, 2019b; Grillet et al., 2019; Human Rights Watch, 2019; and WHO, 2019 for reports.

individual acquires immunity after contracting the disease, and whether a vaccine is mandatory in Colombia.

We use the *International Classification of Diseases* to identify all the related diagnoses that should aggregate under each infectious disease. We then construct incidence rates per 100,000 individuals by dividing the number of cases of each disease by the municipal annual population and multiplying the result by 100,000. Descriptive statistics for all the diseases are presented in Table I. The diseases with the highest incidence during our period of study are AIDS (14.03), tuberculosis (6.57), dengue (5.78), and chickenpox (5.58). Appendix B also displays the geographic distribution of the average incidence rates for each disease by municipality. The maps show a large geographical variation of the incidence rates for all diseases.

We classified the 15 diseases that we examine into three groups as follows:

1. **Vector-borne**: malaria, dengue, leishmaniasis, and Chagas disease.
2. **Vaccine-preventable**: chickenpox, measles, rubella, tuberculosis, diphtheria, and whooping cough (or pertussis).
3. **Sexually transmitted diseases (STDs)**: AIDS, syphilis, chlamydia, and hepatitis B.

Vector-borne diseases are transmitted primarily through the bite of an infected mosquito or insect, although transmission is also possible via blood transfusions, organ transplants, or the sharing of blood-contaminated needles. There are no high-efficiency vaccines available to prevent any of these diseases in Colombia. Infected humans can carry the disease to new locations where they may be bitten by a mosquito or insect that would then become infected and able to spread the disease. Figure I displays the time series patterns of the average incidence rates of each vector-borne disease on a monthly basis. Of the four diseases in this group, malaria and dengue have the highest incidence in Colombia.

Vaccine-preventable diseases are prevented by the administration of high-efficiency vaccines. They are typically transmitted by an infected person through coughing and sneezing. Vaccination

for the diseases in this category is mandatory in Colombia and typically happens in the first year after birth. Children who are too young to get the vaccines are not immune to the diseases. Aside from vaccination, immunity against most of these diseases can be acquired by becoming infected (diphtheria, tuberculosis, and whooping cough are exceptions). Figure II displays the time series patterns of average incidence rates for vaccine-preventable diseases. Tuberculosis and chickenpox had the highest incidence among the Colombian population during the period of study, whereas the incidence of the other diseases was extremely low.

STDs spread through sexual intercourse or direct contact with blood, semen, pre-seminal fluids, rectal fluids, vaginal fluids, or breast milk from an infected individual. There are no vaccines to prevent them. Figure III displays the time series patterns of average incidence rates for STDs. Syphilis, AIDS, and hepatitis B show an increasing trend in the average number of cases per 100,000 individuals beginning around 2016.

III.2 *Venezuelan forced migration*

Direct data on Venezuelan migration are not available at the municipal level. Consequently, we approximate municipal-monthly inflows of Venezuelan forced migration using the following measure:

$$\text{Predicted Inflows}_{mt} = \text{Venezuelan Inflows}_t \times \frac{1}{\sum_{k=1}^{5} w_k distance_{mk}} \tag{1}$$

where *Venezuelan Inflows*$_t$ represents the total inflows of Venezuelan migrants registered entering Colombia in each month *t*, and $distance_{mk}$ is the distance from the centroid of each municipality m to each of the k migration points of entry in the Colombian-Venezuelan border.[8] Because each of the five migration entry points at the border has a different flow of migrants, we assign weights w_k to each of them. The weights are estimated as the ratio of the flow of migrants coming through each point and the total inflows observed in all five points between 2014 and 2017 (when the information by point of entry was made available by

[8]The points are located in Cúcuta, Maicao, Arauca, Puerto Carreño, and Puerto Inírida.

the Colombian migration authorities).[9] Our *predicted inflows* measure is consequently constructed as the interaction of the inverse distance of each municipality to the main migration points of entry (municipal variation) and the total monthly number of Venezuelan migrants entering Colombia (monthly variation).

The monthly cumulative inflow of Venezuelans registered entering Colombia through the main migration entry points is displayed in Figures I through III. The figures reveal that the Venezuelan inflows have been increasing dramatically since early 2016. The figures also suggest that the arrival of Venezuelans has coincided with a dramatic increment in the incidence of STDs, including syphilis and AIDS.

The municipal distribution of the inverse distance of each municipality to the main migration entry points is displayed in the left panel of Figure IV. To test whether this cross-section variation is associated with Venezuelan migration patterns, we use data from the population census of 2005 (the last population census with micro data available) and the foreign population from the population census of 2018.[10] In particular, we use the 2005 population census to estimate the number of Venezuelan nationals in each municipality and the population census of 2018 to estimate the number of foreigners as a share of the population. As displayed in the right panel of Figures IV and V, we observe that our inverse distance measure has a high correlation with the number of Venezuelans and foreigners in each municipality.

In March 2017 the Colombian government began collecting data on the doctor visits of Venezuelan migrants in the Colombian health system. Although the data are not reported regularly by all municipalities and hospitals, and hence, could not be used to conduct a robust statistical analysis, we can still use it to gain a sense of the distribution of Venezuelan patients in Colombia. The municipal distribution of the aggregate number of doctor visits by Venezuelan migrants between March 2017 and December 2018 is presented in Figure VI. It confirms that most health visits are taking place closer to the Colombia–Venezuela border.

[9] International airports are additional points of entry, which we do not include in the predicted inflows. A low percentage of Venezuelan immigrants arrive through international airports. These migrants are largely medium- or high-income individuals and are more likely to have access to health services. Our paper focuses on the impact of the large majority of Venezuelan immigrants: the vulnerable immigrants that lack access to health services, have poor health, and face poor sanitary conditions.

[10] The data from 2018 only allow identifying foreigners. They do not indicate their nationality, but overall more than 95% of foreigners in Colombia are from Venezuela.Although the census collected this information, the data available does not differentiate by nationality

III.3 *Other municipal controls*

We use a number of municipal covariates to asses the robustness of our estimates. They include weather proxies,[11] night light density, conflict-related variables, homicide rates, GDP municipal composition, and proxies for government activity. These variables come primarily from governmental sources except for night light density which comes from the National Oceanic and Atmospheric Administration (see Appendix D for a description of the corresponding sources). Descriptive statistics for these variables are presented in Table I.

IV Empirical Strategy

We test for the effects of Venezuelan forced migration inflows on disease incidence in Colombia by estimating the following specification

$$I_{mt} = \alpha \text{Predicted Inflows}_{mt} + X'_{mt}\Gamma + \sum_{c \epsilon Z} [c_m \times \psi_y] + \gamma_m + \gamma_t + \epsilon_{mt} \tag{2}$$

where I_{mt} represents disease incidence per 100,000 individuals for Colombian nationals in municipality *m* and month-year *t*; *Predicted Inflows*$_{mt}$ is defined following equation 1; X_{mt} is a matrix of municipal controls including departmental-year fixed effects, and interactions of altitude and monthly weather variables[12]; *Z* includes a rich set of pre-existing static municipal characteristics interacted with year dummies[13]; and γ_m and γ_t are fixed effects by municipality and year-month. Standard errors are clustered at the municipal level to account for common unobserved correlations within municipalities.

Our measure of *Predicted Inflows*$_{mt}$ was standardized for ease of interpretation. Consequently, in this specification, α is our coefficient of interest and can be interpreted as the marginal change in disease incidence rates when predicted inflows increase by one standard deviation.

[11] We use interactions of municipal altitude and monthly indicators commonly used to identify periods of intense drought and heavy rain, which are commonly known as *"La Niña"* and *"El Niño"*. The definition for each of these indexes is displayed in Appendix C. The information comes from the Climate Prediction Center of the National Oceanic and Atmospheric Administration. Municipal altitude comes from the Center for Economic Studies at Universidad de los Andes.

[12] These variables are included because vector-borne and respiratory diseases, for instance, tend to have a higher prevalence during rainy seasons.

[13] A detailed list of pre-existing static municipal characteristics included in all our estimates is presented in Panel B of Table I.

In our main estimates, we test for the contemporaneous and lagged effects of migration flows (one and two months after migration takes place) to account for the possibility that the incubation period for some diseases may be longer than a month. In addition, we also test for heterogeneous effects of forced migration on the spread of each disease by age group.

V Results

Tables II and III display the results of equation (2). In the tables, Panel A presents the estimates including only the contemporaneous effects of predicted inflows as the independent variable, whereas Panels B and C include lagged values of that variable.

With regard to the contemporaneous effects of larger predicted migration inflows, we do not identify any significant effects in any of the vector-borne diseases. Because Colombia has an epidemiological profile similar to Venezuela, this outcome is not surprising. However, we observe that larger predicted inflows of forced migrants are associated with a higher incidence of two of the seven vaccine-preventable diseases that we study. In particular, our estimates in Panel A suggest that when predicted migration inflows increase by one standard deviation, the incidence of chickenpox and tuberculosis increases by 0.27 and 0.32 cases per 100,000 individuals, respectively. These increments correspond to sizable effects given that the mean incidence of these diseases for the period of study was 5.58 (for chickenpox) and 6.57 (for tuberculosis). Hence, the estimated point coefficients correspond to increments of 4.8% (for chickenpox) and 4.9% (for tuberculosis) over the mean incidence. Moreover, the estimates of Panels B and C suggest that the effects of both diseases are largest two months after original exposure to infected migrants. Both results are expected. First, the low vaccination rates in Venezuela might be related to a high incidence of vaccine-preventable diseases in migrant children. Second, poor travel conditions and a poor health status before migration have been found to be risk factors in the incidence of tuberculosis (Castelli and Sulis, 2017).

Additionally, we find that larger predicted migration inflows are associated with a higher incidence of STDs. Our point estimates in Panel A suggest that when predicted migration inflows increase by one standard deviation, the incidence of AIDS and syphilis increases by 1.64 and 0.12 cases per 100,000 individuals, respectively. These effects are alarming and represent an increment of 10% and 6.9% over the mean incidence of AIDS and syphilis, respectively. The results displayed in Panels B and C suggest that the effects of migration on STD propagation are largest one month after the exposure to infected migrants.

V.1 Estimates by age group

The rationale behind estimating the effects of migration by age group is that minors and seniors may be more vulnerable to infectious diseases, while adults may be at higher risk for STDs. To account for these possibilities, we create a database in which we classify all cases of the diseases that we study into three age groups: (i) minors (ages 0 to 18), (ii) adults (ages 19 to 64), and (iii) seniors (ages 65+).[14]

We present the time evolution of the total sum of incidence rates per age group and disease in Figures VII to IX. For the case of vector-borne diseases (see Figure VII), we only distinguish different incidence patterns for the cases of leishmaniasis and chagas disease, which tend to disproportionately affect seniors, while having a lower incidence among minors. With regard to vaccine-preventable diseases, minors are disproportionately affected by chickenpox, measles, and pertussis, whereas tuberculosis is more prevalent among seniors (see Figure VIII). STDs are more prevalent in adults and less common in minors (see Figure IX).

We present the estimates of equation 2 for each age group in Tables IV and V. Consistent with our previous results, we find that larger forced migration inflows are associated with higher rates of chickenpox, tuberculosis, AIDS, and syphilis. However, we observe heterogeneous effects by age group.

The effects of chickenpox are concentrated in minors but are also significant for adults. This is intuitive considering that the vaccine for chickenpox is mandatory in Colombia and should be administered at the first birthday of each individual. Consequently, the population susceptible to infection (i.e., the population that is not immune) should be largely concentrated in individuals 0 to 1 years of age. For tuberculosis, cases are concentrated in the senior population, in which the disease is more prevalent (as shown in Figure VIII).

Finally, as expected, STDs are primarily concentrated in adults, the population that is more sexually active and consequently faces a higher risk of exposure to these diseases. For the case of AIDS, however, we also find significant, albeit small effects, among minors; these cases could be explained by prenatal transmission or teenage sexual encounters.[15]

[14] For each group, incidence rates were created by dividing the number of cases observed by the corresponding population in each age group and multiplying by 100,000.

[15] We do not report heterogeneous effects by gender group because the information is not available for a large part of the sample.

V.2 More on the dynamic effects

In order to shed some light on the duration of the effects that we have documented we carry out an estimation in which we examine the dynamic effects of Venezuelan migration in the four infectious diseases in which we found significant effects of migration. The results are presented in Figure X. We find that migration flows have a significant effects three months after migration occurs for the case of AIDs and syphilis, four months for chickenpox, and five for tuberculosis. The reason behind these effects could be that one migrants arrive they can infect others that in turn will also spread the disease, the cycle tends to be resolved only after three to five months after migration flows take place. The specific point estimates for all the diseases are presented in Appendix H.

V.3 Mechanisms

There are two main channels through which forced migrants may be affecting the spread of infectious diseases in hosting communities. First, through contact with infected migrants, and second, by increasing the demand for health services reducing quality and access. Our paper focuses on the first channel by studying the effects of contact with migrants on the spread of infectious diseases. The dynamics effects suggest that contact with infected migrants might be plausible mechanism. In this subsection we try to present more evidence on the validity of each of these channels.

Concerning contact with infected migrants one important question is whether migrants arrive infected to hosting locations or acquire the diseases upon arrival since they are in more vulnerable health and economic situations. We attempt to shed light on this question by examining the incidence of chickenpox (one of the most contiguous infectious diseases) in municipalities that had no incidence of chickenpox before 2016 (before the large surge of Venezuelan migration to Colombia) and the rest of the sample. The results are presented in Table VII and confirm that the positive effects of migration on chicken pox incidence are predominantly observed in municipalities that had eradicated the disease before 2016. We also present the total number of cases of each of the infectious diseases that we study before and after the beginning of the large Venezuelan migration surge of 2016 in Figure XI. The Figure illustrates the dramatic increment in the incidence of most of the diseases that we study.

Further evidence that supports the idea that Venezuelans are bringing the diseases from the origin communities is presented in Appendix I. In the Appendix we use data from ENCOVI a survey representative of the Venezuelan population available between 2014 and 2018 and the population census of 2018 to char-

acterize the Venezuelan population. Data from the ENCOVI suggests that the majority of the Venezuelan population does not have health access. In fact in 2016 approximately 60 percent of the population did not have health services access and this percentage was up to 80 percent by 2018 Figure I.1. We were also able to document that foreigners in Colombia, a population that is represented disproportionately by Venezuelans, have low internal migration, they mostly arrive from other country and stay in the same municipality Figure I.1.

We used the population census of 2018 to characterize foreigners in Colombia. More than ninety percent of foreigners in Colombia are from Venezuela. Hence, this exercise is a good proxy for the characteristics of Venezuelan migrants in the country. We present the results in Figure I.2 and Figure I.3. We observe that relative to the Colombian population, Venezuelans are disproportionately male, single, and more educated. They also seek less medical help for health problems despite the fact they report having more health issues relative to Colombian nationals. This last may be explained by their fears of the costs of medical attention or the possibility of being deported. All of these figures suggest that migrants have less access to health services in Venezuela and Colombia and that they have a worse health condition relative to Colombian citizens.

Concerning the plausible congestion effects of migrants on health services we explore whether migration flows have been reflected in additional health expenditures. Considering that everyone in Colombia has access to health emergency services it is likely that Venezuelan migration, which represents a large population shock in Colombia, will increase demand for health services and create congestion unless the resources to attend the additional patients are also increased with the arrival of migrants. We focus our analysis on the impacts of Venezuelan migration on health transfers sent from the central government to the decentralized local governments. The data for this exercise comes from the Colombian National Planning Department and corresponds to annual health transfers from 2012 to 2018. Our results are presented on Table VIII and show no effects of Venezuelan migration on health transfers of any kind. Consequently, we cannot reject the hypothesis that our effects are related with higher congestion of health services.

V.4 Robustness tests

Are these effects driven by indirect impacts of migrants on economic outcomes?

One relevant question is whether our findings are actually driven by the transmission of infectious diseases from migrants to the rest of the population, or whether they are explained by other indirect impacts of mi-

gration on health. It is possible, for instance, that larger migration flows may increase prices through higher local demand or displace informal workers from the labor markets and thus deteriorate health outcomes through these channels.

To test for such possibilities, we estimate the impacts of predicted inflows on the number of cases of malnutrition,[16] which cannot be transmitted from migrants to the rest of the population and should be more directly related to changes in economic outcomes. The results are presented in column 1 of Table VI. They suggest no significant effects of migration on either contemporaneous or lagged malnutrition.[17]

Placebo test on chronic diseases

We also test for the effects of predicted migration inflows on common chronic diseases that are non-infectious and should not be directly affected by migration. These diseases include hypertension and diabetes. We do not find any impacts of predicted migration inflows on the incidence of these diseases (see columns 2 and 3 of Table VI).

Accounting for zeros in the sample

A large share of municipalities in our sample consistently reported zero cases of each of the diseases that we studied, we check if our results would change if these zeros are omitted from our sample. We present the estimates of this exercise in Appendix E. Our results remain unchanged.

Accounting for heterogeneous effects by altitude

We are also concerned about the fact that vector-borne diseases are predominately observed in municipalities at lower altitudes. Hence, we explore for possible heterogeneous effects by dividing the sample of municipalities at different altitude levels. We still do not find any effects of Venezuelan migration on vector-borne diseases (see Appendix F).

Accounting for Colombians out-migration

An important threat concerning the validity of our results is that Colombian citizens may be moving out of areas that receive Venezuelan migrants. These population trends can also contribute to spread infectious diseases or simply change the composition of the population in each municipality. To verify whether this was the case we use data from the population censuses of 1993, 2005, and 2018 to calculate a municipal measure of individuals who lived in each municipality and were born in Colombia. We then use these data to estimate a regression of population figures on our predicted measure of Venezuelan inflows. The estimates

[16] We estimate the cases of malnutrition using the reports of the Ministry of Health.

[17] For these cases, we also tested the effects of migration flows after three months of arrival considering that the indirect effects of forced migration on prices and labor markets, for instance, may take more time to manifest.

are illustrated in Appendix G and include the same controls and fixed effects used in our main analysis. We are not able to identify any effects of the Venezuelan inflows on Colombian internal migration flows.

Are the effects stronger in infants?

We check for the effects of Venezuelan migration on infants (individuals younger than one year old) for the infectious diseases on our main analysis that had some positive incidence in this age group (see Table J.1) as well as on all vaccine preventable diseases with positive prevalence on this age group (see Table J.2). Although we observe the same signs the results are more imprecise relative to our main analysis. This is the case since there could be prevalence of these diseases in individuals that are immune depressed like pregnant women or seniors in which the vaccine induces an activation of the virus. It is also likely that seniors may not have had access to vaccination for this diseases when they were young. Consequently, by restricting the sample in this age groups we may be reducing relevant variation in the incidence of these diseases.

VI Discussion

We examine the causal role of Venezuelan forced migration in the transmission of 15 infectious diseases in Colombia. These diseases are prevalent among Venezuelan migrants. We group these diseases into three categories as vector-borne, vaccine-preventable, and STDs. To identify causal effects, we exploit the fact that municipalities in close proximity to the main entry migration points experience a disproportionate exposure to infected migrants when monthly cumulative migration flows are larger.

We find that larger forced migration flows are associated with a higher incidence of chickenpox, tuberculosis, AIDS, and syphilis. The point estimates for each of these diseases suggest that the effects of forced migration on the propagation of these diseases is meaningful. The analysis suggests that the main driver the contact between recently arrived migrants and the local population. Given the collapse of the health system in Venezuela and the low vaccination rates, migrants may have contracted infectious diseases before migrating or while travelling to Colombia. The results show that the spread of the diseases take place three to five months after arrival to Colombia and, in the case of chickenpox, in municipalities in which it was eradicated.

Our results highlight the urgency of supporting forcibly displaced populations with adequate and quality health services access upon their arrival at hosting locations. With legal access to health services, migrants may report symptoms rapidly and receive proper treatment, which is crucial to halt the spread of infectious

diseases. In light of the spread of vaccine-preventable diseases, immunization of the migrant population should be a priority, but efforts to create systems for early detection of infected individuals could also prove effective. With regard to STDs, hosting locations need to prioritize migrants' access to health preventive services such as information on safe sex practices as well as access to supplies. Massive health campaigns in regions with a large concentration of migrants might be a cost-effective intervention to vaccinate children, provide early treatment to sick migrants, and undertake prevention campaigns for STDs.

Although our paper uses rich data on disease incidence at the municipal-monthly level, we only observe the total number of cases reported by diagnosis and not data on individuals. Consequently, we cannot differentiate effects on individuals that have multiple infectious diseases. This might be relevant in cases in which individuals have AIDS and may also get tuberculosis as commonly reported by qualitative media reports.

Interesting avenues for future research include identifying and testing policy responses that may effectively reduce the spread of diseases from forced migrants to the rest of the population.

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Table (I) Descriptive Statistics - Infectious Diseases (2012-2018)

Variables	Observations	Average	Std. Deviation	Min	Max
Panel A. Infectious Diseases					
Malaria Incidence per 100,000 Indv.	94248	2.26	28.62	0.00	4725.75
Leishmaniasis Incidence per 100,000 Indv.	94248	1.75	9.88	0.00	486.81
Chagas Incidence per 100,000 Indv.	94248	1.82	11.35	0.00	549.02
Dengue Incidence per 100,000 Indv.	94248	5.78	18.68	0.00	1163.43
Yellow Fever per 100,000 Indv.	94248	0.05	0.98	0.00	109.35
Chickenpox Incidence per 100,000 Indv.	94248	5.58	13.48	0.00	733.14
Measles Incidence per 100,000 Indv.	94248	0.04	0.84	0.00	105.10
Rubella Incidence per 100,000 Indv.	94248	0.20	3.68	0.00	332.75
Tuberculosis Incidence per 100,000 Indv.	94248	6.57	26.25	0.00	2023.83
Diphtheria Incidence per 100,000 Indv.	94248	0.01	0.37	0.00	46.96
Whooping Cough Incidence per 100,000 Indv.	94248	0.22	2.70	0.00	518.77
AIDS Incidence per 100,000 Indv.	94248	14.03	48.79	0.00	5556.14
Syphilis Incidence per 100,000 Indv.	94248	1.73	5.66	0.00	371.31
Hepatitis B Incidence per 100,000 Indv.	94248	0.41	3.10	0.00	218.14
Chlamydia Incidence per 100,000 Indv.	94248	0.34	3.82	0.00	238.44
Panel B. Other Static Controls					
Migrants registered in RAMV- 2018	1122	391.82	2509.74	0.00	43503.00
Job Permits Aug. 2017 - Oct.2017	1122	61.39	875.96	0.00	27703.00
Job Permits Feb. 2018 - Jun. 2018	1122	100.37	1483.08	0.00	47389.00
Job Permits Aug. 2018 - Jan. 2019	1122	250.99	1778.46	0.00	40811.00
Job Permits After Jan. 2019	1122	104.67	1549.73	0.00	48843.00
Night light [1-63(Max.)]- 2009	1122	3.83	7.25	0.00	62.37
GDP in Agriculture (Millions)- 2009	1097	0.26	0.33	0.00	3.91
GDP in Industry (Millions)- 2009	1097	1.13	7.99	0.00	229.70
GDP in Services (Millions)- 2009	1097	1.97	22.79	0.00	726.96
GINI - 2005	1043	0.45	0.03	0.39	0.57
Unsatisfied Basic Needs (% of Households)- 2005	1114	44.94	20.95	5.36	100.00
Informal Labor (% of Households)- 2005	1113	94.89	5.71	62.33	100.00
Total Central Gov. Transfers (Billions)- 2009	1122	127.29	715.12	0.10	20484.41
Mun. Public Income (Millions)-2009	1101	0.31	2.66	0.00	81.31
Mun. Public Expenditures (Millions)-2009	1101	0.31	2.54	0.00	75.53
Homicide Rates per 100,000 Indv.- 2009	1048	29.95	33.98	0.00	241.40
N. of terrorist attacks- 1995	1048	0.03	0.18	0.00	2.00
N. of Financial Institutions- 1995	1046	1.75	8.92	0.00	252.00
N. Tax Collection Offices- 1995	1046	0.69	3.49	0.00	99.00

Table (II) Impacts of Venezuelan Migration on Infectious Diseases - Contemporaneous and Lagged Models

Disease Group	**Vector-borne**					**Vaccine-preventable**					
Variables (per 100,000 indv.)	Malaria	Leish.	Chagas	Dengue	Yellow Fever	Chickenpox	Measles	Rubella	Tuberc.	Diphteria	W. Cough
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A. Contemporaneous Effects											
Predicted Inflows	-0.12	-0.03	-0.07	-0.26	0.00	0.27***	-0.01	-0.00	0.32*	-0.00	0.00
	(0.15)	(0.18)	(0.06)	(0.24)	(0.00)	(0.10)	(0.01)	(0.01)	(0.17)	(0.00)	(0.01)
Observations	82824	82824	82824	82824	82824	82824	82824	82824	82824	82824	82824
Pseudo R-sq.	.39	.3	.35	.19	.076	.14	.023	.15	.21	.021	.039
Panel B. Lagged Effects - 1 Month											
Predicted Inflows (t-1)	-0.13	-0.03	-0.07	-0.30	0.00	0.29***	-0.01	-0.00	0.32*	-0.00	0.00
	(0.16)	(0.19)	(0.07)	(0.26)	(0.01)	(0.10)	(0.01)	(0.01)	(0.18)	(0.00)	(0.01)
Observations	81838	81838	81838	81838	81838	81838	81838	81838	81838	81838	81838
Pseudo R-sq.	.39	.31	.35	.19	.076	.14	.023	.13	.21	.022	.039
Panel C. Lagged Effects - 2 Months											
Predicted Inflows (t-2)	-0.15	-0.05	-0.07	-0.25	0.00	0.31***	-0.01	-0.00	0.37**	-0.00	0.00
	(0.17)	(0.19)	(0.07)	(0.25)	(0.01)	(0.11)	(0.01)	(0.01)	(0.14)	(0.00)	(0.01)
Observations	80852	80852	80852	80852	80852	80852	80852	80852	80852	80852	80852
Pseudo R-sq.	.39	.31	.35	.19	.078	.14	.023	.12	.21	.023	.04
Controls for all Panels											
Month-Year FE	X	X	X	X	X	X	X	X	X	X	X
Municipality FE	X	X	X	X	X	X	X	X	X	X	X
Dep. × Year FE	X	X	X	X	X	X	X	X	X	X	X
Pre-trends × Year FE	X	X	X	X	X	X	X	X	X	X	X
Weather Controls	X	X	X	X	X	X	X	X	X	X	X

Table (III) Impacts of Venezuelan Migration on Infectious Diseases - Contemporaneous and Lagged Models

Disease Group		**STDs**		
Variables (per 100,000 indv.)	AIDS	Syphilis	Hepatitis B	Chlamydia
	(1)	(2)	(3)	(4)
Panel A. Contemporaneous Effects				
Predicted Inflows	1.64*	0.12*	-0.00	0.02
	(0.86)	(0.07)	(0.01)	(0.03)
Observations	82824	82824	82824	82824
Pseudo R-sq.	.29	.13	.39	.12
Panel B. Lagged Effects - 1 Month				
Predicted Inflows (t-1)	1.73*	0.14**	-0.00	0.03
	(0.91)	(0.07)	(0.02)	(0.03)
Observations	81838	81838	81838	81838
Pseudo R-sq.	.29	.14	.4	.12
Panel C. Lagged Effects - 2 Months				
Predicted Inflows (t-2)	1.60*	0.14*	-0.00	0.03
	(0.85)	(0.07)	(0.02)	(0.04)
Observations	80852	80852	80852	80852
Pseudo R-sq.	.29	.14	.4	.13
Controls for all Panels				
Month-Year FE	X	X	X	X
Municipality FE	X	X	X	X
Dep. $\times$ Year FE	X	X	X	X
Pre-trends $\times$ Year FE	X	X	X	X
Weather Controls	X	X	X	X

Table (IV) Impacts of Venezuelan Migration on Infectious Diseases by Age group

Disease Group	**Vector-borne**					**Vaccine-preventable**					
Variables (per 100,000 indv.)	Malaria	Leish.	Chagas	Dengue	Yellow Fever	Chickenpox	Measles	Rubella	Tuberc.	Diphteria	W. Cough
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A. Minors (Ages 18-)											
Predicted Inflows	-0.05	0.02	0.02	-0.52	-0.00	0.42**	-0.02	-0.00	0.10	-0.00	0.01
	(0.12)	(0.16)	(0.01)	(0.45)	(0.01)	(0.19)	(0.02)	(0.01)	(0.09)	(0.00)	(0.03)
Observations	82824	82824	82824	82824	82824	82824	82824	82824	82824	82824	82824
Pseudo R-sq.	.31	.23	.032	.17	.025	.13	.022	.084	.095	.026	.036
Panel B. Adults (Ages 19 to 64)											
Predicted Inflows	-0.17	-0.05	-0.11	-0.18	0.01	0.21**	-0.00	-0.01	0.36	0.00	-0.00
	(0.19)	(0.20)	(0.08)	(0.20)	(0.01)	(0.09)	(0.00)	(0.01)	(0.26)	(0.00)	(0.01)
Observations	82824	82824	82824	82824	82824	82824	82824	82824	82824	82824	82824
Pseudo R-sq.	.39	.26	.3	.16	.1	.11	.024	.15	.19	.017	.028
Panel C. Seniors (Ages 65+)											
Predicted Inflows	-0.19	-0.16	-0.38	0.11	-0.01	0.01	-0.00	-0.00	1.01*	-0.01	-0.03
	(0.14)	(0.46)	(0.35)	(0.20)	(0.01)	(0.07)	(0.00)	(0.01)	(0.58)	(0.00)	(0.02)
Observations	82824	82824	82824	82824	82824	82824	82824	82824	82824	82824	82824
Pseudo R-sq.	.2	.14	.24	.076	.018	.026	.015	.034	.16	.017	.03
Controls for all Panels											
Month-Year FE	X	X	X	X	X	X	X	X	X	X	X
Municipality FE	X	X	X	X	X	X	X	X	X	X	X
Dep. $\times$ Year FE	X	X	X	X	X	X	X	X	X	X	X
Pre-trends $\times$ Year FE	X	X	X	X	X	X	X	X	X	X	X
Weather Controls	X	X	X	X	X	X	X	X	X	X	X

Table (V) Impacts of Venezuelan Migration on Infectious Diseases by Age group

Disease Group		**STDs**		
Variables (per 100,000 indv.)	AIDS	Syphilis	Hepatitis B	Chlamydia
	(1)	(2)	(3)	(4)
Panel A. Minors (Ages 18-)				
Predicted Inflows	0.17*	0.08	-0.01	0.02
	(0.09)	(0.06)	(0.02)	(0.02)
Observations	82824	82824	82824	82824
Pseudo R-sq.	.21	.045	.58	.1
Panel B. Adults (Ages 19 to 64)				
Predicted Inflows	2.82**	0.19**	0.00	0.03
	(1.38)	(0.09)	(0.02)	(0.04)
Observations	82824	82824	82824	82824
Pseudo R-sq.	.28	.12	.078	.096
Panel C. Seniors (Ages 65+)				
Predicted Inflows	0.51	-0.09	0.02	0.02
	(0.89)	(0.06)	(0.05)	(0.06)
Observations	82824	82824	82824	82824
Pseudo R-sq.	.21	.039	.033	.081
Controls for all Panels				
Month-Year FE	X	X	X	X
Municipality FE	X	X	X	X
Dep. $\times$ Year FE	X	X	X	X
Pre-trends $\times$ Year FE	X	X	X	X
Weather Controls	X	X	X	X

Table (VI) Impacts of Venezuelan Migration on Malnutrition and Chronic Diseases

Variables (per 100,000 indv.)	Malnutrition	Hypertension	Diabetes
	(1)	(2)	(3)
Panel A. Contemporaneous Effects			
Predicted Inflows	-0.64	14.45	0.91
	(0.68)	(9.92)	(2.27)
Observations	82824	82824	82824
Pseudo R-sq.	.37	.45	.54
Panel B. Lagged Effects - 1 Month			
Predicted Inflows (t-1)	-0.57	15.63	1.19
	(0.69)	(10.11)	(2.41)
Observations	81838	81838	81838
Pseudo R-sq.	.37	.45	.54
Panel C. Lagged Effects - 2 Months			
Predicted Inflows (t-2)	-0.58	16.60	0.78
	(0.71)	(10.69)	(2.51)
Observations	80852	80852	80852
Pseudo R-sq.	.37	.45	.54
Panel D. Lagged Effects - 3 Months			
Predicted Inflows (t-3)	-0.55	16.69	0.48
	(0.67)	(11.19)	(2.64)
Observations	79866	79866	79866
Pseudo R-sq.	.38	.45	.54
Controls for all Panels			
Month-Year FE	X	X	X
Municipality FE	X	X	X
Dep. $\times$ Year FE	X	X	X
Pre-trends $\times$ Year FE	X	X	X
Weather Controls	X	X	X

Table (VII) Impacts of Venezuelan Migration on Municipalities with Heterogeneous History of Chickenpox Incidence

Variables (per 100,000 indv.)	**Chickenpox**	
I (Chicken pox =1 before 2016)	No	Yes
	(1)	(2)
Predicted Inflows	0.315**	0.064
	(0.135)	(0.262)
R-squared	0.105	0.125
Observations	50,820	32,004
Average incidence before 2014	5.864	
Controls for all Panels		
Year FE	X	X
Municipality FE	X	X
Dep. $\times$Year FE	X	X
Pre-trends $\times$Year FE	X	X
Weather Controls	X	X

Table (VIII) Impacts of Venezuelan Migration on Government Transfers to Municipalities Health Care Systems

Variable in Log.	**Central Government Transfers**			
	Health Care System	Subsidized Health Care System	Public Health Care System	Supply-side Subsidies in Health Care System
	(1)	(2)	(3)	(4)
Predicted Inflows	-0.003	-0.004	0.002	-0.023
	(0.004)	(0.005)	(0.005)	(0.045)
R-squared	0.992	0.988	0.995	0.933
Observations	6,895	6,895	6,895	2,841
Controls for all Panels				
Year FE	X	X	X	X
Municipality FE	X	X	X	X
Dep. $\times$Year FE	X	X	X	X
Pre-trends $\times$Year FE	X	X	X	X
Weather Controls	X	X	X	X

Figure (I) Time Evolution of Vector-Borne Diseases (Mean)

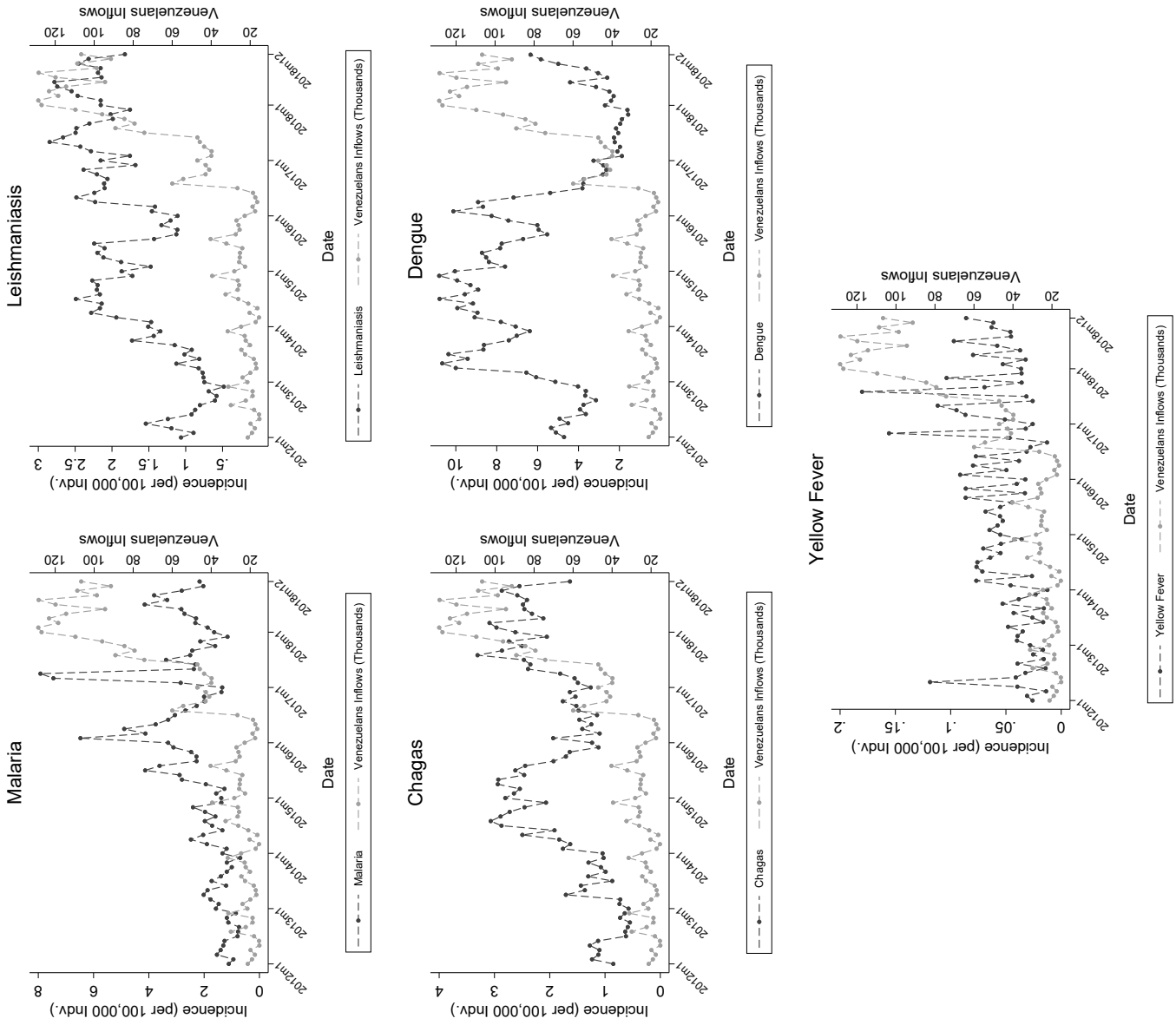


Figure (II) Time Evolution of Vaccine-Preventable Diseases (Mean)

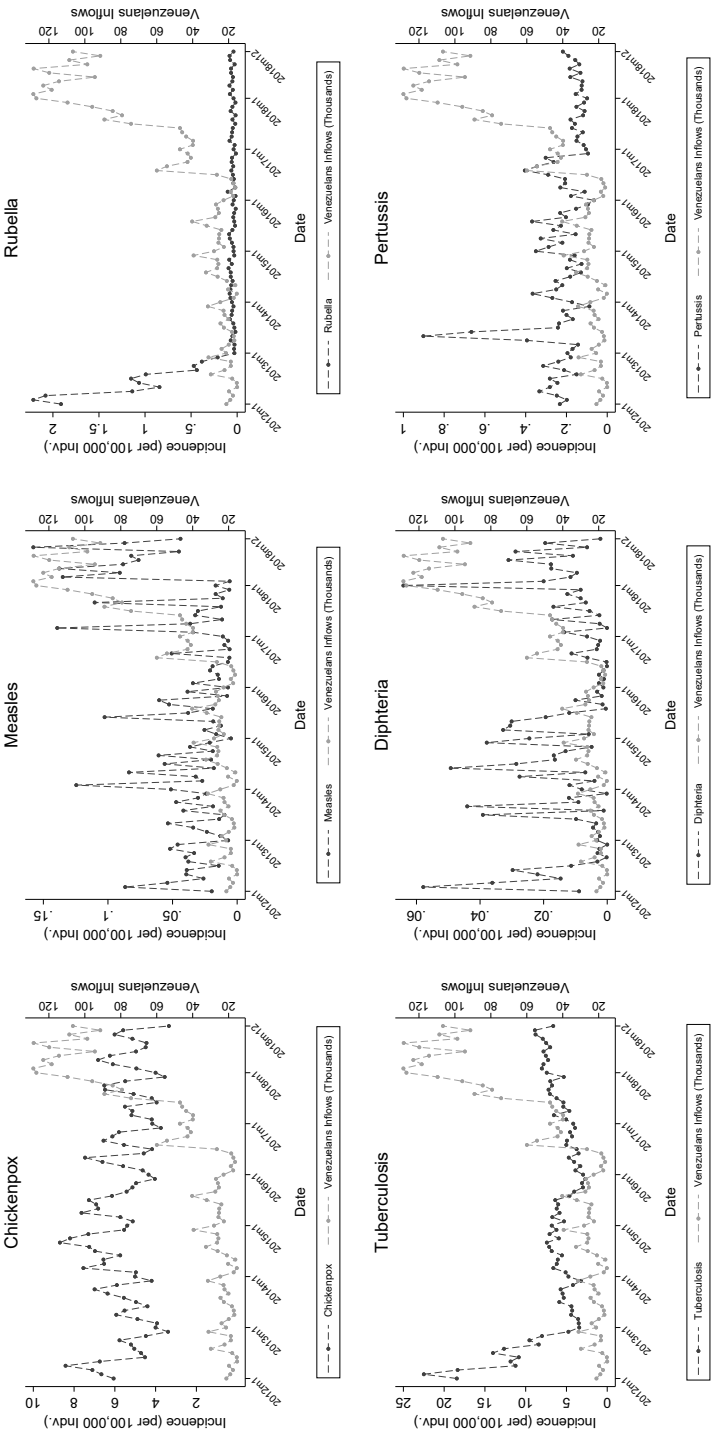


Figure (III) Time Evolution of STDs (mean)

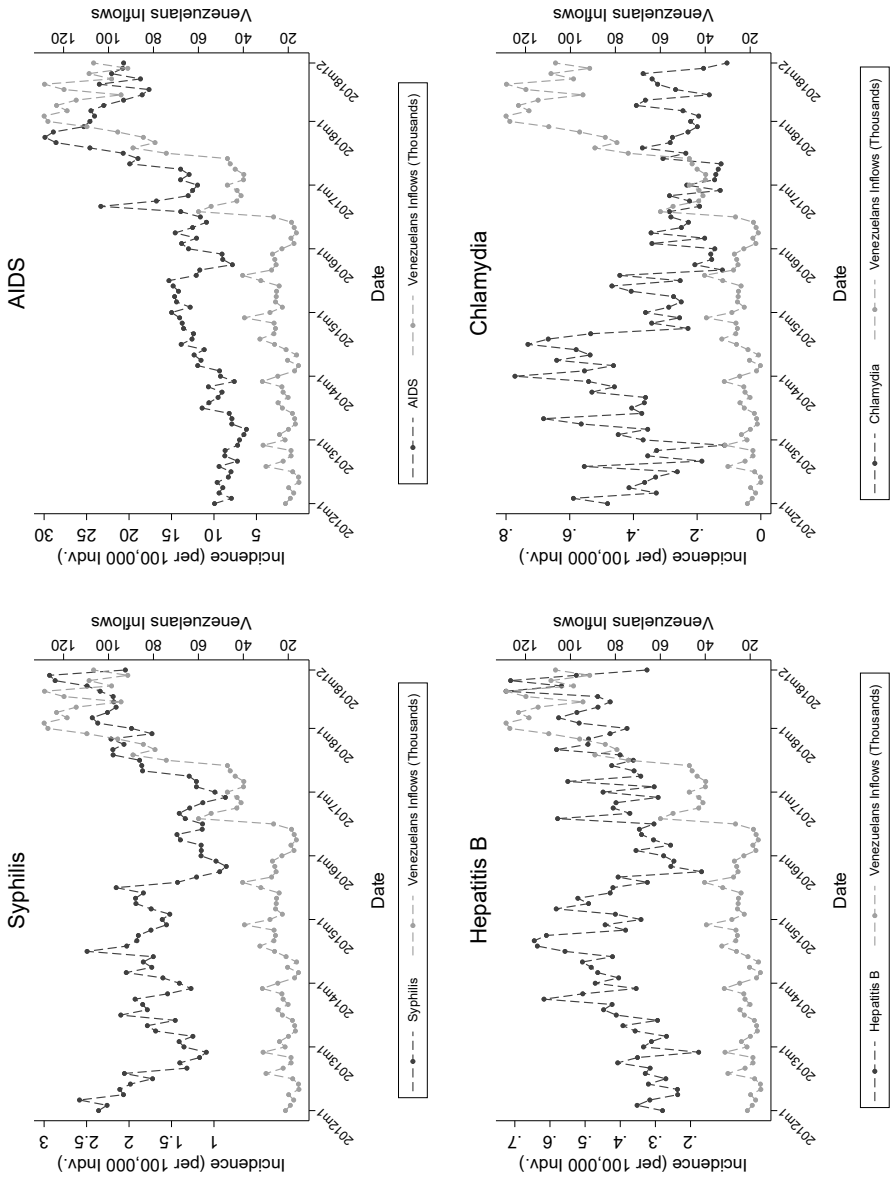
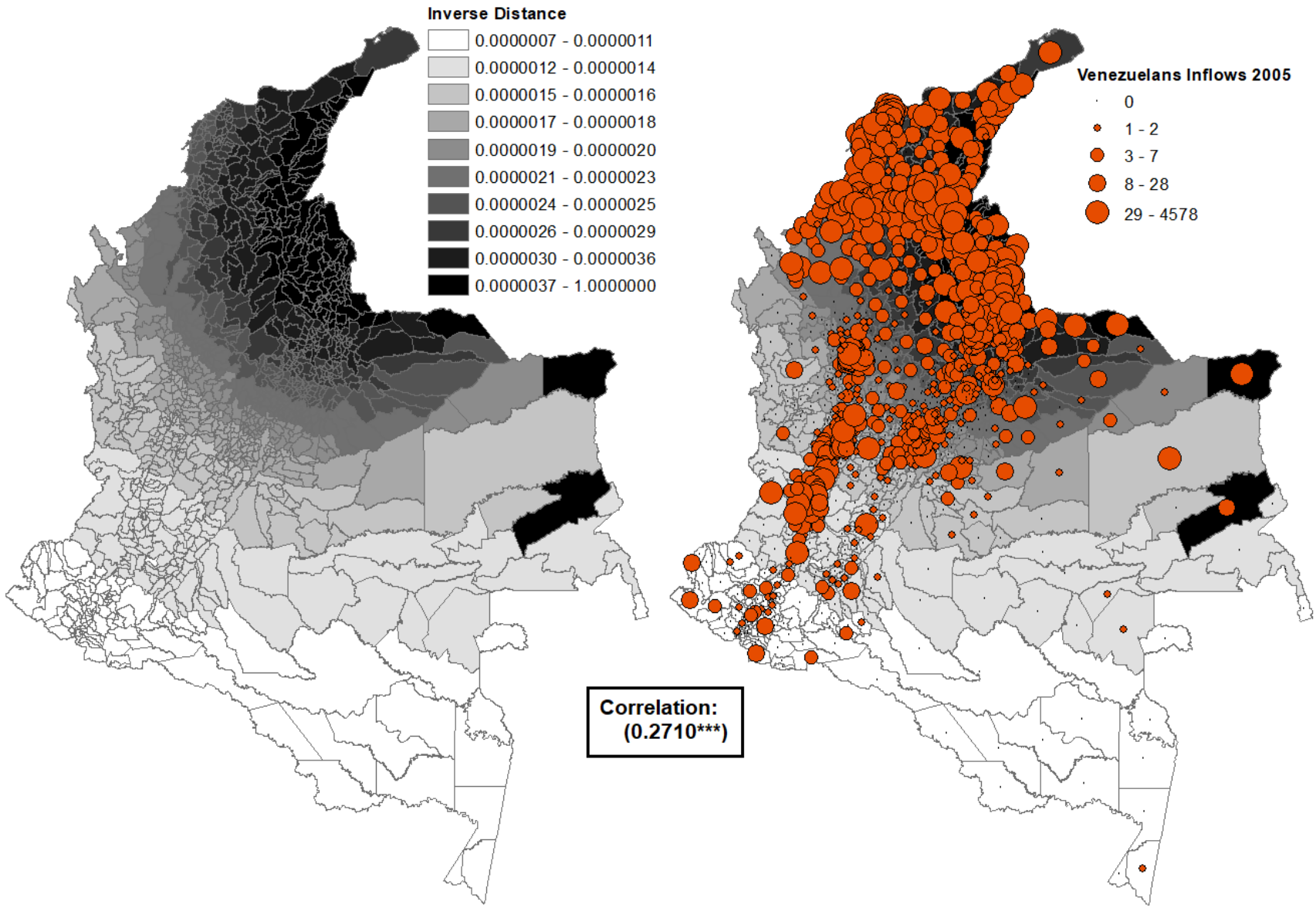
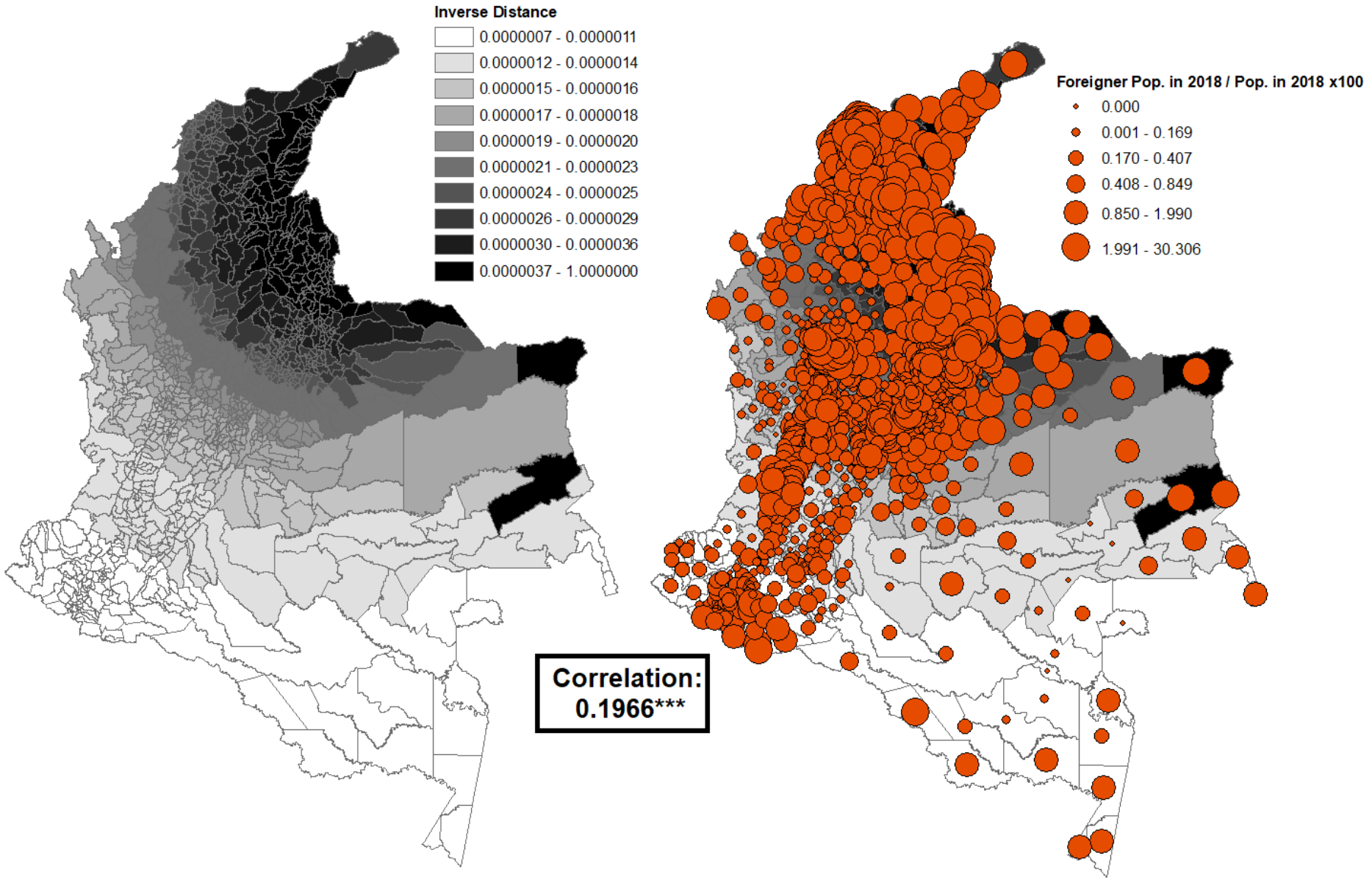


Figure (IV) Inverse Distance and Observed Venezuelan Settlements in 2005



Notes: All categories have the same number of municipalities.

Figure (V) Inverse Distance and Observed Share of Foreigner Population in 2018



Notes: All categories have the same number of municipalities.

Figure (VI) Number of Doctor Visit by Venezuelans in the Colombian Health Care System- March 2017 until Dec 2018

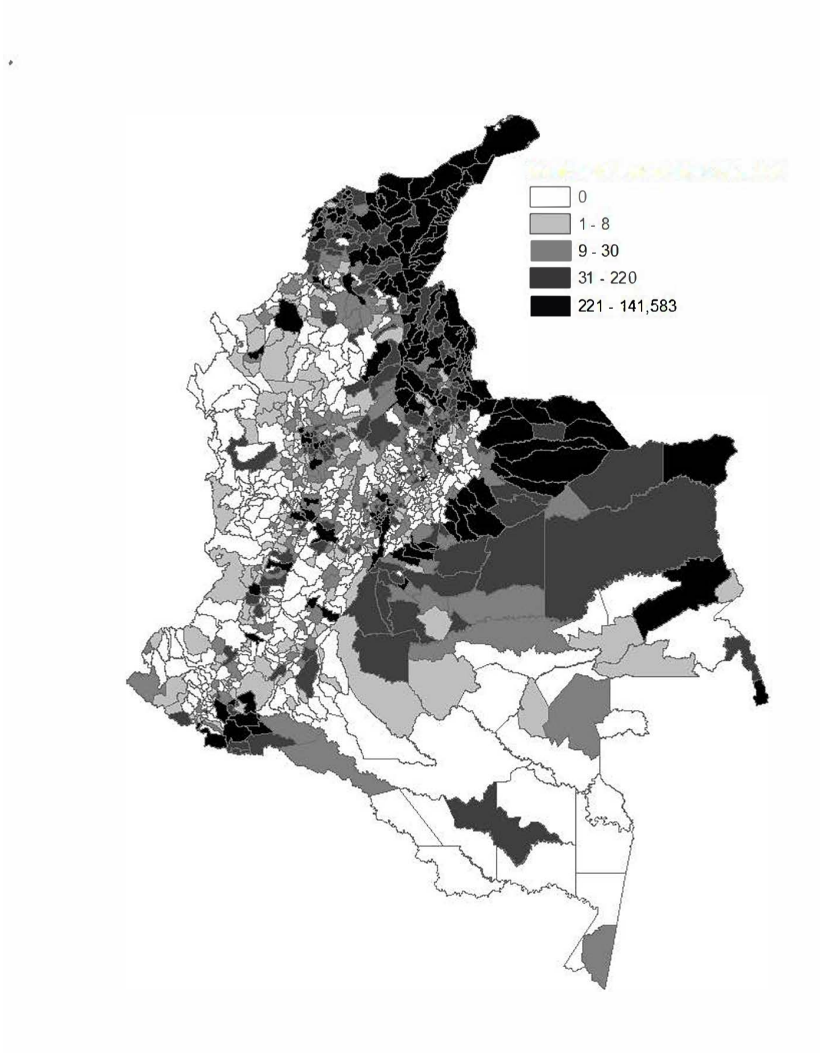


Figure (VII) Cumulative Evolution of Vector-borne Diseases by Age Group

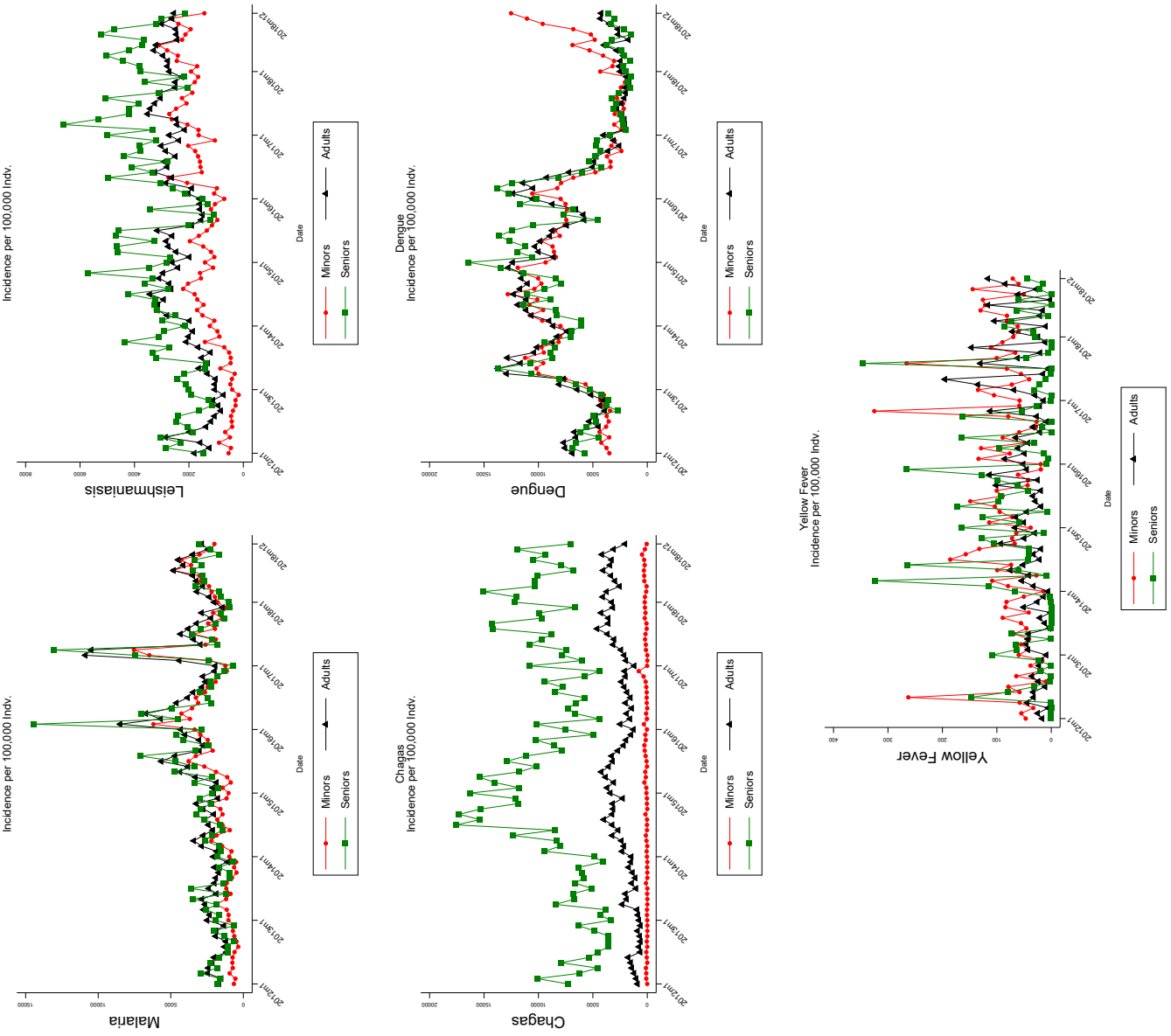


Figure (VIII) Cumulative Evolution of Vaccine-Preventable Diseases by Age Group

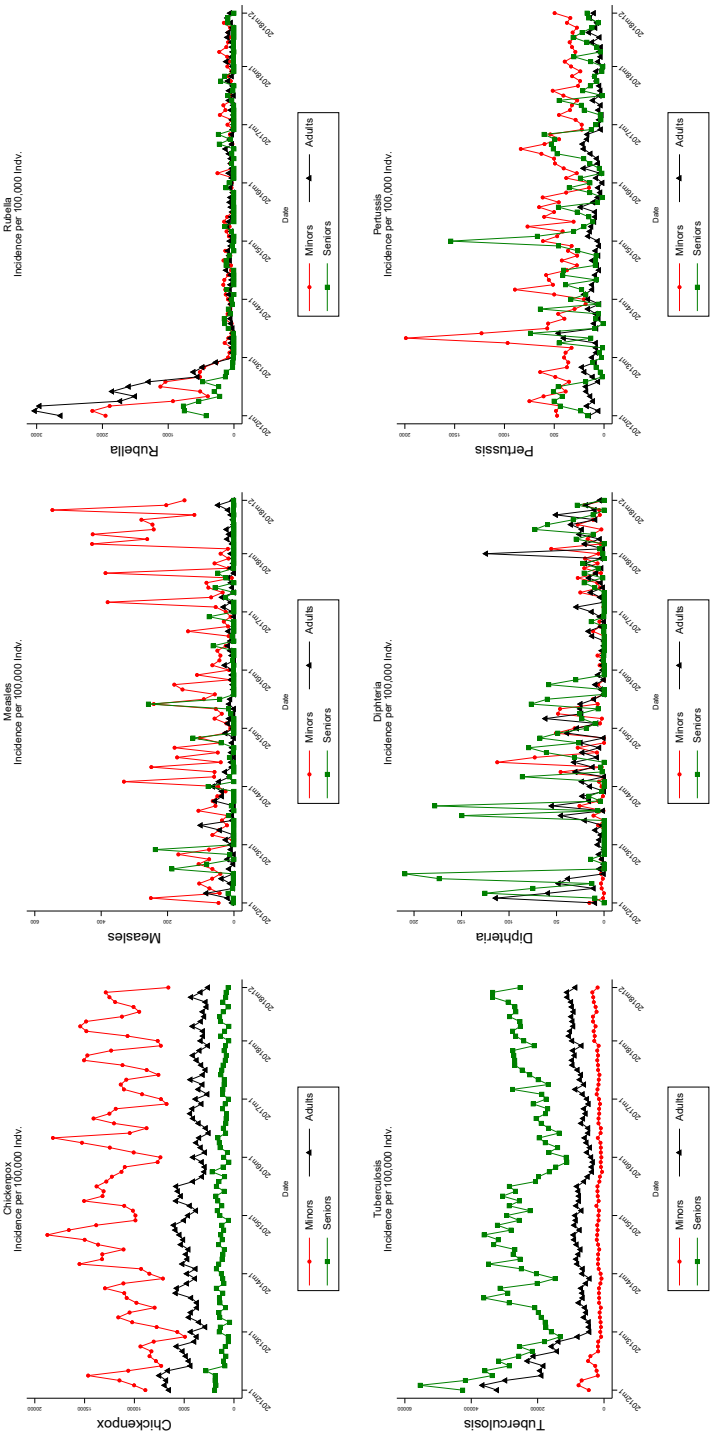


Figure (IX) Cumulative Evolution of STDs by Age Group

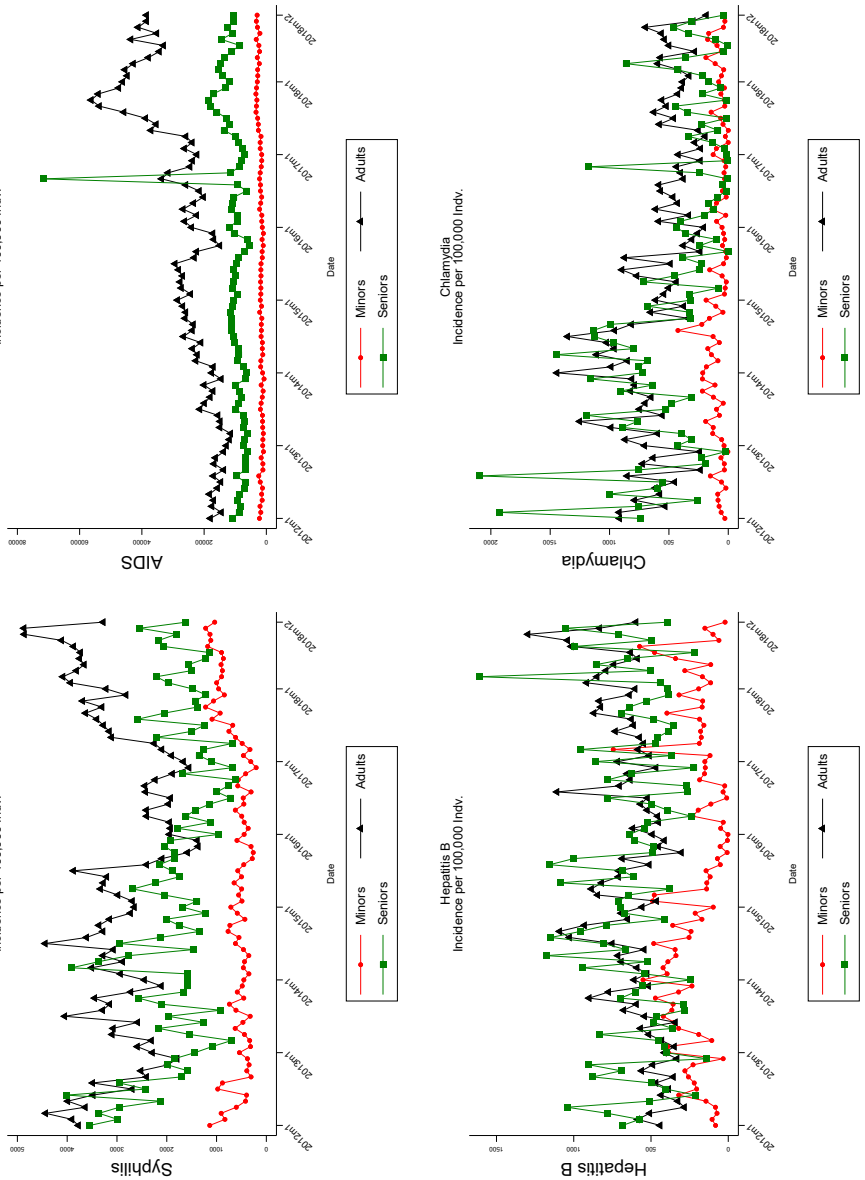
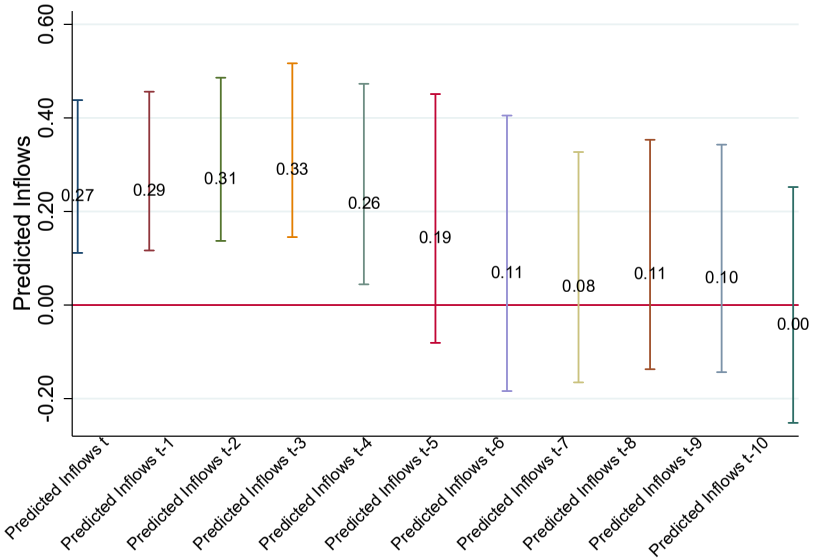
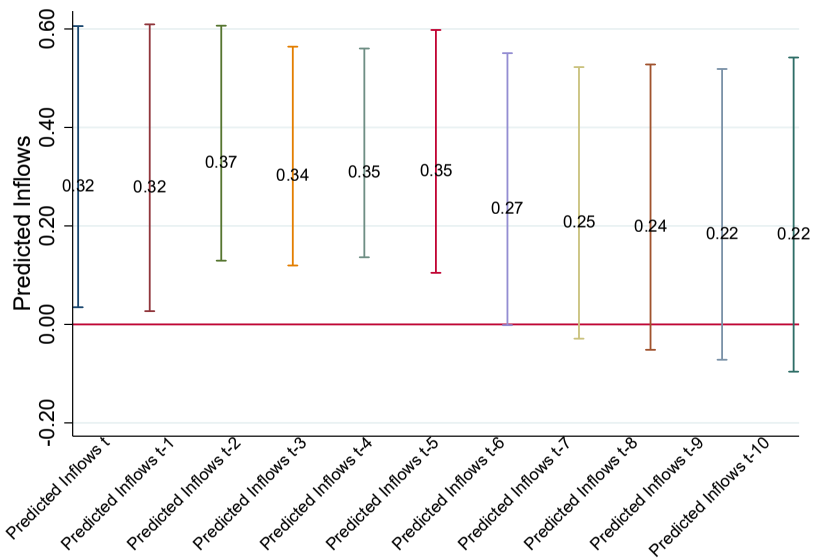


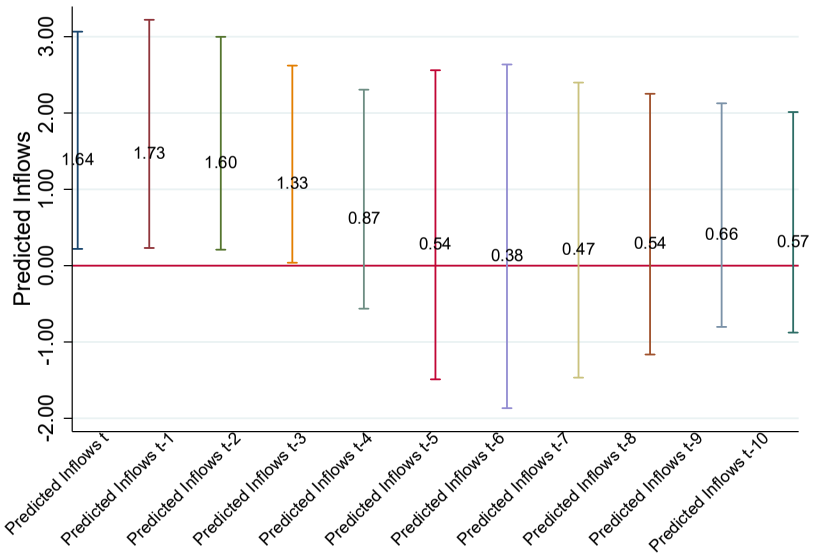
Figure (X) Dynamic Effects of Venezuelan Migration



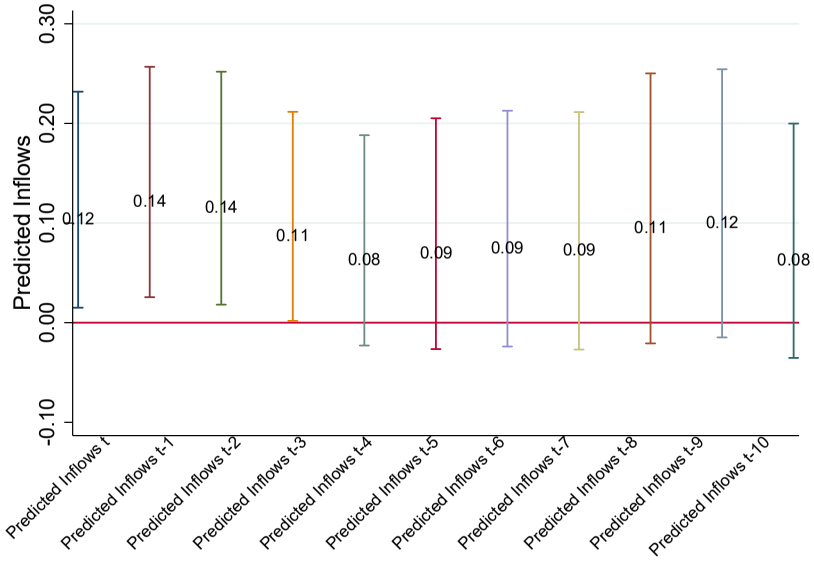
(a) Chickenpox



(b) Tuberculosis

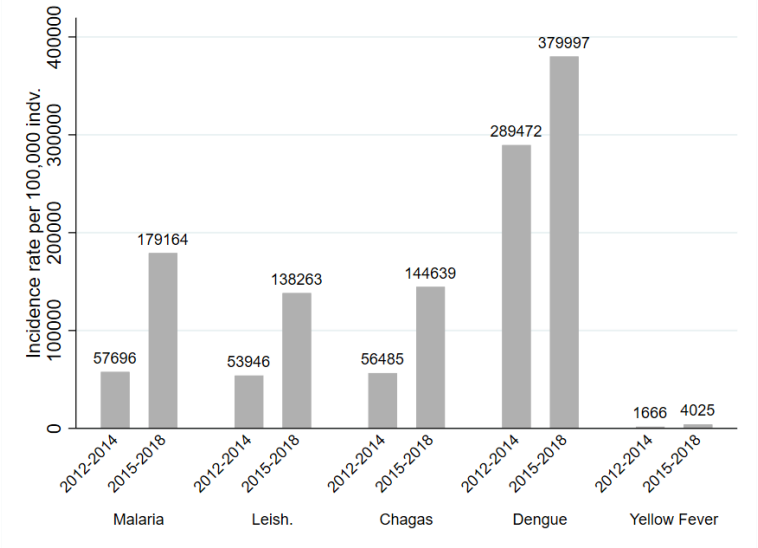


(c) AIDS

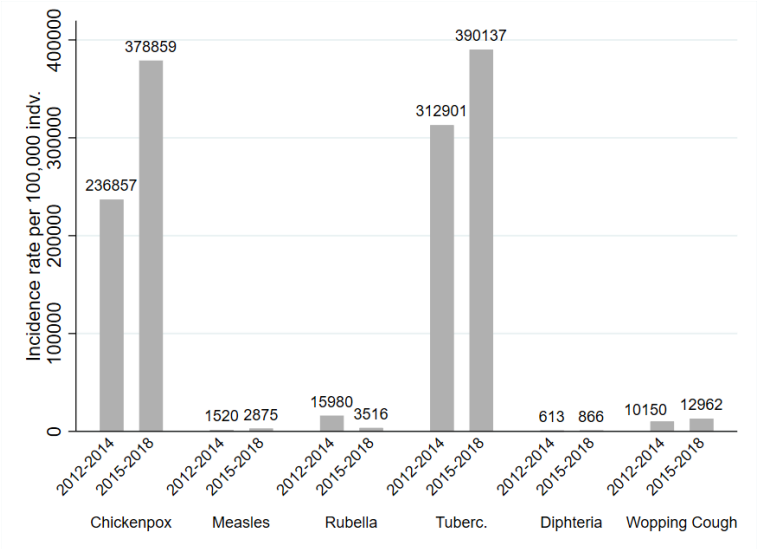


(d) Syphilis

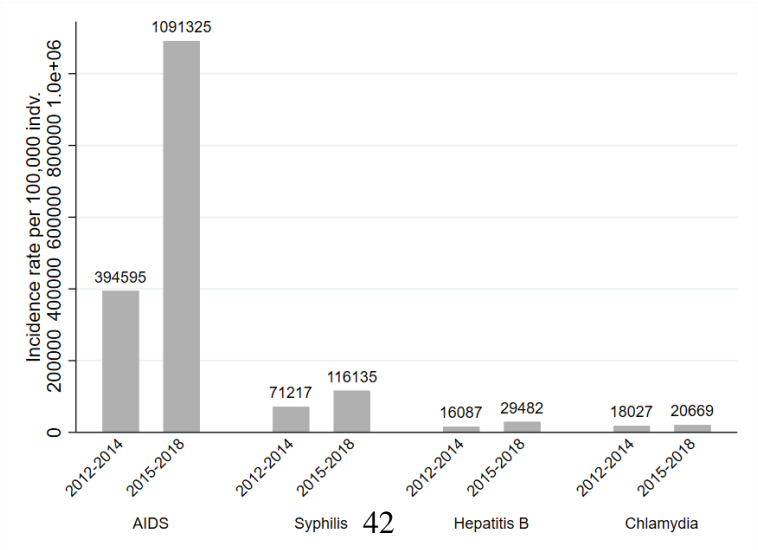
Figure (XI) Comparison Infectious Diseases Incidence Rate before and after Migration Onset



(a) Vector Borne



(b) Vaccine Preventable



(c) STDs

Figure (A.1) Characterization of Vector-borne Infectious Diseases

Disease	Causes	Transmision	Symptoms	Vaccine Exists	Acquire Immunity	Vaccine required in Colombia
Malaria	Parasite	Bites of infected female Anopheles mosquitoes	Fever, chills, and flu-like illness. Left untreated, they may develop severe complications and die.	Yes, low efficacy	No	No
Dengue	Dengue virus	Bite of an infected Aedes species mosquito	Fever, nausea, vomiting, rashes, aches, and pains.	Yes, only for individuals who have been infected	No	No
Leishmaniasis	Protozoan parasite	Bite of phlebotomine sand flies	There are several different forms of leishmaniasis in people. The most common forms are cutaneous leishmaniasis (which causes skin sores) and visceral leishmaniasis (which affects several internal organs).	No	No	--
Yellow Fever	Flavivirus	Bites of infected Aedes aegypti mosquito	Fever, headache, muscle aches, nausea, vomiting , loss of appetite, dizziness, red eyes, face or tongue. Left untreated, yellowing of the skin and the whites of eyes, vomiting blood, decreased urination, bleeding from the nose, mouth and eyes, slow heart rate, liver and kidney failure, brain dysfunction, including delirium, seizures and coma.	Yes, high efficacy	No	Yes
Chagas	Trypanosoma cruzi parasite	Bite of insect vectors	Fever, swelling, and chronic complications include heart rhythm abnormalities that can cause sudden death; a dilated heart that doesn't pump blood well; and a dilated esophagus or colon, leading to difficulties with eating or passing stool.	No	No	--

Source: CDC and Colombian Ministry of Health.

Figure (A.2) Characterization of Vaccine-Preventable Infectious Diseases

	Causes	Transmision	Symptoms	Vaccine Exists	Acquire Immunity	Vaccine required in Colombia
Chickenpox	Varicella-zoster virus	Contact with someone infected.	Blister-like rash, itching, tiredness, and fever	Yes	Most times	Yes
Measles	Rubeolla virus	Infected person coughs or sneezes	Symptoms include high fever, cough, runny nose, and watery eyes. Measles rash appears 3 to 5 days after the first symptoms	Yes	Yes	Yes
Rubella	rubella virus	Direct contact with nasal or throat secretions of infected individuals. It can also be transmitted by breathing in droplets that are sprayed into the air when an infected person sneezes, coughs or talks.	Most people who get rubella usually have a mild illness, with symptoms that can include a low-grade fever, sore throat, and a rash that starts on the face and spreads to the rest of the body. Rubella can cause a miscarriage or serious birth defects in a developing baby if a woman is infected while she is pregnant.	Yes	Yes	Yes
Hepatitis A	Hepatitis A virus	Person-to-person through the fecal-oral route or consumption of contaminated food or water.	Fatigue, low appetite, stomach pain, nausea, and jaundice	Yes	Yes	Yes
Diphteria	Corynebacterium diphtheriae bacteria	Person-to-person, usually through respiratory droplets, like from coughing or sneezing.	Thick covering in the back of the throat. It can lead to difficulty breathing, heart failure, paralysis, and even death	Yes	No	Yes
Tuberculosis	Mycobacterium tuberculosis bacteria	Person-to-person through airborne droplets	The bacteria usually attack the lungs, but TB bacteria can attack any part of the body such as the kidney, spine, and brain	Yes	No	Yes
Whooping Cough (Pertussis)	Bordetella pertussis bacteria	Person-to-person airborne through droplets or by direct contact with infected throat or nasal discharges	Uncontrollable, violent coughing which often makes it hard to breathe. Pertussis can affect people of all ages, but can be very serious, even deadly, for babies less than a year old.	Yes	7 years	Yes

Source: CDC and Colombian Ministry of Health.

Figure (A.3) Characterization of Sexually Transmitted Diseases (STDs)

	Causes	Transmision	Symptoms	Vaccine Exists	Acquire Immunity	Vaccine required in Colombia
HIV/AIDS	HIV virus	Spread through direct contact with certain body fluids (including blood, semen, pre-seminal fluids, rectal fluids, vaginal fluids, and breast milk)	Attacks the body's immune system, specifically the CD4 cells, often called T cells. Over time, HIV can destroy so many of these cells that the body cannot fight off infections and disease.	No	--	--
Syphilis	Treponema pallidum bacteria	Sexually transmitted infection.	It has several stages. A person with primary syphilis generally has a sore or sores at the original site of infection. Symptoms of secondary syphilis include skin rash, swollen lymph nodes, and fever. Tertiary syphilis is associated with severe medical problems.	No	No	--
Hepatits B	Hepatitis B virus (HBV)	Spread through sexual contact, sharing of needles, accidental needle sticks and mother to child	Abdominal pain, dark urine, fever, joint pain, loss of appetite, nausea and vomiting, weakness and fatigue and jaundice.	Yes	No	No
Chlamydia	Chlamydia trachomatis bacterium	Sexually transmitted infection caused by bacteria	Painful urination lower abdominal pain, vaginal discharge in women, discharge from the penis in men, painful sexual intercourse in women, bleeding between periods and after sex in women and testicular pain in men.	No	No	No

Source: CDC and Colombian Ministry of Health.

Figure (B.1) Geographic Distribution of Diseases (Average Incidence Rates)

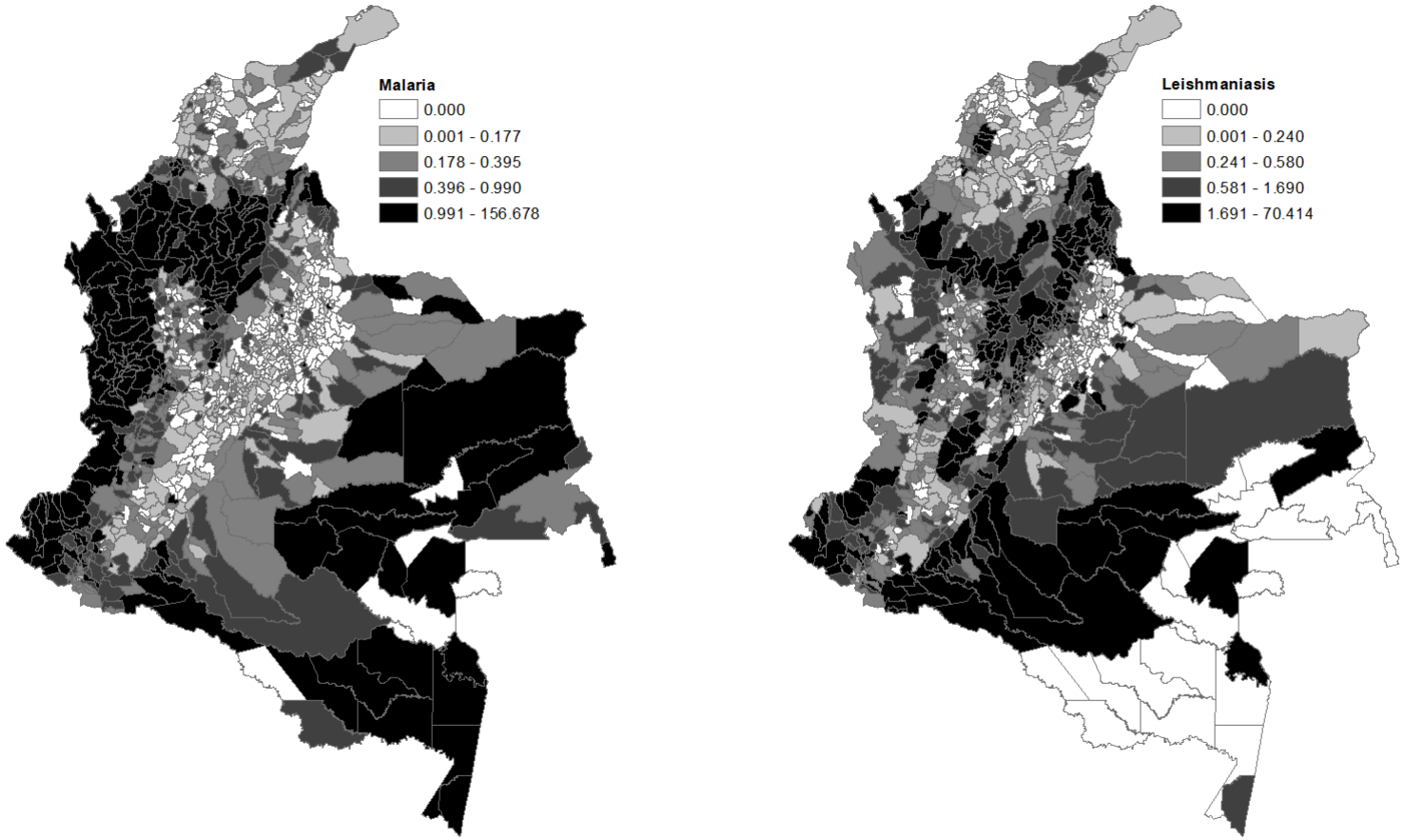


Figure (B.2) Geographic Distribution of Diseases (Average Incidence Rates)

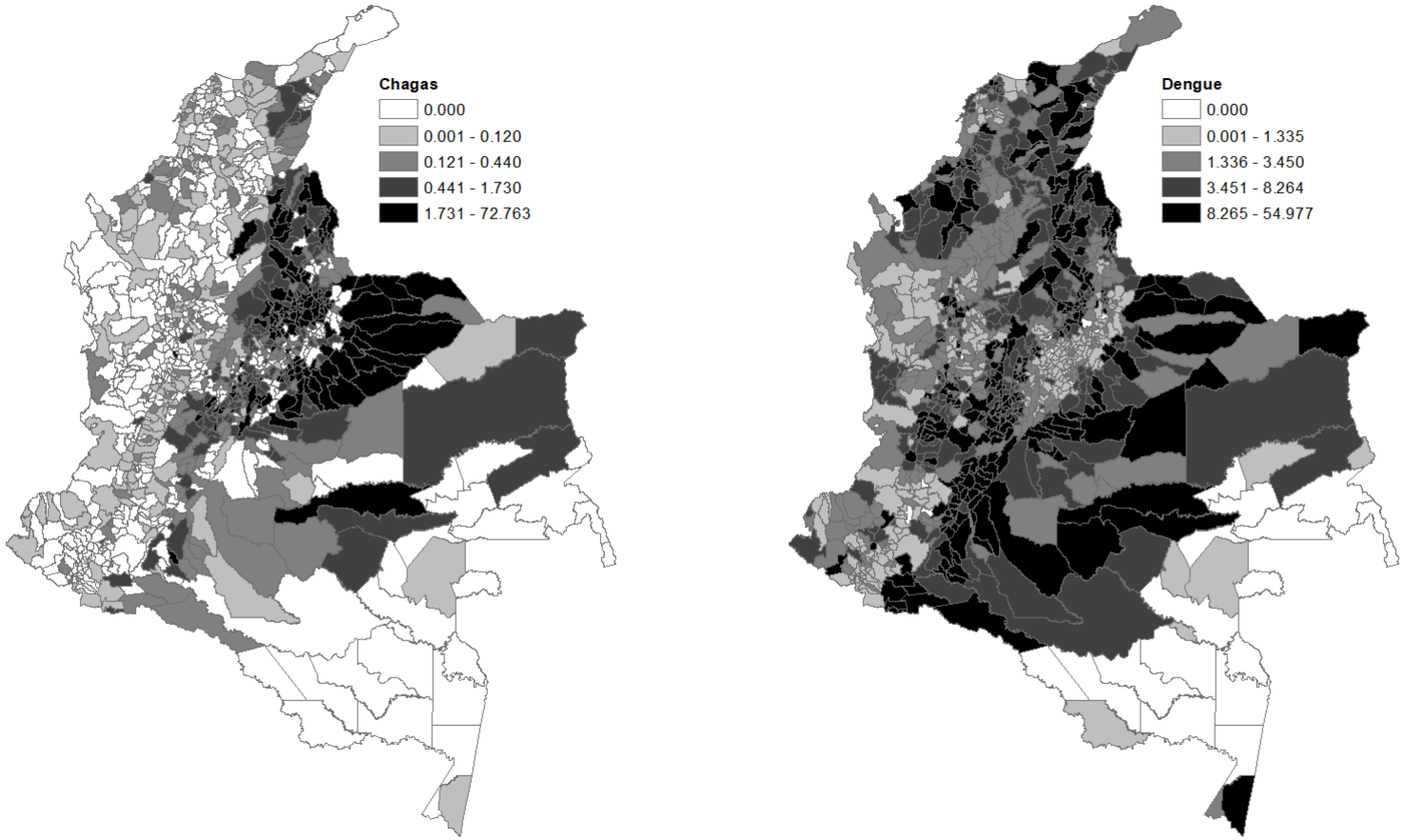


Figure (B.3) Geographic Distribution of Diseases (Average Incidence Rates)

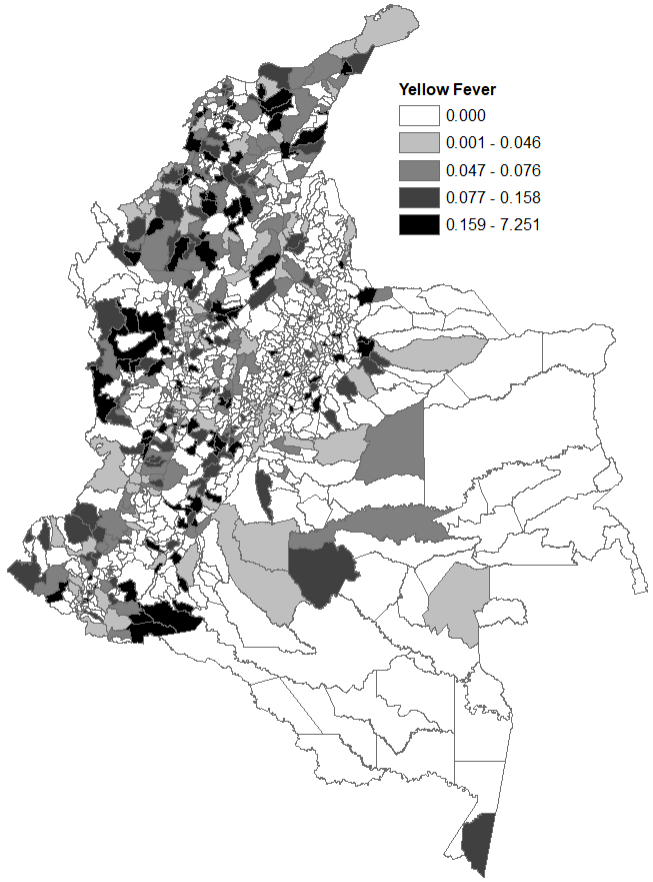


Figure (B.4) Geographic Distribution of Diseases (Average Incidence Rates)

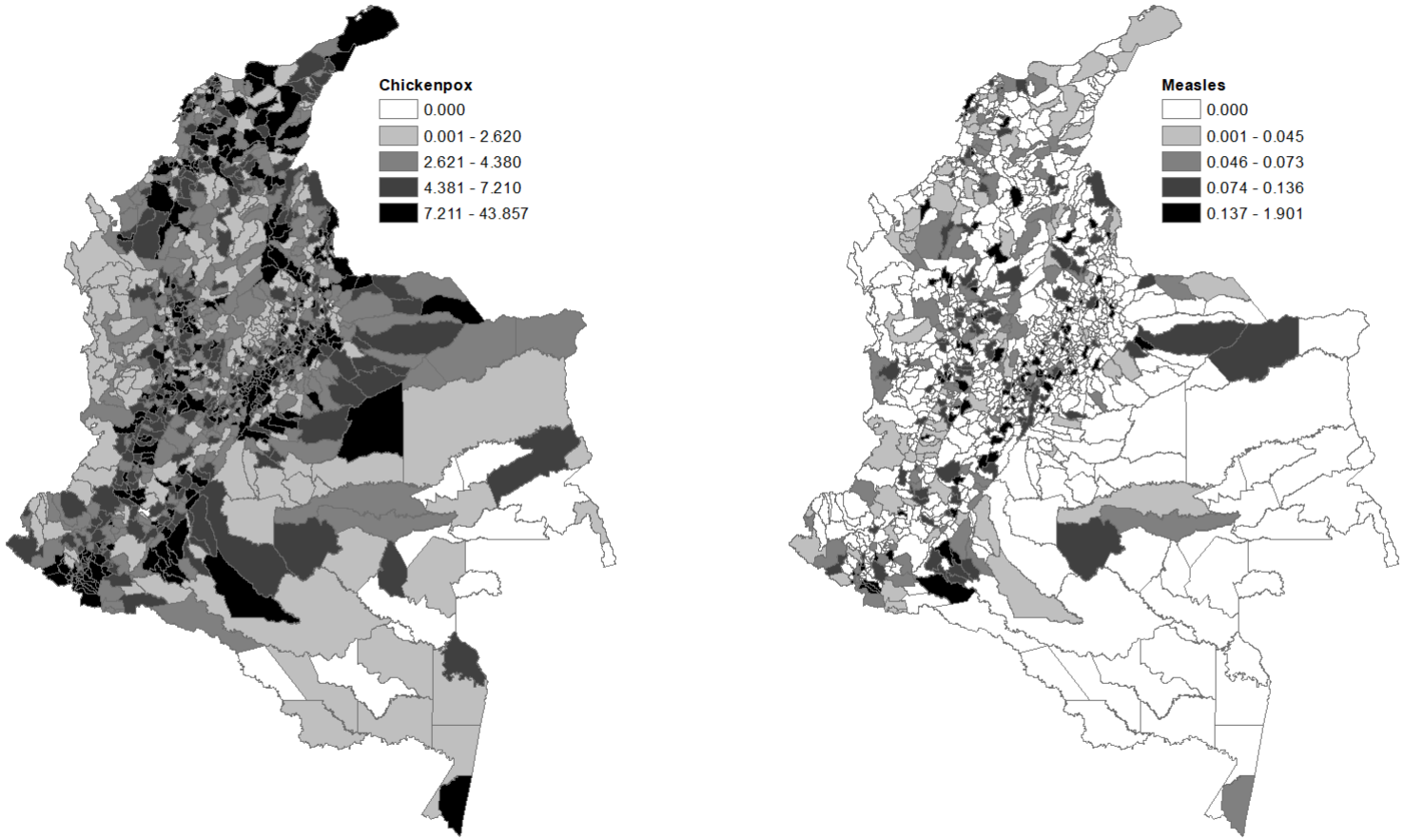


Figure (B.5) Geographic Distribution of Diseases (Average Incidence Rates)

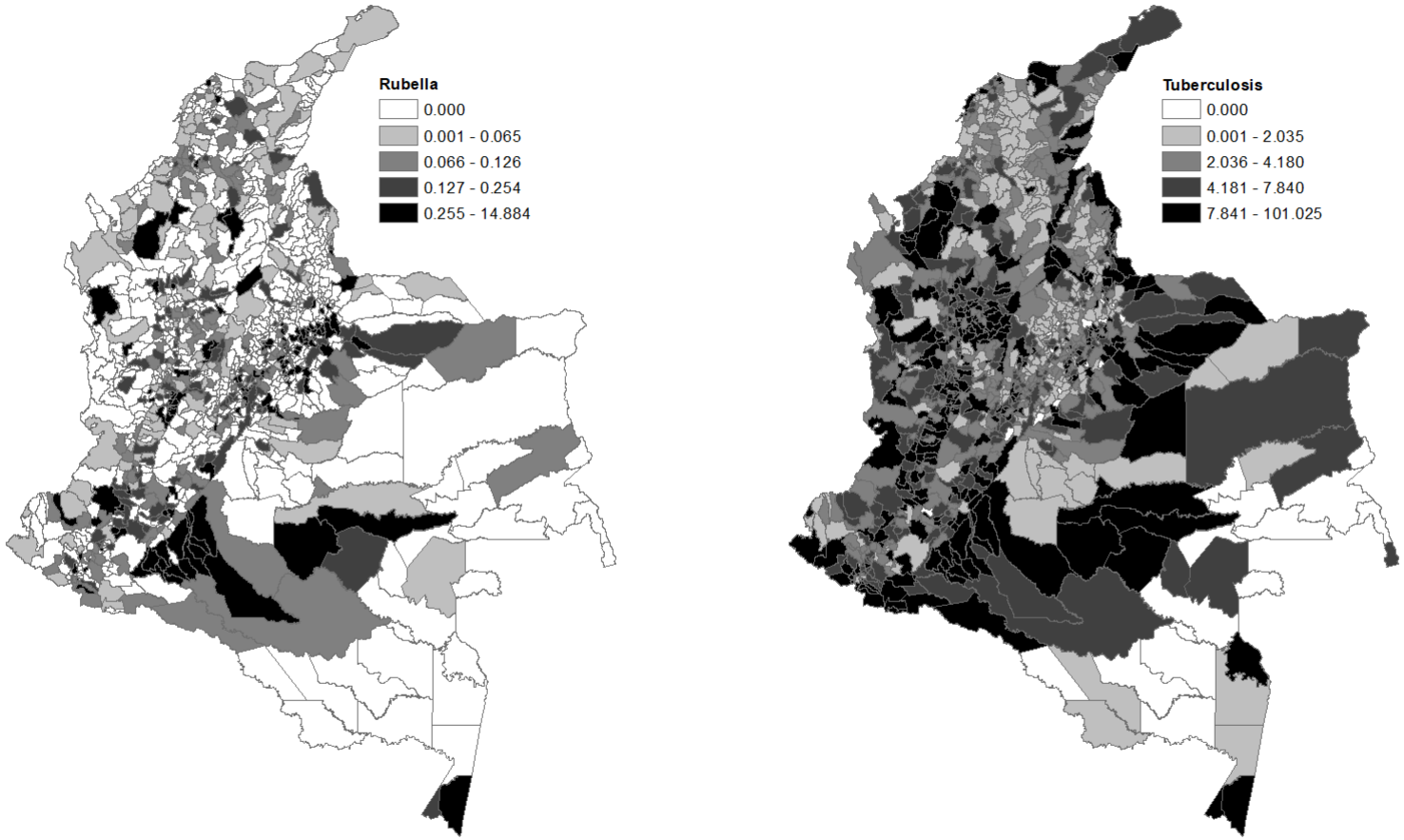


Figure (B.6) Geographic Distribution of Diseases (Average Incidence Rates)

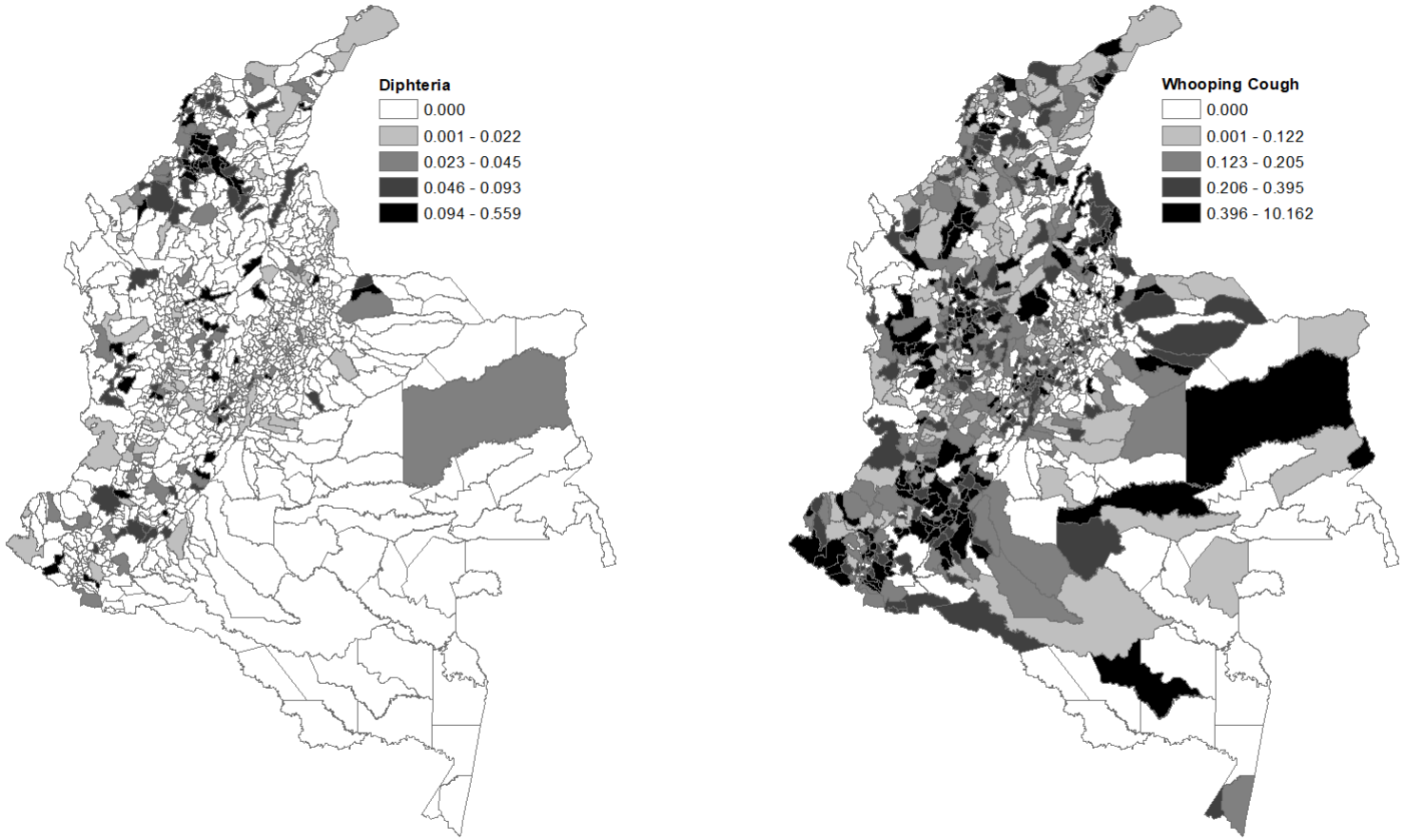


Figure (B.7) Geographic Distribution of Diseases (Average Incidence Rates)

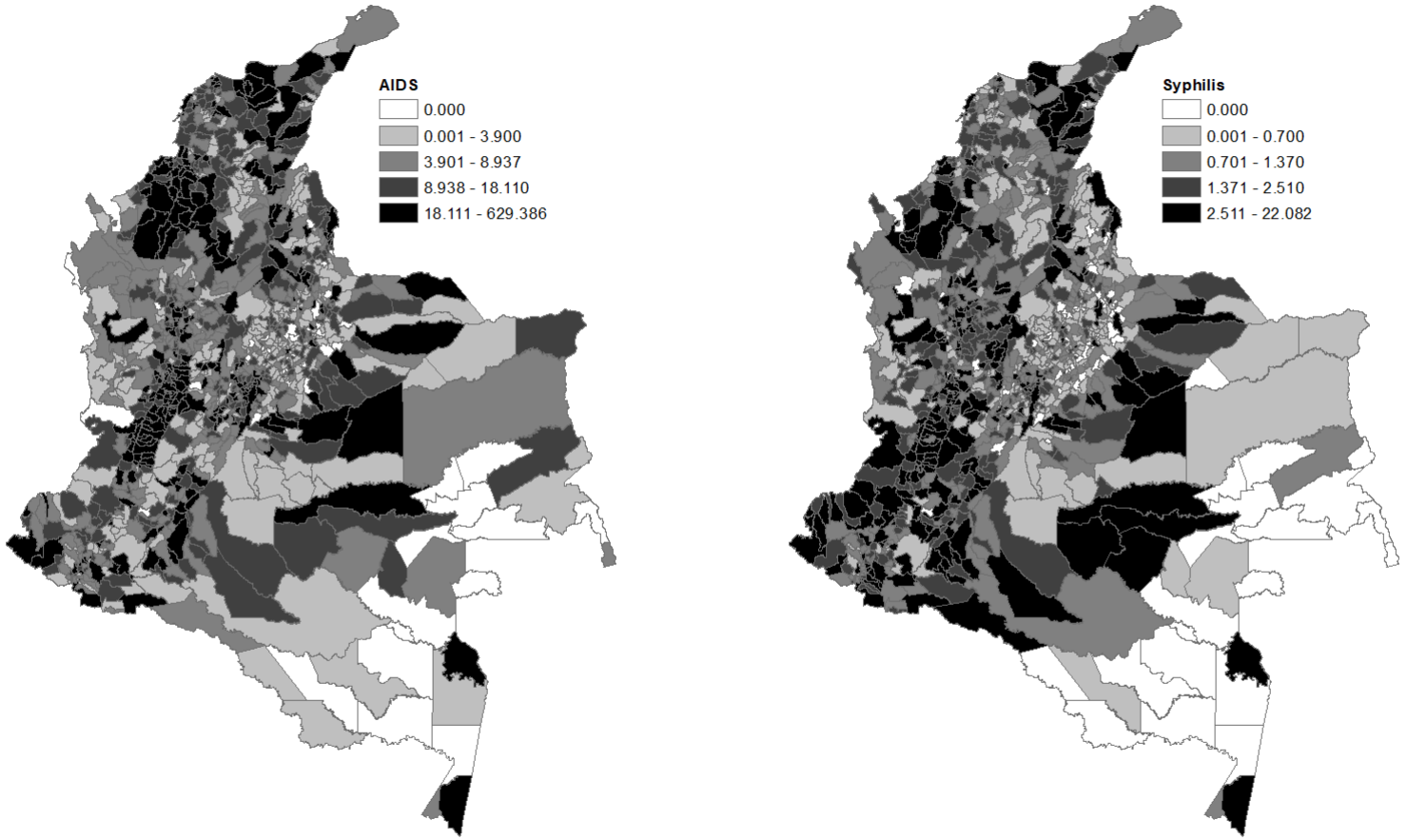


Figure (B.8) Geographic Distribution of Diseases (Average Incidence Rates)

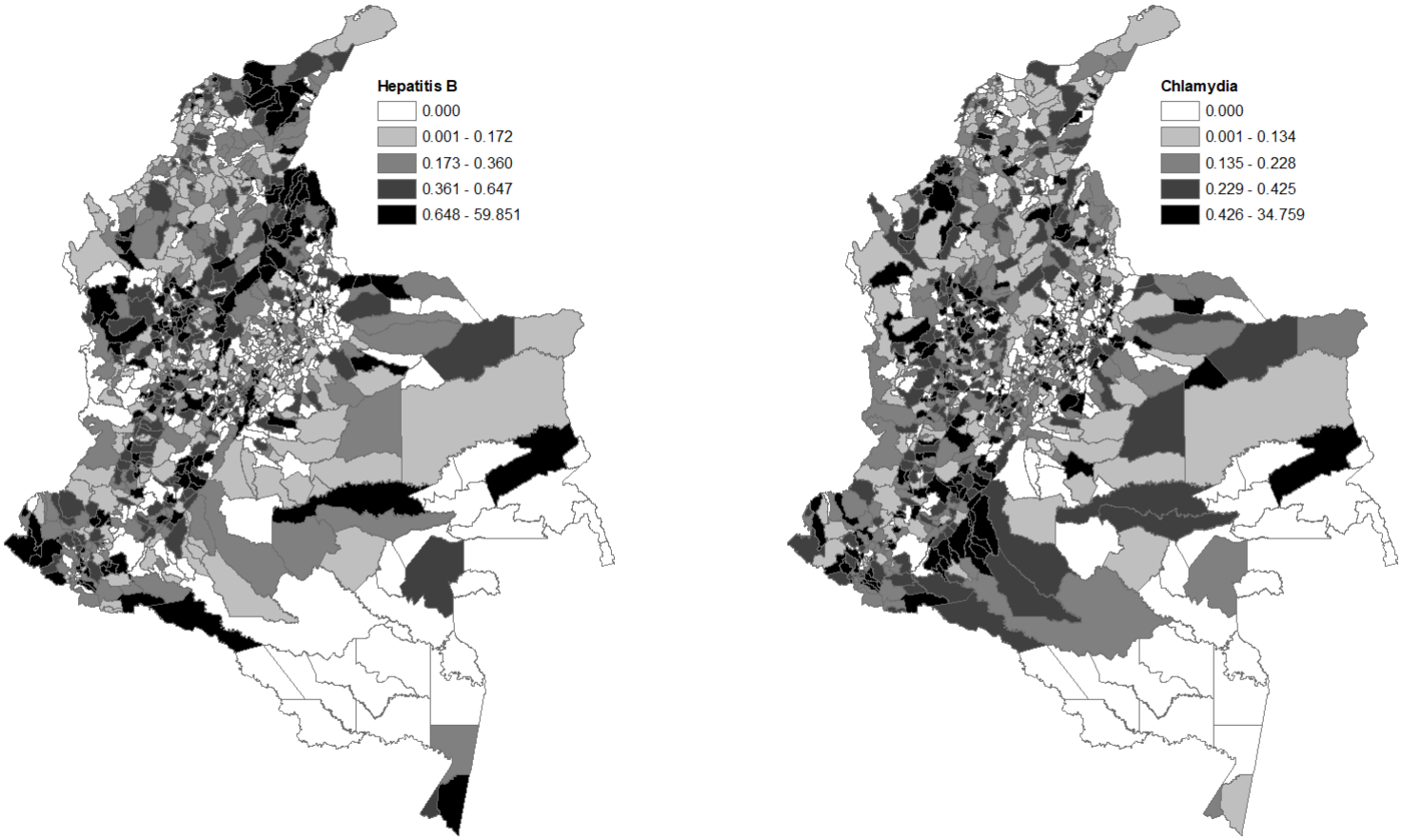


Figure (C.1) Description of Weather Covariates

Index	Definition
Southern Oscillation Index (SOI)	SOI is one measure of the large-scale fluctuations in air pressure occurring between the western and eastern tropical Pacific (i.e., the state of the Southern Oscillation) during El Niño and La Niña episodes. In general, smoothed time series of the SOI correspond very well with changes in ocean temperatures across the eastern tropical Pacific.
Outgoing Longwave Radiation (OLR)	OLR is the measure of electromagnetic radiation of wavelengths between 3.0 and 100 μm emitted from Earth and its atmosphere out to space in the form of thermal radiation. Punctually, Negative (Positive) OLR are indicative of enhanced (suppressed) convection and hence more (less) cloud coverage typical of El Niño (La Niña) episodes.
The North Atlantic Oscillation (NAO)	The North Atlantic Oscillation (NAO) index is based on the surface sea-level pressure difference between the Subtropical (Azores) High and the Subpolar Low. Punctually, refers to the changes in pressure systems in the Atlantic, which affects weather in many parts of the Northern Hemisphere between November and April.
Anomalies of Oceans Surface Winds Index850 hPa (135°East-180°West) (U850-180)	El Niño and La Niña are associated with changes in wind patterns. El Niño occurs when the winds from the East weaken, the warmest surface temperatures of the middle sea cover the central and eastern tropical Pacific, and the region of major rainfall also moves eastward. This measure corresponds to the coordinates in brackets.
Anomalies of Oceans Surface Winds 850 hPa (175°East-140°West) (U850-140)	El Niño and La Niña are associated with changes in wind patterns. El Niño occurs when the winds from the East weaken, the warmest surface temperatures of the middle sea cover the central and eastern tropical Pacific, and the region of major rainfall also moves eastward. This measure corresponds to the coordinates in brackets.
Anomalies of Oceans Surface Winds 850 hPa (135°East-120°West) (U850-120)	El Niño and La Niña are associated with changes in wind patterns. El Niño occurs when the winds from the East weaken, the warmest surface temperatures of the middle sea cover the central and eastern tropical Pacific, and the region of major rainfall also moves eastward. This measure corresponds to the coordinates in brackets.
Sea Surface Temperature. Pacific Region. (Zone 3)	Sea surface temperature is the temperature of the top millimeter of the ocean's surface.
Sea Surface Temperature. Pacific Region. (Zone 3+4)	Sea surface temperature is the temperature of the top millimeter of the ocean's surface.
Anomaly of Sea Surface Temperature. Pacific Region (Zone 3)	Sea surface temperature is the temperature of the top millimeter of the ocean's surface. An anomaly is a departure from average conditions. These anomalies are the hallmark of El Niño and La Niña climate cycles, which can influence weather patterns across the globe.
Anomaly of Sea Surface Temperature. Pacific Region (Zone 1+2)	Sea surface temperature is the temperature of the top millimeter of the ocean's surface. An anomaly is a departure from average conditions. These anomalies are the hallmark of El Niño and La Niña climate cycles, which can influence weather patterns across the globe.

Figure (D.1) Sources of Other Controls

Variable	Source	Year
Migrants Registered in RAMV - 2018	Migración Colombia	2018
Job Permits (August 2017- October 2017)	Migración Colombia	2017
Job Permits (February 2018- June 2018)	Migración Colombia	2018
Job Permits (August 2018-December 2018)	Migración Colombia	2018
Job Permits (December 2018-January 2019)	Migración Colombia	2019
Night light density	National Oceanic and Atmospheric Administration (NOAA)	2009
GDP in Agriculture (Thousands)	Estimates by CEDE Universidad de los Andes, based on information provided by DANE in 2005 Census	2009
GDP in Services (Thousands)	Estimates by CEDE Universidad de los Andes, based on information provided by DANE in 2005 Census	2009
GDP in Industry (Thousands)	Estimates by CEDE Universidad de los Andes, based on information provided by DANE in 2005 Census	2009
GINI	Cálculos CEDE a partir de CASEN1993, ECV2003, Censo1993 y Censo2005 - DANE y Ministerio de Desarro	2005
Unsatisfied Basic Needs (% Households)	Colombian National Planning Department	2005
Informal Labor* (% Household)	Colombian National Planning Department	2005
Total Mun. Income (Thousands)	Colombian National Planning Department	2009
Mun. Public Expenditures (Thousands)	Colombian National Planning Department	2009
Total Central Gov. Transfers (Millions)	Colombian National Planning Department	2009
Homicide Rate (Per 100,000 Indv.)	National Police	2009
N. of Terrorist Attacks	Ministry of National Defence	1995
N. of financial institutions	CEDE, Universidad de los Andes	1995
N. of tax collection offices	CEDE, Universidad de los Andes	1995

Table (E.1) Impacts of Venezuelan Migration on Infectious Diseases - Changing zeros for missing values

Disease Group	**Vector-borne**					**Vaccine-preventable**					
Variables (per 100,000 indv.)	Malaria	Leish.	Chagas	Dengue	Yellow Fever	Chickenpox	Measles	Rubella	Tuberc.	Diphteria	W. Cough
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A. Contemporaneous Effects											
Predicted Inflows	-0.01	-0.19	-0.24	-0.47*	0.19	0.24**	0.14*	0.03	0.25	-0.04	0.06
	(0.37)	(0.15)	(0.26)	(0.29)	(0.33)	(0.09)	(0.08)	(0.08)	(0.20)	(.)	(0.04)
Observations	8947	12117	8204	28514	1157	33653	938	1977	32732	329	4292
Pseudo R-sq.	.46	.53	.6	.31	.71	.39	.79	.77	.36	.94	.63
Panel B. Lagged Effects - 1 Month											
Predicted Inflows (t-1)	0.07	-0.22	-0.23	-0.50	0.06	0.23**	-0.02	0.04	0.26	0.02	0.09**
	(0.49)	(0.17)	(0.30)	(0.31)	(0.22)	(0.10)	(0.08)	(0.10)	(0.21)	(.)	(0.04)
Observations	8837	11989	8136	28210	1141	33245	922	1898	32281	323	4227
Pseudo R-sq.	.46	.53	.6	.31	.71	.39	.79	.77	.36	.94	.63
Panel C. Lagged Effects - 2 Months											
Predicted Inflows (t-2)	0.06	-0.30*	-0.12	-0.44	-0.02	0.26**	-0.09	0.06	0.32*	0.02	0.09*
	(0.52)	(0.18)	(0.32)	(0.32)	(0.16)	(0.10)	(0.09)	(0.10)	(0.17)	(0.04)	(0.05)
Observations	8739	11868	8060	27886	1130	32818	902	1816	31789	310	4168
Pseudo R-sq.	.46	.53	.6	.31	.71	.38	.8	.8	.35	.94	.63
Controls for all Panels											
Month-Year FE	X	X	X	X	X	X	X	X	X	X	X
Municipality FE	X	X	X	X	X	X	X	X	X	X	X
Dep. × Year FE	X	X	X	X	X	X	X	X	X	X	X
Pre-trends × Year FE	X	X	X	X	X	X	X	X	X	X	X
Weather Controls	X	X	X	X	X	X	X	X	X	X	X

Table (E.2) Impacts of Venezuelan Migration on Infectious Diseases - Changing zeros for missing values

Disease Group		**STDs**		
Variables (per 100,000 indv.)	AIDS	Syphilis	Hepatitis B	Chlamydia
	(1)	(2)	(3)	(4)
Panel A. Contemporaneous Effects				
Predicted Inflows	1.64*	0.12***	-0.03	0.10
	(0.92)	(0.04)	(0.05)	(0.10)
Observations	44754	20716	7951	4883
Pseudo R-sq.	.31	.62	.76	.71
Panel B. Lagged Effects - 1 Month				
Predicted Inflows (t-1)	1.74*	0.13***	-0.02	0.11
	(0.96)	(0.04)	(0.05)	(0.11)
Observations	44262	20490	7873	4811
Pseudo R-sq.	.32	.64	.76	.71
Panel C. Lagged Effects - 2 Months				
Predicted Inflows (t-2)	1.62*	0.12***	-0.03	0.10
	(0.90)	(0.05)	(0.05)	(0.12)
Observations	43801	20247	7775	4731
Pseudo R-sq.	.32	.64	.76	.71
Controls for all Panels				
Month-Year FE	X	X	X	X
Municipality FE	X	X	X	X
Dep. $\times$ Year FE	X	X	X	X
Pre-trends $\times$ Year FE	X	X	X	X
Weather Controls	X	X	X	X

Table (F.1) Impacts of Venezuelan Migration on Infectious Diseases - Heterogeneous Effects by Altitude

Disease Group	**Vector-borne**					**Vaccine-preventable**					
Variables (per 100,000 indv.)	Malaria	Leish.	Chagas	Dengue	Yellow Fever	Chickenpox	Measles	Rubella	Tuberc.	Diphteria	W. Cough
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A. Height above sea level <2000 meters											
Predicted Inflows	-0.08	-0.01	-0.06	-0.23	0.00	0.27**	-0.01	-0.01	0.32	-0.00	0.01
	(0.15)	(0.19)	(0.07)	(0.28)	(0.01)	(0.12)	(0.01)	(0.01)	(0.20)	(0.00)	(0.01)
Observations	65436	65436	65436	65436	65436	65436	65436	65436	65436	65436	65436
Pseudo R-sq.	.34	.31	.36	.19	.081	.14	.023	.17	.21	.025	.05
Panel B. Height above sea level <1500 meters											
Predicted Inflows	-0.09	-0.06	-0.08	-0.25	-0.00	0.33***	-0.00	-0.01	0.48**	-0.00	0.01
	(0.17)	(0.20)	(0.06)	(0.29)	(0.01)	(0.12)	(0.01)	(0.01)	(0.24)	(0.00)	(0.01)
Observations	47796	47796	47796	47796	47796	47796	47796	47796	47796	47796	47796
Pseudo R-sq.	.34	.33	.27	.2	.087	.16	.023	.18	.22	.028	.064
Panel C. Height above sea level <1000 meters											
Predicted Inflows	-0.06	0.07	-0.01	-0.27	-0.00	0.40***	-0.01	-0.01	0.38*	-0.00	0.01
	(0.23)	(0.11)	(0.04)	(0.22)	(0.01)	(0.15)	(0.01)	(0.01)	(0.20)	(0.00)	(0.01)
Observations	33936	33936	33936	33936	33936	33936	33936	33936	33936	33936	33936
Pseudo R-sq.	.35	.36	.16	.21	.094	.19	.03	.22	.21	.032	.075
Controls for all Panels											
Month-Year FE	X	X	X	X	X	X	X	X	X	X	X
Municipality FE	X	X	X	X	X	X	X	X	X	X	X
Dep. × Year FE	X	X	X	X	X	X	X	X	X	X	X
Pre-trends × Year FE	X	X	X	X	X	X	X	X	X	X	X
Weather Controls	X	X	X	X	X	X	X	X	X	X	X

Table (F.2) Impacts of Venezuelan Migration on Infectious Diseases - Heterogeneous Effects by Altitude

Disease Group		**STDs**		
Variables (per 100,000 indv.)	AIDS	Syphilis	Hepatitis B	Chlamydia
	(1)	(2)	(3)	(4)
Panel A. Height above sea level <2000 meters				
Predicted Inflows	1.87**	0.13*	-0.01	0.02
	(0.85)	(0.07)	(0.02)	(0.04)
Observations	65436	65436	65436	65436
Pseudo R-sq.	.33	.14	.44	.13
Panel B. Height above sea level <1500 meters				
Predicted Inflows	2.37***	0.15**	-0.01	0.01
	(0.83)	(0.06)	(0.02)	(0.04)
Observations	47796	47796	47796	47796
Pseudo R-sq.	.5	.16	.47	.16
Panel C. Height above sea level <1000 meters				
Predicted Inflows	2.57***	0.15***	-0.01	0.00
	(0.86)	(0.05)	(0.02)	(0.05)
Observations	33936	33936	33936	33936
Pseudo R-sq.	.6	.17	.51	.19
Controls for all Panels				
Month-Year FE	X	X	X	X
Municipality FE	X	X	X	X
Dep. $\times$ Year FE	X	X	X	X
Pre-trends $\times$ Year FE	X	X	X	X
Weather Controls	X	X	X	X

Table (G.1) Impacts of Venezuelan Migration on Internal Migration of Colombian Citizens

Variable in Log.	Colombian Citizens
	(1)
Predicted Inflows	-0.006
	(0.007)
R-squared	0.987
Observations	2,148
Controls for all Panels	
Year FE	X
Municipality FE	X
Dep. $\times$Year FE	X
Pre-trends $\times$Year FE	X

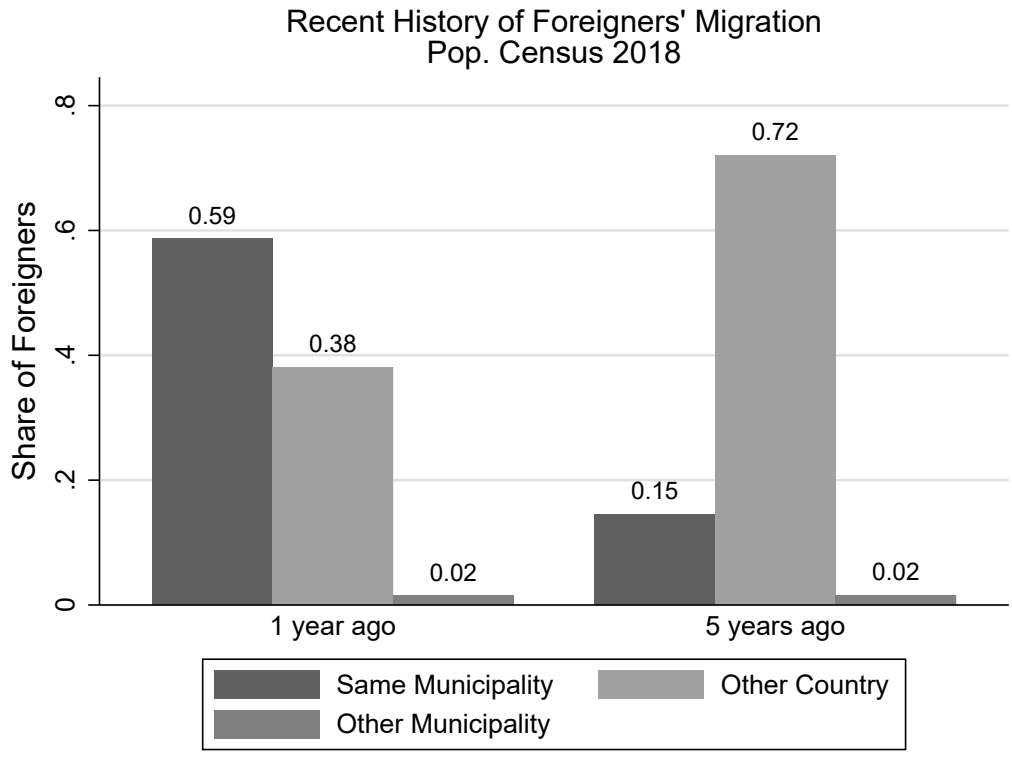
Table (H.1) Dynamic Effects of Venezuelan Migration on Infectious Diseases

Disease Group	**Vector-borne**					**Vaccine-preventable**					
Variables (per 100,000 indv.)	Malaria	Leish.	Chagas	Dengue	Yellow Fever	Chickenpox	Measles	Rubella	Tuberc.	Diphteria	W. Cough
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A. Lagged Effects - 3 Months											
Predicted Inflows (t-3)	-0.16	-0.05	-0.06	-0.24	0.00	0.33***	-0.01	-0.00	0.34**	-0.00	-0.00
	(0.17)	(0.19)	(0.07)	(0.26)	(0.01)	(0.11)	(0.01)	(0.01)	(0.13)	(0.00)	(0.01)
Observations	79,866	79,866	79,866	79,866	79,866	79,866	79,866	79,866	79,866	79,866	79,866
R-squared	0.39	0.31	0.35	0.19	0.08	0.15	0.02	0.11	0.21	0.02	0.04
Panel B. Lagged Effects -4 Months											
Predicted Inflows (t-4)	-0.17	-0.05	-0.06	-0.27	0.00	0.26**	-0.01	-0.00	0.35***	-0.00	-0.00
	(0.18)	(0.20)	(0.07)	(0.26)	(0.01)	(0.13)	(0.01)	(0.01)	(0.13)	(0.00)	(0.01)
Observations	78,880	78,880	78,880	78,880	78,880	78,880	78,880	78,880	78,880	78,880	78,880
R-squared	0.39	0.31	0.35	0.19	0.08	0.15	0.02	0.11	0.21	0.02	0.04
Panel C. Lagged Effects -5 Months											
Predicted Inflows (t-5)	-0.20	-0.06	-0.07	-0.42	-0.00	0.19	-0.01	-0.00	0.35**	-0.00	-0.01
	(0.20)	(0.22)	(0.08)	(0.27)	(0.01)	(0.16)	(0.01)	(0.01)	(0.15)	(0.00)	(0.01)
Observations	77,894	77,894	77,894	77,894	77,894	77,894	77,894	77,894	77,894	77,894	77,894
R-squared	0.39	0.32	0.35	0.19	0.09	0.15	0.02	0.11	0.22	0.02	0.04
Controls for all Panels											
Year FE	X	X	X	X	X	X	X	X	X	X	X
Municipality FE	X	X	X	X	X	X	X	X	X	X	X
Dep. $\times$Year FE	X	X	X	X	X	X	X	X	X	X	X
Pre-trends $\times$Year FE	X	X	X	X	X	X	X	X	X	X	X
Weather Controls	X	X	X	X	X	X	X	X	X	X	X

Table (H.2) Dynamic Effects of Venezuelan Migration on Infectious Diseases

Disease Group		**STDs**		
Variables (per 100,000 indv.)	AIDS	Syphilis	Hepatitis B	Chlamydia
	(1)	(2)	(3)	(4)
Panel A. Lagged Effects - 3 Months				
Predicted Inflows (t-3)	1.33*	0.11*	-0.00	0.02
	(0.78)	(0.06)	(0.02)	(0.04)
Observations	79,866	79,866	79,866	79,866
R-squared	0.29	0.14	0.41	0.13
Panel B. Lagged Effects -4 Months				
Predicted Inflows (t-4)	0.87	0.08	-0.01	0.02
	(0.87)	(0.06)	(0.02)	(0.04)
Observations	78,880	78,880	78,880	78,880
R-squared	0.29	0.14	0.42	0.13
Panel C. Lagged Effects -5 Months				
Predicted Inflows (t-5)	0.54	0.09	-0.01	0.03
	(1.23)	(0.07)	(0.02)	(0.04)
Observations	77,894	77,894	77,894	77,894
R-squared	0.30	0.14	0.42	0.13
Controls for all Panels				
Year FE	X	X	X	X
Municipality FE	X	X	X	X
Dep. $\times$Year FE	X	X	X	X
Pre-trends $\times$Year FE	X	X	X	X
Weather Controls	X	X	X	X

Figure (I.1) Describe Recent Migration History of Venezuelan Pop. (ENCOVI)



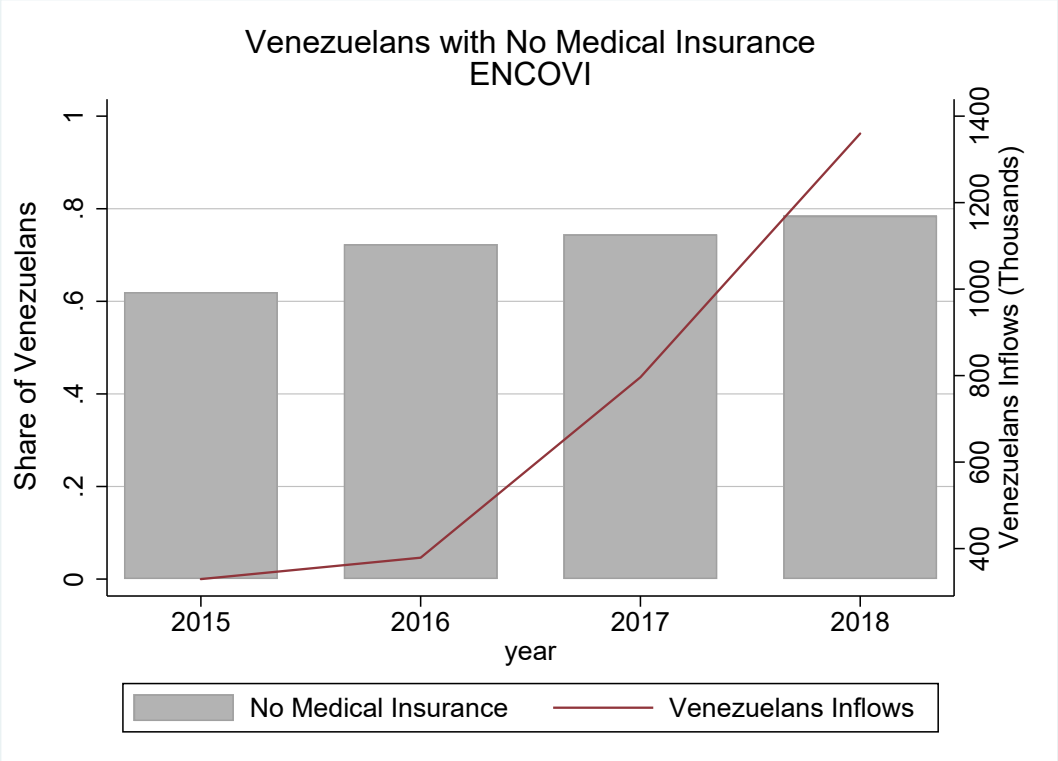
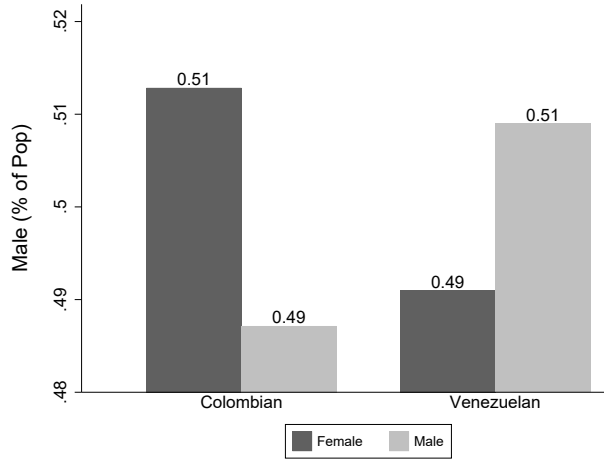
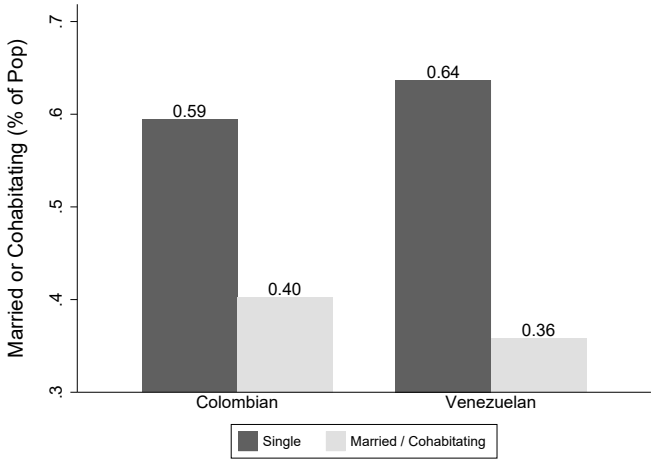


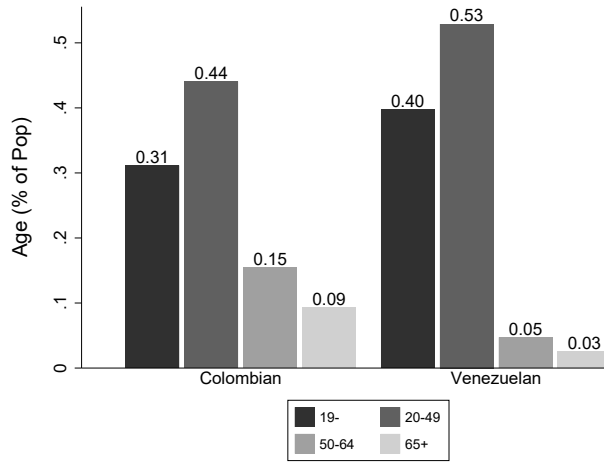
Figure (I.2) Descriptive Statistics Colombians and Foreigners Pop. (Census 2018)



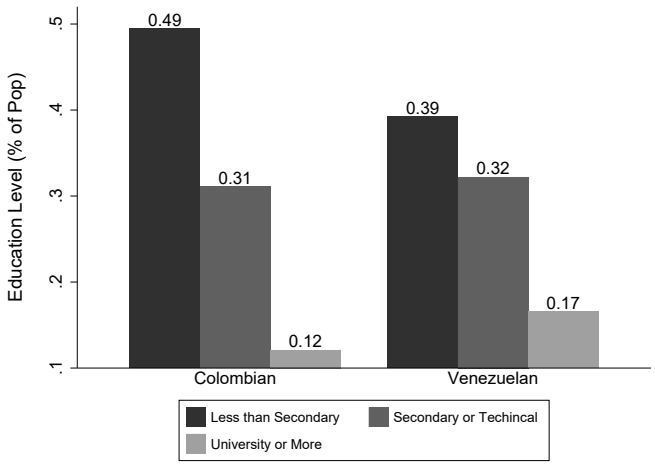
(a) Gender



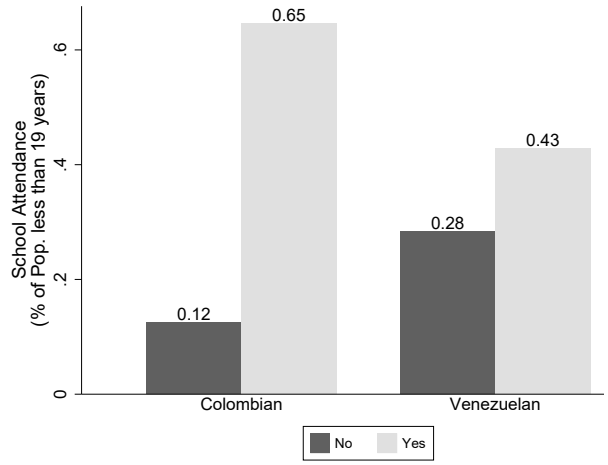
(b) Marital Status



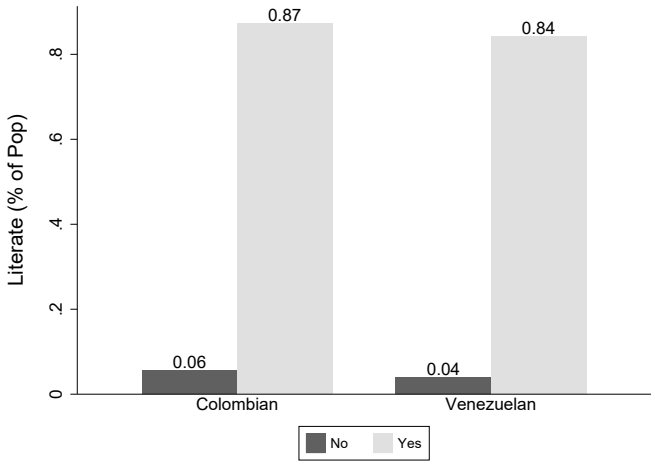
(c) Age



(d) Education Level

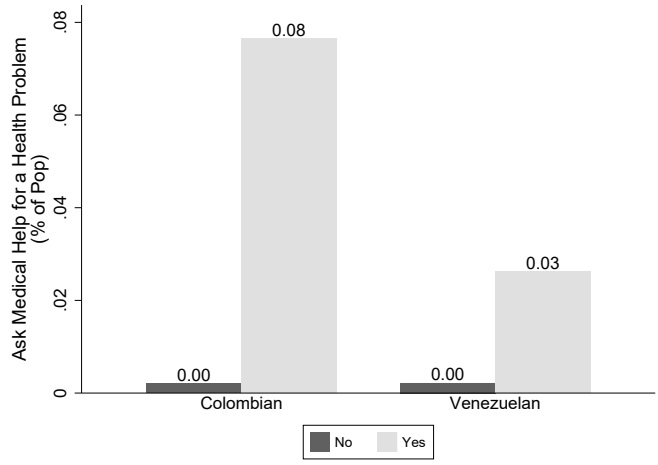


(e) School Attendance

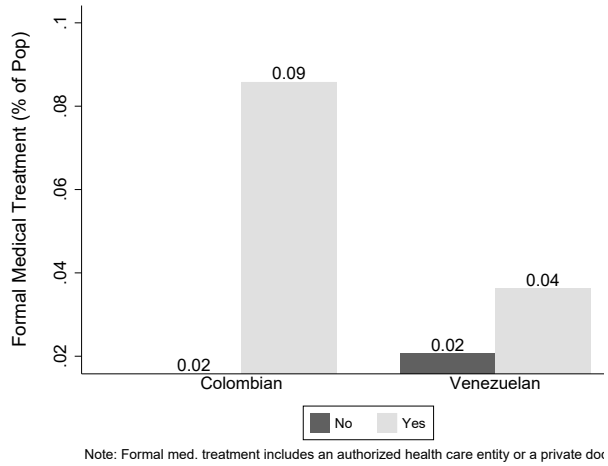


(f) Literate

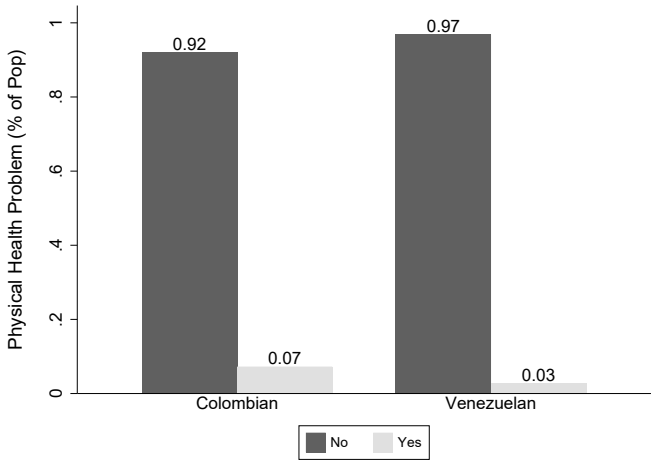
Figure (I.3) Descriptive Statistics Colombians and Foreigners Pop. (Census 2018)



(a) Ask for Medical Help



(b) Ask for Formal Treatment



(c) Physical Problem

Table (J.1) Impacts of Venezuelan Migration on Infants Infectious Diseases

Disease Group	**Vector-borne**			**Vaccine-preventable**			
Variables (per 100,000 indv.)	Malaria	Leish.	Dengue	Chickenpox	Measles	Tuberc.	W. Cough
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Predicted Inflows	-0.010	-0.002	-0.088	0.023	-0.007	0.006	0.219
	(0.008)	(0.004)	(0.357)	(0.065)	(0.029)	(0.006)	(0.134)
Observations	19,571	19,571	19,571	19,571	19,571	19,571	19,571
R-squared	0.236	0.050	0.081	0.108	0.039	0.057	0.059
Controls for all Panels							
Year FE	X	X	X	X	X	X	X
Municipality FE	X	X	X	X	X	X	X
Dep. $\times$Year FE	X	X	X	X	X	X	X
Pre-trends $\times$Year FE	X	X	X	X	X	X	X
Weather Controls	X	X	X	X	X	X	X

Notes: Among infants there are no reported cases of the following diseases: Chagas, Yellow Fever, Rubella and Diphtheria.

Table (J.2) Impacts of Venezuelan Migration on Infants Vaccine Preventable Diseases

Disease Group	**Vaccine-preventable diseases among Infants aged 0 to 1 years old.**								
Variables (per 100,000 indv.)	Chickenpox	Measles	Tuberc.	W. Cough	Yellow Fever	Hepatitis B	Rotavirus	Haemophilus Influenzae	Influenza
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Predicted Inflows	0.023	-0.007	0.006	0.219	0.000	0.003	0.010	0.011	0.036
	(0.065)	(0.029)	(0.006)	(0.134)	(0.001)	(0.003)	(0.013)	(0.044)	(0.023)
Observations	19,571	19,571	19,571	19,571	19,571	19,571	19,571	19,571	19,571
R-squared	0.108	0.039	0.057	0.059	0.050	0.052	0.055	0.050	0.065
Controls for all Panels									
Year FE	X	X	X	X	X	X	X	X	X
Municipality FE	X	X	X	X	X	X	X	X	X
Dep. $\times YearFE$	X	X	X	X	X	X	X	X	X
Pre-trends $\times YearFE$	X	X	X	X	X	X	X	X	X
Weather Controls	X	X	X	X	X	X	X	X	X

Notes: Among infants there are no reported cases of the following vaccine preventable diseases: Polio, Tetanus and Hepatitis A.