Latin America HUB C2M2 Quito
C2M2 Santa Cruz

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C2M2 Quito & C2M2 Santa Cruz – TEAM
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Abstract

As of June 2021, more than 1,260,000 people had died from the coronavirus disease (COVID-19) in the countries of Latin America and the Caribbean, in what constitutes the largest health crisis in the recent history of the region. To give a global idea, this figure is equivalent to 32% of the world's total deaths, a proportion almost four times higher than that of the population of the region in relation to the world population (which is only 8.4%). Unequal access to vaccines and health services (by both countries and social groups within each country) and the appearance of new variants of the virus increase uncertainty about the evolution of the pandemic and the consequent opening and recovery of Latin American economies.

In a global context in which economic, social, and environmental asymmetries are exacerbated, the pandemic led the economy of the Latin American region to experience the largest contraction in GDP since 1900 and to register the worst performance among developing regions. However, it should be noted that, even before the crisis, the region was practically stagnant. In the 2014-2019 period, average growth was only 0.3% and per capita growth was negative. In fact, this six-year term was one of the ones with the lowest growth since on records, only comparable with those that include the First World War or the Great Depression.

Almost zero economic growth before the health crisis, together with the contraction caused by the pandemic and the weakness of the welfare state and the health and social protection systems, have translated into unprecedented increases in unemployment, migration, violence and insecurity. Also, significant falls in income, a decrease in tourist activity, and increases in poverty and inequality that have exacerbated the structural problems that the region already had.

In this context, the development of projects like C2M2 is extremely important; both for those responsible for making policy decisions and for thousands of researchers and academics seeking to better understand the effects and implications of a pandemic such as the one we are currently experiencing at a global level. The Latin American HUB focuses precisely on the spatial analysis and visualization of the redistribution of poverty and other related emerging processes, from the COVID-19 pandemic, in different representative cities of the region: Quito, Santiago, Lima, Cusco, Ouro Preto and Santa Cruz in the Galapagos Islands.

Specifically, our project focuses mainly on the processes related to the redistribution of poverty, migration and human mobility in Quito, Lima and Santiago. As well as the multiplier effects (that is, the consequences) of the total or partial collapse of tourism in cities where tourist activity is the main fuel of the economy, such as Santa Cruz, Cusco and Ouro Preto. Therefore, our HUB has two main components: On the one hand, it focuses on short-term and long-term migration processes, especially on migration from Venezuela and on internal migration in each country because of the mobilization of millions of people who recently arrived in large cities from different rural areas. On the other hand, we focus on the analysis of the collapse of tourism, which allows us to explore the distributive and multiplicative economic impact of this specific pandemic and probably any other global pandemic. However, as part of these two components, we have also focused on analyzing other important issues in relation to the pandemic and its effects, such as: domestic violence, insecurity, education, vaccination processes and the political climate in different cities, from both an individual and a comparative perspective. These will allow us, in the end, to draw adequate conclusions, analyze the situation of each city in relative terms and establish links (differences and similarities) between the different Latin American countries and cities.

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MIGRATION AND MOBILITY

Quito City Project

1. Description of economy

The economic importance of Quito within the gross added value is very significant. In 2010 Quito generated 22.11% of the National GDP, followed by Guayaquil with 20.7%[1], demonstrating a concentration of productive activity in these two cities. The highest peak of growth was registered in 2011 with a rate of 6.34%. The most important economic groups are: Professional and Real Estate Activities (25%), Manufacturing (17%), and Transport - Information and Communications (12%) (Banco Central del Ecuador, INEC, 2014)[2].

According to Banco Central del Ecuador[3], employment figures increased from 55.6% in 2009 to 70.8% in 2014, followed by a decreasing trend and achieving an employment rate of 59.7% in 2019. As a reference, for the same year, the national level employment rate was of 37.9%. On the other hand, since 2009 underemployment decreased from 14.5% to 4.5% on 2015. However, an increasing trend has developed in the last years achieving 15.5% in 2017 and 9% in 2019. In the same way, unemployment increased since 2015 fluctuating from 4.4% to 9.7% on 2019, showing a higher rate than the national level of 4.6% (Banco Central del Ecuador, 2019).

The economic sector that generates the most suitable employment in Quito is the Services sector (48.40%), Commerce and vehicles repair (22.1%), Manufacturing industries (12.3%), Public administration and security (7.7%), Construction (7.5%). Together, these sectors concentrated 98% of the employed population. Within the services sectors, some of the most important are: Accommodation and food activities (7%), Transportation and storage (6.6%), Teaching (5.5%), and Professional activities, scientific and technical (4.6%), Service activities in private homes (4.5%), and administrative activities and services (4.5%) [4].

The loss of jobs in the formal sector and the decrease in income, especially in the informal sector, are a reality. Almost 80% of small and medium businesses - SMEs – dropped sales, and consequently had to reduce personnel, decrease the number of working hours, benefits and employer contributions, to manage some savings in salaries for the company. Subsequently, payment flow of obligations with third parties also decreased. An estimate of 87% of these establishments had great difficulties in meeting their

[1] Banco Central del Ecuador, 2007-2010
[2] Banco Central del Ecuador, 2014
[3] Banco Central del Ecuador, 2019 (https://contenido.bce.fin.ec/documentos/Estadisticas/SectorReal/Previsiones/IndCoyuntura/Empleo/imle201901.pdf)
[4] ENENDUM, 2014

immediate liabilities, payments with suppliers and bank debts, thus resorting to leveraged financing[5]. Thus, according to the National Survey on Household Well-Being in the face of the COVID-19 Pandemic in Ecuador, eight out of ten middle-class households were income restricted because many companies cut hours of work or laid off workers[6].

An interesting article in an economic journal[7], considered Quito as the economically hardest hit city, of Ecuador due to the COVID-19 health emergency. Three indicators account for the dimension of the impact of the pandemic and the restrictions for individuals and businesses.

1. Sales and exports in Quito reached USD 30,395 million, which means a contraction of 27.31% or the equivalent of USD 11,422 million less compared to the same period in 2019. The capital is the city with the largest contraction in sales and exports in 2020, according to the Internal Revenue Service (SRI). The month of May recorded the greatest drop in sales: USD 3,068 millions. Since June, a trend of increasing sales and exports began to show. In July, the drop-in sales in Quito were USD 1,759 million[8].
2. In June 2020, the unemployment rate in Quito was 22.8%, that is, 7.9 percentage points above the Guayaquil rate and 9.5 percentage points above the national unemployment rate[9].
3. The decrease in tax collection, due the drop-in sales and exports, as well as the deterioration in employment and the reduction in family income. Between January and August 2020, tax collection in Quito decreased 18% or the equivalent of USD 1,698 millions compared to the same period of 2020.

Three factors are considered important in the economic reduction of the city. First, nearly 50% of the public sector and its employees are in Quito. Second, most of the income from sales and exports comes from activities that were subject to restrictions, such as trade. And third, the extension of the stage of physical isolation to prevent contagion.

2. Vulnerable Populations

a. Poverty

Since 2017 (21.5%), poverty and income inequality at the national level have shown a tendency to increase, reaching 25% in 2019. Ecuador´s urban areas poverty has also shown the same trend on the rise, reaching 17.2% by 2019, while Quito presents a notably lower rate of 8.2%. Meanwhile Quito´s extreme

[5] Morillo, S. (2021). Impacto de la propagación del COVID-19 en la economía local de las pequeñas y medianas empresas localizadas en la ciudad de Quito. Universidad Politécnica Salesiana.

[6] ECOVID-EC. https://www.unicef.org/ecuador/encovid, accessed October 2021

[7] Coba, Gabriela (2020) "Quito: tres indicadores muestran impacto de la pandemia en la economía", PRIMICIAS, ene 2021. https://www.primicias.ec/noticias/economia/indicadores-quito-ciudad-golpeada-crisis-covid/

[8] SRI, 2020

[9] Camara de Comercio, 2020

poverty indicator is of 2.8%, accompanied by the Gini coefficient of 0.462, which demonstrate the levels of inequality in the city. In other words, 11 of every 100 Quito´s inhabitants are underneath the poverty curve. Some of the reasons for these situations are employment circumstances, such as underemployment, unemployment and the deep dependence of the capital on public spending.

In October 2020 a national telephone survey, that has since had three rounds of information gathering (the other two in January and May 2021), began. According to this survey, called National Survey on Household Well-Being in the face of the COVID-19 Pandemic in Ecuador[10], eight out of ten middle-class households had income restrictions because many companies reduced working hours or laid off workers. With lower income and an increment in expenses, half of the surveyed households requested loans; four out of ten stopped paying basic services and were unable to pay off debts or credit cards. It was also noticed that in May 2021, seven out of ten low-income households were food insecure and 10% in middle-income households, generating little access to nutritious food. Regarding to education, the survey show that minors from poorer households receive half the hours of classes than their peers in private schools, and 90% of them receive classes from their parents' cell phone, because of the lack of resources to acquire a personal laptop. These are statistics at the national level; nevertheless, it is also part of the city of Quito reality.

b. Immigration

The last census, conducted in 2010, shows that the number of foreigners residing in Ecuador amounts to 181,848 people and their percentage with respect to the population total remains at 1.3%[11]. This population has, first, people of Colombian nationality, followed by Peruvian and American, and are concentrated in provinces from Pichincha, Guayas and Carchi. Further, this census highlights an increase in arrival of Cubans, Haitians and places like Nigeria, India, China, Pakistan, Afghanistan, among others[12].

At this point, immigration wasn´t so visible on the streets, commerce and services. Just with the increase of migratory flows of people with Colombian, Cuban and Haitian and later Venezuelan nationality, this was the case. Specially, the crisis in Venezuela of the last four years increased the migratory flows, in the last decade. According to the Ministry of the Interior in 2015 was a population of 8,901 Venezuelans in the country, which increment to 362,862 in 2020[13]. With 15.8% of the active settlements and communities registered in Quito[14].

In a brief analysis, Jacquez Ramírez [15] analyzed the precariousness of immigrant's life conditions during the pandemic in Quito. He contributed with interesting data collected from a survey. For instance,

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[10] ECOVID-EC. https://www.unicef.org/ecuador/encovid, accessed October 2021

[11] INEC, 2010, Base de Datos de Migración, https://www.ecuadorencifras.gob.ec/base-de-datos-migracion/

[12] INEC, 2010

[13] https://gk.city/2019/07/29/venezolanos-ecuador-migracion/

[14] https://r4v.info/es/situations/platform/location/7512

[15] Ramírez Jacques (2021). Inmigrantes en Quito: antes y después de la Pandemia. En Carrión, Fernando y Cepeda, Paulina Quito: La ciudad que se disuelve. Covid-19. Quito (Ecuador): FLACSO.

around half of the immigrants were working in the informal sector (47%), while 14.2% were office workers and 11.2% did not have a job. 49.7% worked on a specific place and 42.9% in the street. When inquiring about monthly income, 62.1% earned between USD 150-380; 19.3% between USD 381 and 500 and 10% less than 100 dollars. It is worth noting that 4.6% indicated that they do not receive any income. Finally, in relation to housing, 40.8% live in a rented apartment; 36.6% in a room of a house and 17.9% in a house or villa. In this regard, during the pandemic half of the immigrants who worked on the street facilitated the virus contagion among them, and found it difficult to obtain money at the streets because mobility was low during the first three months, and afterwards people avoided opening windows at traffic lights and buying on the streets to avoid being infected. Thus, if their income was already below the basic salary before the pandemic, during 2020 it reduced even more. This process, in addition to the precari-ousness initial conditions, lead to a cascade of problems including access to food, home evictions and immigration regularization that migrants faced after the arrival of Covid-19.

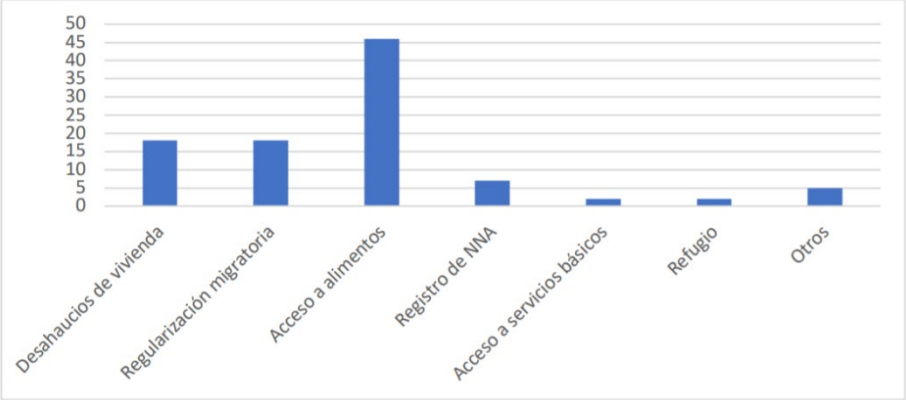

Figure 1. Main problems of immigrants in times of pandemic, Quito Ecuador

Source: Ramírez, 2021: Defensoría del Pueblo, Delegaciones Provinciales de Frontera, abril 2020

3. Status of COVID-19

a. *Confirmed cases: 175,051*

b. Deaths: 3,432

The Metropolitan District of Quito counts with 2,781,641 inhabitants, which represent the 16% of the national population, being the largest city in the country[16]. Since March 2020, the city has been strug-gling in controlling the propagation of COVID-19, throughout several control measures imposed by tech-nical criteria such as mobility restriction, public transportation control, and closure of public places such as cinemas, restaurants, public events, among others. Also, raising awareness into citizens to increase biosafety and control measures has been a corner stone of public intervention.

[16] https://ecu11.com/poblacion-de-quito-numero-actual-de-habitantes/, access October 2021

The measures in the city of Quito during the year 2020 summarize as follows:

Red Light	mar-may/2020	Strict quarantine; no attendance at work or classes; strong mobility restrictions
Yellow Light	jun-ago/2020	Progressive opening of workplaces with capacity control; not attending classes; medium mobility restrictions
Green Light	sep-dic/2020	Opening of public places such as restaurants, cinemas, gyms, etc. with capacity control; no return to class; mobility control measures are maintained a little lighter

In early 2021, the city suffered a relapse in increasing COVID-19 cases. In the months of March and April there was a new quarantine imposed by the national and local authorities. However, over the last six months, activities resumed little by little, and by October 2021, all public and private facilities are in operation, with capacity restrictions and the obligatory use of masks. This process was gradual, in an attempt to recover the economy of the city that has decreased due to the slowdown of economic activities. In general, Quito show that to September 30th 2021, 175,051 confirmed cases out of 609,861 samples taken, due 434,810 cases were discarded [17]. The number of confirmed cases in Quito represent the 38% of national COVID-19 cases [18]. On figure 2, it can be seen that since mid-July 2021, COVID-19 cases show a significant decreasing trend, reaching the lowest incidence values since the first weeks of the start of the pandemic in the city.

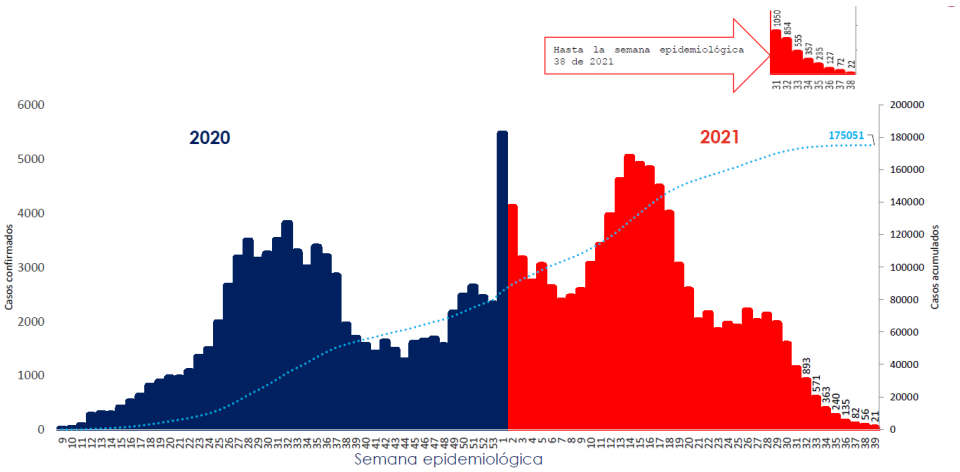

Figure 2. Confirm COVID-19 cases since March 2020 to Sep 2021, Quito Ecuador

Source: https://drive.google.com/file/d/1z4990Gb_RA1YXOeS1Qw7k4iDI-ZKYiot/view, accessed 11/10/2021.

[17] DMQ, 2021: https://drive.google.com/file/d/1z4990Gb_RA1YXOeS1Qw7k4iDI-ZKYiot/view, accessed october 2021
[18] https://www.coronavirusecuador.com/estadisticas-covid-19/, accessed october 2021

Besides, 3,432 deaths [19]by COVID-19 have been identified, accounting for the 16% of total deaths at national level[20]. In figure 3 we can see the excess of mortality from 2020 and 2021 with respect to the average mortality from 2017 to 2019 in Quito. The graph shows that peak of excess of mortality occurred in July and August 2020, followed by a decreasing trend of deaths. Later on 2021, a second peak occurred on April and May, followed as well, for a decreasing trend reaching the lowest rate since COVID-19 initiated (March 2020), on September 2021.

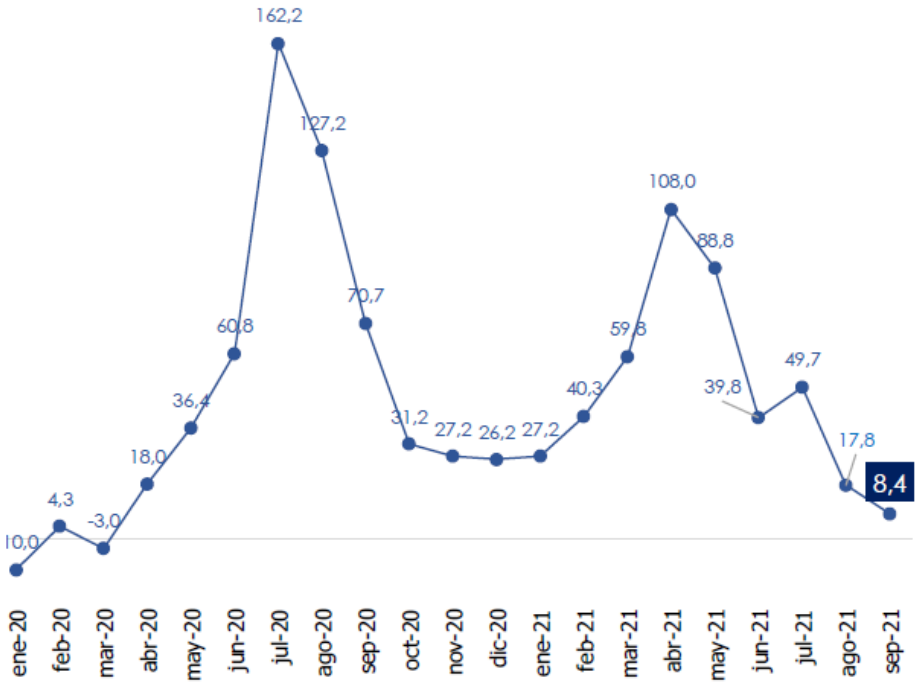

Figure 3. Excess of mortality from Jan 2020 to Sep 2020, Quito Ecuador

Source: https://drive.google.com/file/d/1z4990Gb_RA1YXOeS1Qw7k4iDI-ZKYiot/view, accessed 11/10/2021.

Confirmed cases for female gender are of 85,804 that represents 49% of total cases, while the 51% are registered for the male gender with 89,247 cases. While in confirmed cases by age group, the highest percentage of cases are grouped between 20 and 49 years, corresponding to the economically active population with 60.2% of cases, followed by the age group from 50 to 64 years with 19.71% [21].

The highest contagion rates of COVID-19 into the territory of the city concentrates mostly in the southern area and the peripherical parishes as happened since the beginning of the pandemic, due stand out for their higher poverty rate. Also, in the commercial center of the city, where most of the financial activities of the city take place.

[19] DMQ, 2021: https://drive.google.com/file/d/1z4990Gb_RA1YXOeS1Qw7k4iDI-ZKYiot/view, accessed october 2021
[20] https://www.coronrusecuador.com/estadisticas-covid-19/, accessed october 2021
[21] DMQ, 2021: https://drive.google.com/file/d/1z4990Gb_RA1YXOeS1Qw7k4iDI-ZKYiot/view, accessed october 2021

Vaccination

The nationwide vaccination campaign began in January 2021. Nevertheless, it slowly progressed until June 2021 when the process accelerated. Until September 2020 4,757,656 vaccines were applied[22], predominantly from Sinovac, Pfizer and AstraZeneca. In average, 89.7% of population between 16 and older than 65 years have received at least 1 dose of the vaccine (figure 4). And according to the figure 5, approximately 50% of each age group, second dose is still pending.

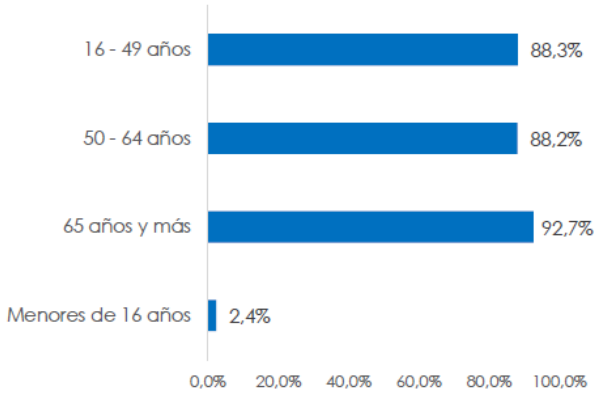

Figure 4. Vaccination coverage by age groups - Sep 2020, Quito Ecuador

Source: https://drive.google.com/file/d/1z4990Gb_RA1YXOeS1Qw7k4iDI-ZKYiot/view, accessed 11/10/2021.

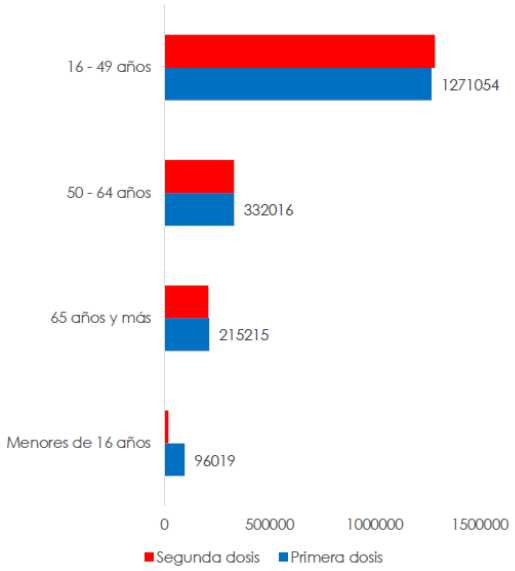

Figure 5. Doses of vaccination applied - Sep 2020, Quito Ecuador

Source: https://drive.google.com/file/d/1z4990Gb_RA1YXOeS1Qw7k4iDI-ZKYiot/view, accessed 11/10/2021.

[22] DMQ, 2021: https://drive.google.com/file/d/1z4990Gb_RA1YXOeS1Qw7k4iDI-ZKYiot/view, accessed october 2021

4. Assessment of project

- Update causal loop diagram

The causal loop (Annexed 1 "Causal loop diagram for the city of Quito") diagram interactively represents the behavior of the system shown in the city of Quito, presenting a collection of connected nodes and the loops created by the connections. Nodes are represented as Opposite "O" for more to less or less to more connections, while Same "S" allows more to more or less to less interaction. The diagram represents the general behavior of the cycle guided by cases of Covid-19 and its side effects in green, which allows the increase or decrease of said cases, and consequently move other variables such as health or medicine. It also shows how public investment can achieve large, medium or zero changes in the health infrastructure that may be saturated due to the increase in cases. On the other hand, the vaccination process is favorable to the population since the risk of contracting the virus tends to decrease. However, if these two cycles are negative, it results in the disproportionate increase in deaths from Covid-19.

The nodes in light blue show the topics of interest for research, representation and discussion analyzed by the Hub. In the case of domestic violence (physical, psychological and sexual violence), its increase or decrease is manifested due to the restriction measures imposed by the government on citizens in order to contain the spread of the virus. This negatively affects the economy since businesses tend to reduce their flow of customers, hence their income, taking as a control measure the reduction of working hours for employees, while others become unemployed. With less income at home, people are forced to seek other sources of earnings such as the social health bonus granted by the Government, entrepreneurship and informal work. Because of this increase or lack of income, consumption of basic services that directly affects access to education as well as social vulnerability is affected, and if these increase, they negatively influence access to health and nutritional deficits. On the other hand, the crime / delinquency node increases due to the aforementioned secondary effects in the category of domestic violence, in contrast to the fact that due to its increase, insecurity in the population is affected and therefore social vulnerability, which feeds to Covid-19 cases.

To interactively access the causal loop diagram, visit the following link https://bit.ly/3DnagJM

Table 1.- variables collected to implement the Causal loop of the second-order impacts of COVID-19 in Quito

Focus priority	Objectives	Variable	Data obtained Quito
Pandemic		Report Coronavirus cases	✔
		Hospital Infrastructure	✔

	Analyze the current state of the pandemic	Public investment in health	✔
		Vaccination	✔
		Hospitalized patients	✔
Economy	Understand the current state of the economy before and after the pandemic.	Employment and Unemployment	✔
		Poverty and unsatisfied basic needs	✔
		Working Age Population (PET)	✔
		Economic indicators	✔
		Electricity consumption	✔
		Quality of household materials	✔
		Access to basic services	✔
		Internet access and consumption	✔
Social	Assess poverty, migration, violence, and education before and after the pandemic	Well-being index	✔
		Domestic violence	✔
		Crime	✔
		Human Rights Violations	✔
		Access to education	✔

- What was learned? (About the project activity/About second order impacts)

The three main lessons learned about the project:

First, the territorial scale at which the data is collected differs widely between countries and cities, as well as the temporal scope of some critical indicators that we seek to obtain. This fact not only complicates comparisons between cities, but also within city assessments. However, most of the effects that we were interested in exploring are probably associated with causal dynamics that occur at a lower-level territorial scale.

Second, most of the data obtained from official sources that were outdated or due to the pandemic itself took time to respond to requests, so it had to be sent more than once to obtain a response. This fact not only delayed the progress of the project, but also exemplifies the difficulties that ordinary citizens face when seeking to access information from state sources.

Third, by triangulating the official sources on domestic violence with the ongoing investigation we were able to observe that Emergency calls to ECU911 were not validated and may have an erroneous percentage in their data. The police reports that follow up on these events had a migration in their program and a lot of information was lost and, finally, the complaints made to the Prosecutor's Office correspond to a very low number of cases in relation to emergency calls. However, the fact that victims placed

police complaints about domestic violence at significantly lower rates than in normal times is probably related to the permanent presence of men in the house, to the closure of the centers where the complaint is received or probably to the cumbersome process that is to file a complaint in the country. However, the result reflects real spatial and temporal trends that allow us to observe how this indicator varied during confinement and how it begins to increase in early 2021.

Regarding the lessons learned about second-order effects, we provide a brief account of our findings on criminal dynamics and social dynamics. In the coming months we also hope to produce new findings on the territorial mobility of migrants and on the interaction between mobility restrictions.

In terms of criminal dynamics, we could map the relative prevalence and evolution of different types of crimes, in that sense, when mobility restrictions were enacted, property crimes and robberies moved from the north central areas from the city. At the same time, in areas of the city where drug microtrafficking was prevalent, mobility restrictions were correlated with a significant increase in gang-related violence that led to higher homicide rates (which decreased in other areas of the city), during the same period. Finally, as mobility restrictions were enacted, official records show a decline in domestic violence. However, unofficial sources suggest a significant increase in domestic violence during the quarters. Reports of domestic violence returned to normal after mobility restrictions were lifted. In summary, our data on the territorial dynamics of different criminal activities and serious crimes point to the heterogeneity of COVID-19 mobility restrictions.

- Analysis conducted – analytical flowcharts with description

1. Spatial analysis

Geographic studies reveal that crime is often concentrated in groups, referred to in the literature as hotspots[23]. Hotspot mapping and analysis clearly identified and visualized crime hotspots, and allow us to understand their relationship to underlying crime-related variables.

On the other hand, tidyverse, rgdal, rgeos, tmap, tmaptools, grid, gridExtra, RColorBrewer [24], allowed to design, standardize and generate maps for the counts of cases previously analyzed, the process for obtaining results is shown in Figure 6.

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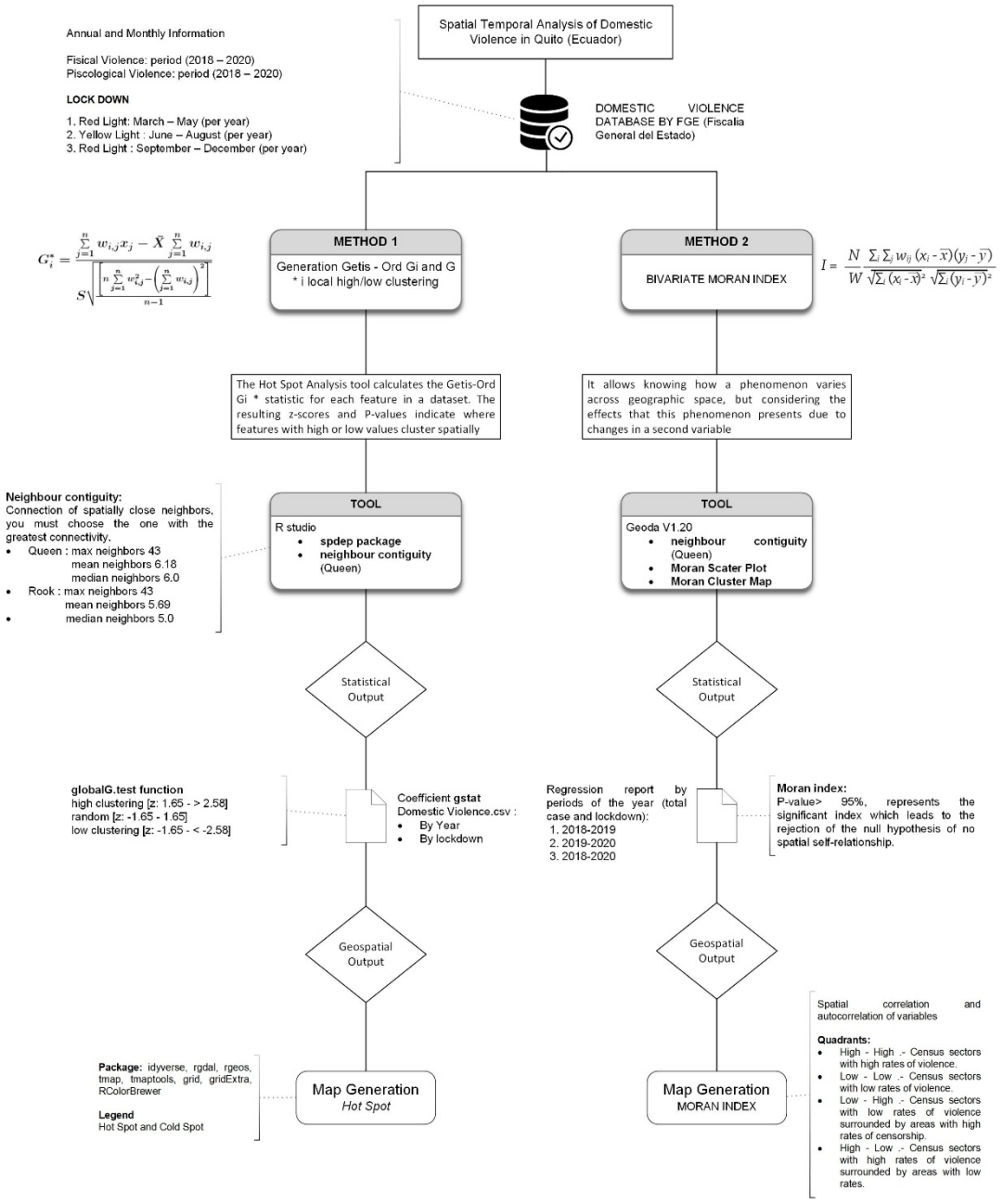
[23] Wang, D., Ding, W., Lo, H., Morabito, M., Chen, P., Salazar, J., & Stepinski, T. (2013). Understanding the spatial distribution of crime based on its related variables *using* geospatial discriminative patterns. *Computers, Environment and Urban Systems*, *39*, 93–106. https://doi.org/10.1016/j.compenvurbsys.2013.01.008

[24] Auguie, B., & Antonov, A. (2016). Package "gridExtra" - Miscellaneous Fuctions for 'Grid' Graphics. https://mran.microsoft.com/snapshot/2017-07-03/web/packages/gridExtra/gridExtra.pdf

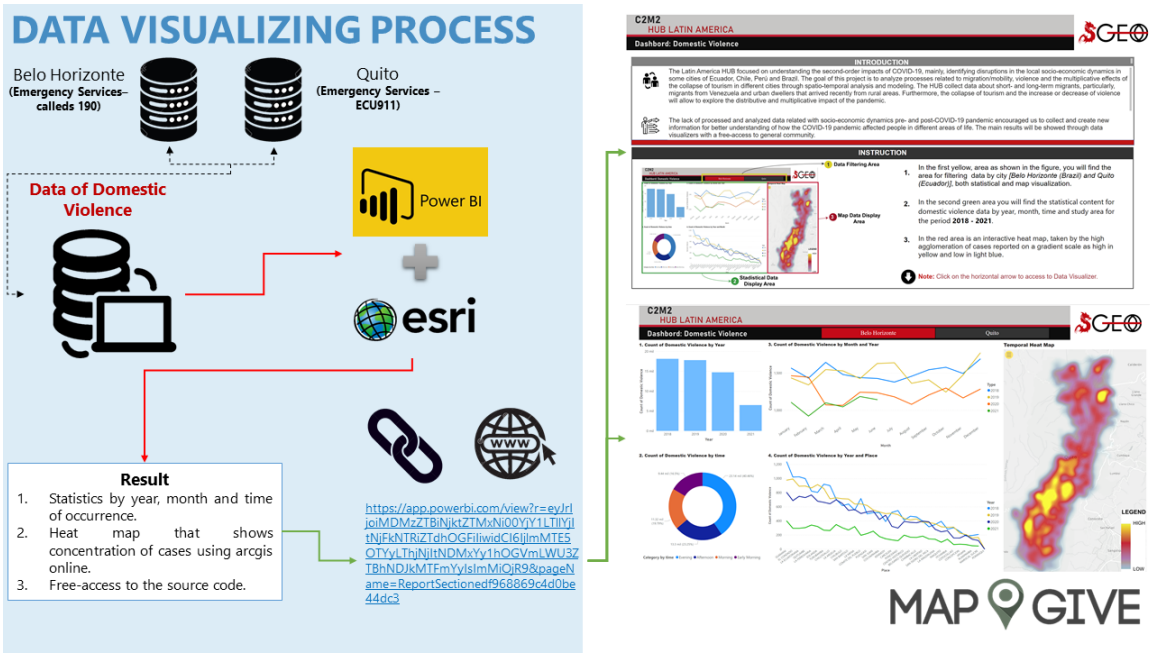
Figure 6. Process for the elaboration of Getis statistics and maps of intrafamily violence by categories based on the Rstudio software.



2. Dashboard

Through the mapping and analysis of the emergency call bases for domestic violence both in Quito and Bello Horizonte, it was possible to capture this data with the help of power BI and ArcGIS online and visualize the data in heat maps. It also helps to identify spatially and temporally where the areas with the highest number of cases are located. This, in turn, allows the population and especially authorities to identify the sites where it is necessary to increase efforts to help citizens.

Figure 7.- Domestic Violence dashboard flow diagram



- Visualizations of results

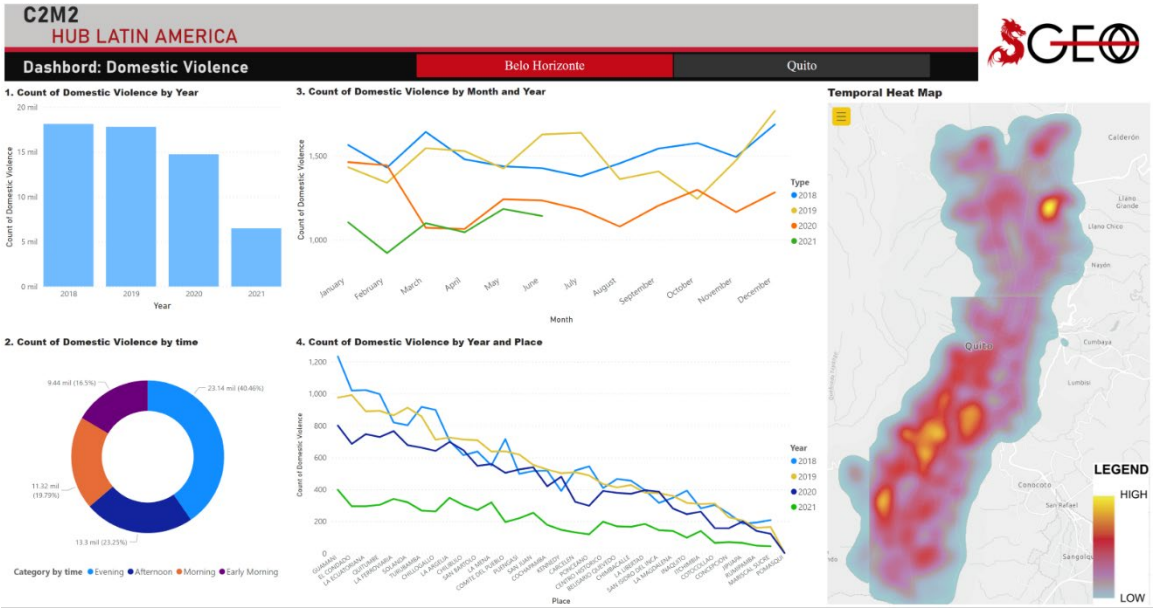
A dashboard is a visualization tool that allows the user to interactively interpret results, in this way one of the second-order effects is presented due to the behavior of the COVID-19 pandemic in the city of Quito with the help of the Power platform BI.

Domestic Violence is one of the effects that has been present in the city of Quito (Ecuador) as well as in Belo Horizonte (Brazil). These cases are distributed by parishes and neighborhoods respectively in the period of January 2018 - June 2021. It is illustrated by four graphs, which contain the general count by year, attacks recorded during the day (early morning, morning, afternoon, night), a breakdown of the cases by months, count by study area and finally a temporary heat map created in the ArcGIS Online platform, which when filtering data in any of the illustrations will change its visualization and will only show the highlighted data.

In this way, figure 8 presents the temporality of domestic violence from January 2018 to June 2021. This data has been provided by the emergency service ECU 911 (emergency calls), from which can be observed throughout the period 2018 - 2019 the cases are similar as for January - February 2020. However, at the time of the start of the Covid-19 pandemic, with the restrictions established by the Government towards the population, it can be seen that from March 2020 until June 2021, emergency calls decreased notably. Also, they cannot recover despite the fact that citizens have been in the vaccination process, this loss may be due to the victim's fear of reporting and the lack of resources to do so. It is presumed

that due to confinement, the victims are unable to do so for fear of being attacked with greater force or towards their children if they had them, since they live with the aggressor for the majority of time.

Figure N° 8 (Annexed 2 - Dashboard of Domestic Violence in Quito)



https://app.powerbi.com/view?r=eyJrIjoiMDMzZTBiNjktZTMxNi00YjY1LTllYjItNjFkNTRiZTdhOG-FiIiwidCI6IjlmMTE5OTYyLThjNjItNDMxYy1hOGVmLWU3ZTBhNDJkMTFmYyIsImMiOjR9 .

- Recommendations

Much of the time planned for each city and project was spent on data collection, which is why in order to have a broader analysis regarding second-order effects and to be able to compare them with the cities of the Hub, it would be important to extend the study time. Additionally, it would be ideal to have a space for exchange of knowledge conversations between the technicians of the Hubs that allows to know about new methodologies and data presentation techniques. It would be important with the analyzes obtained to be able to generate alliances for the training of technical personnel who handle crime and domestic violence information that allows technicians to better analyze their data and the authorities to be able to make appropriate decisions on these issues.

- Community Impacts and Limitations

It is necessary to mention that we have encountered some difficulties throughout the development of the project. For example, in Quito, one of the biggest obstacles has been the lack of secondary data related to the effects of the pandemic. In addition, the level of spatial detail of the information has not

allowed in some cases to analyze these effects on the expected scale. There are also problems regarding access and availability of information by the institutions in charge. Therefore, the application of surveys becomes a fundamental part of our study in order to overcome these difficulties.

- Future Directions

In the city of Quito, secondary data on violence and insecurity has been collected and processed from the country's integrated security services. These data have already been analyzed both spatially and statistically, and the results are being processed in different individual studies to then be able to carry out the comparative study that synthesizes the findings and their policy implications.

- Determinants of Domestic Violence in Quito (Ecuador) during the COVID-19 Pandemic: Using Emergency Phone Calls as a Domestic Violence Indicator (Draft)

- A Spatial Temporal Analysis of Domestic Violence in Quito (Ecuador) during the COVID-19 Pandemic (Draft)

It is worth mentioning that we are close to conducting a survey, specifically aimed at migrants in order to collect primary data that will allow us to advance in the comparative study of the spatial and temporal patterns of migration, vulnerability, political climate and the deterioration of economic and social conditions. The survey has already been designed and approved, and in the coming days they will be applied. (Annexed 3 – Surveys of Venezuelan migrants in Quito)

5. Events and activities

a. Survey:

Addressed to Venezuelan migrants, household leaders, that have arrived prior to March 2020.

Objective:

To understand the migratory flow as an adaptation process to the pandemic.

Description:

The data to be collected includes information on the following conditions:

• Socio-economic, conditions of the place of origin, social networks, current conditions in Quito, conditions for choosing Quito as a destination, conditions for a decision to return to their country, and social and political inclusion.

Contact was made with three migrant associations that will support us with the survey and the survey will be carried out with 300 heads of household.

The survey will be carried out online using Qualtrics software (Annexed 3 - Surveys of Venezuelan migrants in Quito). For visualization purposes, the link is as follows https://usfqadmin.co1.qualtrics.com/jfe/form/SV_bfQHGQTEOCrUSeG

6. Appendices HUB Latin America

1. Appendices 1: "Data Latin America Hub.xlsx. (Data: Spreadsheet of data for each hub X city project, access and sharing information)
2. Appendices 2: "Tools and methods.pdf. (Tools and Methods used to generate data)
3. Appendices 3: "Method HDX Data". (View and download data on the HDX platform) Hub Latin America - Humanitarian Data Exchange (humdata.org)
4. Appendices 4: "Partnerships established" (Flow diagram of the institutional relationships established during the project)

7. Annexed

1. Annexed 1: Causal loop diagram for the city of Quito
2. Annexed 2: Dashboard of Domestic Violence in Quito
3. Annexed 3: Surveys of Venezuelan migrants in Quito

TOURIMS

Santa Cruz City Project

1. Description of economy

The Galapagos Archipelago is one of the 24 provinces of Ecuador. It is made up of a group of 13 major islands, 5 minor islands and 216 islets and rocks of volcanic origin, located approximately 1000 kilometers west of the Ecuadorian coast in the Pacific Ocean. It has a privileged location, at latitude 0 and at the intersection of two important water current systems, the warm current of Panama and the cold current of Humboldt, characteristics that have modeled decisive conditions for the development of the tropical flora and fauna of the islands. Additionally, their ecosystems have evolved in isolation, producing high endemism and ecological fragility. This combination of characteristics makes Galapagos a laboratory of living biodiversity and a highly valued insular ecosystem for conservation purposes, hence it has become a very popular tourism destination for people who is looking for natural and outdoors destinations.

Of the 4 inhabited islands in the Galapagos Archipelago (Santa Cruz, San Cristóbal, Isabela and Floreana), Santa Cruz is the island with the highest number of inhabitants, accounting for 15,701 residentes which represents 62.2% of the total of Galapagos. Its urban parish Puerto Ayora has 46.8%, and the rural parishes Bellavista and Santa Rosa the remaining 13.4% and 2% respectively[25]. A key characteristic of the Galapagos Islands dynamics, and Santa Cruz specifically as it is the most important port for receiving tourists, is that tourism has become the most important element of the economy during the last four decades. The rapid growth of tourism since the 1970´s is now the main driver of change in the social, economic and environmental systems. The growing tourism industry has stimulated a demographic explosion in the last several years, which in turn, increased the requirement for goods and services to cover basic needs and livelihood standards. Consequently, it generated a job expansion in all economic sectors of the island, and at the same time, produced rural land abandonment as farmers and/or members of their households, often-young adults, seek off-farm employment. Thus, the proportion of the population residing in rural areas has decreased from 42% in 1974 to 17% in 2010 (INEC, 1974, 2010). Since 1980 tourism as the main economic activity of the Galapagos Islands and of Santa Cruz, it brought an average of 4,501 tourists per day[26]. The annual tourist population for 2018 was 275,817, which represents a growth of 14% compared to 2017 and of 6.05% compared to the last 10 years. For 2019, the entry of tourists was 271,238 national and international tourists. Therefore, there was a decrease in the number of tourists of 1.7 percent. While on 2020, 72,504 tourists enter the islands showing a rate of -0.73 in relation to 2018 and 2019.

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[25] INEC (2015). Census data.

[26] Observatorio de Turismo Galápagos, Monitoreo de arribos turísticos a Galápagos, (https://www.observatoriogalapagos.gob.ec/arribos-diarios, accessed october 2021)

According to the Galapagos Tourism Observatory[27], in 2018 317 accommodation establishments, 153 restaurant and bar establishments, and 190 tourist boats were registered. The Economic Active Population (EAP) related to the tourism sector is estimated at 42.78% of the total population, while the EAP related to agricultural activities is less than 6 percent[28]. In this sense, tourist activity mobilizes the growth of other economic areas of the islands such as commerce, fishing, construction, food services, among others. Table 2 shows the evolution of the flow of tourists during 2020 and 2021 for Galapagos and Santa Cruz, and it shows a radical decrease of tourist since April 2020, and a slow increment of tourists since August 2020. Nevertheless, at August 2021 the average value of 18,700 tourists that was reached in years of 2017, 2018, and 2019 has not yet been reached, but is close.

Table 2. Monthly arrivals to Galapagos and Santa Cruz

Year	Month	Galápagos	Santa Cruz
2020	January	22,045	15,710
	February	23,947	16,491
	March	11,369	7,826
	April	7	0
	May	20	7
	June	28	13
	July	38	28
	August	456	383
	September	1,232	1,006
	October	3,366	2,506
	November	3,704	2,719
	December	6,292	4,709
2021	January	3,996	2,921
	February	4,977	3,537
	March	6,612	4,703
	April	6,756	4,784
	May	7,452	5,374
	June	8,698	6,353
	July	13,240	9,259
	August	17,491	12,242

[27] Observatorio de Turismo Galápagos, (https://www.observatoriogalapagos.gob.ec/, accessed october 2021)
[28] Plan DSOT, 2015.

Source: Observatorio de Turismo Galápagos, Monitoreo de arribos turísticos a Galápagos, (https://www.observatoriogalapagos.gob.ec/arribos-diarios, accessed october 2021)

Figure 10 shows the monthly average of tourists in Santa Cruz since 2017 to 2021, and it highlights the disappearance of tourist during the months of April, May and June 2020, and as it was shown in table 2, a slowly increase in the entry of tourists to Santa Cruz Island. It is important to keep on mind that this figure represents not just numbers and tendencies, this is the narrative of a profound economic crisis for the inhabitants of Santa Cruz and Galapagos in general.

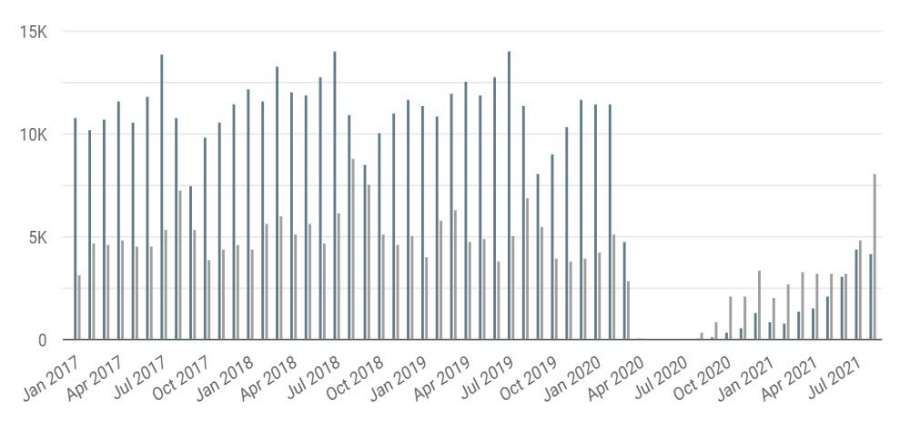

Figure 9. Monthly average of tourists in Santa Cruz 2017-2021

Source: Observatorio de Turismo Galápagos, Monitoreo de arribos turísticos a Galápagos, (https://www.observatoriogalapagos.gob.ec/arribos-diarios, accessed october 2021)

2. Vulnerable Populations

According to the results of the Living Conditions survey for 2014, the 10 percent of the population living in Galapagos is in poverty by consumption[29]. Within the framework of the Ecuadorian Social Protection Network, 2,315 families residing in the Galapagos Islands are in a vulnerable situation. Most of these families live from tourist activities (which have been affected by the impact of the COVID-19 pandemic), and they receive a Family Protection Bonus for Emergency.

According to the Unsatisfied Basic Needs (UBN) methodology, one in 10 people in Galapagos is in a situation of extreme poverty (lack of access to two or more basic needs) and another 40% is in a situation of non-extreme poverty (presents a single basic deficiency). The most common conditions that contribute to this situation are inadequate sanitary conditions and critical overcrowding.

29 Inec-World Bank. (2014). Report of poverty by consumption Ecuador 2006-2014.

Of the 24 provinces of Ecuador, only two (Pichincha and Azuay) have lower levels of poverty than Galapagos, where the poverty rate is 52 percent. As in the rest of the country, rural areas of the Galapagos have a higher incidence of poverty (78 percent) compared to urban areas (47 percent). This is largely due to the dispersion of the population in rural areas and the difficulty of achieving a good coverage of basic services.

Moreover, as in the rest of the country, the urgent need for improvements in the quality of life of the population is evident, especially in rural areas. Some of the most important deficiencies are the coverage of the water systems by public network, the adequacy of the houses and the establishment of systems for the management of sewage, either through septic tanks or sewage systems.

Finally, according to the Poverty Lines methodology, there is no extreme poverty in Galapagos. However, a segment of the population (8 percent) is very close to the extreme poverty thresholds and must be considered in a vulnerable situation. This methodology confirms a higher incidence of poverty in rural areas. Similarly, it indicates that although there is inequity in terms of the distribution of goods among the inhabitants of Galapagos, there is a higher level of equity in the islands than in the rest of the country.[30]

3. Status of COVID-19

Based on the information provided by the Ecuadorian Ministry of Health through their INFOGRAFÍA N°512 with cut-off on 23/07/2021, the city of Santa Cruz registers 822 confirmed cases of Covid-19[31]. This corresponds to a contagion rate of 4.04% of the total population, which by the end of 2020 is estimated at 20,302 inhabitants.[32] The general total of Covid-19 infections for the Galapagos Islands is 1,489 people, accounting for the 0.3% of cases at the national level. Also, the number of deaths from this cause adds up to 11, which corresponds to a mortality rate of 0.73%, which is low in relation to the average mortality produced by the disease at a national average (4.5%).

In table 1 we can see the evolution that the contagion of Covid19 had in Galapagos and the city of Santa Cruz since the beginning of the pandemic March 2020 to date. In average 52% of the cases in Galapagos happened in Santa Cruz Island, due it is the main gateway to the Islands and the most important city in terms of tourism and other economic activities in Galapagos.

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[30] Granda L, M, S González C and V Calvopiña C. (2013). Measurement of poverty in Galapagos. Pp. 84-91. In: Galapagos Report 2011-2012. GNPD, GCREG, CDF and GC. Puerto Ayora, Galápagos, Ecuador.

[31] Secretaria Nacional de Riesgos y Emergencias Del Ecuador (National Secretariat of Risks and Energies of Ecuador). Infografía N°512, (https://www.gestionderiesgos.gob.ec/informes-de-situacion-covid-19-desde-el-13-de-marzo-del-2020/, accessed october 2021)

[32] Instituto Nacional de Estadistica y Censos (National Institute of Statistics and Censuses). (2020). Proyección de la Población Ecuatoriana por Años, Según Cantones 2010-2020: Proyecciones poblacionales.

Table 3. COVID-19 cases in Galapagos and Santa Cruz

		Galapagos		Santa Cruz		
Year	Month	Galapagos Cumulative Total	Galapagos Total cases per month	Santa Cruz Cumulative Total	Santa Cruz Total cases per month	% Santa Cruz cases / Galápagos cases
2020	March	5	5	2	2	40%
	April	68	63	50	48	76%
	May	76	8	54	4	50%
	June	88	12	57	3	25%
	July	103	15	71	14	93%
	August	109	6	74	3	50%
	September	198	89	146	72	81%
	October	227	29	163	17	59%
	November	628	401	422	259	65%
	December	918	290	504	82	28%
2021	January	1089	171	613	109	64%
	February	1309	220	749	136	62%
	March	1346	37	773	24	65%
	April	1387	41	793	20	49%
	May	1441	54	814	21	39%
	June	1466	25	818	4	16%
	July	1489	23	822	4	17%

Source: Secretaria Nacional de Riesgos y Emergencias Del Ecuador, Situación Nacional por COVID-19, Infografías (https://www.gestionderiesgos.gob.ec/informes-de-situacion-covid-19-desde-el-13-de-marzo-del-2020/, accessed october 2021)

The information of table 1 is presented in figure 1, which let us identify the peak of cases during the period of November 2020 to February 2021, and highlights that by March the total number of cases fall and stabilize in very few cases. The increasing trend is connected with the reactivation of tourism activities since august 2020, which was considered a necessary intervention due it is well known that tourism is the economic activity that boost Galapagos economy, and the population social and economic condition was in a precariousness state.

On the other hand, the decrease trend after the peak is explained due to a very intense vaccination campaign that took place from March to April 2021, achieving a success of approximately 100% inhabitants from 16 to over 65 years old vaccinated.

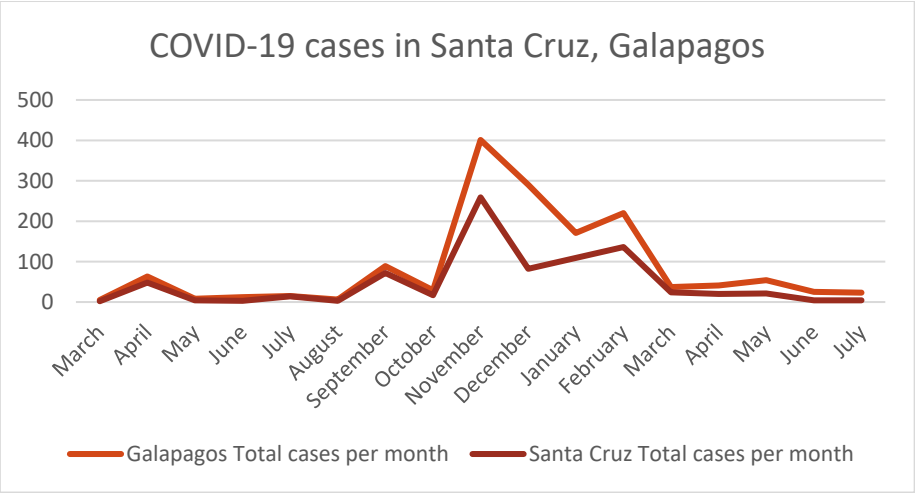


Figure 10. COVID-19 cases in Santa Cruz, Galápagos

Source: Secretaria Nacional de Riesgos y Emergencias Del Ecuador, Situación Nacional por COVID-19, Infografías (https://www.gestionderiesgos.gob.ec/informes-de-situacion-covid-19-desde-el-13-de-marzo-del-2020/, accessed october 2021)

Galapagos is now considered one of the few places in the planet that is almost COVID-19 free, and the Ministry of Tourism is using this advantage to incentive tourism in the Islands, due natural destination and outdoor activities are very attractive to international tourism because of the pandemic. Several measures have been stablished for the entry of tourist to the island, to avoid putting at risk the local inhabitants and other tourists, including a PCR negative test, and show proof of medical and evacuation insurance.

4. Assessment of project

a. Update causal loop diagram

The causal loop diagram (Annexed 4 "Diagram of causal loop for the city of Santa Cruz", interactively represents the behavior of the system shown in the city of Santa Cruz. It presents a collection of connected nodes and the loops created by connections Nodes are represented as Opposite "O" for more to less or less to more connections, while Same "S" allows more to more or less to less interaction.

The diagram presents the general behavior of the cycle guided by Covid-19 cases and its secondary effects in green. It allows the increase or decrease of said cases, such as health or medicine, which shows how, through the Government budget and public investment that produces large, medium or zero changes in the health and vaccination infrastructure. However, if these cycles are negative, the disproportionate increase in deaths from Covid-19 results.

The nodes in light blue show the topics of interest for research, representation, and discussion analyzed by the Hub. In the case of tourist movements, the increase or decrease of it, is manifested due to the restriction measures imposed by the Government on citizens in order to contain the spread of the virus. Other factors are financial aid by NGOs and the income of the Galapagos National Park, which they attribute to the tourist flows in Santa Cruz. On the other hand, the economic income from businesses dedicated exclusively to tourism have presented losses during the pandemic, which has led to unemployment and the generation of fewer economic resources within the home, giving way to increased social vulnerability that generates changes in domestic violence and delinquency / crime, triggering insecurity in the national and tourist population. To interactively access the causal loop diagram, visit the link below https://bit.ly/30LHgHu

Table 4.- variables collected to implement the Causal loop of the second-order impacts of COVID-19 in Santa Cruz

Focus priority	Objectives	Variable	Data obtained Santa Cruz
Pandemic	Analyze the current state of the pandemic	Report Coronavirus cases	✔
		Hospital Infrastructure	✔
		Public investment in health	✔
		Vaccination	✔
		Emergency Calls during the COVID-19 Pandemic	✔
Economy	Understand the current state of the economy before and after the pandemic.	Employment and Unemployment	✔
		Poverty and unsatisfied basic needs	✔
		Working Age Population (PET)	✔
		Economic indicators	✔
		Electricity consumption	✔
		Quality of household materials	✔
		Access to basic services	✔
		Internet access and consumption	✔
Social	Assess poverty, migration, violence, and education before and after the pandemic	Well-being index	✔
		Population Location (urban or rural)	✔
		Domestic violence	✔
		Crime	✔
Tourism	Tourist movements	Tourist movements	✔
		Visits to facilities (hotels, restaurants and attractions)	✔

b. What was learned? (About the project activity/About second order impacts)

The 3 main lessons learned about the project:

First, the territorial scale at which the data is collected differs widely between countries and cities, as well as the temporal scope of some critical indicators that we seek to obtain. This fact not only complicates comparisons between cities, but also within city assessments. However, most of the effects that we were interested in exploring are probably associated with causal dynamics that occur at a lower level territorial scale. Second, most of the data obtained from official sources were outdated, or due to the pandemic itself, it took time to respond to requests, so it had to be sent more than once to obtain a response. This fact, not only delayed the progress of the project, but also exemplifies the difficulties that ordinary citizens face when seeking access to information from state sources, which added to the lack of expertise in data management by the technicians in charge of the information. Third, in the specific case of Santa Cruz, the information from Trip Advisor was used to learn about tourist mobility, which allowed, on a time scale, to identify how the number of visits drastically decreased. However, in the spatial part we still identify certain shortcomings that we hope with the development of the app will allow us to obtain localized data without so many errors. In terms of criminal dynamics, we could map the relative prevalence and evolution of different types of crimes. In that sense, when restrictions on mobility were enacted, it was not affected in Santa Cruz, what varies is the location. Of the crime itself, since it usually focuses on the tourist part of Santa Cruz and with the pandemic, this criminal movement changed towards urban areas.

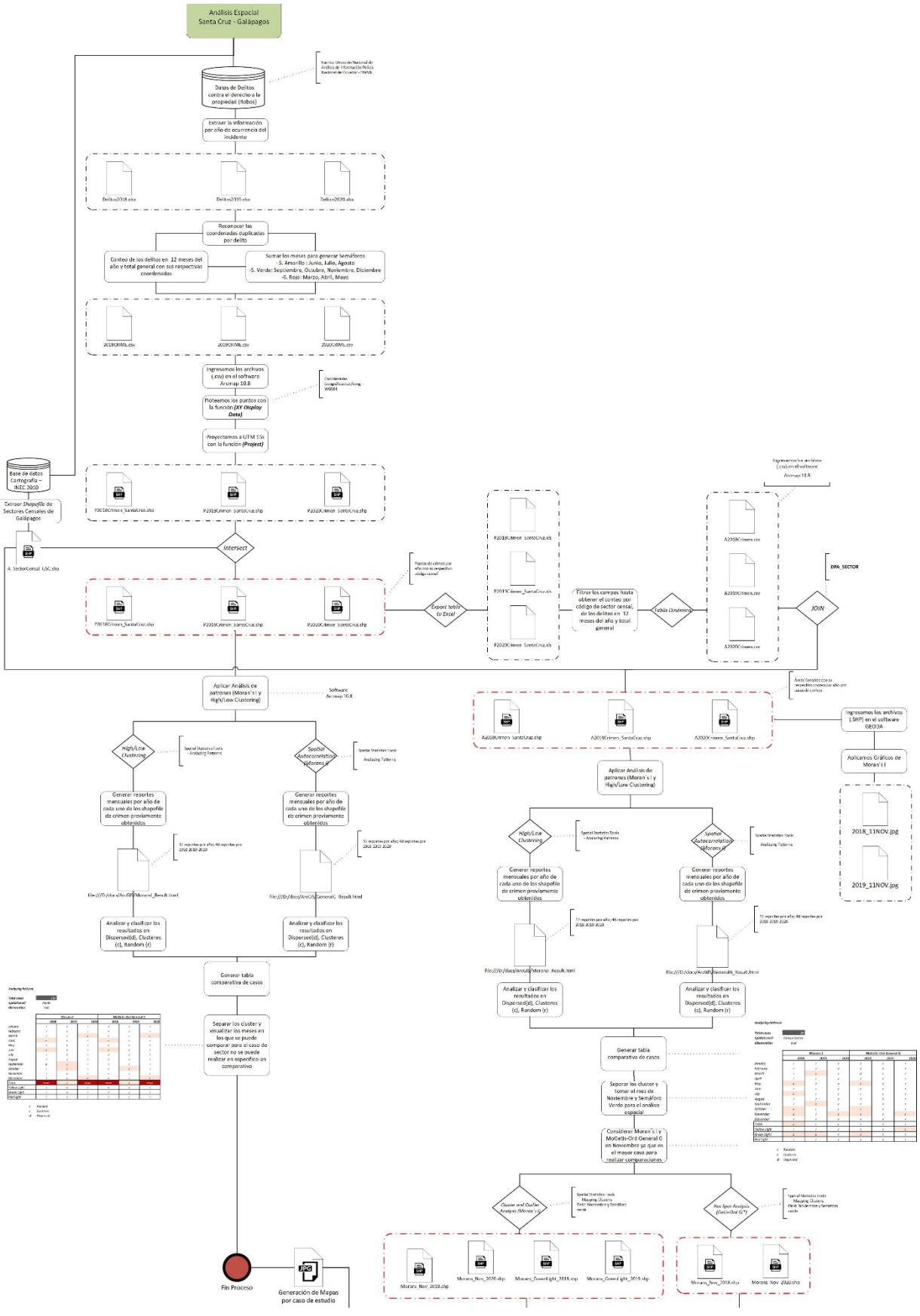
c. Analysis conducted – analytical flowcharts with description

1. Spatial analysis

Decades of research in crime and violence have demonstrated that crime does not occur randomly across space and time (Freeman et al. 1996; Johnson 2010; Weisburd 2015). Events are rather clustered and follow specific patterns based on social, economic, demographic and ecological characteristics of the environment (Merton 1938; Shaw and McKay 1942; Gibbs and Erickson 1976; Blau and Blau 1982; Sampson and Lauritsen 1994; Papachristos et al. 2011; Damm and Dustmann 2014; Weisburd 2015) (Campedelli, Favarin, Aziani, & Piquero, 2020).

In this regard, through analyzing the spatial pattern, and comparing it to previous years we focus on the extent to which various policies associated with containing the spread of COVID- 19 may have affected the frequency and patterning of criminal activity.

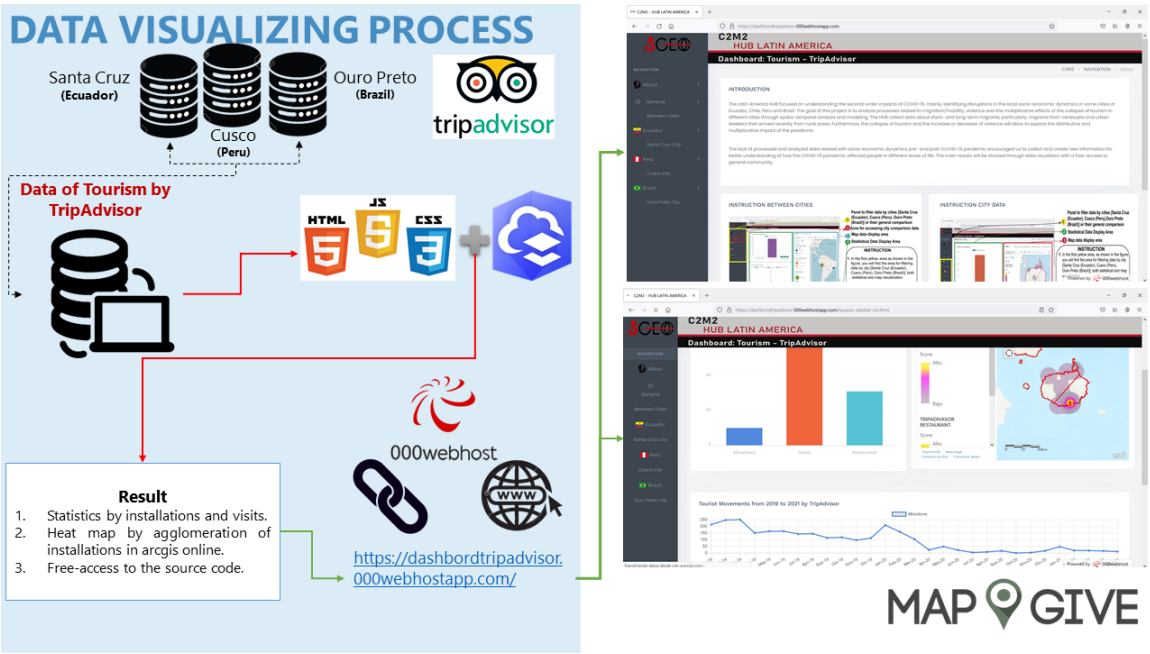
Figure 11. Process for the elaboration of Getis statistics and maps of crime data.



2. Dashboard

By mapping and analyzing the databases collected through trip advisor on visits to hotels, restaurants and attractions in Santa Cruz, Cusco and Ouro Preto, it was possible to capture these data with the help of javascript and arcgis online and thus view the data on maps of heat, managing to identify spatially and temporally where the areas with the greatest number of visits are located and to identify the abrupt drop in the entry of tourists to each city. This analysis allows us to observe if the vaccination measures, especially in Santa Cruz, are generating positive effects to improve the economy of this city and the income of the tourism sector, which are mostly on the islands.

Figure 12.- Domestic Violence dashboard flow diagram



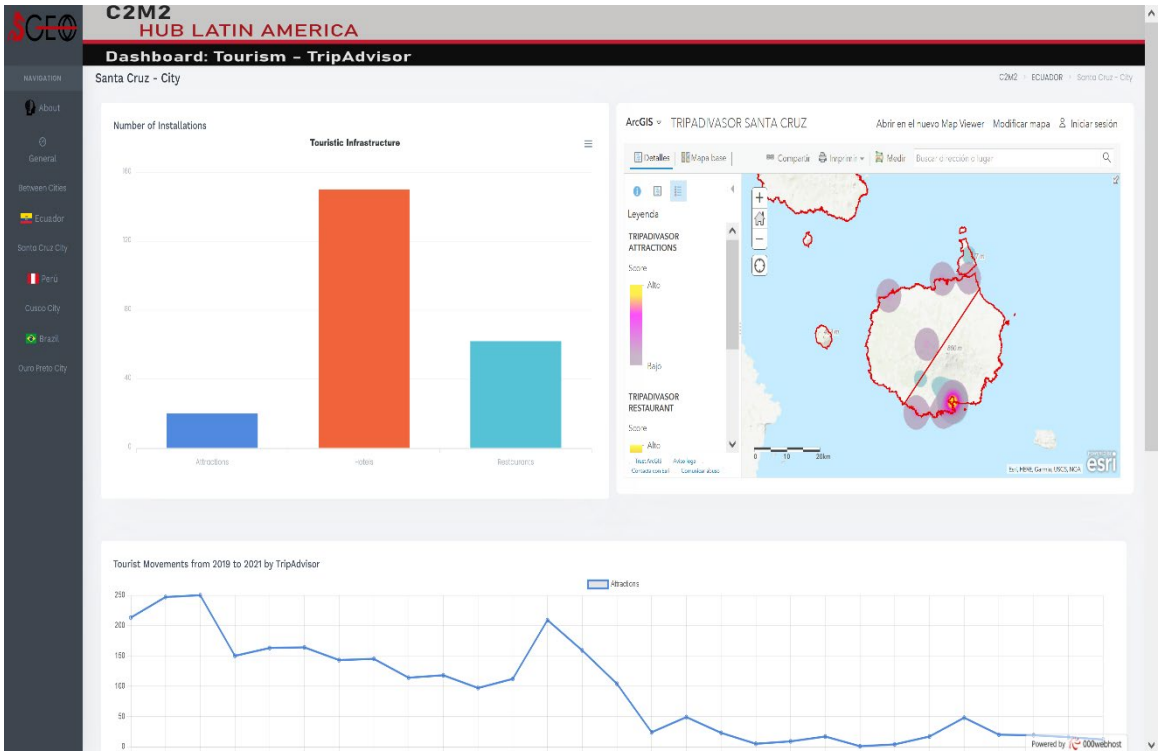
d. Visualizations of results (include how these are disseminated and target audience)

A dashboard is a visualization tool that allows the user to interactively interpret results, in this way one of the second-order effects is presented due to the behavior of the COVID-19 pandemic in the city of Santa Cruz, through block programming such as Java Script, HTML and CSS.

Tourism is one of the effects that occurs generally in the cities of Santa Cruz (Ecuador), Cusco (Peru) and Ouro Preto (Brazil), depending on the number of facilities for attractions, hotels and restaurants, if applicable. When you enter the city of Santa Cruz, you can view other statistics, which present the comparison between facilities and tourist movements in the 2019-2021 period, where the drop in tourism is notably observed at the beginning of March 2020 and how it is not recovers by 2021, despite the fact that the area has already integrated the vaccination process.

In the right area of the web page there is an interactive map created in the ArcGIS Online platform, the same one that represents the areas where the city offers the greatest concentration of tourist facilities, be these attractions, restaurants or hotels, which are displayed with higher incidence in the southern part of the island, specifically in Puerto Ayora (Figure N° 13).

Figure N°13 (Annexed 5 - Tourism Viewer for the city of Santa Cruz)



https://dashbordtripadvisor.000webhostapp.com/index.html .

e. Recommendations

Much of the time planned for each city and project was spent on data collection, which is why in order to have a broader analysis regarding second-order effects and to be able to compare them with the cities of the Hub, it would be important to extend the study time. In addition, it would be ideal to have a space for exchange of knowledge type conversations between the technicians of the Hubs that allow them to learn about new methodologies and data presentation techniques. In the specific case of Santa Cruz, it would be ideal to carry out some training to the institutions on the use and management of spatial data and that many of the problems in obtaining them is the lack of knowledge and the scope of the analyses that they can generate.

f. Community Impacts and Limitations

It is necessary to mention that we have encountered some difficulties throughout the development of the project. For example, in Santa Cruz one of the biggest obstacles has been the lack of secondary

data related to the effects of the pandemic. Therefore, data collection has been planned through surveys that will allow knowing the second-order effects in this city. Unfortunately, the lack of access and availability of information on the islands is a problem when trying to analyze the current or historical situation. Therefore, the application of surveys becomes a fundamental part of our study in order to overcome these difficulties.

g. Future Directions

In Santa Cruz, secondary data on violence, insecurity and flow of tourists have been collected. In addition, a survey was applied to parents of primary schools in order to obtain primary data related to the socio-economic situation of the families, the effects of the pandemic on health and education, and the vaccination process. Approximately 465 surveys were collected and their data is currently being analyzed.

• Analysis of the results obtained from the 500 Household surveys carried out with the parents of children from 1st to 7th grade of elementary schools in Santa Cruz. (Annex 6 Survey - Delivery of incentives)

In addition, Ouro Preto has a program that has been designed to collect information from the Trip Advisor website. This program has allowed us to obtain data on the location, concentration and flow of visits to the main hotels, attractions and restaurants in the city. This information will be used for the spatial study of tourism.

• Generation of a dashboard that allows to know the data in pandemic and its evolution

5. Events and activities

a. Survey:

Second-order effects generated by the COVID-19 pandemic on Santa Cruz Island, Galapagos, 2021-2022.

Objective:

To determine the second-order effects generated by the COVID-19 pandemic.

Description:

This study will allow better understanding how the COVID-19 Pandemic affected the social, economic aspects of the population of Santa Cruz in Galapagos. In this study, approximately 500, persons participated. They were all over 18, with Access to a computer or mobile equipment with internet.

The surveys were made with Qualtrics Software (Annexed 7 – Household Survey Santa Cruz)

For visualization purposes, visit the following link: https://usfqadmin.co1.qualtrics.com/jfe/form/SV_bpwVWXrD9nAjJZ4

b. **Workshop**

Date: November 4 and 5

Objective: Improve service techniques in the tourism sector (hotels and restaurants) in order to encourage tourism in Santa Cruz.

Description:

1. Workshop: Coffee and cocoa

The cocoa and coffee workshop aims to help participants understand the complexity of flavors and aromas that can develop in these products due to the territory from which they come. It is expected that the participants will understand the quality of Ecuadorian cocoa, how this can be a hallmark of Ecuador and understand a little more about the importance of its value chain.

2. Activity: Galapagos Coffee Tasting in the Trapiche. Workshop: Sustainable cooking

In the sustainable cooking workshop, we will see how, in a simple and fun way, we can connect local producers with businesses. The environmental, social and economic benefits of consuming Galapagos products, the way these decisions can be effectively communicated to customers, and the impact it can have on the local economy. In addition to enjoying tastings of agro-ecological products.

3. Activity: Visit to Finca Huerta Luna and assembly of Dish with local products. Workshop: Visitor experience

Customer service and hospitality are fundamental parts of the tourism industry. In this workshop we will channel the visitor's experience and what are the trends for the future.

4. Activity: Practical workshop in a local restaurant. Workshop: Culture and wine pairing

The world of wine is fascinating, and in many countries, it is a fundamental part of the culture.

With this workshop we will have a brief vision of the importance of wine, its characteristics and pairing.

Activity: Wine Tasting.

Annexed 8:

1.Description and schedule

2.Participants list

3.Certificates

4.Photographs

6. Appendices HUB Latin America

1. Appendices 1: "Data Latin America Hub.xlsx. (Data: Spreadsheet of data for each hub X city project, access and sharing information)
2. Appendices 2: "Tools and methods.pdf. (Tools and Methods used to generate data)
3. Appendices 3: "Method HDX Data". (View and download data on the HDX platform) Hub Latin America - Humanitarian Data Exchange (humdata.org)
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7. Annexed

1. Annexed 4: Causal loop diagram for the city of Santa Cruz
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5. Annexed 8: Workshop for hotels and restaurants

Latin America HUB C2M2 Ouro Preto

November, 2021

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Abstract

Ouro Preto is located in an area known as "Vale das Vertentes", upper Rio Doce River basin in the State of Minas Gerais. The Ouro Preto region was explored since the XVI Century by Portuguese expeditions, searching for precious metals (Espíndola, 2005). However, it was only with the discovery of alluvial gold in the (actual) municipalities of Mariana and Ouro Preto, in 1698 that permanent (non-indigenous) settlements started to grow, reaching around 226 thousand in 1751 and 407 thousand in the peak of gold mining (Campos, 2020).

Between the years 1730 to 1760, with the success of mining activity, the region until then called Vila Rica, went through a period of great urban expansion, becoming the center of economic reference in Brazil. Still in the 1760s, gold mining at the site decreased and the region was no longer the center of economic reference in Brazil. Nevertheless, in 1823, Vila Rica was elevated to the title of capital of the Province of Minas Gerais, becoming known as Ouro Preto. As reported by Assumpção and Castral (2019), the new title did not prevent the process of urban decay due to the depletion of gold deposits and the damage generated by mining. The decadence scenario lasted for some decades and, in 1897, Ouro Preto ceased to be the capital of Minas Gerais, moving the position to Belo Horizonte. The change in the capital caused serious problems in Ouro Preto, mainly due to the strong population exodus and the worsening of the crisis and the political and administrative abandonment of the city.

This condition only began to be changed from the second half of the 20th century, when the ideological discussions motivated by a national preservationist policy aimed at building a desired national identity began. Thus, Ouro Preto gradually assumed a new prominent place on the national scene due to the recognition of its importance during the colonial period and the large number of buildings remaining from that time (Assumpção and Castral, 2019; Horta, 2014; Natal, 2007).

In 1933, the city of Ouro Preto was declared a National Monument by the newly created SPHAN (National Historical and Artistic Heritage Service). In 1938, the city was listed by IPHAN (National Historical and Artistic Heritage Institute) and, finally, in 1980, the city was recognized by the United Nations (UNESCO) as a Cultural Heritage of Humanity). According to Icomos (1980), receiving the title of Cultural Heritage of Humanity in Ouro Preto is justified by some factors, among which stand out its simple and creative architecture, besides being a unique pole of Baroque architecture. The official recognition of Ouro Preto's historical, artistic and cultural heritage was therefore responsible for ensuring the preservation and restoration of many of its monuments and buildings. It was also fundamental for projecting the image of the place as an important Brazilian tourist destination, inaugurating a new phase in the economic history of Ouro Preto.

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TOURIMS

Ouro Preto City Project

1. Description of economy

The Tourism Sector

The municipalities of Ouro Preto and Mariana are the most important tour destination in the state of Minas Gerais, and one of the most important in Brazil. Ouro Preto, a World Heritage recognized by UNESCO in 1980, presents the most important colonial architecture of the Colonial Brazil, including churches, museums and houses.

The tourism development of Ouro Preto is largely related to the projection of a tourist image strongly linked to the richness of its historical, artistic and cultural heritage, with emphasis on its colonial architectural collection and Baroque art. Brussadin and Silva (2015) highlight that cultural tourism gained strength in Ouro Preto from the 1960s, when tourists began to seek the destination attracted, mainly, by the interest in the Baroque architectural ensemble and by the historical value. According to the authors, the tourist flow intensified in the 1970s, a period that coincides with the appearance of the first means of accommodation in the city. Subsequently, the recognition of the city as a World Heritage Site by UNESCO, in addition to investments and incentives in the tourism sector, made Ouro Preto one of the main cultural tourism destinations in Brazil.

Currently Ouro Preto is part of the Gold Tourist Circuit regulated by the Minas Gerais Tourist Circuits policy. The municipality is also part of the Estrada Real tourist itinerary and of the Association of Historic Cities of Minas Gerais, standing out as one of the cities that make up the Brazilian Tourism Map.

The Ministry of Tourism uses the Brazilian Tourism Map as an instrument to identify the performance of the economy of the tourist sector of the destinations. The map assists in making decisions for the implementation of public policies aimed at the peculiarities of Brazilian municipalities and aims to optimize the distribution of public resources. It is through the Tourism of Brazil map that the Ministry defines priority areas for the implementation of public policies and fundraising for projects with the Ministry of Tourism.

The map is based on a methodology for categorizing municipalities formed by a set of variables that include: a. number of formal occupations in the accommodation sector; ii. Number of formal establishments in the accommodation sector; iii. Estimation of domestic tourist flow, iv. Estimation of international tourist flow. Based on these variables, municipalities are classified into 5 categories (A, B, C, D, E). Category A represents the municipalities with the largest tourist flow and the largest number of jobs and establishments in the accommodation sector. The map is updated every two years and in its last update, held in 2019, the municipality of Ouro Preto was classified and certified in category B. Of the total of 2,694 municipalities evaluated, only 62 of them (2.30%) were classified in the category A and 257 (9.54%) in category B.

For its tourist importance, Ouro Preto is considered by the National Tourism Policy (PNT) one of the 65 destinations that induce the development of tourism in Brazil. Inducing destinations are considered those that have basic and tourist infrastructure and qualified attractions, which are characterized as receptors and / or distributors of tourist flows (Observatório de Turismo de Minas Gerais, 2020).

Data from the last study that evaluated the competitiveness index of tourism-inducing destinations, conducted in 2015, revealed that Ouro Preto stands out strongly in the cultural dimension. The objective of the competitiveness index is

> "[...] reflect on the stage of development of the destination according to its growing capacity to generate business in economic activities related to the tourism sector, in a sustainable way, providing tourists with a positive experience." (Ministry of Tourism, 2015)

The competitiveness of the destination is evaluated in 13 dimensions, including: general infrastructure, access, tourist services and equipment, tourist attractions, marketing and destination promotion, public policies, regional cooperation, monitoring, local economy, business capacity, social aspects, environmental aspects and cultural. Among the dimensions evaluated, the destination stands out strongly in the assessment of cultural aspects, reflecting the strong vocation of cultural tourism in the region.

According to that study, among the factors that positively influenced the result of the dimension, the following stand out:

- Presence of typical artisanal activity - handicrafts in silver and soapstone - whose product is sold in stores and fairs within easy reach for tourists, especially the Feira de Pedra Sabão;
- Presence of artistic groups with traditional popular manifestation, such as groups from the Congo, carnival groups, musical bands and choirs, which are frequently performed in destinations and in other states;
- Existence of intangible heritage registered by Iphan, which is a tourist attraction, such as the Ring of Bells;
- Existence of artistic and historical heritage listed by the municipality, by the state and listed by Iphan, which are also tourist attractions, such as: Ouro Preto's architectural and urban ensemble, 18th century house, Governor's Palace, Ruins of the Patriotic Iron Factory, Casa da Câmara and Jail, Nossa Senhora da Conceição de Antônio Dias Church, Nossa Senhora de Nazaré Church, Santo Antônio Church (located in the district of Glaura), São Bartolomeu Church, among other items;
- Presence of an association of artisans in the destination, which strengthens and maintains the tradition of local crafts;
- Existence of a cultural asset recognized as a World Heritage Site by UNESCO - the Historic City of Ouro Preto;
- Adhesion of the destination to the National Culture System.

(Ministry of Tourism, 2015, p. 44)

Other academic studies on the development of tourism in Ouro Preto corroborate the importance of historical and cultural heritage for local tourist activity. Research conducted by Gosling and Machado (2010), points out that the perception of the tourist image of Ouro Preto by visitors is strongly associated with its historical-cultural vocation, with the constructs of cultural heritage, cultural attractions and price significantly impacting the satisfaction of tourists with the trip to Ouro Preto. The authors also identified a strong immediate effect between satisfaction and word of mouth, suggesting that visitors satisfied with their visit to Ouro Preto tend to recommend the destination to their friends and family. It is worth mentioning that the data from the last profile survey of the tourist demand of Ouro Preto, carried out in 2017, identified that the main means of communication used for the choice of destination was the recommendation of friends, followed by the destination recommendation sites and social networks.

The study by Gosling and Machado (2010) also identified that, among the tourist attractions of the city, those that were considered more expressive and singular, according to the perception of the tourists participating in the research were: Museum of Inconfidência, Carnaval, Igreja do Pilar, Igreja de São Francisco, Casa dos Contos, Praça Tiradentes, Baroque art and local crafts.

The work carried out by Freitas-Coelho, Gosling and Berbel (2016) points out that the actors of the local tourist trade in Ouro Preto (entrepreneurs in the tourist sector, residents and public managers) recognize that the peculiar history and culture of Ouro Preto are essential factors for the attraction of visitors and also for the competitiveness of the destination in relation to other historic cities in Brazil. In addition to its historical attractions, the interviewees mentioned that Ouro Preto has great potential to develop nature and ecotourism tourism, with emphasis on tourist attractions such as Itacolomi State Park, waterfalls and rural neighborhoods of Lavras Novas and São Bartolomeu.

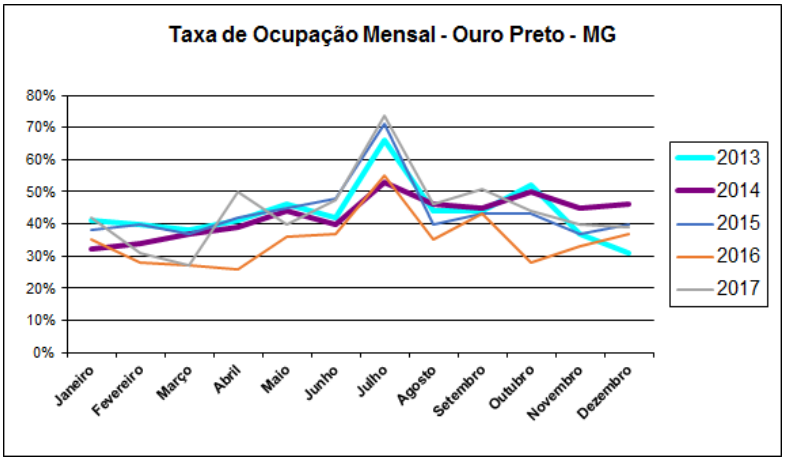
While the main tourism attractions are in the historic center of Ouro Preto, the municipality also offers other points of high tourist demands in its districts, such as São Bartolomeu, Glaura, Amarantina, Lavras Novas, among others. These include several types of attractions, including colonial sites (including churches), nature (hiking, waterfalls, and outdoor radical sports), gastronomy and crafts. In this sense, we will assess the suitability of including other touristic areas in the municipality of Ouro Preto in the analysis of the impacts of COVID-19.

Although Ouro Preto has great potential for attractiveness and international projection, mainly due to the title of Cultural Heritage of Humanity by UNESCO, the demand for tourists is still little internationalized. Data from the latest tourism demand survey, carried out in 2017 by the State Secretariat of Tourism and Sports of MG, indicate that 96.59% of Ouro Preto's tourists are national tourists, mainly from Minas Gerais, followed by São Paulo and Rio de Janeiro (Observatório of Tourism of Minas Gerais, 2020).

The demand study also points out that most trips to Ouro Preto are organized on their own, without hiring travel packages, using their own vehicle or road bus. Most tourists spend the night in the city for 2 nights and use the local hotel network as the main means of accommodation.

The data from the historical series of the hotel occupancy rate of Ouro Preto, in the years 2013 to 2017, show that the general average occupancy is 42%. The month of July registered the best performance, reaching an average rate of 74% in hotel occupancy. July corresponds to the period of Brazilian school holidays and coincides with the Ouro Preto Winter Festival and the celebrations of Semana da Cidade, an annual event that celebrates the city's anniversary. December is the lowest average month, with a hotel occupancy rate of 26%, as shown in figure 1 below.

Figure 1 – Monthly occupancy rate in Ouro Preto (historical time-serie from 2013 to 2017)

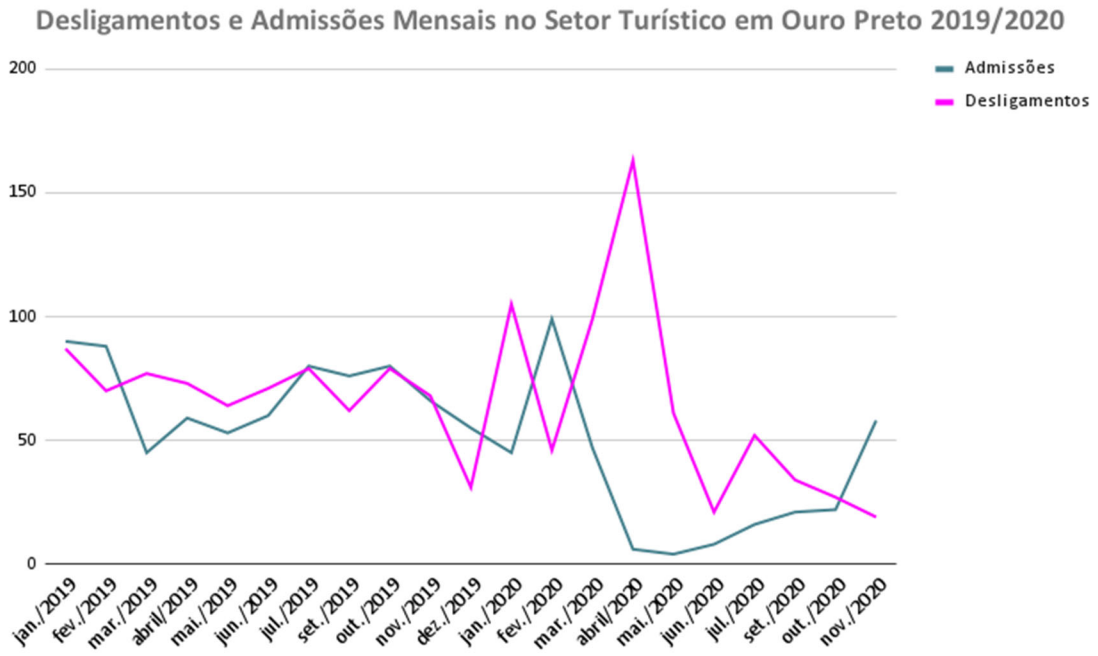


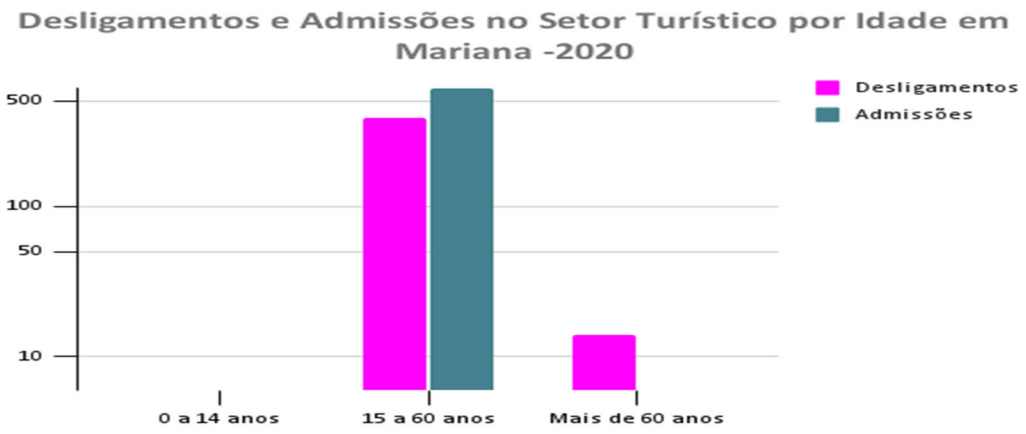
Source: https://turismo.ouropreto.mg.gov.br/pesquisas

The graphics used to analyze the employment flow in the tourism sector in Ouro Preto and Mariana were generated from the General Register of the Employed and Unemployed (CAGED-Cadastro Geral de Empregados e Desempregados) data processing in the years 2019 and 2020. These graphics show the impact of COVID-19 pandemic on recruitment and dismissal in the tourism industry.

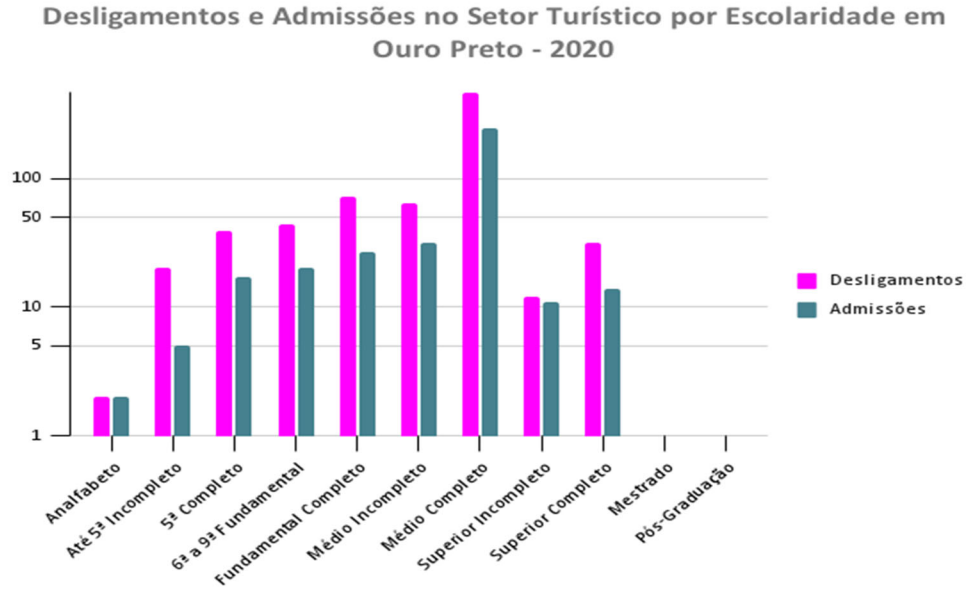
The CAGED is a national survey that allows the possibility of monitoring the formal employment flow in Brazil, providing a national database for research on recruitment and dismissal. By 2019, the data update was performed in the CAGED/RAIS online platform where the user can select the variables of interest and download the data in na Excel spreadsheet. The data for the year 2020 was downloaded from the web site into Rstudio software due to this data is not available in the CAGED/RAIS online platform. Through the Rstudio was possible to select the information of interest for the Ouro Preto and Mariana municipalities.

A great portion of the Ouro Preto's economy is concentrated on the tourism. Thus, in the next graph (monthly recruitments and dismissals in 2019 and 2020), we can observe a notable change at the start of the pandemic in Brazil (march and april), with an important increase on dismissals and a decrease on recruitments in the tourism sector.

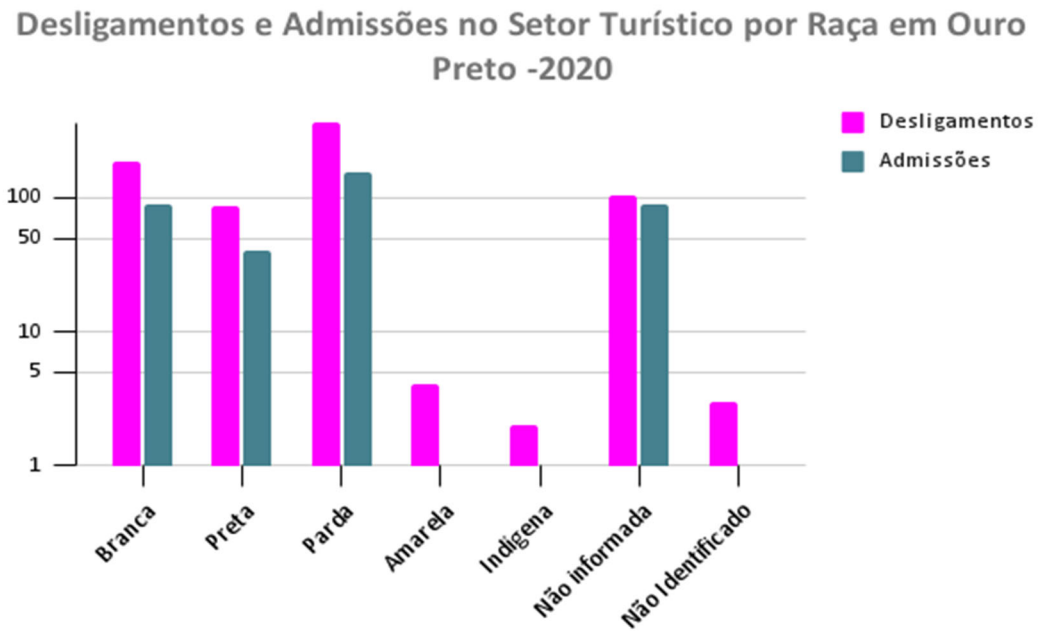




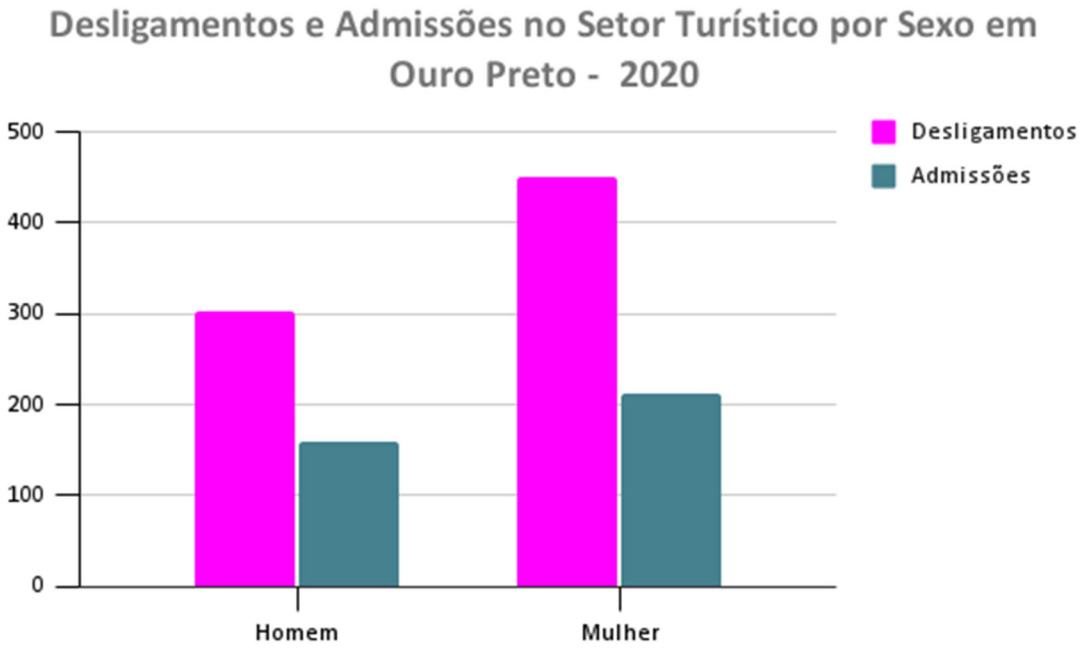
By considering the educational level, it is noticeable, in the next graph, that the dismissal rate stands out from recruitments in all levels of education. It proves that the tourism crisis resulted from Covid-19 pandemic, affected the entire labor Market. In addition, the highest rates of recruitments and dismissals are found in the population with complete high school.



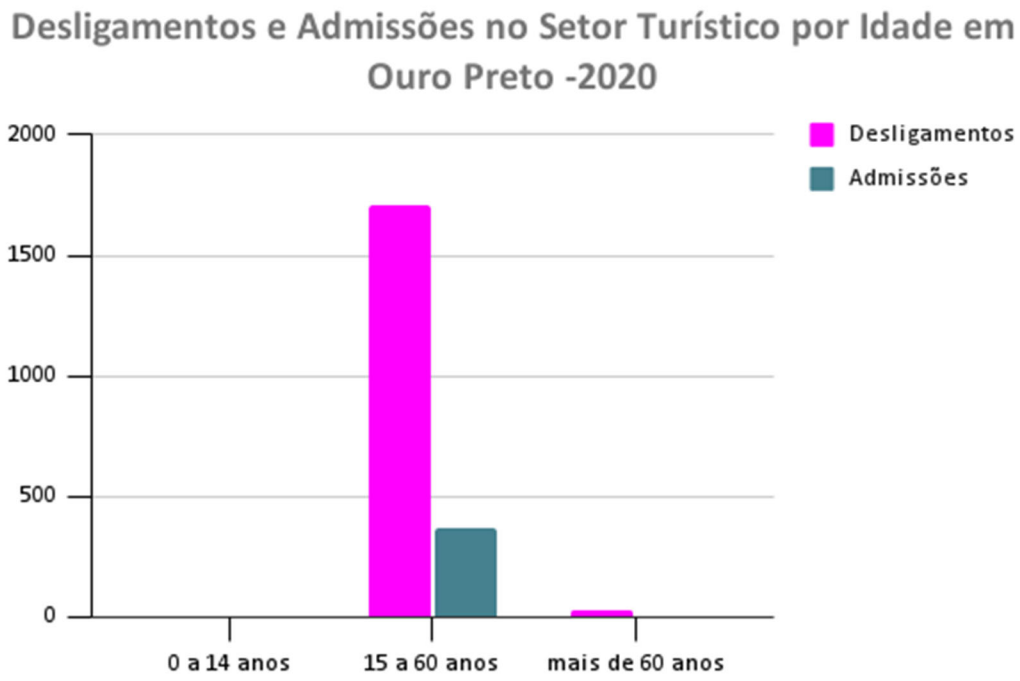
The next graph shows the rates of recruitments and dismissals by race in Ouro Preto at 2020, including indigenous and "*amarela*" races. We can see that, in the Ouro Preto municipality, the recruitments and dismissals are higher in Pardo persons, followed by White, no-reported, Black, "Amarelos" and Indigenous persons.



Gender analysis shows that the rates of recruitments and dismissal remain high in Women within the tourism sector of Ouro preto.



Finally, the analysis by age shows a notable discrepancy between dismissal and recruitment rate in the economically active population where there were three times as many dismissals recorded as new jobs created for persons aged between 15 and 60 by 2020.



2. Vulnerable Populations

2.1 – Social vulnerability and Covid-19 pandemic

A universal and visible process about vulnerability discussion has been addressed in three different but complementary senses into the literature (Carneiro, 2005). In the first, vulnerability is related to the scarcity or lack of family/individual income due to their precarious insertion in the labor Market. In the second, the vulnerability increases with the lack or poor access to basic and essential social services such as housing, health, education, basic sanitation and electricity. Finally, the vulnerability has often been closely associated with poverty not only in relation with incomes or access to social goods and services, but also, in particular, to family or individuals' capacities. The poverty, in this sense, is defined as "the deprivation of capabilities, where people's lack of the basic capabilities to do and be in the life of society, the failure of opportunities to reach certain minimally acceptable levels for living a tolerable life, regardless of their incomes" (Carneiro, 2005: 71).

Since social inequalities can vary geographically, over time and among different social groups, vulnerability also varies over space and through time, being able to have many different connotations, depending on the research orientation and perspective (Cutter, 1996). This study aims to identify the structural features at census tracts level in Ouro Preto city, Minas Gerais state in Brazil. The selected structural features have the capability to define the situation of families that live under vulnerable conditions (considering household census data) due to the Covid-19 pandemic impacts from March 2020 on.

In this context, we define as vulnerability to risky situations that impact the urban dwellers, who exceed the conditions of exclusion in economic terms, even going beyond issues relating to the loss of essential rights Living under vulnerability conditions, families disproportionately suffer due to societal inequalities: poverty, lack of access to education, jobs, health, entertainment, food and culture; school evasion, the absence of job prospect on the labor market, and also, issues related with domestic violence (Abramovay et al, 2002). Several studies have been demonstrated that this process was aggravated by the Covid-19 pandemic, particularly, as a consequence of governments policies to prevent the virus spread, the lockdown.

2.2 – Social vulnerability index construction

We used variables from 2010 Demographic Census to build an index to quantify the social vulnerability at census tracks level in Ouro Preto municipality, Minas Gerais state in Brazil. Thus, we work with ten dimensions to build the Social Vulnerability Index using variables from IBGE Census data at 2010.

2.2.1 – Social Vulnerability dimensions

The main difficulty in working with the concept of social vulnerability refers to the need to quantify it, which explains why the amount of social losses are absent or residual in studies on cost estimates arising from environmental catastrophes, traffic accidents or urban violence (Rondon and Andrade, 2005; Rodrigues et al, 2007).

In fact, social vulnerability is most often described using individual characteristics such as race, age, income, type of housing and employment rate, quantifiable aspects of its characterization. However, this information, even aggregated, is part of a larger product that defines contexts of social vulnerability, or concentration of social disadvantages (Wilson, 1987; 2009), whose in-depth analysis requires the combination of different research techniques that allow the apprehension a variety of evidence on the topic.

A starting point would be to include information about characteristics of places, communities or territories that contribute to the social vulnerability of the areas. These characteristics imply dimensions of a context of vulnerability that affects individuals and populations inserted in space and generally portray this degree of concentration of disadvantages, making these places attract or repel investments or social benefits (Skogan, 1990).

2.2.1.1 – Household density

The average number of people that lives in each urban home, based on Census 2010.

2.2.1.2 – Per capita income

The amount of money earned per household, based on census data at 2010.

2.2.1.3 – Bathrooms

Percentage of urban households with at least one complete bathroom inside home, based on Census 2010.

2.2.1.4 – Garbage collected
Percentage of urban households with regular solid waste collection, based on Census 2010.

2.2.1.5 – Electricity
Percentage of urban households with power supply, based on Census 2010.

2.2.1.6 – Literate Women
Percentage of literate females over 10 years old with household responsibility, based on Census 2010.

2.2.1.7 – Black Children
Percentage of black children between 0 and 9 years old, based on Census 2010.

2.2.1.8 – Nominal Income
Percentage of persons with household responsibility earning monthly minimum wage salary or less, based on Census 2010.

2.2.1.9 – Total dependency
It is the ratio of those not in dependency and those in total dependency in the census track, based on the Census 2010.

2.2.1.9 – Literate
Literate rate of persons over 20 years old in the census track, based on Census 2010.

Table 1 – Descriptive statistics of the observed variables used to build the Social Vulnerability Index.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
densidade domiciliar	221	1,00	5,14	3,4178	,44145
renda per capita domiciliar	221	,46	500,00	7,4101	36,17676
% domicilios com banheiro	213	,00	1,00	,9917	,06895
% domicilios com lixo coletado	213	,00	1,00	,8055	,29195
% domicilios com energia elétrica	213	,00	1,00	,9857	,07328
% Mulheres responsáveis alfabetizadas com 10 ou mais anos de idade	213	,00	,63	,3275	,12725
% crianças de 0 a 9 anos idade – cor preta	213	,00	,10	,0166	,01534
% pessoas responsáveis com rendimento nominal mensal de até 1 salário mínimo	213	,00	,92	,3614	,17491
Razão de dependencia de total	213	,000	,905	,43549	,109848
Taxa de alfabetização de pessoas com 20 anos ou mais	213	,683	1,000	,92550	,064767
Valid N (listwise)	212				

2.2.2 – Methodology to build the Social Vulnerability Index

The social vulnerability index (IVS) was built on the basis of the exploratory factor analysis. This statistical method is a multivariate technique that identify the underlying relationship between measured variables. It aims to explain correlations between manifest variables as a function of a little set of no-measured variables. The no-measured variables are named as Factors. Factors are latent variables or constructs that are calculated by linear combinations of original variables. In this study, we used the variables detailed in the table XX (above) to build a latent trace that represents the IVS in each census track of Ouro Preto.

The Kaiser-Meyer-Olklin -KMO test (KAISER, 1974) was used to determine how suited data is for factor analysis. The correlation between variables was validated though the Bartlett test of Sphericity (BARTLETT, 1954). Results showed a good fit for the explanatory fator model (KMO = 0,79), with a significant Bartlett test (p-value < 0,0001).

The table 2 (below) shows the proportion of variance, in percentage, explained by all the factors through the eigenvalues associated with each factor. The higher percentage of explained total variance

corresponds to Fator 1 > Fator 2. Furthermore, the verimax rotation was permormed to simplifies the identification and interpretation of the factor. The factors that have eigenvalues (total variance explained) greater than 1 were chosen, therefore, the final exploratory factor model retain just one latent factor, which explains 52.74% of variance in the original data. This value was considered as an acceptable result.

Table 2- Percentage of the explained variance and the percentage of variance accounted by the factors after varimax rotation.

Factor	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	3,851	38,506	38,506
2	1,423	14,234	52,740
3	,991	9,906	62,647
4	,860	8,600	71,247
5	,815	8,153	79,399
6	,728	7,280	86,679
7	,491	4,915	91,594
8	,422	4,216	95,810
9	,267	2,672	98,482
10	,152	1,518	100,000

Extraction Method: Alpha Factoring.

The table 3 (below) shows the factor loadings (contributions) of the variables in each factor. We can observe that the variables household density, per capita income, black children, people with nominal income less than 1SM, and total dependency ratio, have a negative contribution with factor 1. Whereas the variables bathrooms, garbage collected, electricity and literate, have a positive contribution with factor 2. In view of this results, we combine and transform the current set of latent variables. It allows that the calculated social vulnerability index may indicates a high vulnerability associated with the original dimensions. The combination was performed based on the representativeness of each factor in relation to its ability to represent the total variance of the data matrix. Thus, the final index was calculated from the weighted sum of each factor by its participation in the total variance of the data.

Therefore, the latent variable, generated by factor analysis, was transformed[1], and it will name as Social Vulnerability Index (IVS). It means that census tracks with values above the average values of the variables used in this study, could score the highest IVS. Consequently, lower values of IVS are related with census tracks that are less vulnerable, while higher values are associated with high vulnerability. Values close to zero indicate that IVS census tracks are close to the index average. This index shows an acceptable representation of the social vulnerability condition over the census track (Figure 3).

[1] Seus valores foram invertidos para refletir o sentido latente original e representar o conceito de vulnerabilidade social.

Table 3- Factor loadings calculated after Verimax rotation of the original latent variable

Rotated Factor Matrix[a]

	Factor	
	1	2
densidade domiciliar	-,185	,712
renda per capita domiciliar	-,094	-,418
% domicilios com banheiro	,519	-,131
% domicilios com lixo coletado	,731	,042
% domicilios com energia elétrica	,397	-,022
% Mulheres responsáveis alfabetizadas com 10 ou mais anos de idade	,447	,016
% crianças de 0 a 9 anos idade - cor preta	-,329	,436
% pessoas responsáveis com rendimento nominal mensal de até 1 salário mínimo	-,738	,324
Razão de dependencia de total	-,646	,262
Taxa de alfabetização de pessoas com 20 anos ou mais	,882	-,126

Extraction Method: Alpha Factoring.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

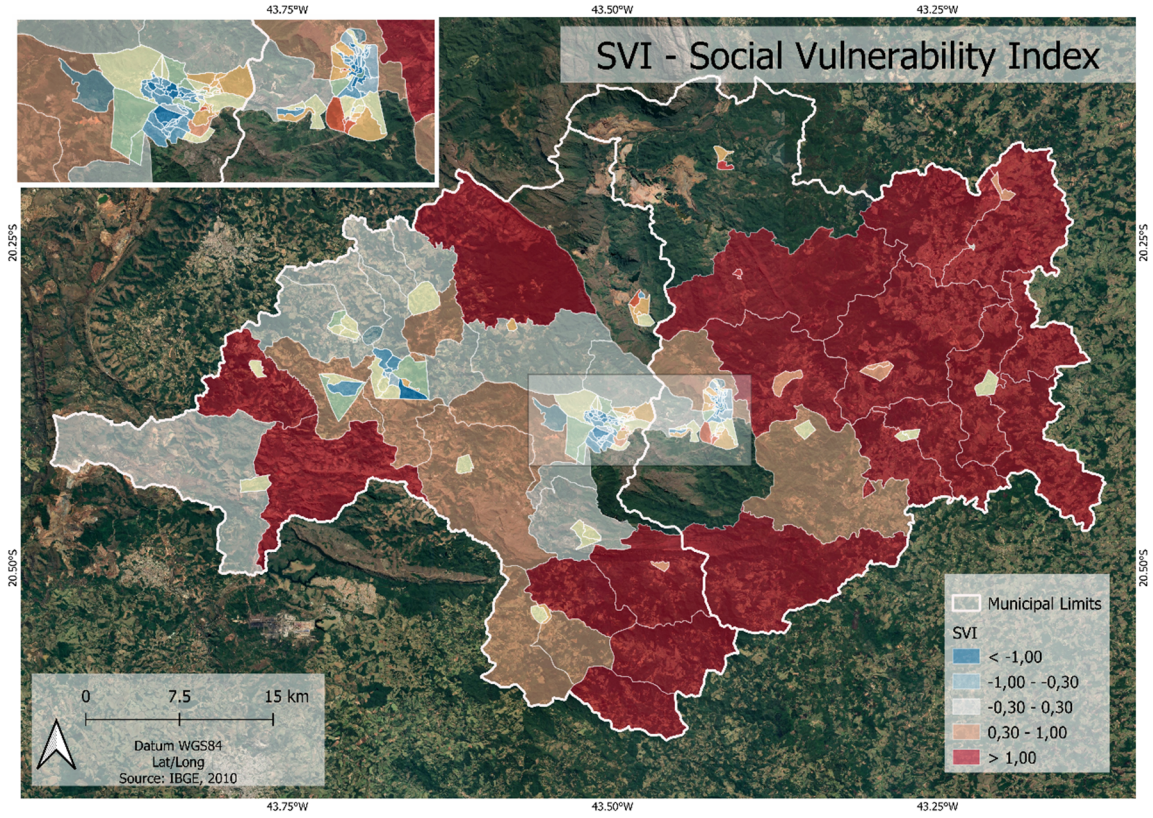
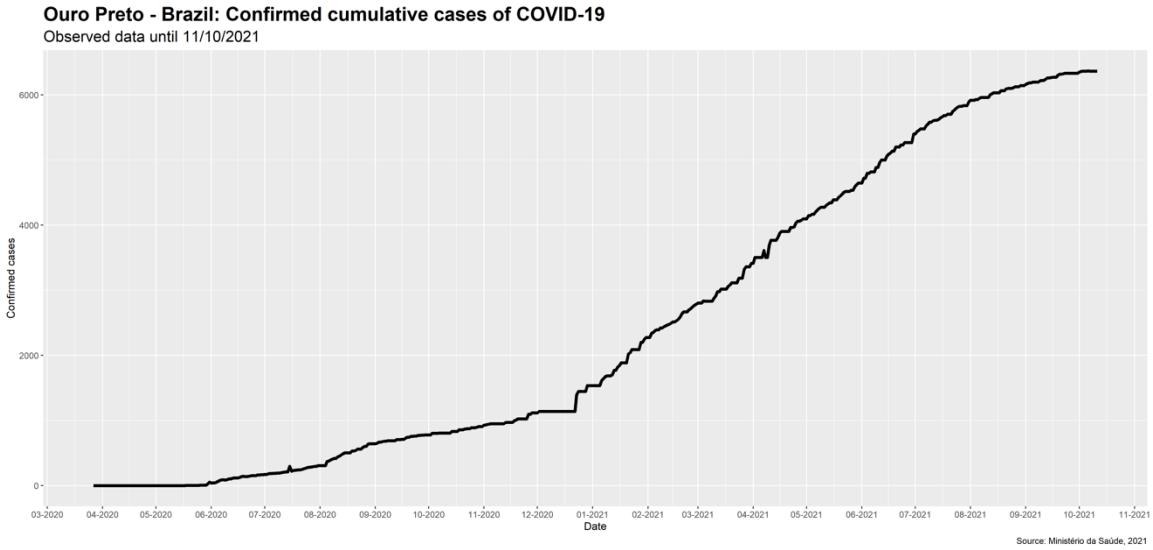


Figure 3. Social Vulnerability Index in Ouro Preto

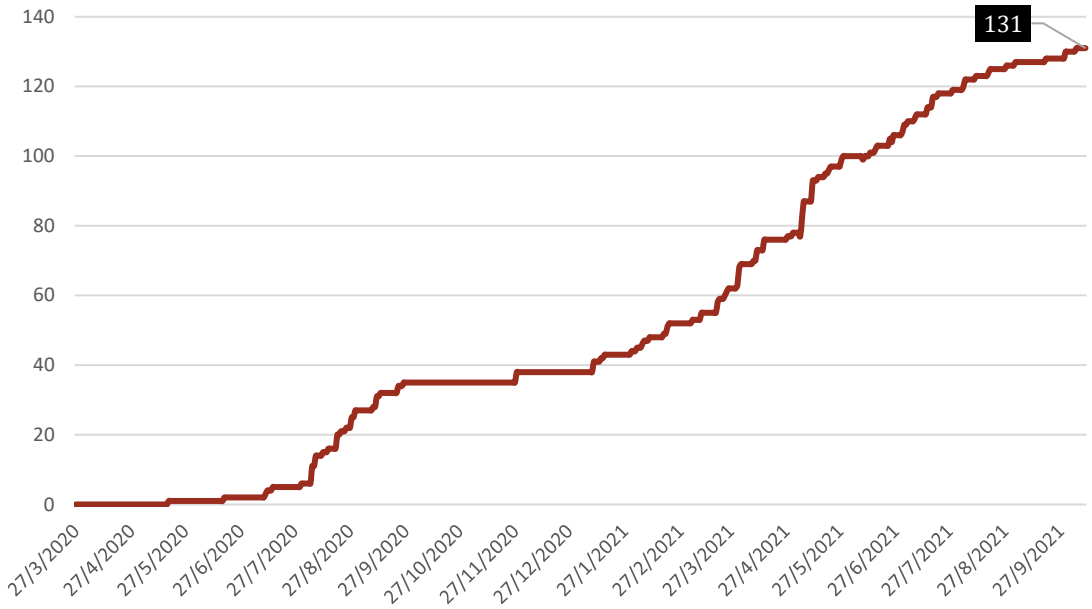
3. Status of COVID-19

The first case of someone suffering Covid-19 was reported in Ouro Preto on May 18, 2020, according to the Health Ministry. Two months had already passed since the first case reported in Brazil. It was because Ouro Preto does have direct connections with the major airports and with the coastal region, despite its tourism importance. Additionally, the big cities like Belo Horizonte (Minas Gerais state) had already put in place restrictions of free movement. It indirectly affects the tourist fluxes in Ouro Preto, slowing the virus spread between localities

Yet 8.56% of the total population (74.281 inhabitants) in Ouro Preto were infected with Covid-19, with a mortality rate of 2,06%, totaling 131 deaths. The total number of cases could have been much bigger without the regular restrictions implemented on economic activities by the Minas Gerais Government and the Municipality, but also of social distancing policies. However, to avoid greater economic losses, the suspension of economic activities shows a cyclical pattern, with reopening and reclosing plans based on local virus transmission dynamics. This led to new "waves" of infection in Ouro Preto. The next Figure shows the increase of the cumulative confirmed Covid-19 cases in Ouro Preto municipality. We can note a rapid increase in confirmed cases in 2021, due to the spread of the Gamma covid-19 variant, which is more transmissible. Recently, the observed growth began to decline due to vaccination campaigns in the country, even with the re-opening of the economic activities.

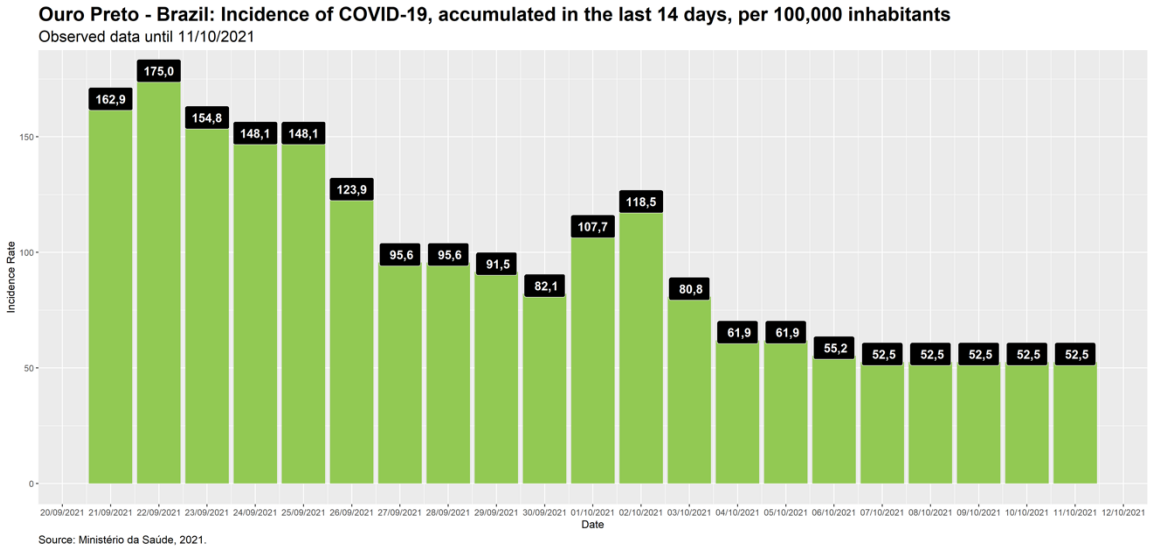


Number of deaths (accumulated) by COVID-19, Ouro Preto, Brazil
Data until 10/11/2021

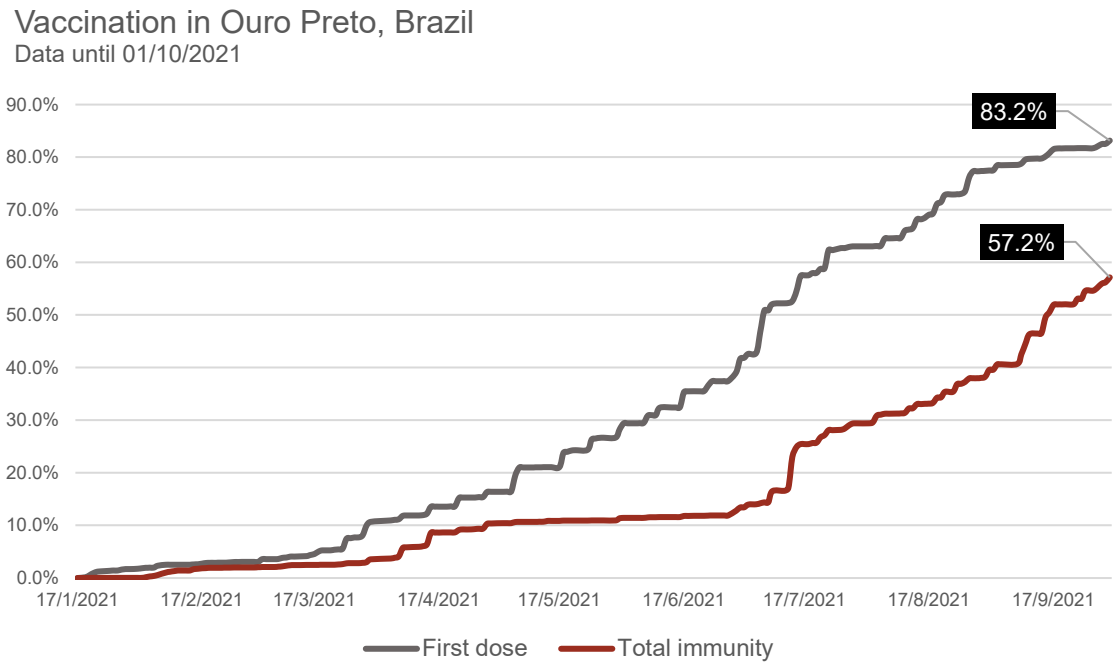


Source: Ministério da Saúde, 2021

The incidence rate has now dropped below 100 per 100,000 people, achieving sustainable levels. Incidence rate is important because it provides a complete picture of the speed of which the virus spread through the community.

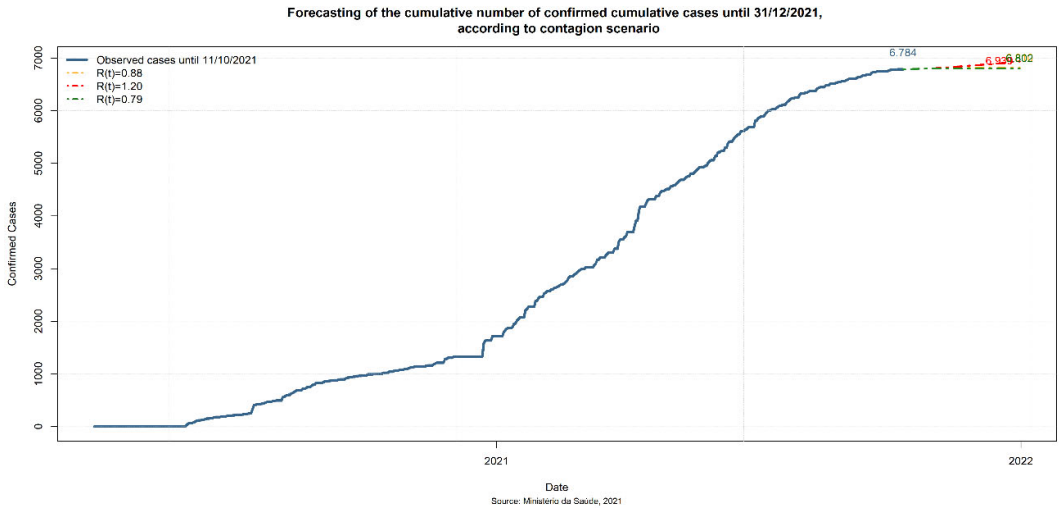


The reduction in the incidence rate occurs at the same time the economic activities were re-opened, and therefore the free movement of people in Ouro Preto increases. As was mentioned above, the Community transmission is low due to the vaccination coverage, mainly in the second semester 2021.



Source: Ministério da Saúde, 2021

In early October 2021, the number of people who receive all doses prescribed by the vaccination protocol surpassed 50% of the Ouro Preto population. So far, more than 80% have had a first vaccine dose. This situation resulted on a real-time reproduction number (Rt) below 1,00, which is projected to be maintained during the next months. Thus, as a result, it is estimated that the total number of infected people in Ouro Preto does not exceed 7,000 cases.



4. Assessment of project

a. Update causal loop diagram

The Ouro Preto hub designed the causal loop described in "Annexed 1: Causal loop of the second-order impacts of COVID-19 in Ouro Preto" in order to guide the process of data collection (Table 4) and analysis and interpretation of second-order impacts of COVID-19 in Ouro Preto.

We first defined the main dimensions or clusters of factors that relates COVID19 with second-order impacts. The clusters are defined in the legend of Figure 4: municipal policies, tourism sector, crimes, education, public health. The next step was to define which factors, or measurable variables in each cluster, we had ready for use now or we must collect as secondary data (Table 4). The next step was to establish the causal loops. We kept (as can be seen in the legend), for easy of interpretation, the definition of clusters and different colors in the arrows regarding opposite or similar effects.

As a way to interpret, we begin with the driver of change, our first-order impacts, in green (the pandemics, its transmission, associated mortality and pressure over the health system). From this starting point we tried to identify and define the second-order impacts. We assume two main directions of second order impacts. First, how they induced municipal policies (in pink color), which per se reflect state and federal policies to deal with the pandemics, and how these policies (or the lack of them, or ineffective policies) help to define the intensity of second-order impacts. Then, we assume that the second order impacts may also be a combination of both, direct and indirect (mediated by policies). This is the case, for example, of the effect of "social isolation" on the cluster "crimes"; and "social isolation" and "lockdown policies" on the clusters "education" and tourism sectors". For each of these loops, we hypothesized the directions of causality and signals, same or opposite.

The clusters (no color), "demographic characteristics" and "social vulnerability", define underlying or pre-existing conditions that in combination with the impacts of pandemics can increase the second-order intensity of impacts.

Table 4 – Description of variables collected to implement the Causal loop of the second-order impacts of COVID-19 in Ouro Preto

Elements data	Collected?	Mapped?	Level
1.Administrative boundaries			
Municipality	yes	yes	municipal
Census tract	yes	yes	intra-municipal
Districts	yes	yes	intra-municipal
2. Road network			
urban streets	yes	yes	intra-municipal
3. Pandemic (Driver of impacts)			
Social isolation (Index)	yes	na	municipal
4.Tourism Sector			
Hotels and restaurants	yes	yes	intra-municipal
Job admissions	yes	na	municipal
Touristic Atractives	yes	yes	intra-municipal
5. Municipal policies			
Municipal tax revenues	no	na	municipal
Supply of public services	no	na	municipal
Lockdown policies	no	na	municipal
6.Health			
Pressure over health sector	yes	na	municipal
Covid-19 transmission	yes	na	municipal
Covid-19 Mortality	yes	na	municipal
Covid-19 forecasting	yes	na	municipal
ICU forecasting	yes	na	municipal
7.Education			
Schools address	yes	yes	intra-municipal
School enrollment	yes	yes	intra-municipal
School Closured	no	na	municipal
8.Public safety			
Homicides	yes	yes	intra-municipal
Domestic violence	yes	yes	intra-municipal
Robbery and Thefts	yes	yes	intra-municipal
9. Vunerability			
Demographic characteristics	yes	yes	intra-municipal
Social (and Health) Vulnerability Index	yes	yes	intra-municipal

b. What was learned? (About the project activity/About second order impacts)

A key lesson learned about the project is the need to improve quality and accessibility of data, both on first and second order impacts. Public policies regarding the impacts of COVID have been blurred due to misinformation and the lack of adequate information. During our project, we identified that this gap in information opens room for ineffective actions. The same caveat applies to the second-order impacts, particularly in what regards the production of local level (Ouro Preto and Mariana) information. The higher (municipal) aggregate level of some information, such as COVID, is also a limitation for better focused policies regarding the first and second order impacts. Due to the lack of organization and perhaps scientific interest, the partnership with the municipality of Ouro Preto was very limited. Finally, the information from Trip Advisor was used to learn about tourist mobility, which allowed, on a time scale, to identify how the number of visits drastically decreased. However, in the spatial part we still identify certain shortcomings that we hope with the development of the app will allow us to obtain localized data without so many errors. In terms of criminal dynamics, we could map the relative prevalence and evolution of different types of crimes in time and space.

c. Analysis conducted – analytical flowcharts with description
    i. Covid-19 Lockdown effect, touristic demand and criminal dynamic: a microscale geostatistical analysis of the historic center of Ouro Preto (Brazil)

Purpose:

This study aims to evaluate if the decrease of flow of passersby because the Covid-19 pandemic has affected the spatial pattern of crimes in the historical city of Ouro Preto.

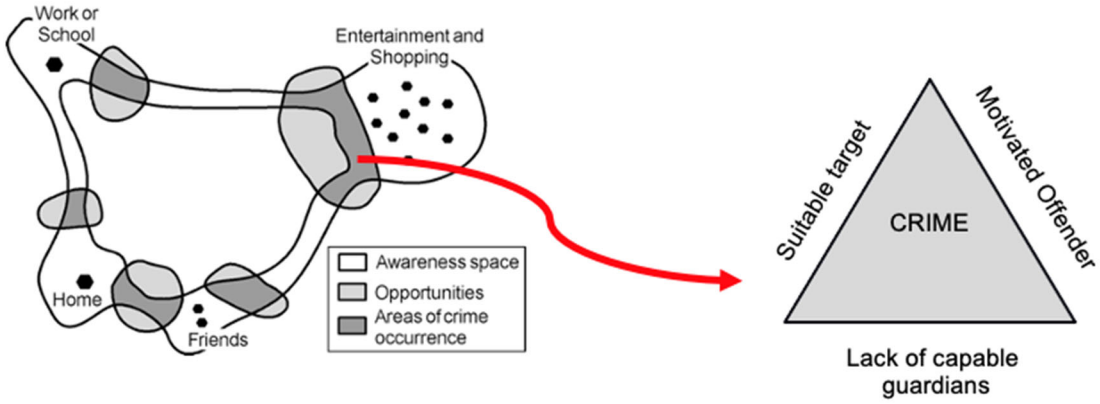
Theoretical background

The routine activities theory states that crime is more likely to take place when three elements are combined, which are the following: a motivated criminal, an available target and the absence of proper guardians. In the later developments of this theory, Marcus Felson and collaborators have argued that how people organize their everyday life, in terms of time and space, can increase or decrease the risks of a crime taking place. Also, recent technological developments contribute to novel forms of crime as well as new social interactions, which have an enormous effect on types of crimes.

Coronavirus has completely changed social interactions. Governments are requiring their citizens to stay at home in order to prevent the spread of the disease. In some countries, such as Brazil, state and local agencies have issued determinations preventing commercial businesses from opening. They are also prohibiting the circulation of people in major streets or in downtown areas. In the city of Ouro Preto was no different.

These changes in social interactions do not have any precedent in recent history, altering completely the way that people perceive their lives. As a result of this new lifestyle, it is expected that crime patterns will also change. Goods and money are not circulating in the city, as the businesses, touristic attractive, as well are closed and consumers have to stay at home. There are more on-line transactions and fewer in person interactions, which makes opportunity crimes, such as mugging or pickpocket, almost impossible to take place. However, since people are staying at home, they have hiperinteractions with their loved ones. There is not an intercalation between work and domestic activities, making differences more visible, which can result in fights, disagreements and even homicides.

Figure 1 - Crime Pattern and Routine Activities Theory



Research questions

How the Covid19 pandemic reduced the routine activity of people on the streets of Ouro Preto's historic center, changing the spatial concentration of violent crimes?

Hypotheses

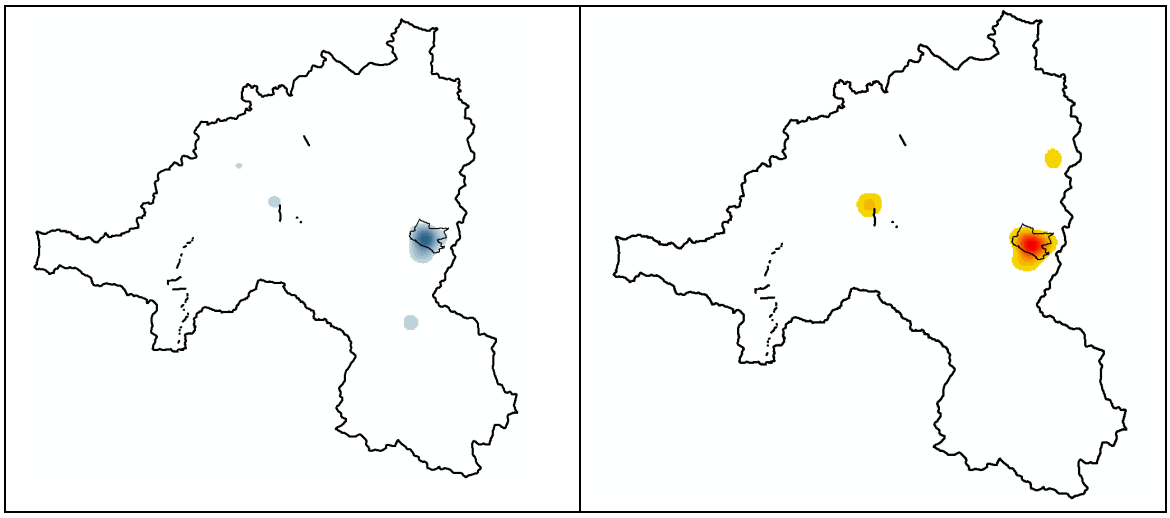
H1 – COVID19 pandemics impacted urban mobility, measured (as a proxy) by the number of reviews in the TripAdvisor platform (restaurants);

H2 – Lower urban mobility impacted the spatial concentration of violent crimes

H3 – There is a temporal lag between the end of lockdown, the comeback (demand) of services uses and criminality in the urban space

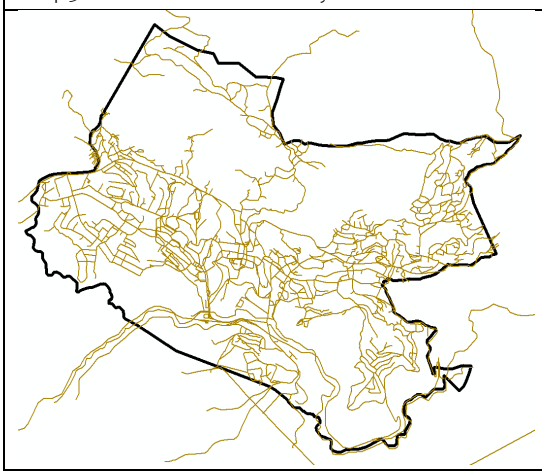
Study area and Period of analysis

Map 1 – Touristic center of Ouro Preto	Map 2 – Hot Spots of property crimes in Ouro Preto

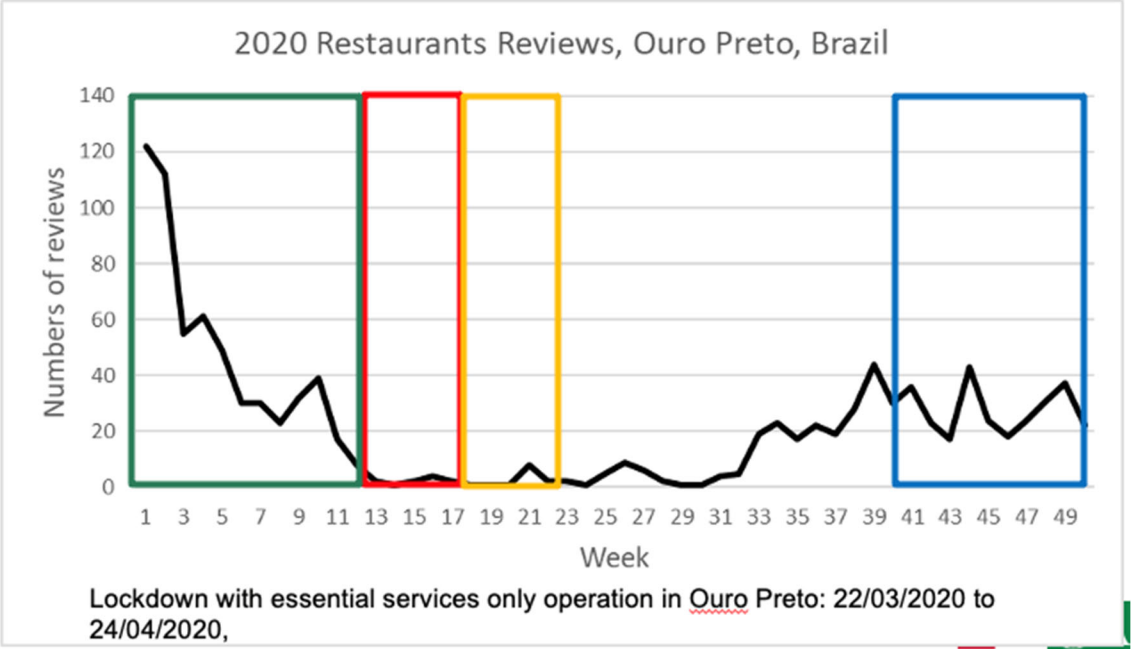


Defined study area

Map3 – Historical center city of Ouro Preto

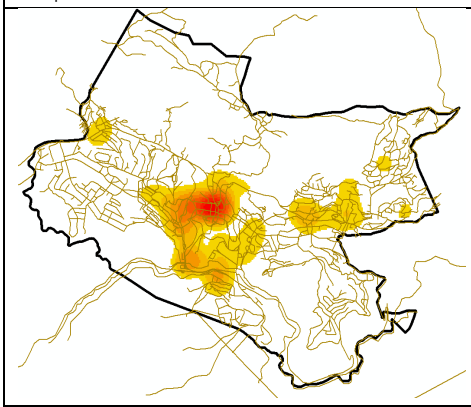
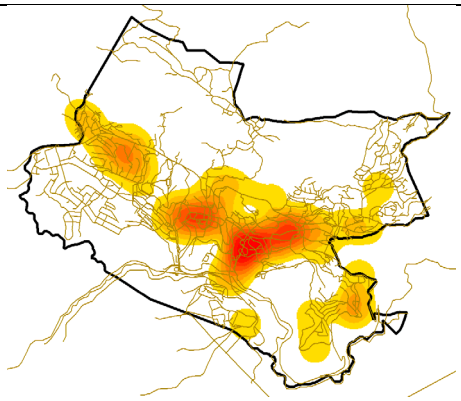


Period of analysis

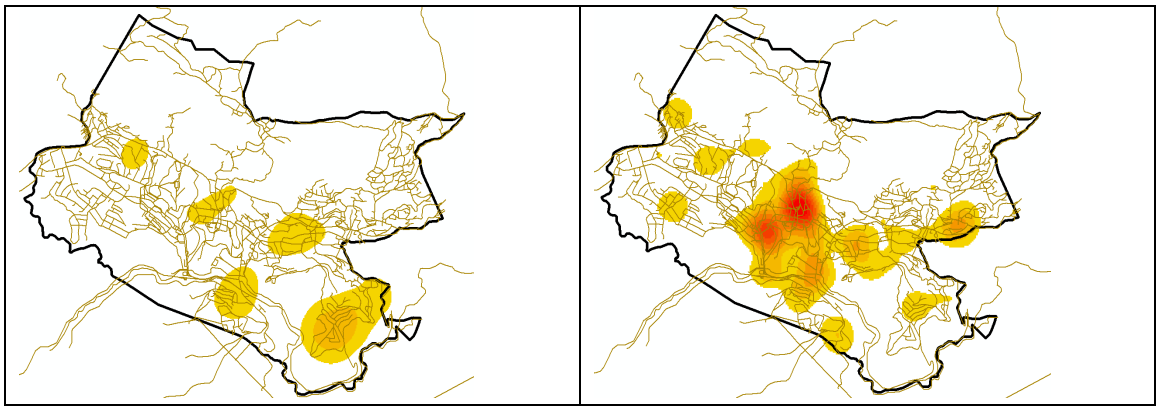


Results

Hot Spots of property crimes by specific period of time

Map 1 – Pre-lockdown	Map 2 – Lockdown
	

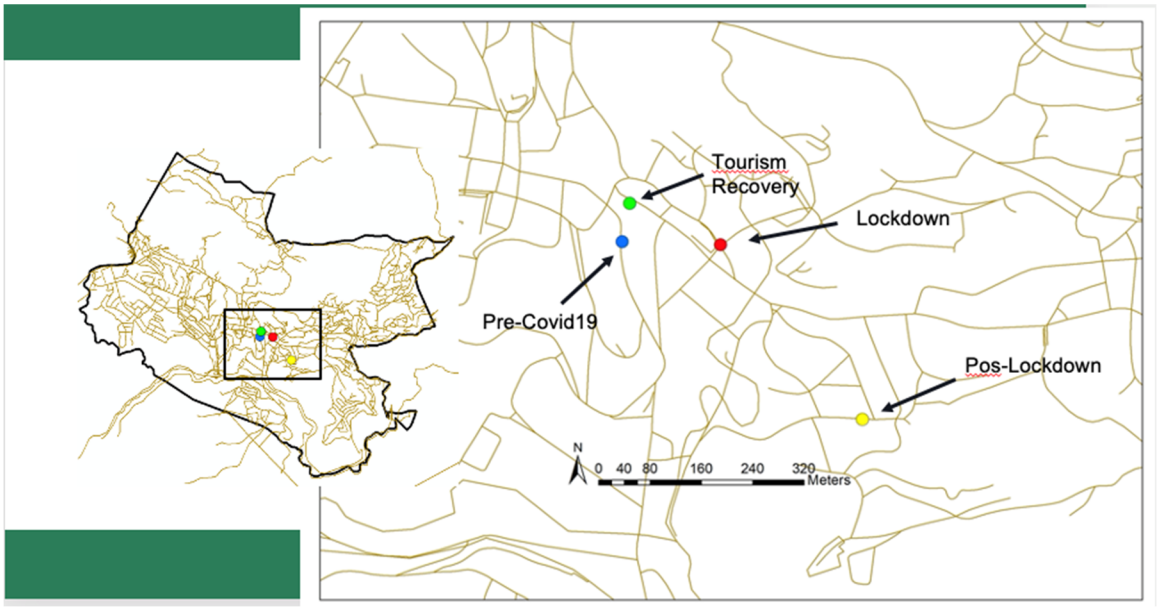
Map 3 – Pos lockdown	Map 4 – Tourism Recovery



Changes in mobility and crime risks in Touristic center of Ouro Preto

Situation	Period	Numbers of days	Violent Crimes	Crime per day	Reviews	Review per day
Pre Covid19 pandemic	Jan 01 to Mar 21	80	128	1,60	574	7,18
Lockdown	Mar 22 to Apr 24	34	41	1,21	9	0,26
Pos Lockdown	Apr 25 to May 28	34	17	0,50	9	0,26
Tourism recovery	Oct 01 to Dec 31	92	69	0,75	394	4,28

Changing in the Spatial Mean Center



Conclusions

Many studies analysis the effect of Covid-19 on crime using temporal series and city or bigger scale. We proposed study the impact of Covid-19 on urban mobility in the micro scale and spatial dimension on crime. There are many possibilities to collect data of urban mobility, we believe that costumer's reviews are a good one because reflect how people are using services and attractions

d. Visualizations of results (include how these are disseminated and target audience)

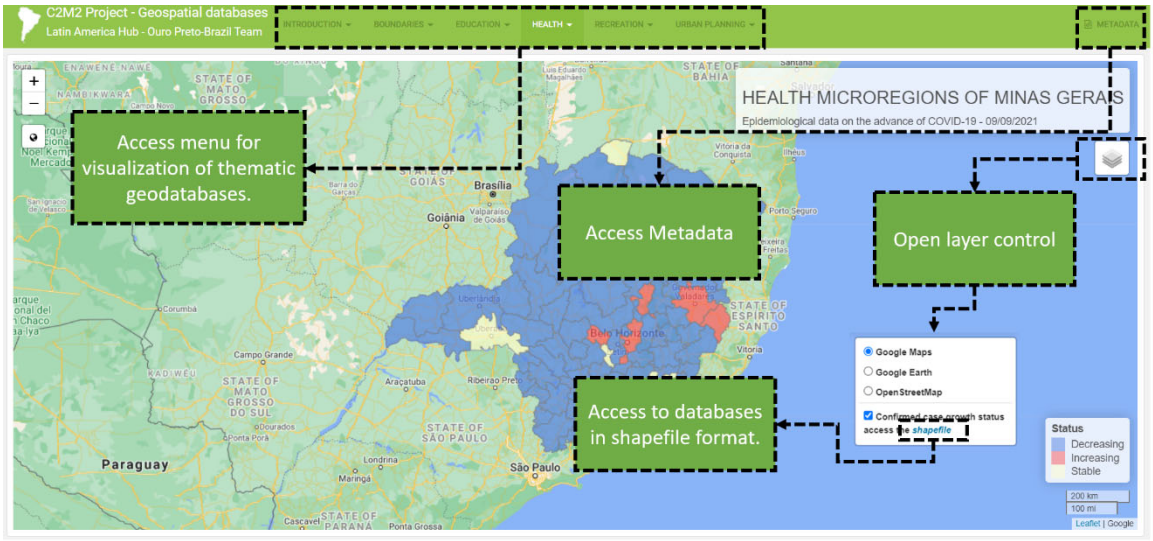
One of the greatest interests in current communication is the possibility of providing information in a digital medium, with easy access, interactivity and the greatest possible transmission of content. Several tools are engaged in this task today, including covering data generally typified as geographic. However, many of these platforms have a cost associated with technology, while other tools are developed on platforms known as open source.

In this sense, the main objective is presenting a map viewer, with the possibility of accessing metadata and downloading shapefiles, while allowing a preview of the files and providing first insights into the content.

The viewer is built in R language (Ripley, 2001), intersected with some JavaScript and html5 scripts. The packages present in the R library are used, especially the leaflet (Cheng, Karambelkar & Xie, 2017) and Flexdashboard (Iannone, Allaire & Borges, 2018) packages. The programming allows access to shapefile databases, treatment of indicators, storage in a shared environment and construction of a final html file, which can be used on any web page for viewing and browsing. In addition to being a layer visualization tool, you can select basemaps from a variety of sources, including GoogleMaps, Google Earth, and OpenStreetMap.

The geo-viewer can be accessed by the next URL https://demometrics.000webhostapp.com/C2M2_PROJECT/VISUALIZADOR.html. The figure 5 show how this tool could be used through the access of the available geographic databases.

Figure 5: Visualization options



The geo-viewer makes available the Minas Gerais geo-data of the health micro and macro-regions, but also data from the Ouro Preto and Mariana municipalities, based on different topics such as Health, territorial boundaries, urban planning, recreation and education.

The layer viewer is advantageous in terms of programming flexibility, allowing data treatment using the R language library, while allowing interoperability with interchange files such as *shapefiles* and *.dbf* files. There is, on the other hand, the limitation of dependence on infrastructure for publication, as on any website on the internet. However, as it is an html file as a product, the publication becomes simpler and cheaper compared to other existing solutions. Annexed 2: Geo-viewer.

e. Recommendations

The implementation of the project included the period of social isolation and high prevalence rates of COVID19. In this regard, for a fully understanding of second-order impacts, it would be important a longer-term perspective that includes the final stages of the lockdown period, fully or almost fully vaccinated population and fully retaking of economic activities. We would thus be able to evaluate the pre, during and after epidemics stages of second-order impacts and the adequacy and effectiveness of public policies, especially regarding the recovery of the economic and sector and public services and long-lasting social impacts (e.g., education and crime rates). We also believe that an individual and household level survey is key to understand the second-order impacts from the perspective of the population (combining objective questions and perceptions).

f. Future Directions (next steps for teams, use of data, local capacity influenced by project)

We built an online survey to be applied to hotels and commercial establishments in Ouro Preto. The aim is to understand the impacts of the COVID-19 in the local business. We will have a meeting with public officials in Ouro Preto early December 2021 to validate the survey and establish a partnership for its implementation.

The implementation and analysis will be contingent upon additional funding.

g. Community impacts and limitations

During the project we had access to publicly available secondary data on Ouro Preto. However, we had difficulties to obtain data from the Municipality of Ouro Preto, especially in terms of taxes and other socioeconomic information gathered by the municipality. We had also difficulties to implement the survey due to the lack of time and the consolidation of a partnership with the municipality. However, we produced, with the existing secondary data (including spatial information), information that we believe will be important for policymaking and planning in Ouro Preto, and thus positively impacting the community. As a last activity of the project in early December 2021, we will implement a workshop with public officials in Ouro Preto to show the results of the project, deliver all database produced, and establish a partnership for a potential implementation of the survey in the near future (pending on funding). Annexed 3: Survey

5. Events and activities

We participated in several workshops promoted by the organization of the C2M2 project. We also organized a workshop with public officials in the municipality of Ouro Preto, on December 6th, 2021, in order to present the results of the project and share the data and results. We elaborated an online survey on second-order impacts of COVID-19; it is currently on review at the Ethics Committee at UFMG, and may be ready for implementation in 2022 (financing pending).

6. Appendices

1. Appendices 1: “Data Latin America Hub.xlsx. (Data: Spreadsheet of data for each hub X city project, access and sharing information)
2. Appendices 2: “Tools and methods.pdf. (Tools and Methods used to generate data)

3. Appendices 3: “Method HDX Data”. (View and download data on the HDX platform) Hub Latin America - Humanitarian Data Exchange (humdata.org)
4. Appendices 4: “Partnerships established” (Flow diagram of the institutional relationships established during the project)

7. Appendices

1. Annexed 1: Causal loop of the second-order impacts of COVID-19 in Ouro Preto
2. Annexed 2: Geo-viewer
3. Annexed 3: Survey

Latin America HUB- C2M2 Santiago de Chile

October 15, 2021

C2M2 Quito & C2M2 Santa Cruz – TEAM
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Abstract

Chile was one of the Latin American countries with the largest number of confirmed cases of COVID-19 during the first stages of the pandemic. The most affected area was the Metropolitan Region, where the capital city of Santiago is located. As the number of confirmed cases of COVID -19 accounted for roughly 40 percent of the total cases registered in Chile. Chile is the independent country with the third largest gross domestic product (GDP) per capita in Latin America, after Uruguay and Panama. In 2021, the economy recovered rapidly, and the vaccination campaign advanced at one of the fastest rates worldwide. Nonetheless, unemployment remained high throughout the period, while the popularity of Chile's leadership reached its lowest levels in the country's recorded history. The city of Santiago provides an interesting testing ground for analyzing second-order-effects of the COVID-19 pandemic for two basic reasons. First, it is a highly unequal and segregated city. Second, the government strategy to cope with the COVID-19 pandemic included municipal level quarantines and mobility restriction policies. Both conditions make the Metropolitan Region of Santiago an ideal testing-ground to assess the effects of mobility restrictions on socially relevant second-order-effects.Through the C2M2 project we collected information from governmental and open sources, in order to assess the magnitude of COVID-19 spread at the municipal level, the enactment and removal of mobility restrictions, and a series of indicators related to second-order-effects. On the one hand, we collected data on different types of criminal activities across the city, and at the municipal level. On the other hand, we also gathered information on social help policies deployed by the Executive, as well as data on protest and rioting activities in the wake of worsening economic conditions during 2020. Finally, we are now conducting a survey with Venezuelan migrants in Santiago, to assess whether they have relocated in the city as a result of the pandemic.

In terms of our main results, our data on the territorial dynamic of different criminal activities and felonies points at the heterogeneity (across different types of crime, e.g., homicides in areas controlled by narco-trafficking gangs vs. domestic violence) of COVID-19 mobility restrictions. That heterogeneity relates to crime specific dynamics, which we are now researching based on qualitative interviews with qualified sources.Regarding social assistance packages, controlling for the differential impact of the COVID-19 pandemic across the social ladder (poorer communities were significantly more affected by the virus and secondary-order effects such as poverty and unemployment), our preliminary results point to two key findings. First, monetary assistance packages were fairly distributed across municipalities in ways that reflect objective needs. Second, non-monetary help packages (i.e., food boxes, etc.) were more discretionally distributed to politically aligned mayoralties. The latter are more difficult to monitor by bureaucratic oversight agencies and are thus more amenable to clientelist disbursement of handouts.Finally, the main limitation of our project relates to the risk of incurring in serious ecological fallacies, given that relevant phenomena are usually very localized (by block or a series of blocks), whereas available data is usually aggregated at the municipality level.

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5. *Events and activities* ***16***

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7. *Annexed* ***17***

Santiago City Project

1. Description of economy

According to the census of 2017, the population that made up the Santiago metropolitan area reached 6,257,516 inhabitants, equivalent to 35.6% of the national total[1]. This figure reflects the broad growth in the city's population during the 20th century.

Santiago is the most important pole of economic development in Chile and one of the most relevant cities in Latin America. According to the Central Bank, the gross domestic product of the Metropolitan Region in 2005 was 24,461,582 million Chilean pesos (approx. USD 35,380 million) and it was equivalent to 43.68% of the total national GDP[2]. This figure, adjusted with purchasing power parity, increased to USD 91 billion, which places it as the 53rd city with the highest income, and the fifth largest city in Latin America (after Mexico City, Buenos Aires, São Paulo and Rio de Janeiro). By 2020, Santiago´s GDP would reach USD 170 billion with an effective annual growth rate of 4.1%.

Santiago is the financial and administrative center of the country; consequently, the main activities are concentrated in the tertiary sector, producing 79.81% of the city´s GDP. Industrial activities also play an important role, being responsible for 19.5% of the city's GDP, contributing 45.22% of the sector's income nationwide. Similarly, activities such as construction, transport, commerce and finance, contributes with 40 to 50% of the national GDP in each sector[3]. And tourism also stands out, concentrating in Santiago and Los Libertadores trans-Andean pass, 55% of turists who enter the country per year. And even though this economic prosperity, the average salary is $861.

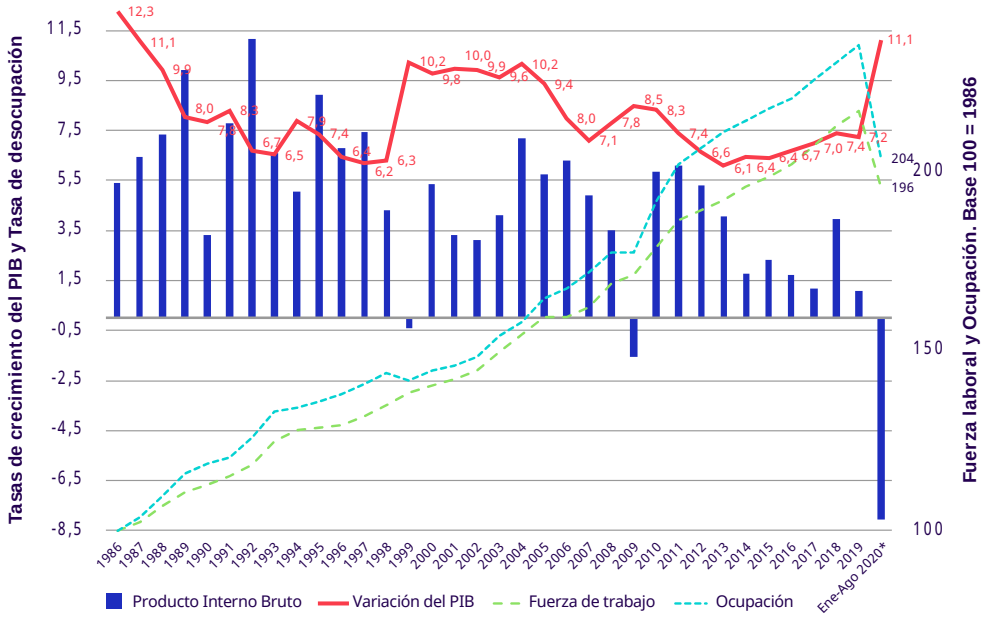
[1] Instituto Nacional de Estadísticas, Ministerio de Vivienda y Urbanismo (2017). https://ine-chile.maps.arcgis.com/apps/Cascade/index.html?appid=cf0be9a196e24eaa9e6eafb970939f2a. Consultado el 14 de enero de 2021.

[2] Banco Central de Chile, Ficha Producto Interno Bruto Regional 2003 – 2005, https://web.archive.org/web/20071222065556/http://www.bcentral.cl/publicaciones/estadisticas/actividad-economica-gasto/aeg07b.htm Consultado el 14 de enero de 2021

[3] Banco Central de Chile, Ficha Producto Interno Bruto Regional 2003 – 2005, https://web.archive.org/web/20071222065556/http://www.bcentral.cl/publicaciones/estadisticas/actividad-economica-gasto/aeg07b.htm Consultado el 14 de enero de 2021

Like everywhere else, the COVID-19 outbreak generated significant consequences for Chile's economy. Alike other Latin American markets, the country's GDP decreased between 5.7 and 6.2 per cent in 2020. The economy resumed its growth in 2021, with an estimated annual growth rate higher than 10 percent by the end of 2021.[4]

The economic contraction pushed unemployment upwards, reaching an historical record in Chile's contemporary period. Figure 1 describes, according to ILO's estimates for 2020, the magnitude of the economic recession induced by COVID-19 and its associated mobility restrictions. In this context, between March 3 — when the first coronavirus case in the country was reported — and March 19, 2020, the value of the Chilean peso depreciated almost seven percent, whereas the IPSA stock exchange index declined by around 30 percent.



Source: OIT (2020), pp. 7.

Unemployment was especially prevalent among low-skilled workers, and particularly among women. Although the Chilean government disbursed relatively generous social assistance packages during 2020 and particularly during 2021, the disbursement of those benefits was belated due to bureaucratic and logistic hindrances.[5] Delays in the disbursement of social assistance, during

[4] Estimates disseminated by the National Institute of Statistics (INE-Chile), https://ine.cl/inicio

[5] See Blofield, Giambruno, and Filgueira (2020). "Policy expansion in compressed time: Assessing the speed, breadth and sufficiency of post- COVID social protection measures in ten Latin American countries", CEPAL, August 2020.

2020, triggered congressional initiatives that allow citizens to rely on their pension funds to self-finance the crisis. While this mechanism alleviated the social emergency and contributed to resume economic dynamism, they also partially de-funded pension funds, while contributing to inflationary pressures in the economy during 2021.

Despite Chile's recent economic recovery, unemployment remains high. According to a recent comparison of three mobile trimesters, total employment between April and June of 2021 was 126.432 jobs short of that observed for the December 2020-February 2021 mobile trimester. Most lost jobs pertain to low-skilled jobs lost in the private sector. In the meantime, the majority of new jobs were created in the informal, self-employed sector. Moreover, COVID-19 mobility restrictions also induced close to 300.000 people to remain inactive, without seeking jobs in the economy.[6]

The economic recovery that consolidated in the second half of 2021 is predominantly attributable to the massive economic help packages approved by the end of 2020 and early 2021, which have unleashed consumption. Economic expansion has also led to overheating, with an estimated inflation reaching close to 6 percent by the end of the year. The country's ensuing constituent and electoral processes, have also fostered greater economic uncertainty, and further contributed to depreciate the Chilean peso against the US dollars.

2. Vulnerable Populations

Recently, Santiago was the scene of social unrest, through which the people initially opposed the rise in the price of subway tickets, but later evolved into a revolution to express discontent with the previous and current government's management due to the great social and economic inequality gap among the Chilean population (the gap between the rich and poor dropped by 5.1 percent). Although Chile has shown itself to be one of the most economically stable countries within the region, the reality of the population lives differs[7].

[6] https://economiayempresa.udp.cl/2021/08/09/tras-cuarentenas-masivas-300-mil-personas-pasaron-a-la-inactividad-y-el-24-no-busco-empleo-por-la-pandemia/

[7] France 24, Las manifestaciones en Chile desafían el Coronavirus y al Gobierno de Sebastián Piñera, marzo 2020. https://www.france24.com/es/20200314-manifestaciones-chile-desafian-coronavirus-gobierno-sebastian-pinera Consultado el 14 de enero de 2021

Polarization among social classes is evident in the city (figure 2). The wealthiest part of the city, northeastern Santiago, is a stark contrast to the poorest areas in the south and northwestern parts. Centers of culture are congregated at the center of the city. Shopping malls and new cultural buildings are being placed in already high-income parts of the city. In the south, where poverty in Santiago is evident, important buildings, like high schools, are being underdeveloped. Instead, these regions are known for landfills and jails.

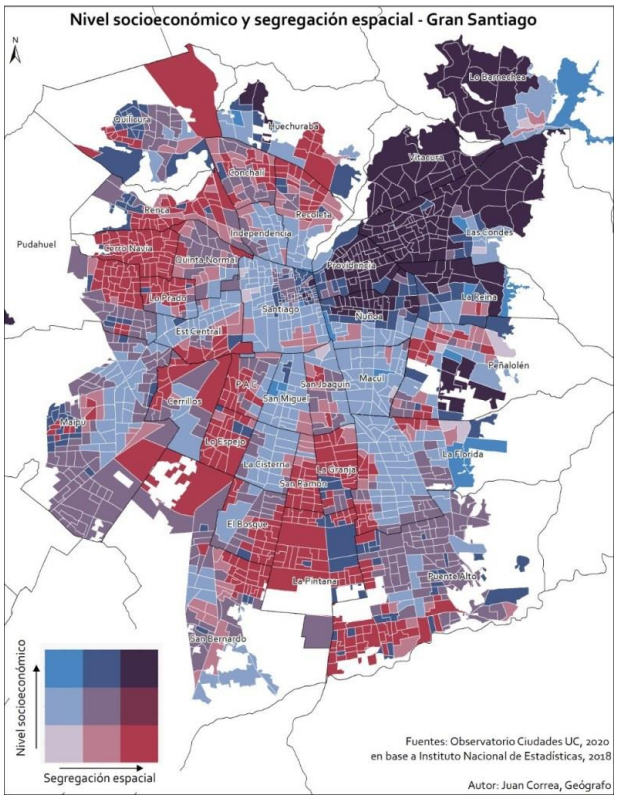


Figure 2 Socioeconomic segregation in Santiago de Chile[8]

Poverty rates in Santiago are on the rise. Although Santiago remains below the national poverty rate of 15.2 percent, it increased by about 1 percent between 2007 and 2010. Access to healthcare is one of the most relevant problems in the city, and now more than ever, the limitations of the health system were made evident by the coronavirus outbreak. While, health education is also lacking and many of the city's poorest residents develop preventable diseases as a result.

[8] Correa, Juan (2020) Mapa de Segregación Socioeconómica – Santiago de Chile, Centro Producción del Espacio, UDLA. https://produccionde lespacio.org/2020/09/11/11-9-la-ciudad-de-santiago-como-simbolo-fascista/ Consultado el 14 de enero de 2021.

The population of Santiago doubled between 1940 and 1960, resulting in a housing crisis. Even the efforts of the government through projects such as 'Operation Site', the problem persists, and low-income people live in precarious conditions.

Average education for Heads of Household is nine years. In some of the most poverty-stricken neighborhoods of Santiago, only one out of five youths have access to higher education. Moreover, the average family's head of household has only reached nine years of education[9].

As the capital and most populous metropolitan area of Chile, Santiago was the epicenter of the COVID-19 pandemic, and its associated health and economic effects. Moreover, given its highly segregated nature, the Metropolitan Area of Santiago is an ideal scenario for observing socially heterogenous COVID-19 secondary effects at close distance.

3. Status of COVID-19

According to the website COVID in Chile[10], update to October 12 of 2021 by the Ministry of Health of Chile, the current status of the disease is as follows:

a. Confirmed cases: 1.666.383
b. Confirmed deaths: 37.574
c. Cases/1M people: 87,055
d. Confirmed cases in the Metropolitan Area of Santiago: 697.084
e. Confirmed deaths in the Metropolitan Area of Santiago: 19.244
f. Percentage of the population with complete vaccination scheme: 74.4 percent
g. Percentage of the population with at least one vaccination shot: 83.4 percent

Chile was one of the Latin American countries with the largest number of confirmed cases of COVID-19 during the first stages of the pandemic[11]. The most affected area was the Metropolitan region, where the capital city of Santiago is located. As the number of confirmed cases of COVID - 19 accounted for roughly 40 percent of the total cases registered in Chile.

Chile is the independent country with the third largest gross domestic product (GDP) per capita in Latin America, after Uruguay and Panama. Yet its health system is deemed less stable than those

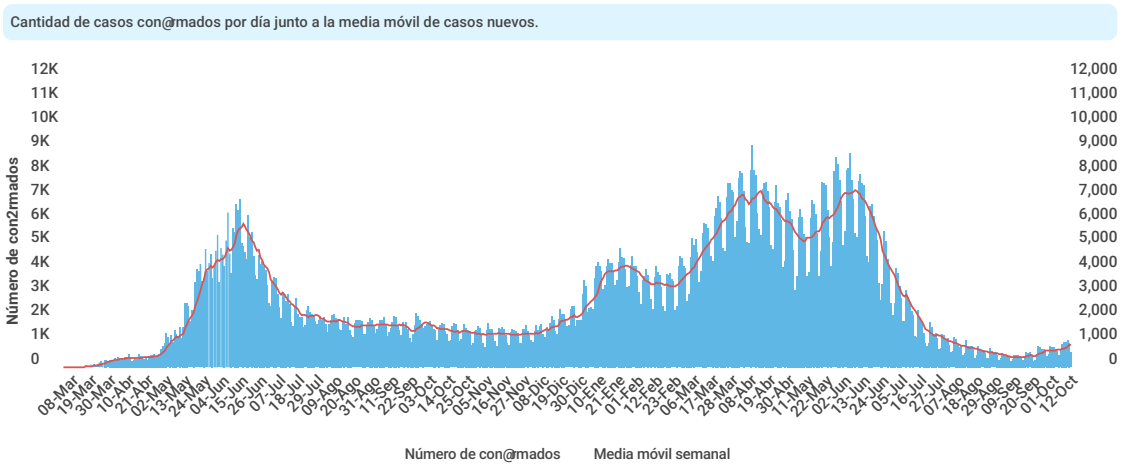
[9] Babb, Stefanie (2018) "10 important and relevant facts about poverty in Santiago", Borgen Project.
[10] https://covid19.soporta.cl
[11] https://www.statista.com/statistics/1103828/chile-coronavirus-cases-region/

of Argentina, Nicaragua, and Peru, for instance[12]. Chile has over 66 percent more inhabitants than the Dominican Republic, but the latter has over twice as many hospitals[13]. During the harshest peak of the pandemic, by mid-2020, hospitals were under heavy stress, while the government significantly expanded the number of critical care beds to accommodate surmounting demand. Since then, the country has observed a second and third of the pandemic in early to mid-2021.

Since early 2021, Chile conducted a very efficient vaccination plan, which has reached a very high coverage. As cases declined, in August and mid-September, mobility restrictions and curfews were finally lifted, as social and economic activities resumed. Figure 3 displays the evolution of cases in Chile. Figure 4 displays the evolution of vaccination shots in the country.

In turn, Figure 5 displays the dynamic of mobility patterns observed in the three municipalities of Metropolitan Santiago, according to Google's mobility tracker statistics. While downtown Santiago reflects the average trend observed in the city, Vitacura represents the wealthier municipality in the city, and Puente Alto, a popular (middle and lower class) and the most populous municipality in the city. As can be observed in Figure 5, mobility restrictions were significantly more observed in wealthier areas of the city, whose inhabitants could more often work at a distance, without risking their income.

Figure 3 Number of confirmed cases per day in Chile[14]



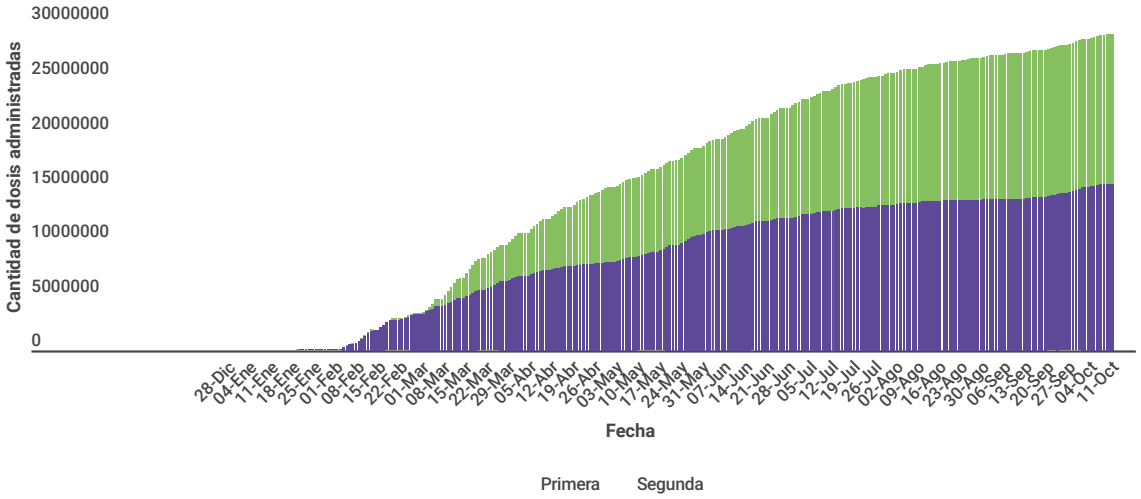
Source: Ministerio de Salud, Chile.

[12] https://www.statista.com/statistics/1105897/latin-america-global-health-security-index-robust-health-system/

[13] https://www.statista.com/topics/6197/coronavirus-covid-19-in-chile/

[14] Cifras Oficiales COVID-19 https://www.gob.cl/coronavirus/cifrasoficiales/. Downloaded October 12, 2021.

Figure 4 Number of vaccination shots (first and second shot) in Chile[15]

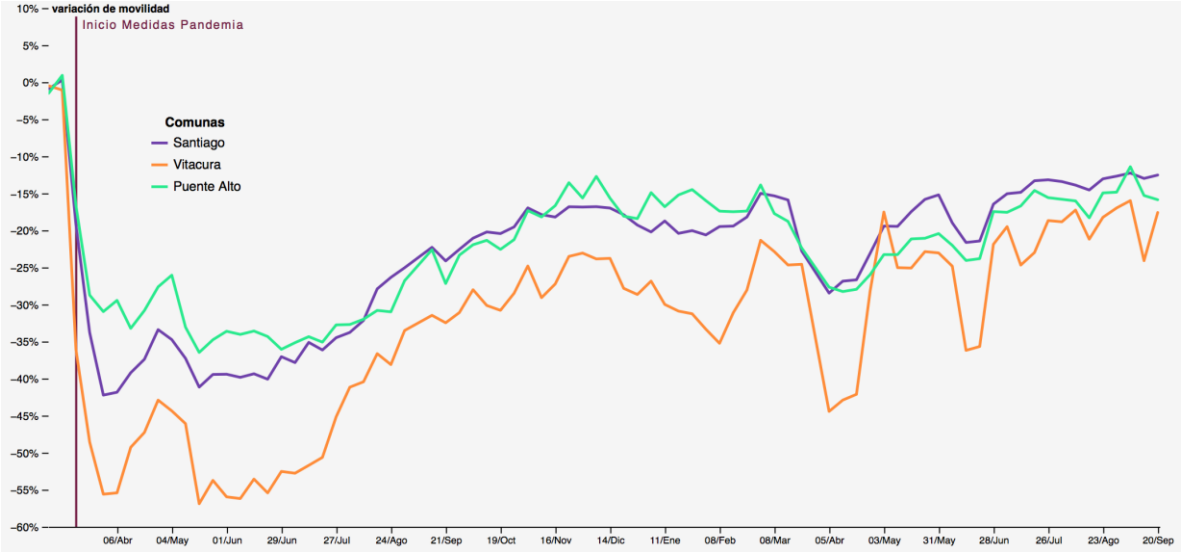


Source: Ministerio de Salud, Chile.

Figure 5 Google's mobility patterns in three municipalities in Metropolitan Santiago.[16]

[15]Cifras Oficiales COVID-19 https://www.gob.cl/coronavirus/cifrasoficiales/. Downloaded October 12, 2021.

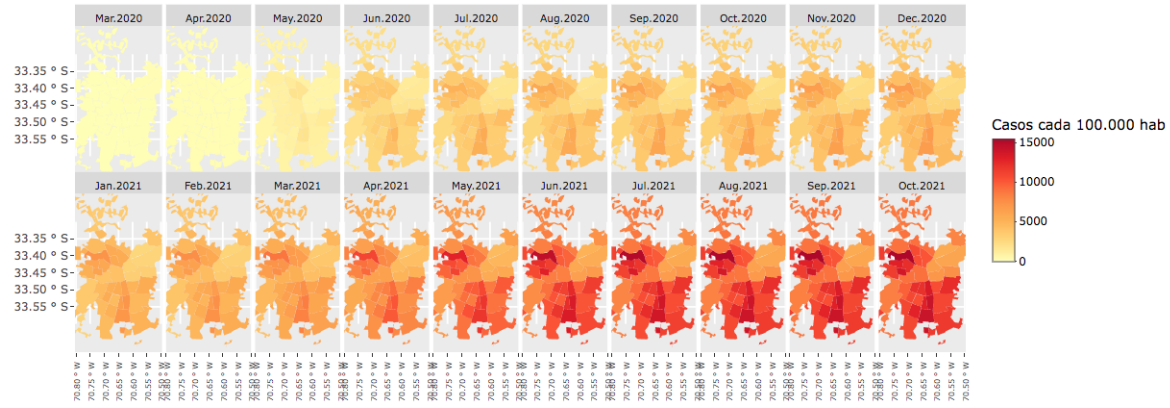
[16]https://covidanalytics.isci.cl/movilidad/visor-movilidad/. Downloaded October 12, 2021.



Source: ISCI COVID Analytics

Finally, Figures 6 and 7 display the territorial dynamics of COVID-19 cases and deaths in the Metropolitan Region of Santiago. As can be observed in both figures, cases and deaths were significantly less in the north-eastern quadrant of the city, where upper-class neighborhoods are located. In the meantime, the north-western and southern peripheries of Metropolitan Santiago, where less affluent citizens dwell, where the most heavily affected by COVID-19 cases and deaths. In those areas of the city, the rate of death/cases was also significantly higher than in the north-eastern quadrant.

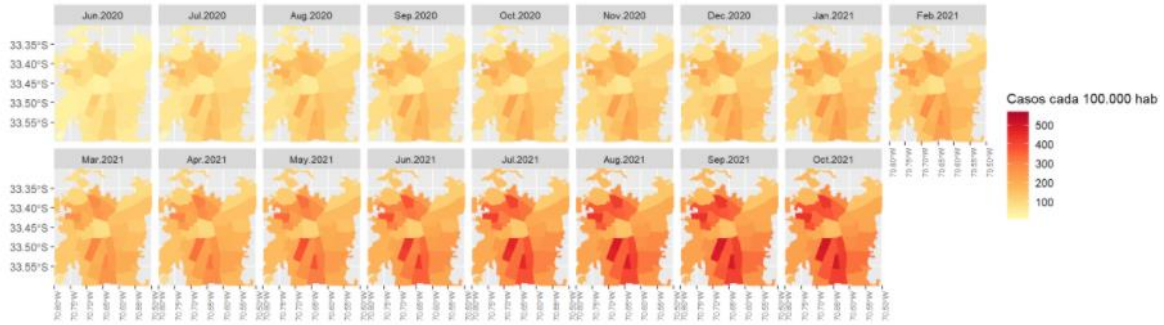
Figure 6 Evolution of COVID-19 cases in Metropolitan Santiago.[17]



Source: Ministerio de Salud, Chile.

[17] https://rpubs.com/bwcastillo/datos_covid. Downloaded October 12, 2021.

Figure 7 Evolution of COVID-19 cases in Metropolitan Santiago.[18]



Source: Ministerio de Salud, Chile.

4. Assessment of project

In this section we present the updated causal loop diagrams, and discuss several lessons drawn from the analyses we have been able to conduct to this date.

a. Update causal loop diagram

Below we present two causal loop diagrams. Annexed 1 "Diagram of causal loop of COVID-19 system for the city of Santiago", corresponds to the COVID-19 system, which describes our expectations regarding the dynamic of COVID-19 in the city, according to two stylized socioeconomic contexts: poor and rich municipalities. We think this diagram is an appropriate description of the heterogenous causal dynamics associated to COVID-19 territorial dynamic in the Metropolitan Region of Santiago.

Annexed 2 "Diagram of causal loop of Covid-19 second order effects (criminal dynamic mobility and migration) for the city of Santiago", corresponds to our expectations regarding second-order effects of COVID-19, priming, in particular, its effects regarding criminal dynamics, mobility across the city, and intra-city mobility patterns of immigrants. The two rectangles drawn into Figure 9 depict the dynamics associated to different types of crime (in peripheral and residential areas of the city; and in downtown areas subjected to more stringently enforced mobility restrictions). Those distinct dynamics are the first second-order effects of COVID-19 we analyzed in our project. We describe the main lessons drawn from those analyses below.

b. What was learned? (About the project activity/About second order impacts)

[18] https://rpubs.com/bwcastillo/datos_covid. Downloaded October 12, 2021.

The main lessons learned about the project are three. First, the territorial scale at which data is gathered differs widely across countries and cities, as well as the temporal scope of some critical indicators we sought to obtain. This fact not only complicates comparisons across-cities, but also within city assessments. In particular, most of the data for the Metropolitan Region of Santiago is available at the municipal level. However, most of the effects we were interested in exploring are likely associated to causal dynamics that occur at a lower-level territorial scale. Thus, we are worried about running into ecological fallacies while analyzing the data we were able to gathered. Second, most of the data obtained from official sources had to be sought through explicit data transparency claims. Those claims were denied several times, and had to be reissued, before we could finally obtain the requested information. This fact not only delayed our progress, but also exemplifies the difficulties ordinary citizens confront while seeking to access information from state sources. Third, triangulating official sources on crime (and specifically on domestic violence) with ongoing research by one of our associated projects (VIODEMOS), based on a hotline for domestic violence cases, we learnt that the observed decline in police reports associated to domestic violence correlated with an increase in emergency calls to the hotline. The explanation for this discrepancy is that, given mobility restrictions, males were more often at home than during normal times. In this context, victims reached out to the hotline during acute incidents, and did so more often than during normal times. However, the fact that victims placed police claims for domestic violence at significantly lower rates than during normal times is likely related to the permanent presence of males in the house. As a result, while some of our criminal dynamic indicators (e.g., homicide rates) directly reflect "real" trends, others conflate the prevalence of claims at the police station with the real incidence of specific crimes and felonies.

Regarding the lessons learnt about second order effects, we provide a brief narrative of our findings on criminal dynamics and the political dynamics of social help distribution. In the next few months, we also expect to produce new findings on the territorial mobility of migrants, and on the interaction among mobility restrictions, social help distribution, and social protest and rioting.

In terms of criminal dynamics, we could map the relative prevalence and evolution of different types of crime and felony in Metropolitan Santiago. Some of those offenses predominantly increased in downtown areas, while others did in peripheral regions. Based on this information, we conducted a series of interviews with qualified informants to better understand the relationship between observed patterns and COVID-19 mobility restrictions. Our findings and observed dynamics seem consistent with the Neighborhood Effects Theory (Sampsonset al, 2002; Galster, 2012). In that regard, when mobility restrictions were enacted, crimes against property and burglaries shifted from downtown areas to peripheral districts. At the same time, in peripheral areas of the city were micro-trafficking of drugs was prevalent, mobility restrictions correlated with a significant increase in gang-related violence that led to higher homicide rates (which declined in other areas of the city, during the same period). Gang-driven violence is likely associated

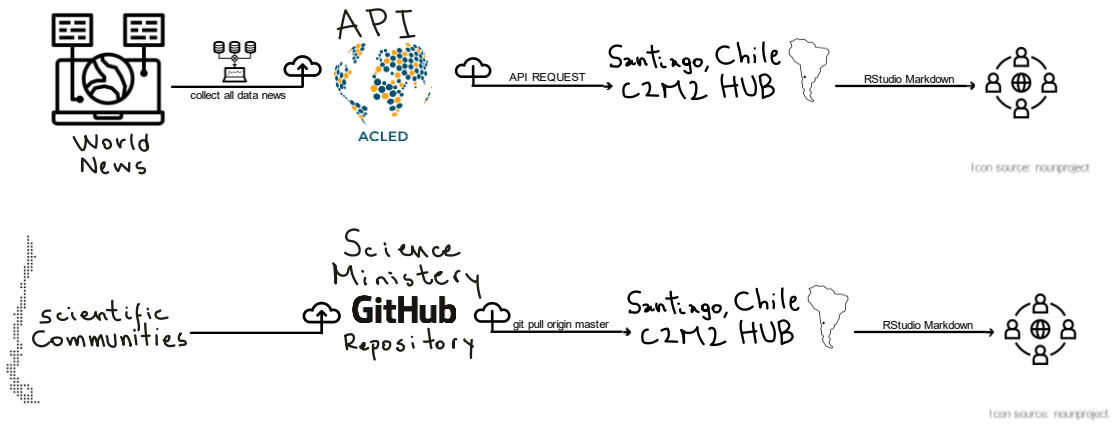
to competition for turf, as well as to efforts to take-over drug deposits by competing gangs whose distribution networks were distorted by border closures in the northern area of Chile. Finally, as mobility restrictions were enacted, official records display a decrease in domestic violence. However, non-official sources suggests a significant increase in domestic violence during quaraintaines. Claims about domestic violence went back to normal after mobility restrictions were removed (and males returned to work). In sum, our data on the territorial dynamic of different criminal activities and felonies points at the heterogeneity (across different types of crime) of COVID-19 mobility restrictions.

The data we gathered also allows us to assess the political logic guiding social help distribution across the city. Controlling for the differential impact of the COVID-19 pandemic across the social ladder (poorer communities were significantly more affected by the virus and secondary-order effects such as poverty and unemployment), our preliminary results point to two key findings. First, monetary assistance packages were fairly distributed across municipalities in ways that reflect objective needs. Second, non-monetary help packages (i.e. food boxes, etc.) were more discretionally distributed to politically aligned mayoralties. The latter are more difficult to monitor by bureaucratic oversight agencies, and are thus more amenable to clientelistic disbursement of handouts.

c. Analysis conducted – analytical flowcharts with description.

The four flowcharts included below depict the steps we followed to acquire and analyze the data gathered through the project. Some of the information was obtained through open repositories available through Chilean state sources. This included indicators already available in websites that we scrapped to compile and parse a dataset, as well as other indicators that had to be requested through the Transparency Portal of the Chilean state. Finally, we also compiled information by downloading indicators from APIs pertaining to different organizations, such as the ACLED database on protest and rioting activities.

Figure 10. Analytical flowcharts: criminal dynamics indicators, social help data, protest and rioting data, and COVID-19 territorial dynamics.



d. Visualizations of results (include how these are disseminated and target audience)

So far, our results are available through a series of Rpubs data repositories, which were already disseminated and made available to fellow social science researchers. The preliminary Rpubs repositories are available here:

Annexed 3: Crimen covid 19 https://rpubs.com/bwcastillo/crime_covid1

Annexed 4: State aid by COVID 19 https://rpubs.com/bwcastillo/ayudaCovid

Annexed 5: Riots COVID 19 https://rpubs.com/bwcastillo/riots_covid

Annexed 6: Data COVID 19 https://rpubs.com/bwcastillo/datos_covid

We are currently working on improving visualizations in order to reach a broader audience. We expect to draw on those visualizations to structure dissemination workshops in which we plan to discuss the implications of our findings for policy-making. Given Chile's ongoing constitutional convention process, we would like to disseminate our findings to relevant stake-holders in Chile's Constitutional Convention.

e. Recommendations

The main obstacles we encounter when developing the project related to data availability and comparability across cases. Those hindrances should be solved in a case-by-case basis, and thus, cannot be tackled through more centralized coordination or planning. In that regard, we think the project was incredibly well

planned and coordinated by our regional hub. One possible recommendation for future projects is to allow for more decentralized cross-regional interactions, which could produce new research partnerships.

f. Community Impacts and Limitations

We think that our broader impact relates to the compilation, parsing, and triangulation of data that was not available in the public realm. In particular, our contribution in that regard relates to the mapping of complex and territorially heterogenous second-order effects of the COVID-19 pandemic. Besides, we are making such data and resulting analyses available to the broader community in a simple way. We think this will have an impact on ongoing research efforts by colleagues. Yet, we also expect to have a positive impact on relevant stakeholders and citizens' welfare.

g. Future Directions (next steps for teams, use of data, local capacity influenced by project)

First, besides improving description (e.g., we are now incorporating the Moran Index and the Local Indicator of Spatial Analysis (LISA)), a crucial future step is to go beyond descriptive analyses to assess the complex causal dynamics that drive observed spatial/temporal dynamics related to the second-order COVID-19 effects for which we gave gathered good quality data.

Second, in the next few months, we expect to generate broader research impacts by collaborating with other hubs. For instance, we have started to think about pursuing comparative analyses across countries on second-order effects for which data is available for two or more cities. For example, we have begun to collaborate on a comparative project to sort out relevant dynamics associated with domestic violence (intra-household) across Latin American cities.

Third, we are currently conducting a survey directed at Venezuelan immigrants in the Metropolitan Region of Santiago. Through this survey, which is similar to one being implemented in other Latin American research hubs, we expect to be able to map within city mobility patterns related to the economic impacts of the COVID-19 pandemic. (Annexed 7: Qualtrics Survey Software)

Finally, regarding dissemination, we plan to organize presentations to local and national stakeholders and policy-makers to make our data and analyses available to the policy community. Moreover, we will also put together an easy-to-access website to make data and analyses easy to access to everyone interested.

5. Events and activities

a) Survey App

At the host institution for the Santiago Project, we are developing a new approach for conducting research in complex and heterogeneous social contexts. That approach, which we tentatively called “Thick Data”

combines methodologies from the social sciences with emerging Big Data techniques. In this regard, we conduct ethnographies (digital and at the local level), in-depth and survey interviews and experiments, participatory mapping, and focus groups with web-scrapping and topic modelling of conversations in social media. The C2M2 project has been instrumental in advancing the development of a survey app (we include screen captures below), which creates and administers public opinion panels through which we recruit and compensate participants in our surveys and survey experiments. The app, which runs in both PC and smartphone platforms, is currently being used to reach out and interview migrants in the city of Santiago. After participating in the survey, interviewees receive a monetary compensation for their participation, which can be cashed in a neighborhood shop. Panel-Up also opens a permanent communication channel with registered users, who can be contacted through either SMS messages or WhatsApp. Panelists can also send comments, concerns, etc., through the app, to our operational hub. Panel-up monitors fieldwork deployment through a dashboard that provides information on response rates by panel and by locality and socioeconomic characteristics in real time and can be customized to serve the needs of specific research designs.

Annexed 8: Survey app

In this link:

(https://www.d https://www.dropbox.com/s/ycmgtq393gz1yqr/Telar%20Story%20Map.pptx?dl=0 https://www.dropbox.com/s/ycmgtq393gz1yqr/Telar%20Story%20Map.pptx?dl=0ropbox.com/s/ycmgtq393gz1yqr/Telar%20Story%20Map.pptx?dl=0) you can explore an example of the use of Thick Data and Panel-Up in tracking down the social and political dynamics associated to Chile's Constitutional Convention.

6. Appendices

1. Appendices 1: "Data Latin America Hub.xlsx. (Data: Spreadsheet of data for each hub X city project, access and sharing information)
2. Appendices 2: "Tools and methods.pdf. (Tools and Methods used to generate data)
3. Appendices 3: "Method HDX Data". (View and download data on the HDX platform) Hub Latin America - Humanitarian Data Exchange (humdata.org)
4. Appendices 4: "Partnerships established" (Flow diagram of the institutional relationships established during the project)

7. Annexed

1. Annexed 1: Diagram of causal loop of COVID-19 system for the city of Santiago
2. Annexed 2: Diagram of causal loop of Covid-19 second order effects
3. Annexed 3: Crimen COVID 19

4. Annexed 4: State aid by COVID 19
5. Annexed 5: Riots COVID 19
6. Annexed 6: Data COVID 19
7. Annexed 7: Qualtrics Survey Software
8. Annexed 8: Survey app

Latin America HUB C2M2 Lima

November, 2021

C2M2 Quito & C2M2 Santa Cruz – TEAM
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Abstract

Peru is one of the countries most affected by the pandemic worldwide, reporting more than 200,000 deaths from COVID-19. Metropolitan Lima, as the capital city, has the highest incidence of cases and deaths, and consequently, this city had the highest second-order impacts. In addition to the direct effects of COVID-19 on the health of the population and the health system, there are also second-order effects because of the measures taken, such as the lockdown and closure of borders, affecting the economy, transportation, food security, social security and the derivatives of each of these measures.

We collected information from the virtual platforms of the Peruvian ministries, publicly available data, and by request of our team to the respective governmental program offices in order to evaluate and monitor the impacts

Among the results, we observed a decrease in crime reports and domestic violence complaints (physical, psychological and sexual) in the total restriction period from March to June 2020. In the following months, the incidence of complaints increased to pre-pandemic values, which evidences difficulties in the access of the population to the reporting platforms in periods of states of emergency in the region.

Additionally, for the monitoring of the economic situation, employment rate and average monthly income indicators were used, which showed a greater impact on the service sector (tourism, restaurants, entertainment, etc.), which had a slow recovery as the restriction measures were lifted in the city.

The greatest limitation presented was the updating of information due to the quality control carried out by the institutions at the end of the year, an indispensable requirement for sharing official data. Finally, the results of the first and second-order impacts will be shared through the institutional blog to achieve better dissemination of information.

Content

Abstract 1

Content 2

MIGRATION AND MOBILITY 3

Lima City Project 3

1. ***Description of economy*** *3*

2. *Vulnerable Populations* *5*

3. ***Status of COVID-19*** *9*

4. ***Assessment of project*** *11*

5. ***Events and Activities*** *15*

6. ***Appendices*** *18*

7. ***Annexed*** *18*

MIGRATION AND MOBILITY

Lima City Project

1. Description of economy

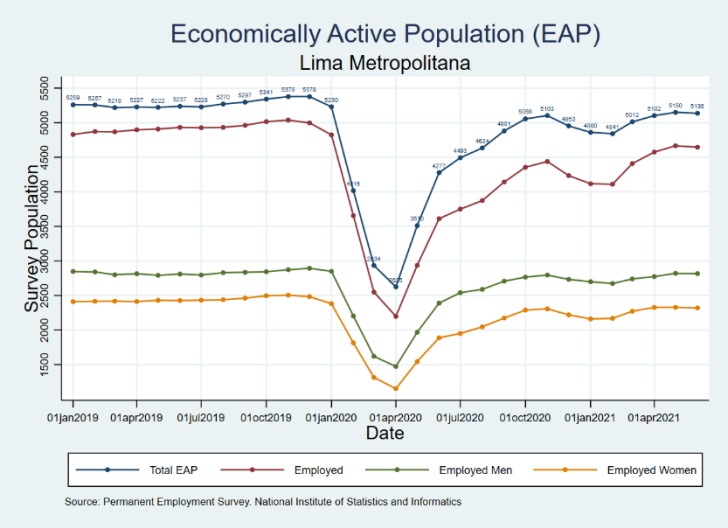
Metropolitan Lima is the capital of Peru, concentrating much of the national economy and commerce and being occupied by 29% of the national population according to the 2017 National Census.

The National Institute of Statistics and Informatics tracks economic indicators through the Permanent Employment Survey by taking a representative sample of Metropolitan Lima.

a) Economically Active Population:

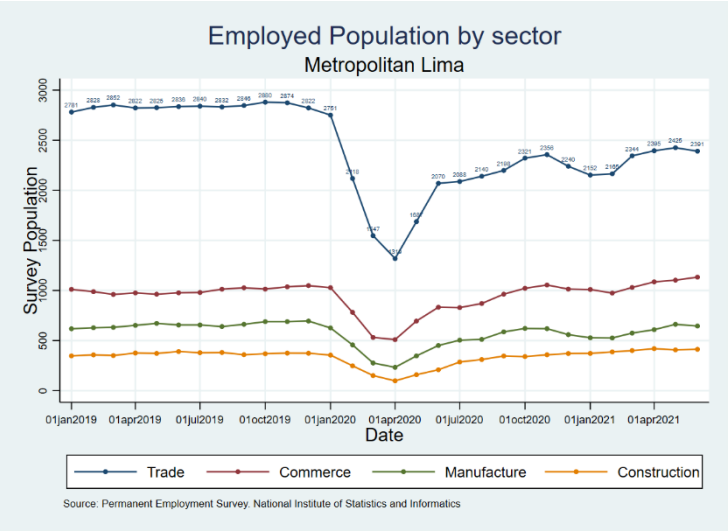
This indicator remained constant until 2019; from 2020 onwards, we observed a decrease accentuated with the beginning of the quarantine and closure of services; the maximum drop occurs in April with a decrease of 50% in the employed population compared to 2019.

From May 2020 onwards, the economically active population begins to rise until now, registering a slight decrease at the beginning of 2021, which coincides with the beginning of the second pandemic wave.



b) Employed population by economic sector:

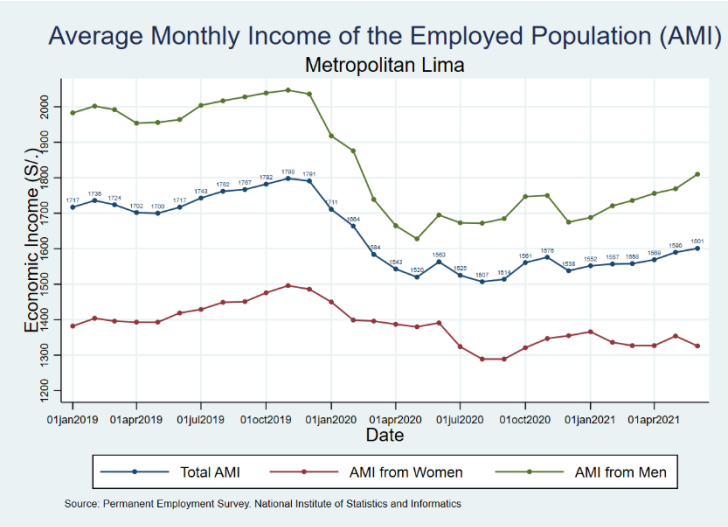
Due to the confinement and restriction measures taken by the state, the four economic sectors, service, commerce, manufacturing, and construction, presented a decrease in the employed population. It was registered the maximum drop in April 2020. Then beginning its ascent to date, observing a recovery to pre-pandemic levels in commerce, manufacturing, and construction, except the services sector, which



includes jobs related to tourism, restaurants, transportation and other social services.

c) Average monthly income:

This indicator also shows a decrease from January 2020 to August 2020 with approximately 250 soles. From September 2020, there is an increase in this economic income; however, it does not recover the values before the pandemic

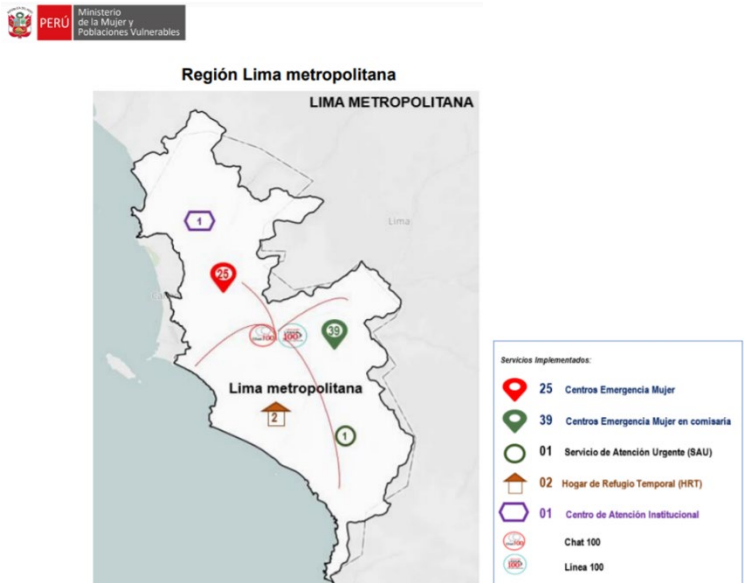


2. Vulnerable Populations

The National Plan against Gender Violence identifies children, adolescents, the elderly, the disabled, the LGBTI population, and people living with HIV as vulnerable groups in the region, this condition is exacerbated when the gender factor is added. Women are the most affected, accentuating the pre-existing gender gaps in the economic, and labor and education sectors.

According to the report of the Institute of Statistics and Informatics, in Metropolitan Lima, in 34.6% of households, the economic support corresponds to the woman, which makes these households prone to poverty because their insertion in the labor market is more limited in addition to facing the responsibilities of the household.

The trends of violence in these groups during the 2017-2020 period have not changed. During the 2020 pandemic, it is observed that 31% of the people who suffered domestic violence were minors, and 7% to older adults. In addition, people with physical disabilities were the vulnerable group that made the highest number of complaints of domestic violence and, to a lesser extent, people belonging to the LGBTI community or living with HIV.



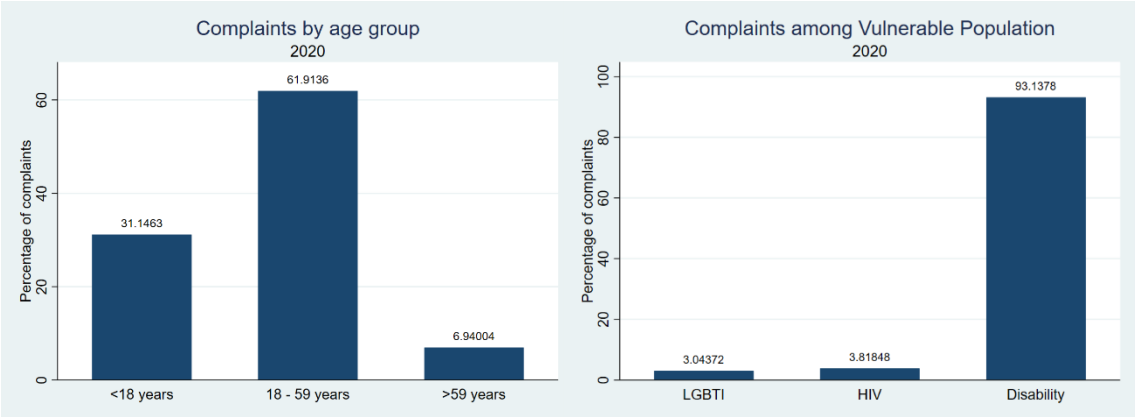


Figure. Complaints during the first year of the COVID-19 pandemic among vulnerable groups

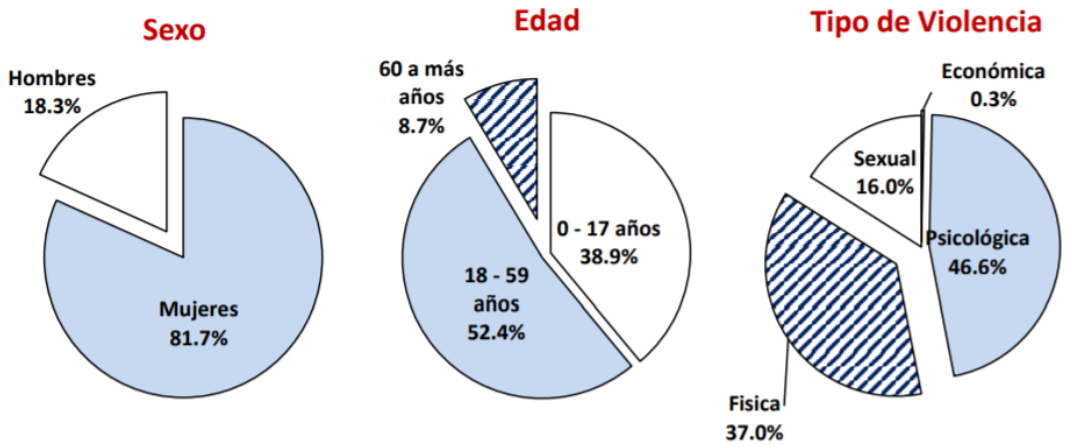


Figure. Complaints during the second year of the COVID-19 pandemic among vulnerable groups.

Source: Case CEM / AURORA / MIMP. Preliminary Report 2021. (1)

Finally, we assessed the vulnerability of Metropolitan Lima in the national context. For this purpose, we used the Social Vulnerability Index (SVI) of the Centers for Disease Control and Prevention. The information was extracted from the 2017 Census, Demographic and Family Health Survey, and updated data from the Ministry of Health

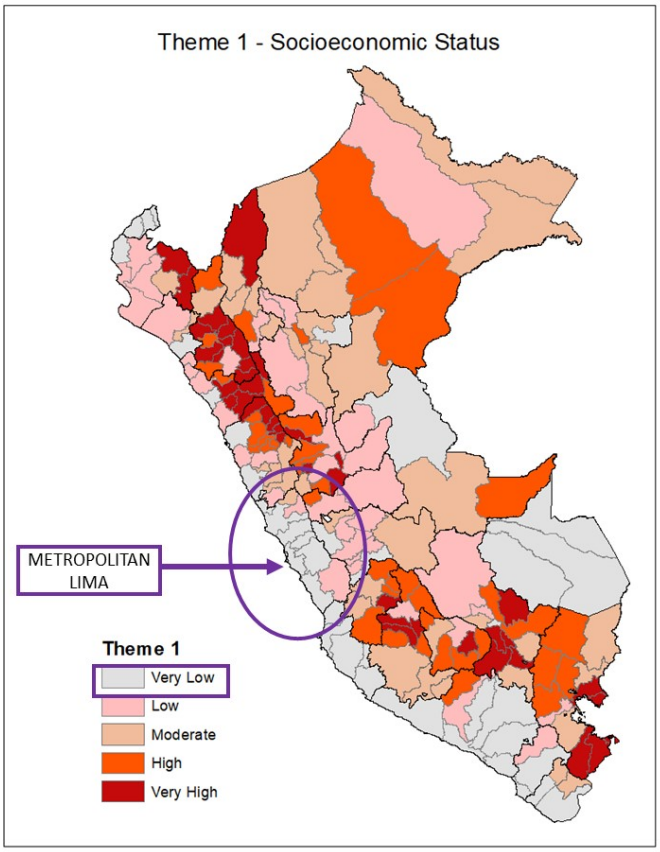
For the construction of the SVI indicators, we expressed 15 variables in population percentages or incidences, which we ordered in ascending order. Negative variables (i.e. poverty) were given ranks from 1 to 196; on the other hand, positive variables (i.e. economic income) whose higher percentage value in the population meant less vulnerability were given ranks from 196 to 1. Subsequently, we calculated

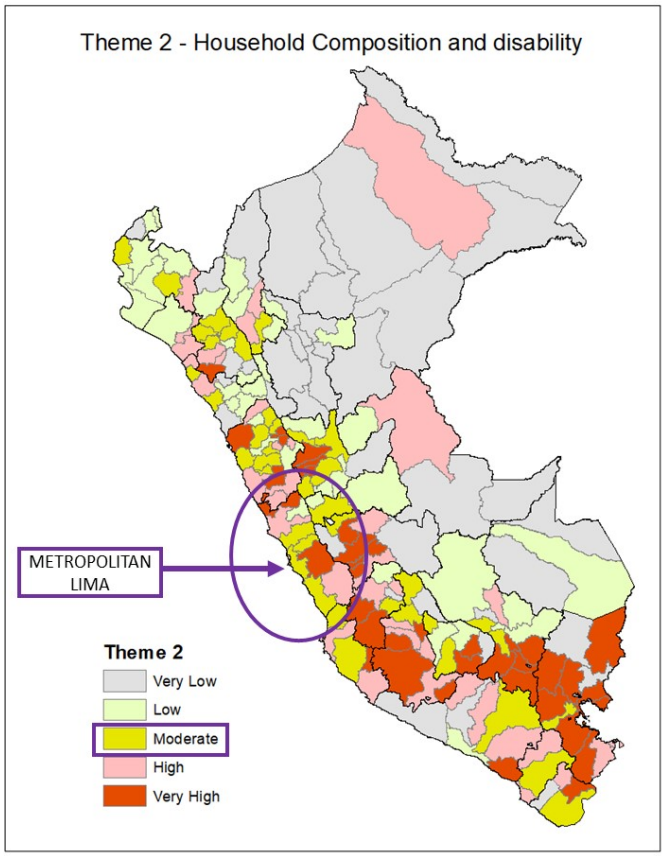
percentile-ranks using the formula: Percentile-rank = (Rank - 1) / 195. Then, we added the indicators by SVI themes to calculate ranks and percentile ranks by theme. Finally, the index was classified into quintiles to obtain the following groups: very low (<20%), low (20-40%), moderate (40-60%), high (60-80%), and very high (> 80%) vulnerability.

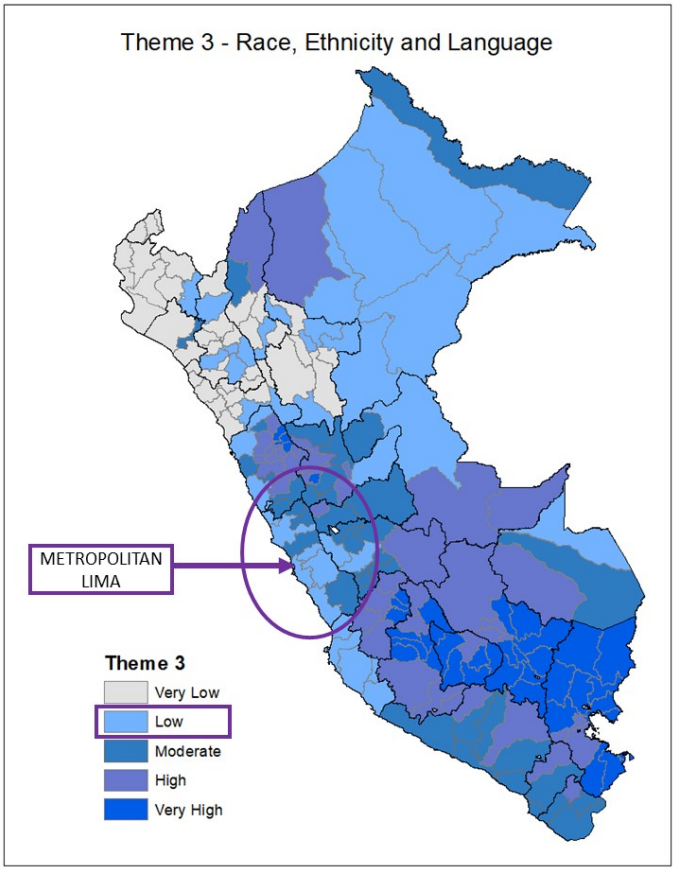
This Index shows that Metropolitan Lima is vulnerable due to Household Composition-Disability indicators presenting moderate vulnerability respectively compared to the other provinces of Peru.

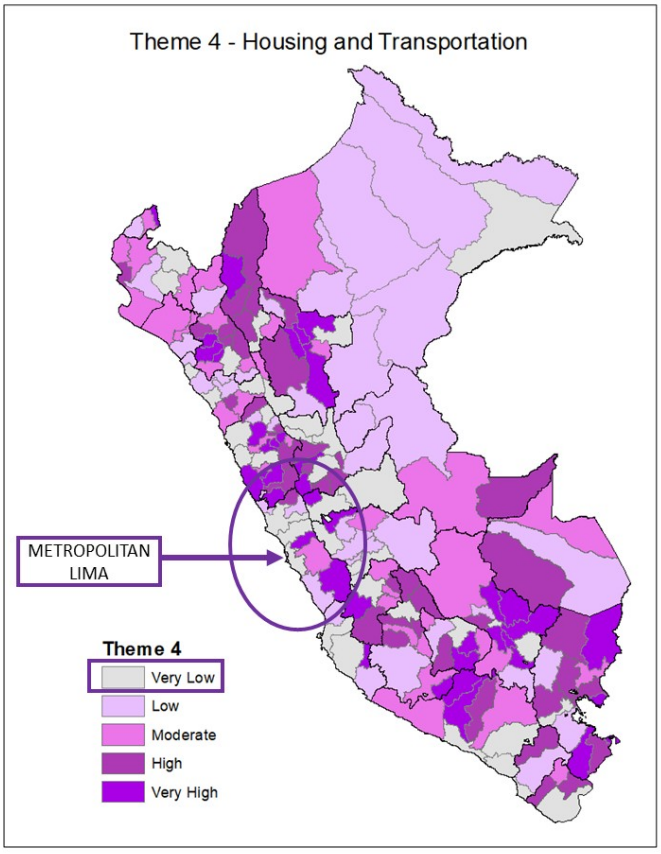
Table 1. Vulnerability indicators by theme (n = 196)

Theme	Indicator
Socioeconomic Status	% Persons in poverty
	% Unemployed persons
	Per Capita Monthly Income
	% Persons with no High School
Household Composition and disability	% Persons aged 65 and older
	% Persons aged 17 and younger
	% Persons with a disability
	% Single parent household
Race	% Indigenous persons
Ethnicity	
Language	% Persons who do not speak Spanish
Housing	% Housing with poor structures
Transportation	% Occupied housing units with more people than rooms
	% Paved roads


Theme 1 - Socioeconomic Status
METROPOLITAN LIMA
Theme 1
Very Low
Low
Moderate
High
Very High

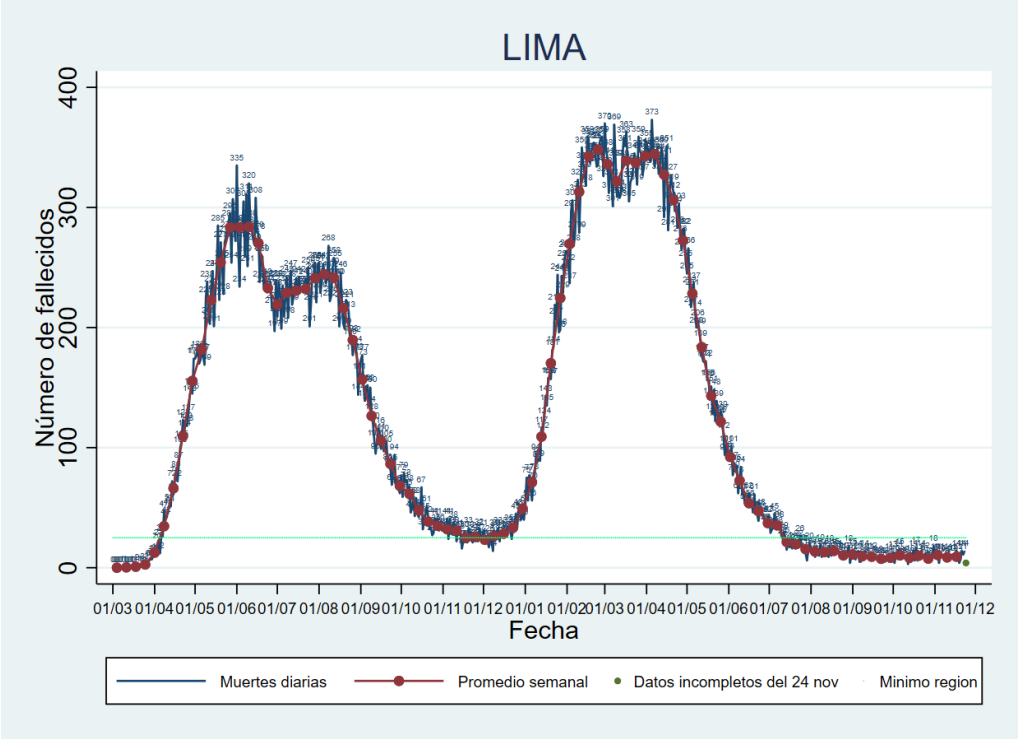

Theme 2 - Household Composition and disability
METROPOLITAN LIMA
Theme 2
Very Low
Low
Moderate
High
Very High

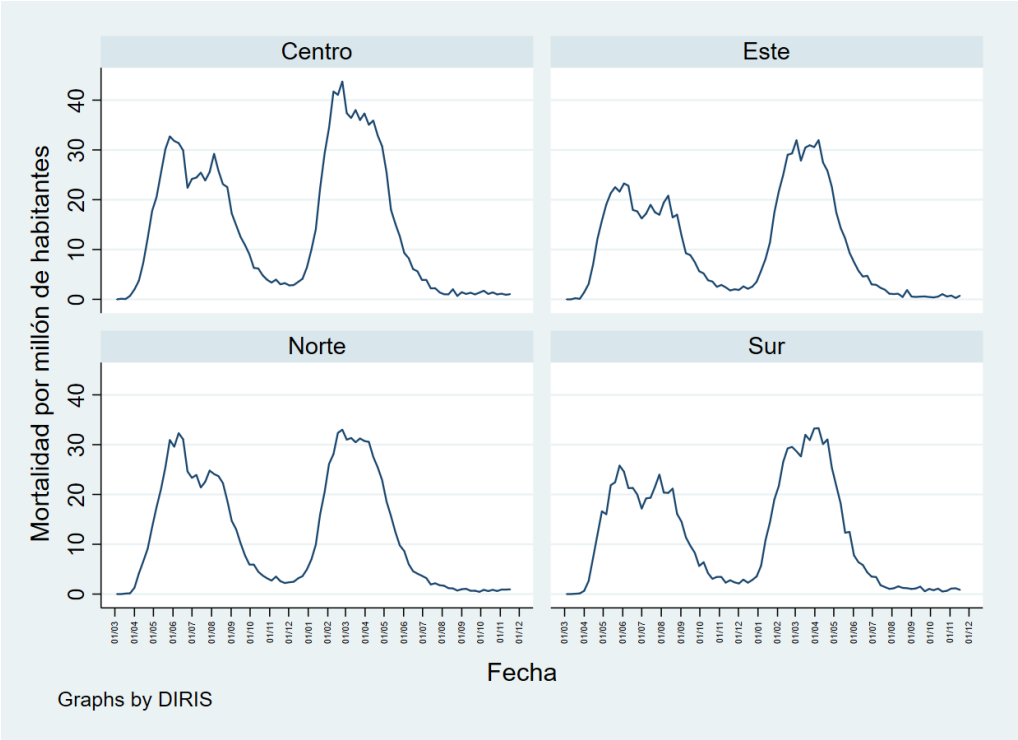

Theme 3 - Race, Ethnicity and Language
METROPOLITAN LIMA
Theme 3
Very Low
Low
Moderate
High
Very High

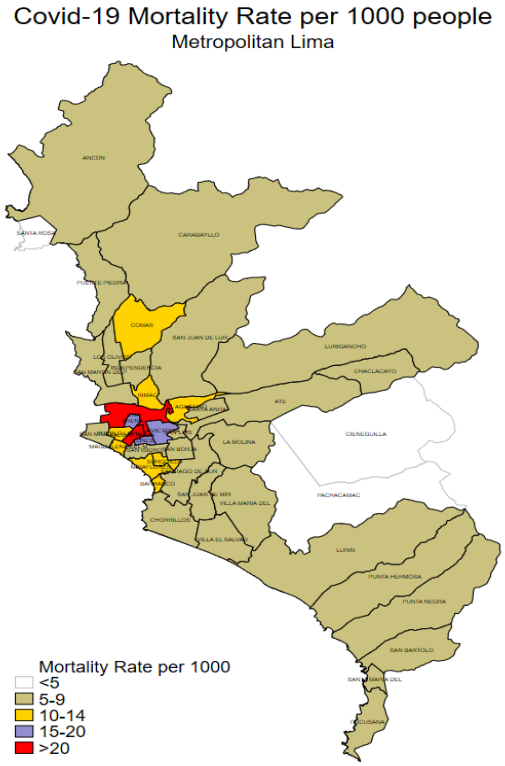

Theme 4 - Housing and Transportation
METROPOLITAN LIMA
Theme 4
Very Low
Low
Moderate
High
Very High

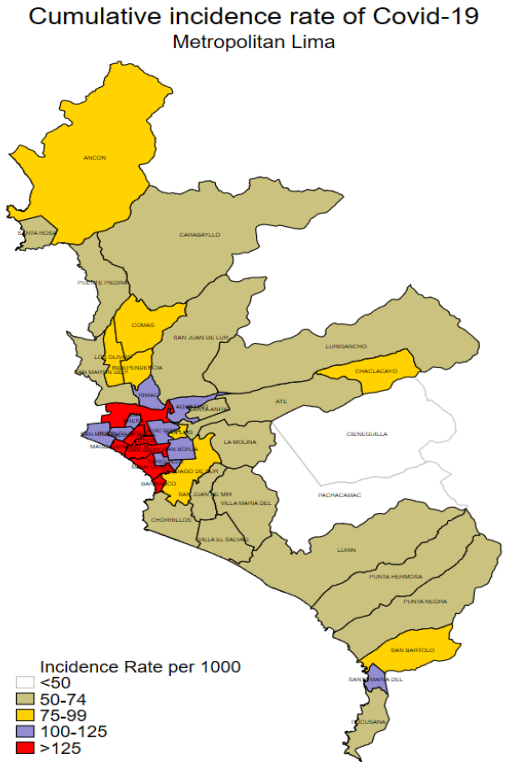
3. Status of COVID-19

Public data from the Ministry of Health provides information on the state of the pandemic, which shows that in Peru, up to September 2021, there have been two pandemic waves, with approximately 73,000 deaths and 809,000 cases concentrated in Metropolitan Lima, with the districts located in Central Lima having the highest death and case rates. (2)

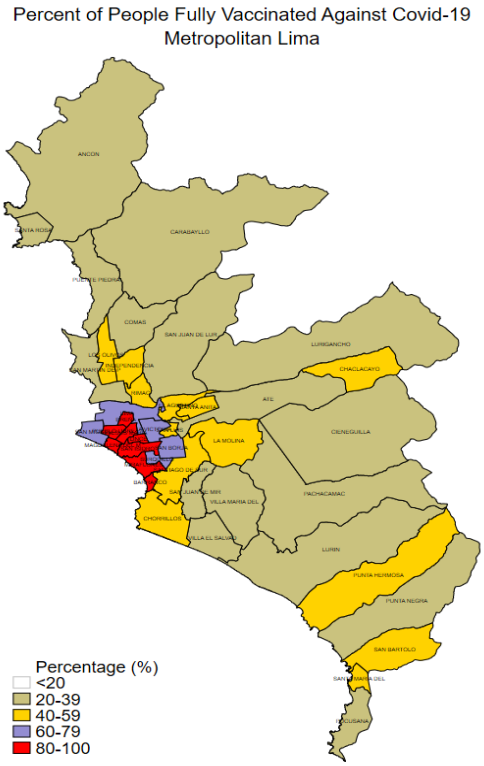



Centro
Este
Norte
Sur
Mortalidad por millón de habitantes
0
10
20
30
40
Fecha
Graphs by DIRIS


Covid-19 Mortality Rate per 1000 people
Metropolitan Lima
Mortality Rate per 1000
<5
5-9
10-14
15-20
>20


Cumulative incidence rate of Covid-19
Metropolitan Lima
Incidence Rate per 1000
<50
50-74
75-99
100-125
>125

On the other hand, in March 2021, the vaccination campaign against Covid-19 began, with which approximately 4.5 million people have been immunized by September.



4. Assessment of project

a. Update causal loop diagram

The restriction measures and business closures have had a profound impact on all sectors such as the economy, education, and public safety, which together with the advance of the pandemic have repercussions on the mental health of individuals and households, generating or intensifying the vulnerability of individuals.

In the present causal loop diagram (Annexed 1), COVID-19 represents the cases, hospitalized and deaths due to the disease, this leads to an increase or decrease in the time of confinement for Metropolitan Lima, which would have a domino effect on the variables of economy, employment, crime and violence, which in turn condition the mental health status of the household and the person.

With the beginning of the vaccination program, a decrease in the COVID-19 indicators was observed, which made it possible to stop the cascade of second-order effects, reactivating the economy and other sectors.

b. What was learned? (About the project activity/About second order impacts)

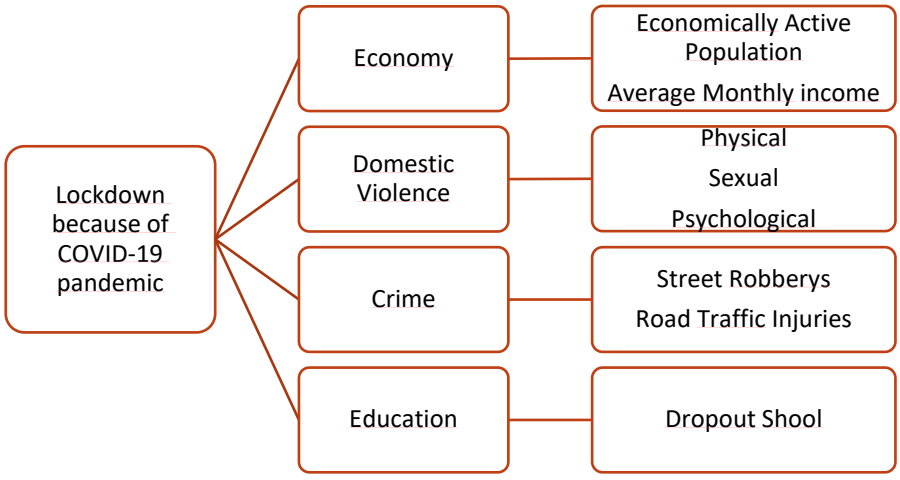
It is observed that the second-order effects in Metropolitan Lima had a faster development compared to the actions taken to mitigate the social consequences of lockdown. In addition, it is worth mentioning the cascading effect involving the sectors of the economy, education, citizen security, and domestic violence being dependent in different magnitudes.

Metropolitan Lima is a heterogeneous city at the moment of comparing districts and even within the same locality. In that sense, the economic, educational and security citizen effects will have a different local impact depending on the area in which the person resides.

Therefore, the plans that are develop must present integral solutions taking into account the needs that the household presented before the pandemic and that was accentuated with the pandemic.

Finally, the pandemic has intensified the existing inequality gaps among the population, due to the presence of COVID-19 in their social environment as well as the effects on the economy, which can be reflected in the proportion of women and men who have a job, or the monthly income they receive and the evolution in the recovery of these indicators.

c. Analysis conducted – analytical flowcharts with description



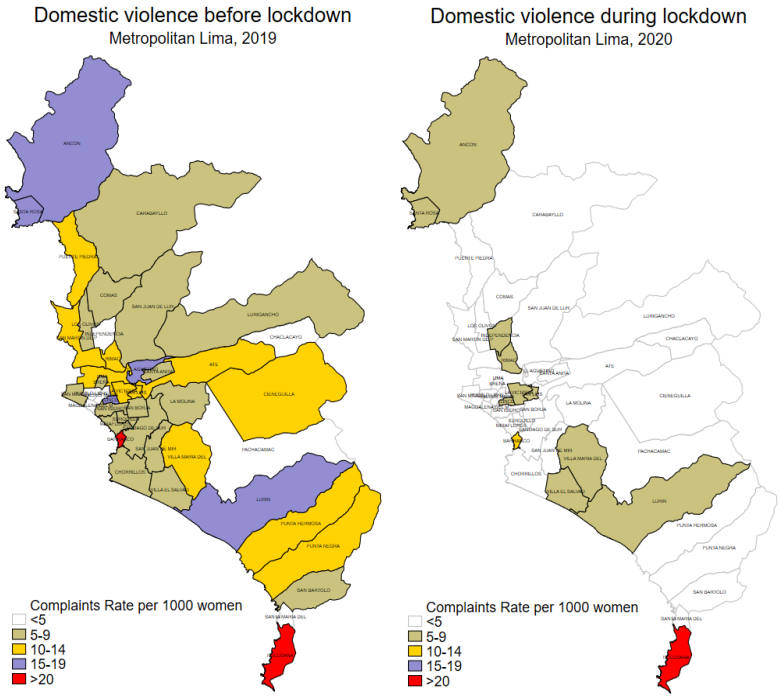
Considering that Metropolitan Lima is one of the provinces with the highest rate of domestic violence, in the initial assessment we identified women as one of the most vulnerable groups in the pandemic, added to the presence of family burden of care in the home as well as the economic responsibility that represents a significant percentage of the population.

Because of this, remote communication was established with the AURORA Program in charge of the national domestic violence program to address the impacts in this area. Secondly, using causal loop diagrams and the literature reviewed, the relationship between domestic violence and the economic sector and school dropout was identified. (5) Economic trends were monitored to complement the evaluation of the dynamics of domestic violence complaints.

d. Visualizations of results (include how these are disseminated and target audience)

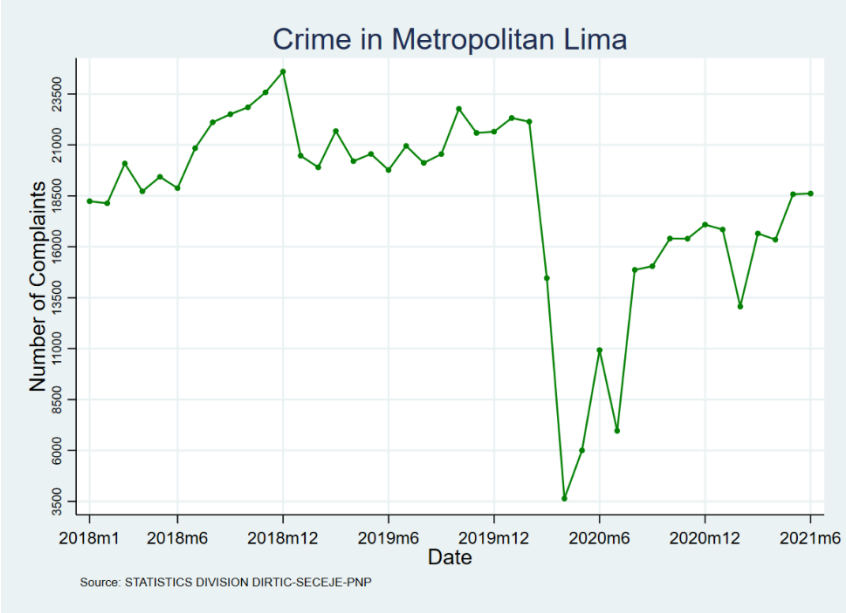
The state of emergency and confinement establishes a situation of vulnerability in women victims of domestic violence. In Peru, through the AURORA Program of the Ministry of Women and Vulnerable Population, there are Women's Emergency Centers (CEM), which are offices where the victim can file a complaint about physical, psychological, or sexual aggression. (3)

In Metropolitan Lima, during the months of strict confinement, there was an absence of complaints about all types of violence, but the registry was restored as of July. According to the program's Observatory, the CEMs are concentrated in the districts of Central Lima; however, during the confinement, complaints were more frequent in the districts located in the northern and southern areas, which is why we recommend that the institution implement CEMs in peripheral localities.



Additionally, the dynamics of crimes such as robbery and attempted robbery of objects or vehicles, swindling, and extortion recorded during the pandemic were evaluated. The descriptive analysis uses administrative data of complaints at the district level, comparing the figures with the pre-quarantine period. The results show a decrease from March 2020 coinciding with the restriction measures; in the following months, this figure rises without reaching the values of previous years. (4)

Finally, to domestic violence and citizen security, it is observed that the centers of complaints are concentrated in the area of Central Lima; however, during the pandemic, the districts that presented



slightly higher rates of complaints are located in the northern and southern areas of Metropolitan Lima. It is worth mentioning that these localities have a higher vulnerability index concerning their economy, education, access to health services, sanitation and social programs.

The results obtained will be shared remotely with the corresponding governmental institutions, expressing our interest in working together.

e. Recommendations

- Improve the flow of complaints from victims of domestic violence or crime during future states of emergency or pandemics.

- For the evaluation of second-order indicators, long timeframes (quarterly or semi-annually) should be considered to allow a directional evolution to be seen.

- The projects and actions that Institution will develop to stop or lessen the second-order effects should have a multidisciplinary approach, establishing dialogue tables or focal groups that involve actors from different social, age and labor groups.

f. Community Impacts and Limitations

- The impact on the community as a result of covid-19 is present in all senses (economic, social, mental) which conditions an exacerbation of inequality gaps, specifically that corresponding to gender, with women and other discriminated groups such as the migrant community or the disabled being the most affected by the second-order effects.

- The main limitation for the development of the project corresponds to the access to institutional information, the data are public; however, the format required for the analysis requires that they be found in greater temporal and spatial detail, allowing for an adequate follow-up of the indicators.

g. Future Directions (next steps for teams, use of data, local capacity influenced by project)

- We are waiting for the hosting of the blog created for the dissemination of information on the first and second order impacts of Covid-19.
http://www.pruebacovid.andeanquipu.org/729-2/

- We will also seek to expand the evaluation of other vulnerable sectors such as the elderly and people with disabilities. Specifically, the employment rate and their access to social programs and health services.

5. Events and Activities

a. Workshops

The work team conducted two virtual workshops for training in the use of the following software: the Stata statistical package and the ArcGIS Geographic Information System with support from the Quito Hub and QGIS provided by Dr. Junghwan Kim.

Given the state of emergency in Peru, communication with government institutions was virtual. In this context, we established communication with the Ministry of Women and Vulnerable Populations, the Ministry of the Interior, and the Ministry of Education. We showed the results on domestic violence during the C2M2 symposium held June 22-25.

In addition, we created a blog to better disseminate the first and second-order impacts. To date, we are still waiting for the hosting to make the official publication of this platform.
Link to the blog: http://www.pruebacovid.andeanquipu.org/729-2/

On the other hand, we organized virtual meetings in the Research Unit of EMERGE-UPCH for the communication of the monitoring and progress of the pandemic, in addition to the evaluation of research work related to COVID-19.

b. Surveys

In addition to the information provided by government institutions, we used information from surveys conducted by the National Institute of Statistics and Informatics:
Information available: http://iinei.inei.gob.pe/microdatos/

Survey	Information	Data
National Household Survey	It is updated, quarterly. It uses a representative sample of Metropolitan Lima for the inference of results.	Internet access Households benefiting from social programs
Permanent Employment Survey		Employment and unemployment rate Average Monthly Income
National Survey of Budgetary Programs		Perception of Insecurity Rate of victims by type of criminal act

c. Data Collected

	Institution	Data collected
1	Ministry of Women and Vulnerable Populations	Domestic Violence: Violence against Women and Family Members
2	Ministry of the Interior	Crimes
3	Ministry of Education	School enrollment
4	Ministry of Foreign Trade and Tourism	Arrival and Departure of foreign citizens at Jorge Chavez airport.

5		Arrival and Departure of national citizens at Jorge Chavez airport.
6	Ministry of Environment	Weather and air quality elements: T°, P, H. PM2.5
7	Ministry of Culture	Alert of attacks to tourist sites
8	Ministry of Development and Social Inclusion	Bonus: "Universal", "familiar"
9	Ministry of Labor and Employment Promotion	Bonus for workers
10	National Registry of Identification and Civil Status	Civil Registry of Births
11		Civil Registry of Deaths
12	Permanent Employment Survey	Employed and unemployed population
13	National Household Survey Indicators are quarterly and are estimated for Metropolitan Lima	Households benefiting from social programs
14		Internet access
15		Employed and unemployed population
16		Average monthly income from job
17	Ministry of Health	Cases Covid-19
18		Deaths Covid-19
19		Vaccination Covid-19
20		Sars-Cov2 variants
21		Occupancy of hospital beds Covid-19
22		ICU bed occupancy Covid-19
23		Morbidities attended in emergency
24		Population with anemia
25		Children receiving iron supplementation

6. Appendices

1. Appendices 1: “Data Latin America Hub.xlsx. (Data: Spreadsheet of data for each hub X city project, access and sharing information)
2. Appendices 2: “Tools and methods.pdf. (Tools and Methods used to generate data)
3. Appendices 3: “Method HDX Data”. (View and download data on the HDX platform) Hub Latin America - Humanitarian Data Exchange (humdata.org)
4. Appendices 4: “Partnerships established” (Flow diagram of the institutional relationships established during the project)

7. Annexed

1. Annexed 1: Causal loop diagram for the city of Lima

Latin America HUB C2M2 Cusco

November, 2021

C2M2 Cusco – TEAM
Santos Mera
Delia Ramos

HUB Latin America Lead
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Abstract

The C2M2 Project in Cusco has compiled information regarding the evolution of the Pandemic and its impact on tourism, education and family violence. The number of infected and deceased in the region of Cusco, depended on the measures taken by the State and the vaccination process, which has been one of the slowest and most controversial in the world, starting only in February 2021 and as of July 15, only 11% of the population being fully vaccinated.

Tourism relates to various activities, hotels and restaurants, guidance and transportation, sale of handicrafts and souvenirs, entrance to tourist places such as museums, churches, archaeological sites, tourist circuits and corridors, etc., especially in the case of Cusco, which embraces one of the modern wonders of the world such as Machu Picchu.

In education, the current conditions of energy and internet, and access to these services, played an important role in being able to continue education activities at different levels, but mainly in regular basic education. Students from primary and high school education saw an unusual migration, from the city to the countryside and from private educational centers to state ones.

Similarly, family violence has had a similar dynamic. The complaints received at the Women's Emergency Centers (CEM) reduced in quantity, but not because they had decreased, but because these establishments were affected by restrictions, as they are not considered essential services, this is something that is validated in contrast to the record of calls to line 100.

Contenido

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TOURISM

Cusco City Project

1. Description of economy

According to the document "Socio-Economic Labor Diagnosis - Cusco", Peru has experienced two phases of economic development, between 2002 - 2013 and 2014 - 2019 with a GDP growth of 6.1% and 3.1% respectively.

The Cusco Region showed irregular behavior, with the highest peak in 2013 with 16.3%, and later showing slight annual increases. The lowest peak occurred in 2017 with -1.5%. In 2019, there was an improvement, reaching 2.2%. See Graph 11 and Table 1.

Graph 1: Evolution of GDP 2010-2010

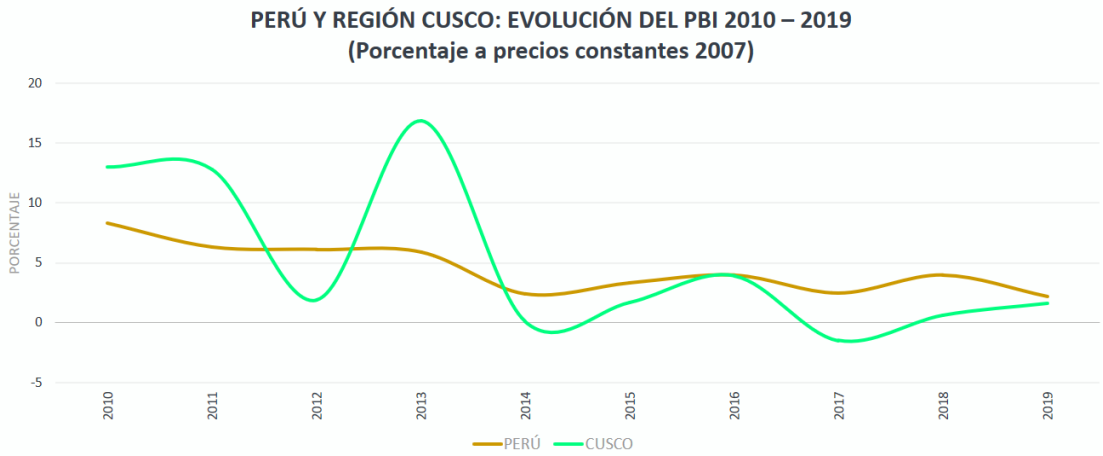


Table 01: GDP from 2010 to 2019

AÑO	PERÚ	CUSCO
2010	8.3	13
2011	6.3	12.8
2012	6.1	1.9
2013	5.9	16.9
2014	2.4	0.1
2015	3.3	1.7
2016	4	3.9
2017	2.5	-1.5
2018	4	0.6
2019	2.2	1.6

This document also mentions the economic activities carried out in the Cusco Region. Among them are Mining extraction, Commerce, Construction, Manufacturing and Services. The Services sector is the one

that shows the greatest movement. Under this sector, we find activities of electricity, gas and water; telecommunications, information services, public administration, defense, accommodation and restaurants and other services (education, financial services, services provided to third parties, among others). The Cusco Urban Development Plan of 2023, mentions "that Tourism is the most representative activity of the province. However, it has also become one of the causes of the rising cost of living, the high price of housing, mainly in sectors close to the Historic Center, illegal traffic of land for construction, population of hillsides and land not suitable for construction, environmental pollution, noise pollution and visual pollution. " The increase in the cost of living is associated with the designation of the Historic Sanctuary of Machupicchu as a World Modern Wonder. This world recognition attracts, each year, a large number of national and foreign tourists, being the months of June to August the months of high season, due to the absence of rain, which allows the tourists to visit places without problems like closed roads due to heavy rains. With the declaration of a state of health emergency by the COVID-19 Pandemic, restrictive measures were adopted such as the closure of borders, social distancing and closure of non-essential activities, causing great anxiety in the population. Tourist activity and binding activities (Hotels, Restaurants, Craftsmen, Travel Agencies, Bars and Discotheques) quickly showed the hit of the pandemic, as shown in Table 2 and 3.

Table 2: Cusco: Number of Tourist Tickets Sold

Mes	2018	2019	2020
Enero	73058	70986	71300
Febrero	56646	55017	54853
Marzo	73019	66238	0
Abril	76109	93688	0
Mayo	90493	93460	0
Junio	87637	87808	0
Julio	123027	122833	0
Agosto	124723	120579	0
Septiembre	103698	103395	0
Octubre	103074	103536	0
Noviembre	81548	81989	0
Diciembre	63933	66125	0
Total	1056965	1065654	126153

Table 3: VISIT OF NATIONAL AND FOREIGN TOURISTS THE MAIN TOURIST PLACES OF THE CUSCO REGION

MES	2019	2020	2021

	NACIONAL	EXTRANJERO	TOTAL	NACIONAL	EXTRANJERO	TOTAL	NACIONAL	EXTRANJERO	TOTAL
ENERO	155 166	231 039	386 205	188 674	333 330	522 004	95524	7966	103490
FEBRERO	131 458	206 984	338 442	144 416	209 861	354 277	0	0	0
MARZO	96 855	293 260	390 115	51 998	106 318	158 316	39383	4841	44224
ABRIL	108 279	453 807	562 086	0	0	0	37428	10073	47501
MAYO	232 962	477 263	710 225	0	0	0	79219	23450	102669
JUNIO	148 663	455 951	604 614	0	0	0	95559	33271	128830
JULIO	207 463	572 092	779 555	0	0	0	212431	59058	271489
AGOSTO	272 673	505 789	778 462	0	0	0	278827	67809	346636
SETIEMBRE	207 987	447 716	655 703	0	0	0			
OCTUBRE	221 389	422 087	643 476	13 746	799	14 545			
NOVIEMBRE	206 443	355 529	561 972	59 537	7 485	67022			
DICIEMBRE	112 520	295 759	408 279	78 899	14 076	92975			
TOTAL	2 101 858	4 717 276	6 819 134	537 270	671 869	1 209 139	838371	206468	1044839

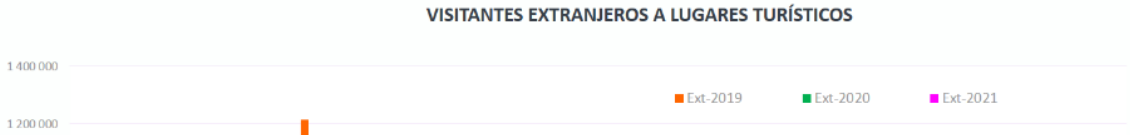
Among the main tourist places in the Cusco region are:

- Inka Chachabamba Trail (Km. 104)
- Manuel Chávez Ballón Site Museum
- Inka Intihuatana Trail (Km.122)
- MachuPicchu Historic Sanctuary
- Inka Piskacucho Trail (Km.82)
- Saqsayhuaman
- Ollantaytambo
- Choquequirao Archeological Park
- Pisaq
- Raqchi Archeological Park
- Pikillaqta Archeological Park
- Cusco Regional Historic Museum
- Moray Archeological Complex
- Inka Qorywayrachina Trail
- MachuPicchu Archeological Complex

On March 16, the Government declared a state of national emergency with Supreme Decree No. 044-2020-PCM because of COVID-19, which is why there are zero visitors in some months.

In Graph 02, you can see the variation of the tourist flow, 27% of foreign tourists are observed with respect to 2019, these data are updated to September 17, 2021. In Table 04, the decrease in arrival is observed of domestic and foreign flights to the Alejandro Velasco Astete International Airport.

Graph 2: Foreign visitors to tourist places



Graph 3: National visitors to tourist places

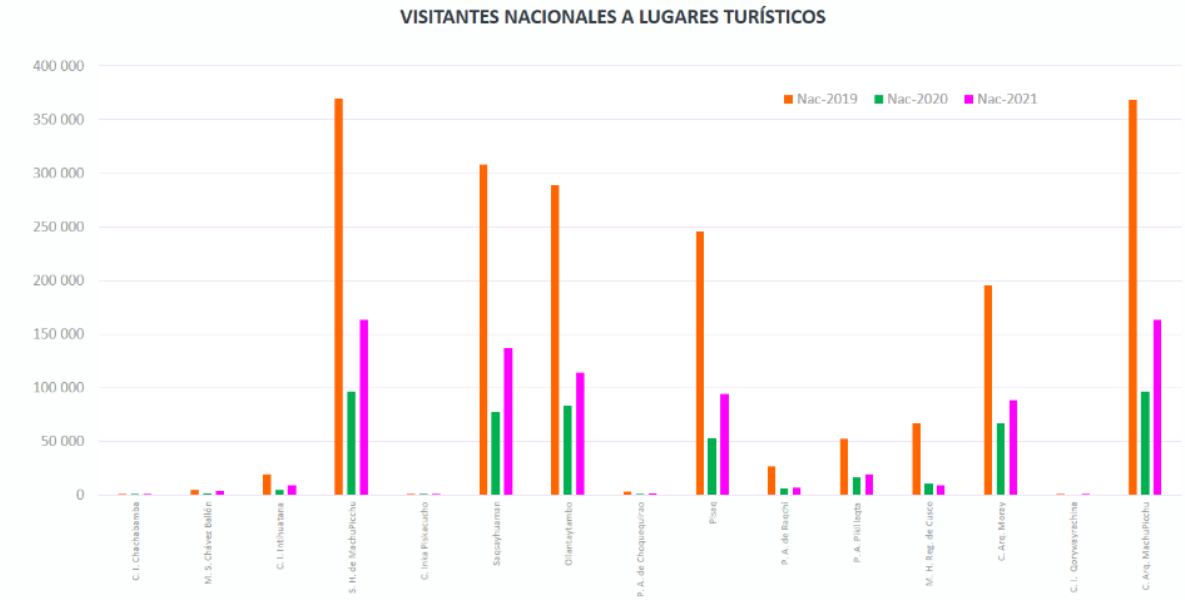


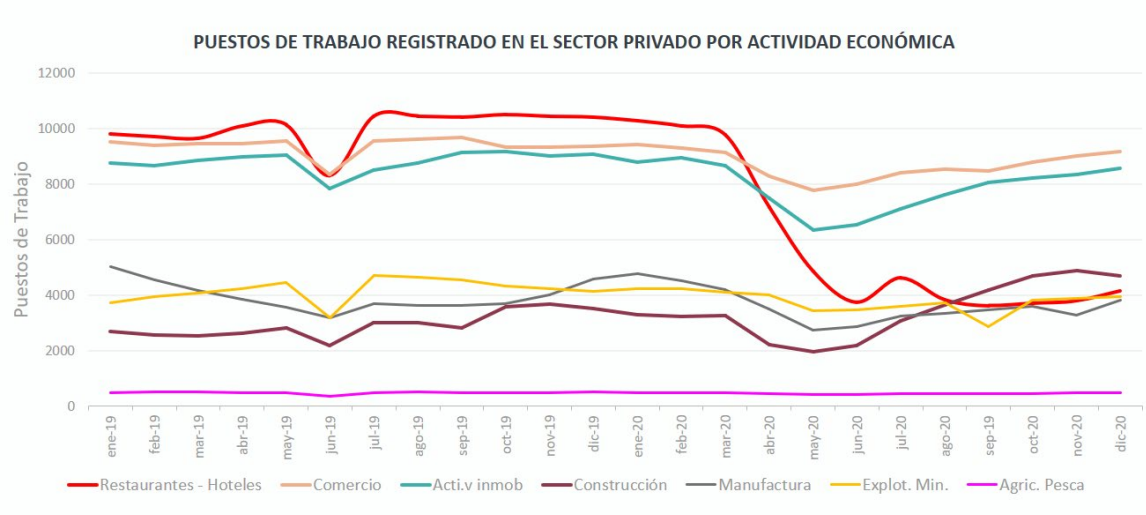
Table 4: CUSCO: GENERAL MOVEMENT OF PASSENGERS ON NATIONAL AND FOREIGN FLIGHTS AT THE ALEJANDRO VELASCO ASTETE INTERNATIONAL AIRPORT,

MES	2019			2020		
	TOTAL	NACIONAL	EXTRANJERO	TOTAL	NACIONAL	EXTRANJERO
ENERO	288 282	276 727	11 555	326 574	310 620	15 954
FEBRERO	263 759	253 878	9 881	308 334	293 289	15 045
MARZO	281 664	270 770	10 894	156 645	149 317	7 328
ABRIL	312 907	302 413	10 494	5 407	4 329	1 078
MAYO	342 038	331 644	10 394	1 873	1 873	0
JUNIO	323 367	313 270	10 097	990	990	0
JULIO	381 311	365 755	15 556	9 177	19 177	0
AGOSTO	388 705	374 189	14 516	6 438	6 292	146
SETIEMBRE	348 531	336 218	12 313	3 915	3 913	2
OCTUBRE	348 662	335 384	13 278	37 281	37 281	0
NOVIEMBRE	319 052	306 028	13 024	57 830	57 830	0
DICIEMBRE	307 891	294 316	13 575	89 167	89 167	0
TOTAL	3 906 169	3 760 592	145 577	1 013 631	974 078	39 553

Regarding the employment situation, Graph 04 shows the monthly variation of jobs by economic sector. For the month of June 2020, a drastic drop in jobs shows for the Restaurants and Hotels sector, which continues until the end of the same year.

"There are about 100,000 jobs in the tourism sector and there is great concern that it cannot be recovered in the medium or long term."

Graph 4: Registered jobs in the private sector by economic activity



2. Vulnerable Populations

The document "Peru: Living conditions of the population at risk from the COVID-19 pandemic", mentions that "The Economic Commission for Latin America and the Caribbean (ECLAC) considers socially vulnerable groups, when there is a contextual factor that makes them more likely to face adverse circumstances for their social insertion and personal development [...]. The exercise of behaviors that involve greater exposure to harmful events, or the presence of a shared basic attribute (age, sex, ethnic condition) that is it supposes it confers risks or common problems."

The vulnerable groups identified in this document are "ethnic groups (indigenous people who, beyond their poverty, live in situations of risk, Afro-descendants), minors with special educational needs (with disabilities or limitations or with exceptional talents or capacities), girls, boys and young people who work affecting their health and education. Also, migrants, people with disabilities, older adults, young people who neither study nor work, single women heads of households with dependents, people in a situation of forced displacement for violence, religious minorities, sexual minorities and domestic staff, considered as populations in situations of discrimination, among other groups. "

Through Supreme Decree No. 094-2020-PCM, the Peruvian Government established the measures that the entire population must take for a new social coexistence and established the State of National

Emergency and the mandatory social isolation (quarantine). This caused the closure of various economic activities and therefore unemployment. The restriction of free movement, prevented people from developing any economic activity that allowed them to generate income and buy food.

Faced with this scenario, the provincial Municipality, through the Human and Social Development Administration, promoted the expansion of social programs, like the opening of two new popular soup kitchens, with 38 soup kitchens that operate throughout the province of Cusco.

The Ministry of Development and Social Inclusion admits that many soup kitchens stopped serving due to the increase in COVID-19 infections.

Another group that affected by social isolation measures was the education sector. The beginning of the school year coincided with the declaration of the pandemic. In a first stage the beginning of school was suspended, given the uncertainty of the behavior of COVID-19 would be (every 2 weeks the population was informed of the expansion or modification of health security measures), therefore proposing the development of virtual classes.

Remote or virtual work was also an option for sectors that could adapt to this system. The Covid-19 pandemic has caused not only repercussions on physical health, but also mental health and in different socioeconomic areas. The alternative of working and studying from home, in many cases in unfavorable conditions due to overcrowding, lack of access to basic services, increased the risk of infection and was even higher if people suffered from a pre-existing clinical conditions, many families counted with 1 or no devices with internet access.

As of 2019, 18.8% of the enrolled school-age population had internet at home, 15.3% cable TV or satellite antenna at home and 96.7% had cell phones at home.

It is worth mentioning that the level of poverty in the Cusco Region was at 20.2% and extreme poverty was at 2.9%, A person is considered in a situation of poverty when there is a monthly per capita expenditure that does not cover the cost of the equivalent regular basic basket, currently on $352 soles per month. Extreme poverty meanwhile, refers to a monthly per capita expense lower than the cost of the regular basic food basket equivalent to $187 soles per month.

One of the effects of living together at home and carrying out virtual activities simultaneously is observed in the variation of drinking water and electricity.

- WATER CONSUMPTION

According to the National Superintendency of Sanitation Services (SUNASS), water consumption rate is classified in: Residential and Non-residential Class (see table 05)

Table 5: CLASSIFICATION OF WATER CONSUMPTION

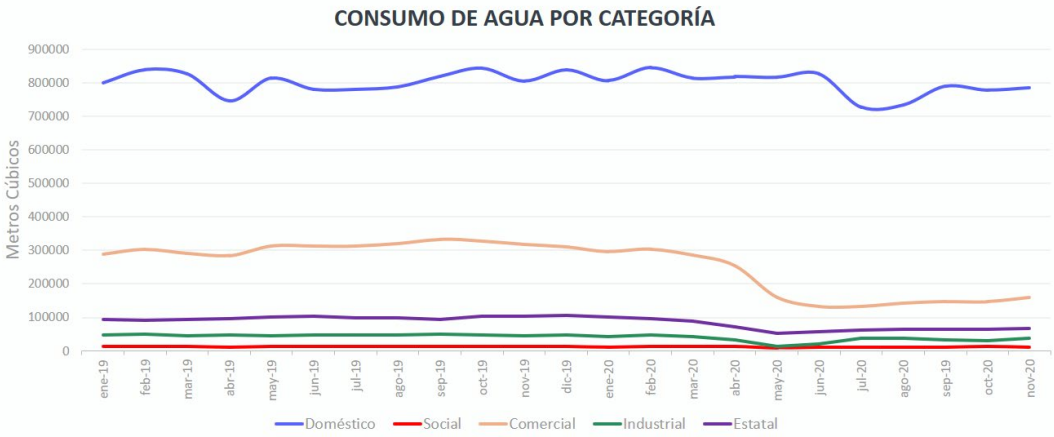
Clase Residencial	Clase No Residencial
Categoría Social	Categoría Comercial y Otros
Categoría Doméstica	Categoría Industrial
	Categoría Estatal

Table 06 shows the Drinking Water Consumption Record by category. Graph 05 shows constant values in the domestic consumption of drinking water, with a slight decrease in consumption in the month of July, coinciding with the national holidays.

Table 06: RECORD OF DRINKING WATER CONSUMPTION BY CATEGORY

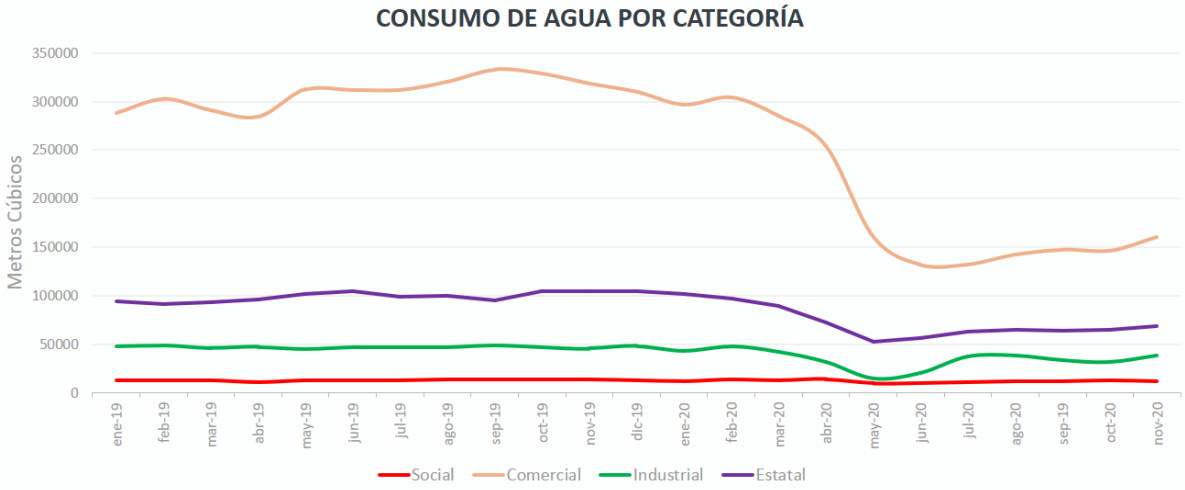
MESES	CATEGORÍA					TOTAL
	RESIDENCIAL		NO RESIDENCIAL			
	Doméstico	Social	Comercial	Industrial	Estatal	
Ene-19	800096	12990	287851	47581	94293	1242811
Feb-19	839622	12691	302647	49021	91823	1295804
Mar-19	826339	13110	290697	46277	92889	1269804
Abr-19	745589	11390	284564	47315	96418	1185276
May-19	814139	13032	312493	44879	102024	1286567
Jun-19	780627	12658	312171	46881	104779	1257116
Jul-19	780627	12658	312171	46881	99025	1282684
Ago-19	788411	13482	320204	46860	99570	1268527
Sep-19	818442	13982	332794	49100	95100	1309861
Oct-19	843181	13566	328636	46833	104422	1336638
Nov-19	804722	13550	319026	45603	104773	11287674
Dic-19	838880	12996	309968	48101	105037	1314982
Ene-20	805923	12258	296414	43607	101538	1259740
Feb-20	845317	13478	304077	47528	97037	1307437
Mar-20	814095	12572	285202	42410	89308	1243587
Abr-20	817919	13993	254204	32033	72277	1190426
May-20	815846	9625	160874	14646	52989	1053980
Jun-20	827279	10178	131990	20256	56396	1046099
Jul-20	727828	10889	132537	37645	62715	971614
Ago-20	734035	11592	142291	38680	65194	991792
Sep-19	788995	11812	147481	33427	64109	1045824
Oct-20	778063	12739	146384	31747	64756	1033689
Nov-20	785724	11931	160131	38001	68355	1064142

Graph 5: Water consumption by category

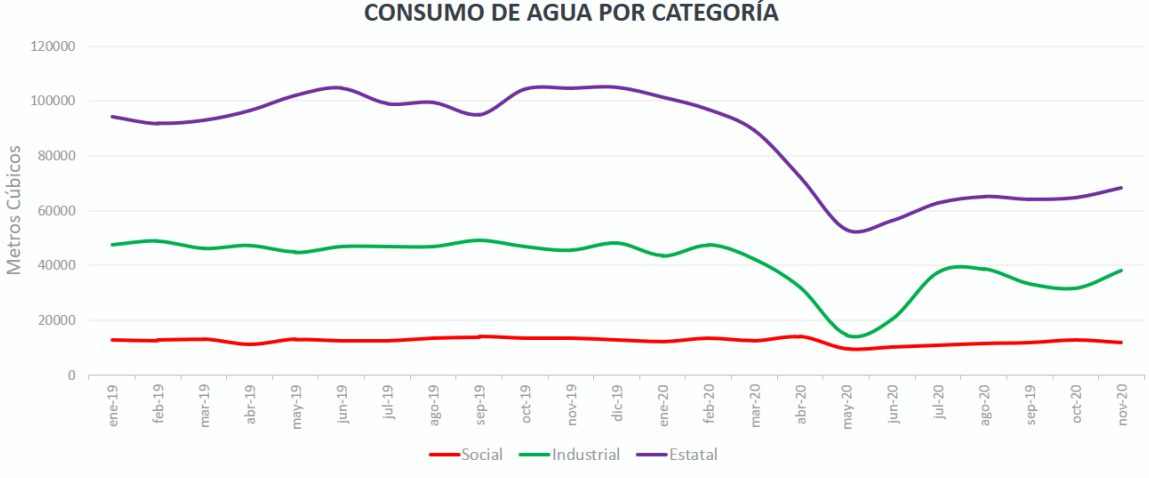


Graphs 6 and 7 show a large decrease in the consumption of commercial, state and industrial drinking water in May, coinciding with the decrease in jobs and from there it remains constant.

Graph 6: Water consumption by category



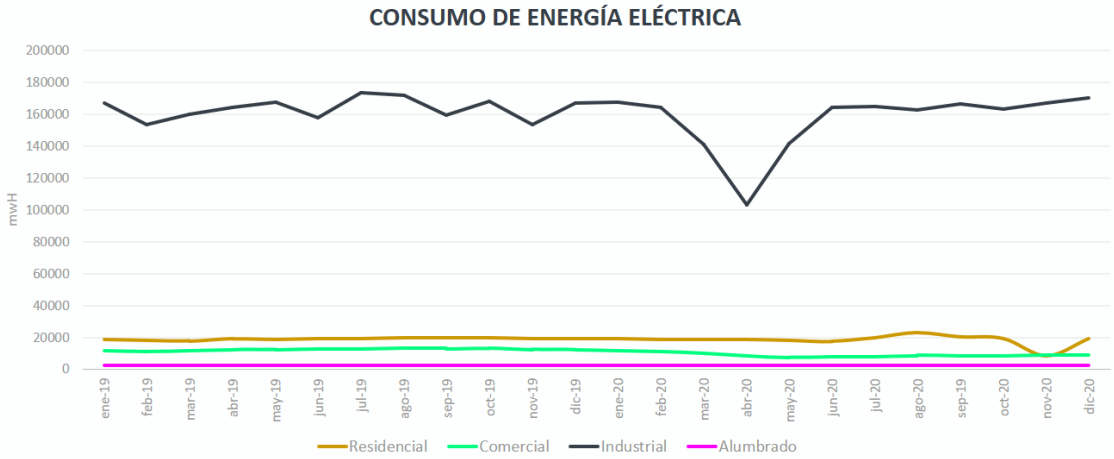
Graph 6: Water consumption by category



- ELECTRIC ENERGY CONSUMPTION

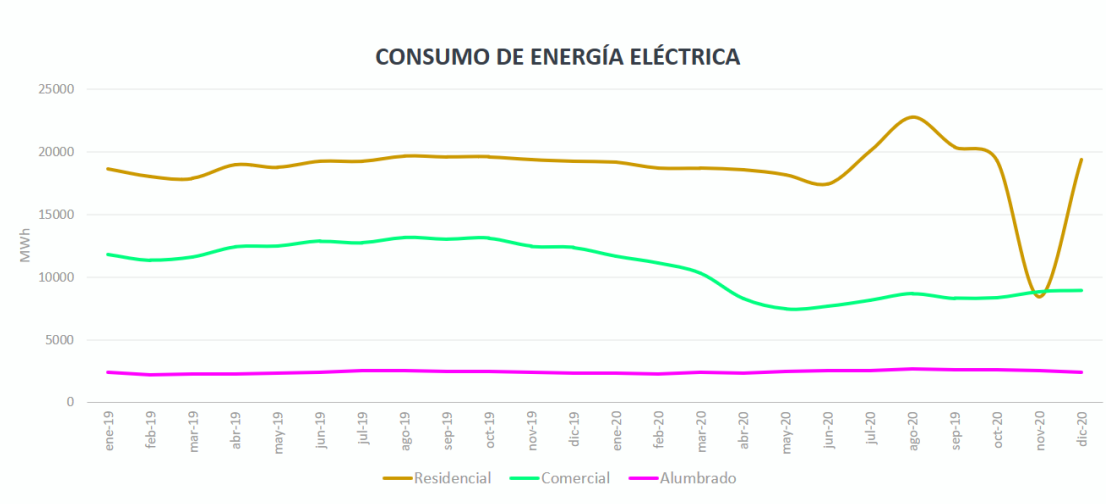
Electric energy consumption is measured in MegaWattsxhour (MWh), in the Industrial, Commercial, Residential and Public Lighting category. In Graph 8 it is observed that at the level of industrial consumption there is a decrease in the month of April 2020, one month after the declaration of the state of emergency, then we make an enlargement in the graph to observe the other categories (See Graph 09).

Graph 8: Electricity consumption



In Graph 9, we note an increase in Residential consumption, in August 2020 and a decrease in November, and for Commercial consumption, there is a decrease in consumption, in the month of May, which remains constant, coinciding with the highest number of positive cases for COVID-19.

Graph 9: Electricity consumption



- ELECTRICAL SYSTEM

The electrical system is defined as the set of facilities, conductors and equipment necessary for the generation, transport and distribution of electrical energy.

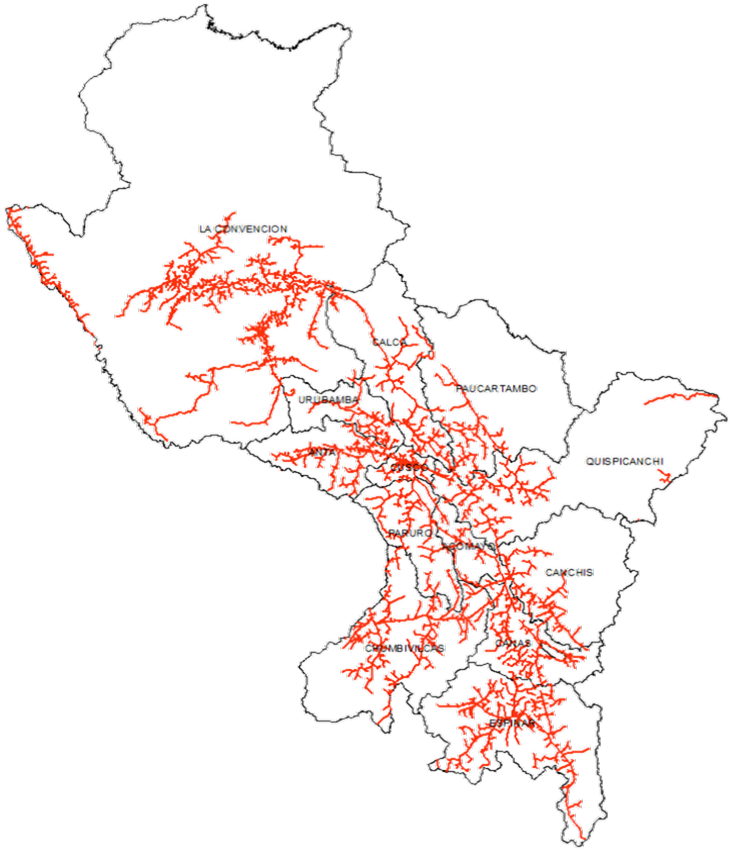


Figure 01

DISTRIBUTION OF THE ELECTRICAL SYSTEM IN THE CUSCO REGION

Sistema Eléctrico	
Provincia	**Longitud (Km)**
Acomayo	225.119
Anta	487.364
Calca	606.227
Canas	609.368
Canchis	414.616
Chumbivilcas	910.710
Cusco	401.873
Espinar	1 028.382
La Convencion	2 347.889
Paruro	429.469
Paucartambo	388.068
Quispicanchi	649.649
Urubamba	308.940

Table 07

LENGTH OF THE ELECTRICAL SYSTEM IN KM.

USO	2019		2020	
	Etotal_MWh	Factura_Mi	Etotal_MWh	Factura_Mi
RESIDENCIAL	228 147.41114	142 753.36350	220 973.10692	144 725.10170
COMERCIAL	149 312.32100	87 735.64410	107 753.11400	67 123.73920
INDUSTRIAL	1 961 700.53745	4 439 691.91928	1 874 482.99592	454 551.99644
ALUMBRADO PÚBLICO	28 654.15800	19 159.83380	29 741.85700	21 382.16140

Table 9.- ELECTRICAL ENERGY CONSUMPTION 2019-2020

- STUDENT POPULATION

Due to the pandemic, many educational centers have found it necessary to adapt the teaching modality to the virtual modality, causing students to change schools, because they cannot pay the monthly payments, because they do not have internet access or signal of radio - tv or for not being satisfied with the service provided. Originating the migration of the student population from the city to the countryside.

Table 10.- MAGNITUDES OF EDUCATION IN PERU

MAGNITUDES DE LA EDUCACIÓN EN EL PERÚ

Vista Rápida del Sistema Educativo

1. Matrícula

CUSCO 2019

CUSCO: MATRÍCULA EN EL SISTEMA EDUCATIVO POR TIPO DE GESTIÓN Y ÁREA GEOGRÁFICA, SEGÚN ETAPA, MODALIDAD Y NIVEL EDUCATIVO, 2019

Etapa, modalidad y nivel educativo	Total	Gestión		Área		Sexo		Pública		Privada	
		Pública	Privada	Urbana	Rural	Masculino	Femenino	Urbana	Rural	Urbana	Rural
Total	**395 106**	**307 333**	**87 773**	**307 625**	**87 481**	**199 682**	**195 424**	**222 231**	**85 102**	**85 394**	**2 379**
Básica Regular	**343 875**	**287 006**	**56 869**	**256 783**	**87 092**	**175 765**	**168 110**	**202 218**	**84 788**	**54 565**	**2 304**
Inicial	72 859	59 031	13 828	50 817	22 042	36 966	35 893	37 540	21 491	13 277	551
Primaria	151 382	125 958	25 424	110 012	41 370	77 325	74 057	85 989	39 969	24 023	1 401
Secundaria	119 634	102 017	17 617	95 954	23 680	61 474	58 160	78 689	23 328	17 265	352
Básica Alternativa	**10 734**	**7 656**	**3 078**	**10 583**	**151**	**5 508**	**5 226**	**7 518**	**138**	**3 065**	**13**
Básica Especial	**978**	**931**	**47**	**978**	**-**	**516**	**462**	**931**	**-**	**47**	**-**
Técnico-Productiva	**10 495**	**4 219**	**6 276**	**10 352**	**143**	**4 396**	**6 099**	**4 138**	**81**	**6 214**	**62**
Superior No Universitaria	**29 024**	**7 521**	**21 503**	**28 929**	**95**	**13 497**	**15 527**	**7 426**	**95**	**21 503**	**-**
Pedagógica	5 089	2 133	2 956	5 089	-	1 363	3 726	2 133	-	2 956	-
Tecnológica	23 586	5 039	18 547	23 491	95	11 895	11 691	4 944	95	18 547	-
Artística	349	349	-	349	-	239	110	349	-	-	-

Fuente: MINISTERIO DE EDUCACIÓN - Censo Educativo.

Table 11.- MAGNITUDES OF EDUCATION IN PERU

MAGNITUDES DE LA EDUCACIÓN EN EL PERÚ

Vista Rápida del Sistema Educativo

1. Matrícula

CUSCO 2020

CUSCO: MATRÍCULA EN EL SISTEMA EDUCATIVO POR TIPO DE GESTIÓN Y ÁREA GEOGRÁFICA, SEGÚN ETAPA, MODALIDAD Y NIVEL EDUCATIVO, 2020

Etapa, modalidad y nivel educativo	Total	Gestión		Área		Sexo		Pública		Privada	
		Pública	Privada	Urbana	Rural	Masculino	Femenino	Urbana	Rural	Urbana	Rural
Total	**406 647**	**319 043**	**87 604**	**265 421**	**141 226**	**205 342**	**201 305**	**181 522**	**137 521**	**83 899**	**3 705**
Básica Regular	**351 230**	**298 145**	**53 085**	**212 821**	**138 409**	**179 551**	**171 679**	**162 767**	**135 378**	**50 054**	**3 031**
Inicial	72 871	61 264	11 607	41 839	31 032	37 014	35 857	31 031	30 233	10 808	799
Primaria	157 920	133 089	24 831	95 894	62 026	80 657	77 263	72 798	60 291	23 096	1 735
Secundaria	120 439	103 792	16 647	75 088	45 351	61 880	58 559	58 938	44 854	16 150	497
Básica Alternativa	**9 279**	**6 915**	**2 364**	**8 788**	**491**	**4 476**	**4 803**	**6 625**	**290**	**2 163**	**201**
Básica Especial	**1 168**	**1 141**	**27**	**1 010**	**158**	**661**	**507**	**983**	**158**	**27**	**-**
Técnico-Productiva	**9 067**	**5 323**	**3 744**	**8 171**	**896**	**3 451**	**5 616**	**4 900**	**423**	**3 271**	**473**
Superior No Universitaria	**35 903**	**7 519**	**28 384**	**34 631**	**1 272**	**17 203**	**18 700**	**6 247**	**1 272**	**28 384**	**-**
Pedagógica	4 693	2 172	2 521	4 473	220	1 270	3 423	1 952	220	2 521	-
Tecnológica	30 649	4 786	25 863	29 760	889	15 492	15 157	3 897	889	25 863	-
Artística	561	561	-	398	163	441	120	398	163	-	-

Fuente: MINISTERIO DE EDUCACIÓN - Censo Educativo.

Table 12 REGISTRATION NUMBER 2019 - 2020

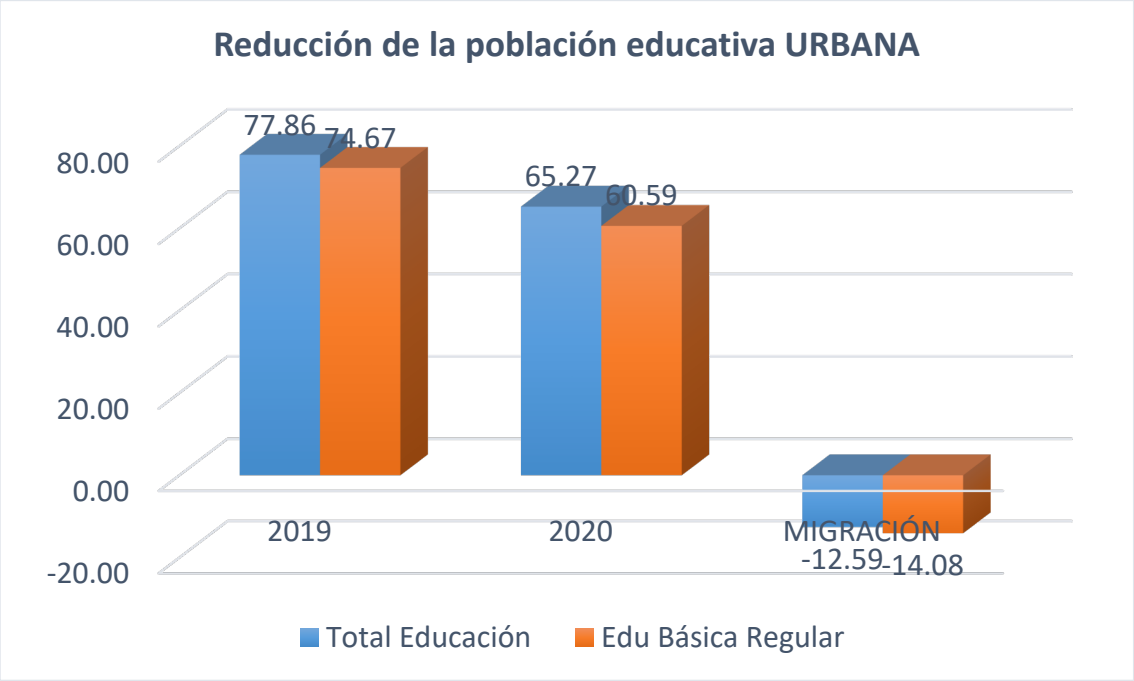
Matrícula CUSCO 2019					
	Total	Urbano	Rural	Urbano %	Rural %
Total Educación	395106	307625	87481	77.86	22.14
Edu Básica Regular	343875	256783	87092	74.67	25.33

Matrícula CUSCO 2020					
	Total	Urbano	Rural	Urbano %	Rural %
Total Educación	406647	265421	141226	65.27	34.73
Edu Básica Regular	351230	212821	138409	60.59	39.41

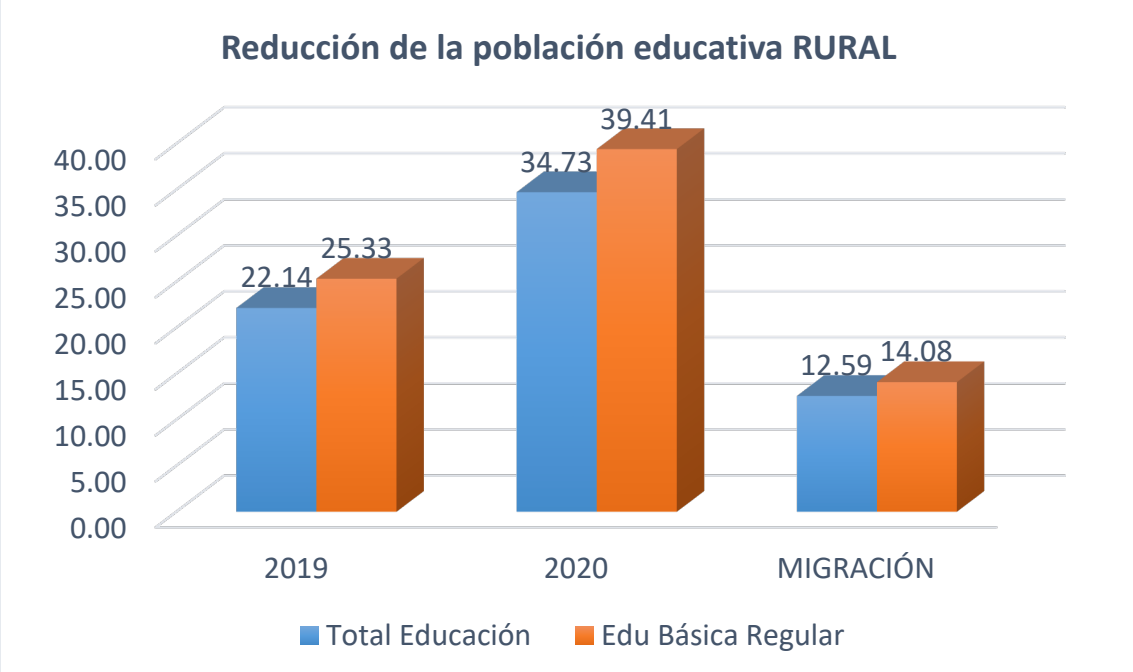
Urbano %			
	2019	2020	MIGRACIÓN
Total Educación	77.86	65.27	-12.59
Edu Básica Regular	74.67	60.59	-14.08

Rural %			
	2019	2020	MIGRACIÓN
Total Edu	22.14	34.73	12.59
Edu Básica Regular	25.33	39.41	14.08

Graph 10: Reduction of the URBAN educational population

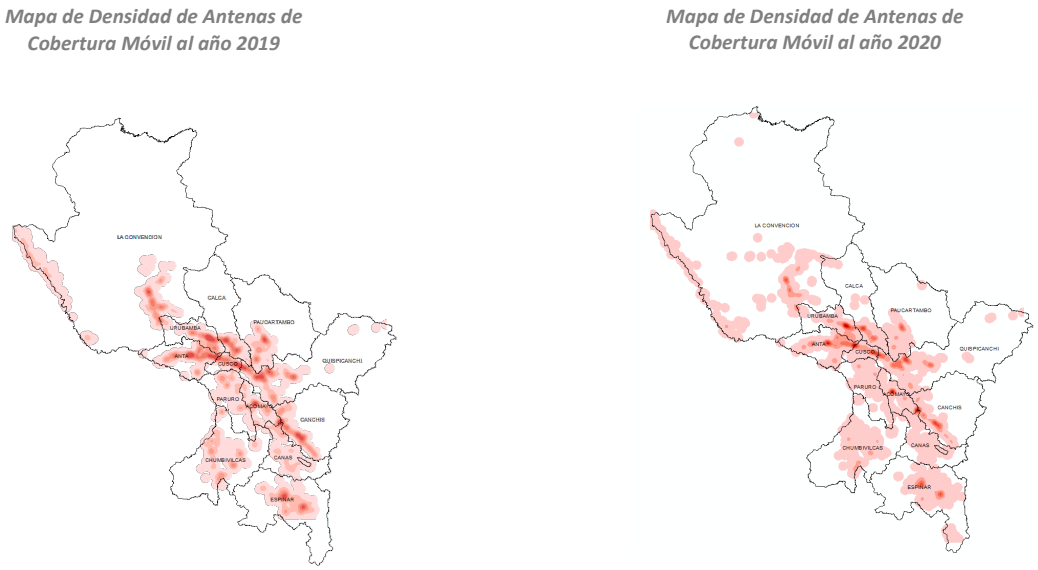


Graph 11: REDUCTION OF THE RURAL EDUCATIONAL POPULATION



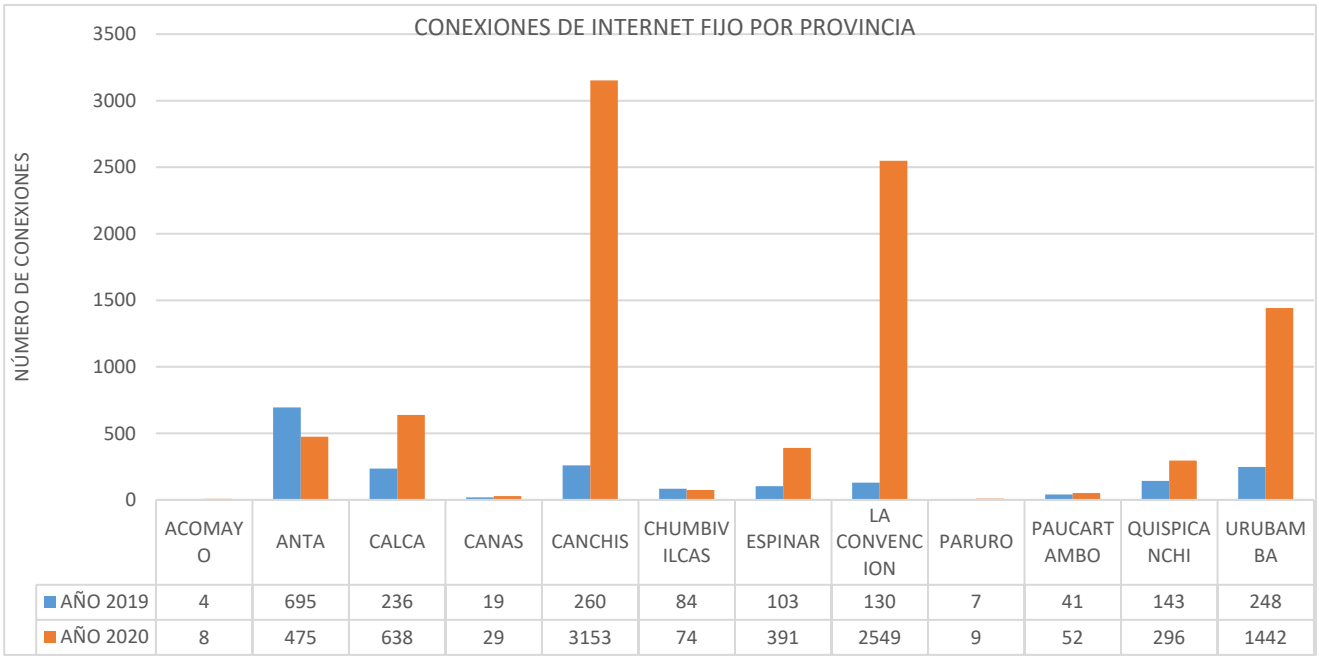
- INTERNET CONNECTIVITY

Figure 02: DENSITY OF MOBILE COVERAGE ANTENNAS 2019 - 2020



In graph 12 we can see the increase in fixed internet connections in some provinces, Cusco is not included by scale, otherwise these increases would not be appreciated.

Graph 12: Fixed internet connections by province



	ACOMAYO	ANTA	CALCA	CANAS	CANCHIS	CHUMBIVILCAS	ESPINAR	LA CONVENCION	PARURO	PAUCARTAMBO	QUISPICANCHI	URUBAMBA
AÑO 2019	4	695	236	19	260	84	103	130	7	41	143	248
AÑO 2020	8	475	638	29	3153	74	391	2549	9	52	296	1442

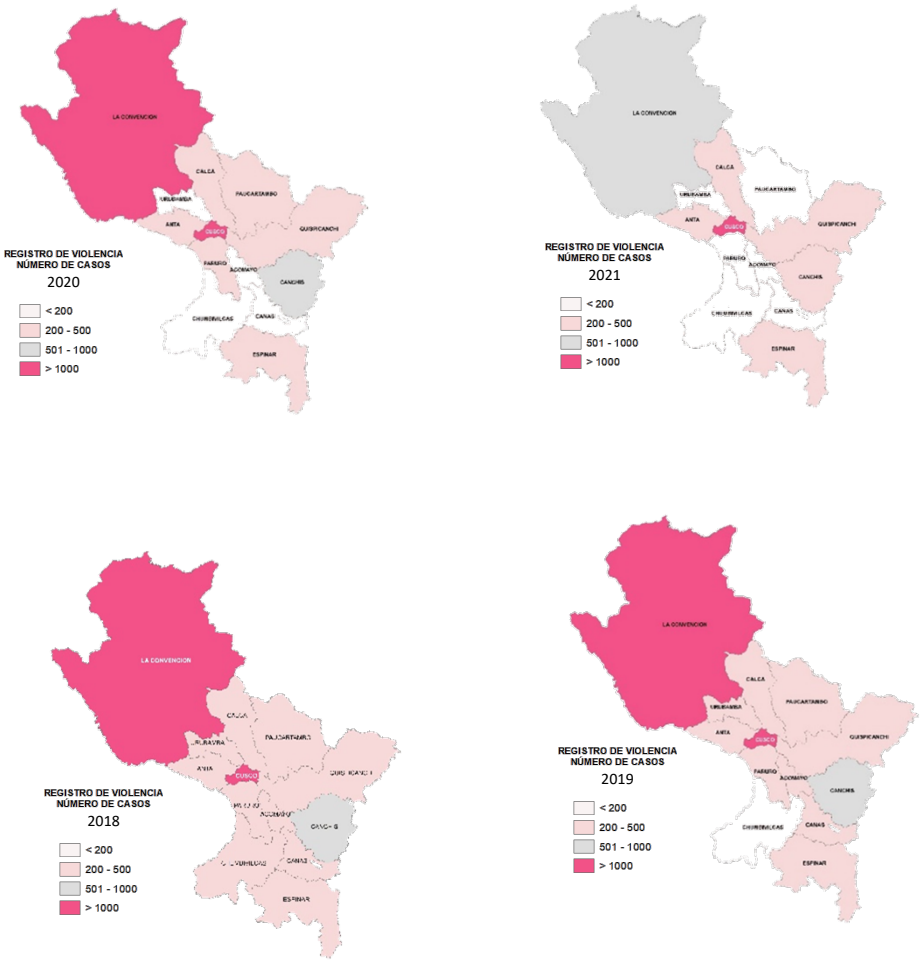
- DOMESTIC VIOLENCE

The data was obtained from the georeferenced information system of the interventions of the Ministry of Women and Vulnerable Populations – MIMP at the provincial level, and allows to visualize basic statistics of the Women's Emergency Centers -CEM, the Telephone Attention Service Line 100.

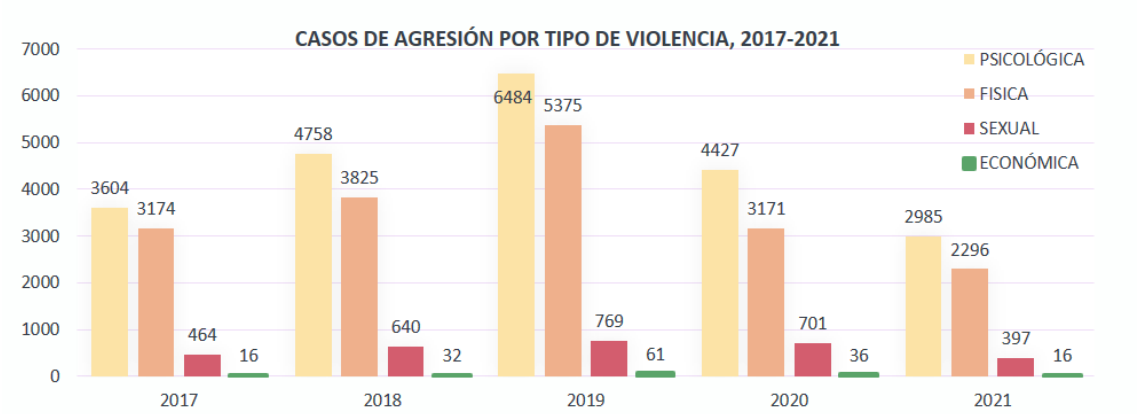
At the national level, 58.9% of people tolerate or justify violence against women. According to ENARES 2019, 73.8% of women who have ever been in a relationship between the ages of 15 and 49 who suffered physical violence from their partners or ex-partner, did not seek help in an institution. Three women were victims of femicides every 10 days, between 2015 and 2019.

If we look at graphs 13 and 14, there is evidence of a decrease in violence cases. Since the beginning of the pandemic, the Women's Emergency Centers closed for not having adequate space to maintain social distancing and for not being considered an essential service. This prevented victims of aggression from attending to present their complaint. Another data that we have considered is the calls registered to Line 100, which shows a 100% increase in calls compared to 2019, as shown in Graphs 15 and 16.

Figure 3: ACCUMULATED RECORD OF VIOLENCE 2018 – 2021

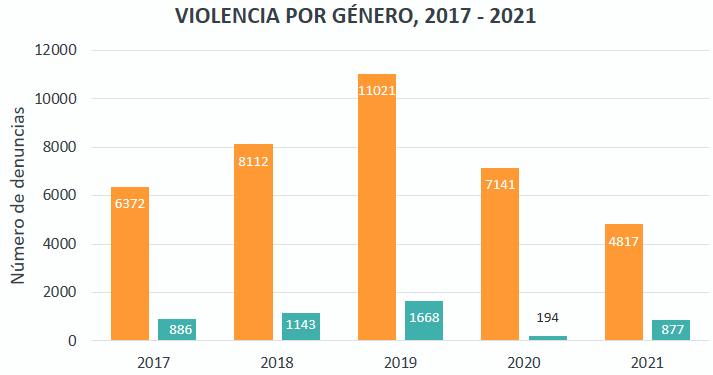


Graph 13 shows the total number of registered cases of violence (Psychological, Economic, Physical and Sexual)

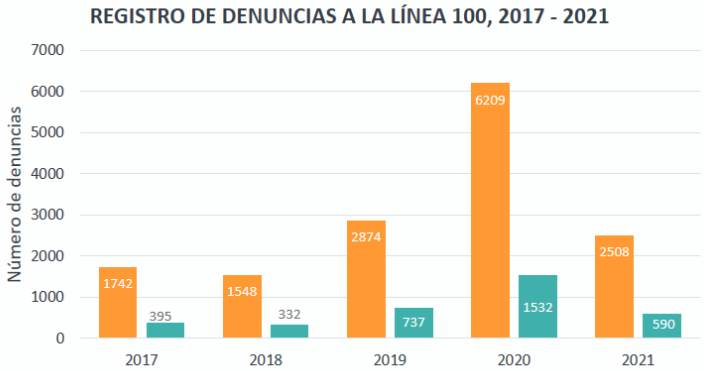


Los datos corresponden al año 2017, 2018, 2019, 2020 y 2021(Hasta el mes de junio)

Graph 14: Gender violence, 2017 - 2021



Graph 15: Registration of complaints to line 100, 2017 - 2021



Graph 16: Registration of calls to line 100, 2017 - 2021

In both records, Línea 100 and CEM, more cases of violence against women are reported.

Hombres que han denunciado un hecho de violencia.

Mujeres que han registrado un hecho de violencia.

3. Status of COVID-19

POSITIVE CASES

According to the data obtained from the Regional Health Directorate of Cusco there are:

Positive cases as of December 31, 2020 (See Figure 04, Table 13 and Graph 17).

Figure 04

NUMBER OF POSITIVE CASES OF COVID -19, 2020

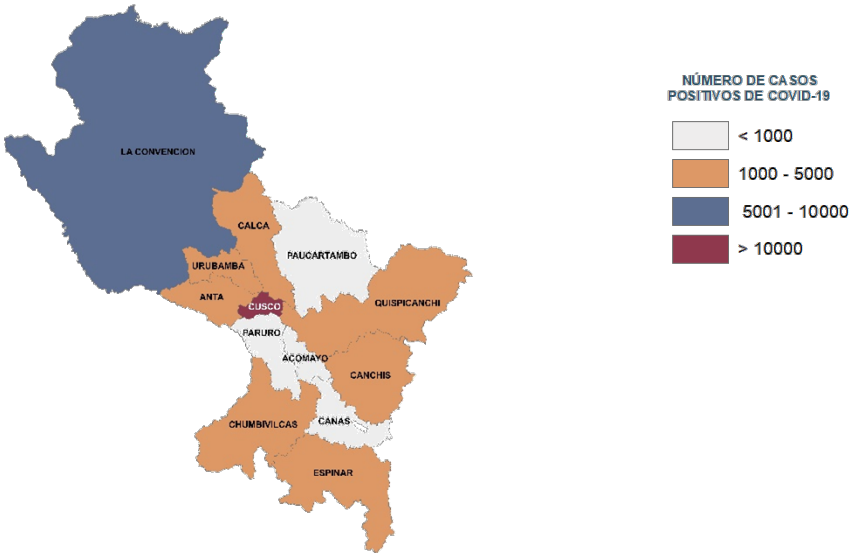


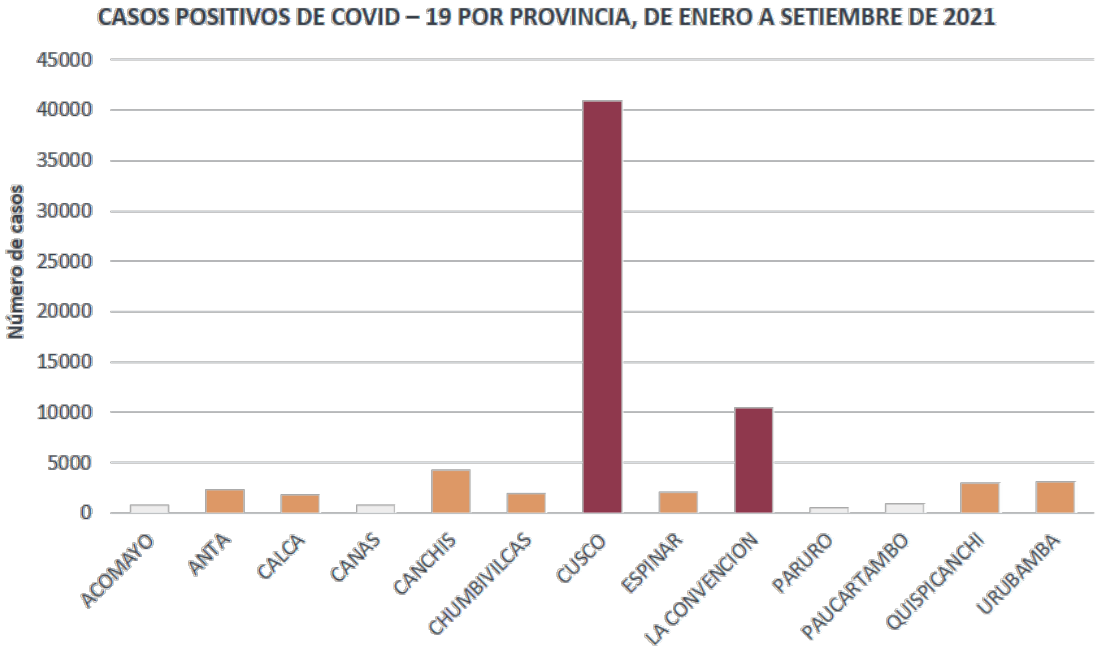
Tabla 13

NUMBER OF POSITIVE COVID-19 CASES, FROM AUGUST TO DECEMBER 2020

PROVINCIA	AGO 2020	SET 2020	OCT 2020	NOV 2020	DIC 2020
ACOMAYO	79	259	393	423	445
ANTA	821	1449	1855	1944	2022
CALCA	495	910	1255	1341	1401
CANAS	154	920	318	369	393
CANCHIS	902	2556	3275	3546	3777
CHUMBIVILCAS	289	783	832	918	1023

CUSCO	22047	34106	44239	47818	50257
ESPINAR	401	1839	1868	2257	2484
LA CONVENCION	3164	5143	6321	6964	7484
PARURO	121	263	455	502	529
PAUCARTAMBO	142	329	476	572	631
QUISPICANCHI	1033	2453	2466	2694	2829
URUBAMBA	582	1411	1771	2105	2215

Graph 17: Positive COVID-19 Cases by Province, January to September 2021



- Positive cases as of December 31, 2020 (See Figure 05, Table 14 y Graph 18).

Data obtained is updated as of September 30, 2021

Figure 05: NUMBER OF POSITIVE COVID -19 CASES, 2021

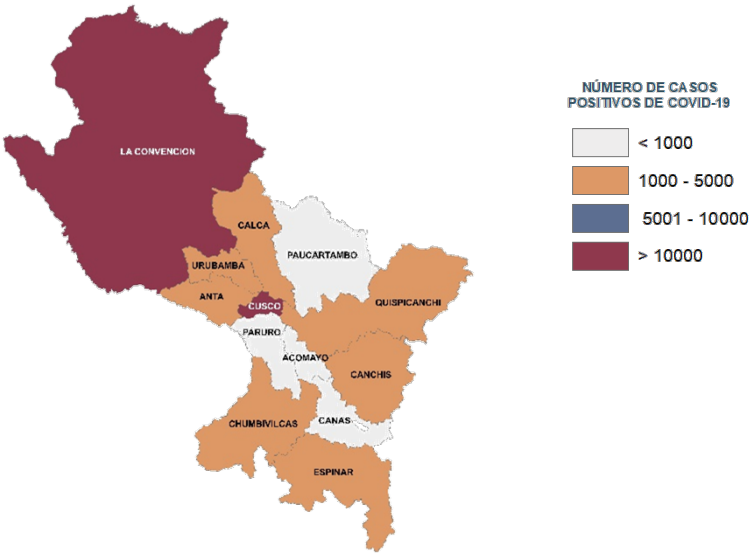
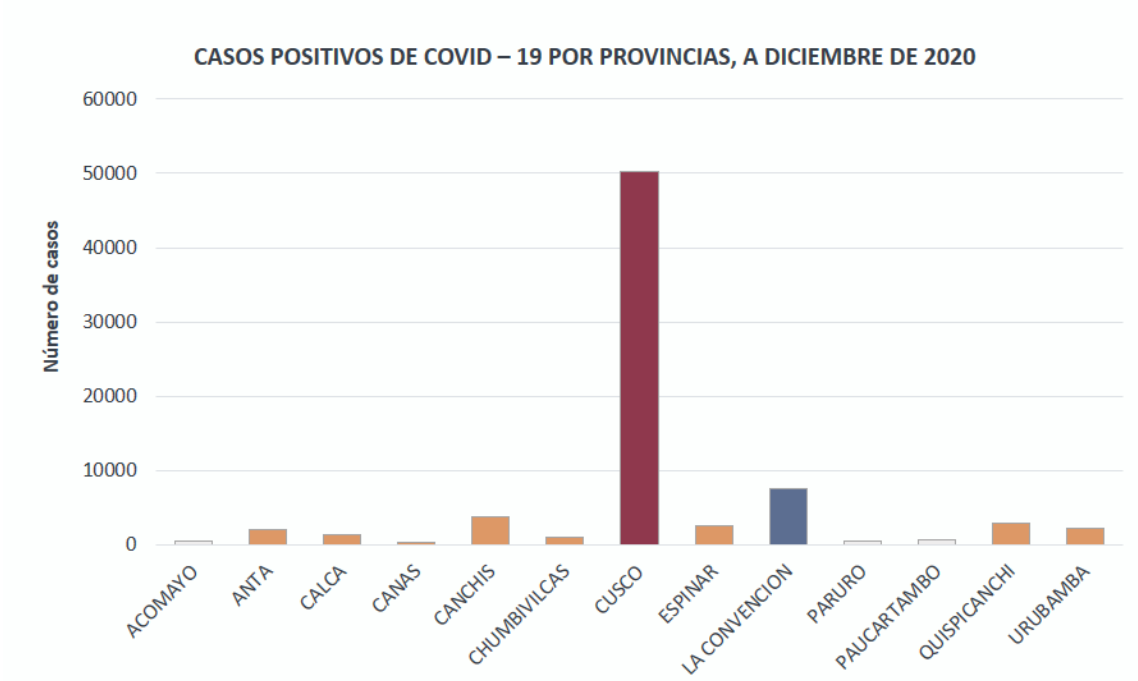


Table 14

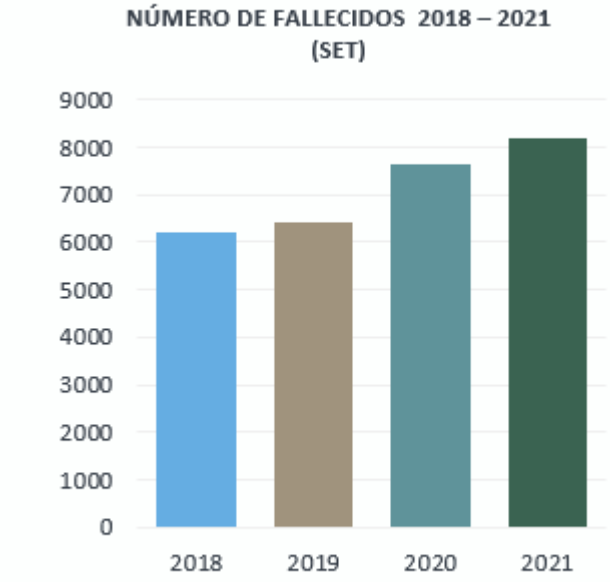
NUMBER OF POSITIVE COVID-19 CASES, FROM JANUARY TO SEPTEMBER 2021

PROVINCIA	ENE 2021	FEB 2021	MAR 2021	ABR 2021	MAY 2021	JUN 2021	JUL 2021	AGO 2021	SET 2021
ACOMAYO	21	84	144	288	474	618	659	686	696
ANTA	187	471	1044	1603	2020	2168	2256	2284	2322
CALCA	123	286	651	1077	1452	1592	1680	1722	1774
CANAS	28	108	292	421	582	722	786	806	819
CANCHIS	314	929	1632	2259	3053	3745	4040	4157	4238
CHUMBIVILCAS	381	855	1023	1230	1522	1746	1833	1905	1943
CUSCO	3046	7871	14116	22062	31255	35454	37644	39403	40913
ESPINAR	250	457	732	1066	1354	1668	1884	1983	2056
LA CONVENCION	8704	2850	4487	6335	8127	9350	9920	10277	10493
PARURO	30	111	225	349	448	500	535	543	554
PAUCARTAMBO	30	128	305	629	811	889	919	932	944
QUISPICANCHI	195	625	1153	1765	2309	2646	2826	2915	2958
URUBAMBA	154	718	1444	1928	2510	2775	2918	2994	3085

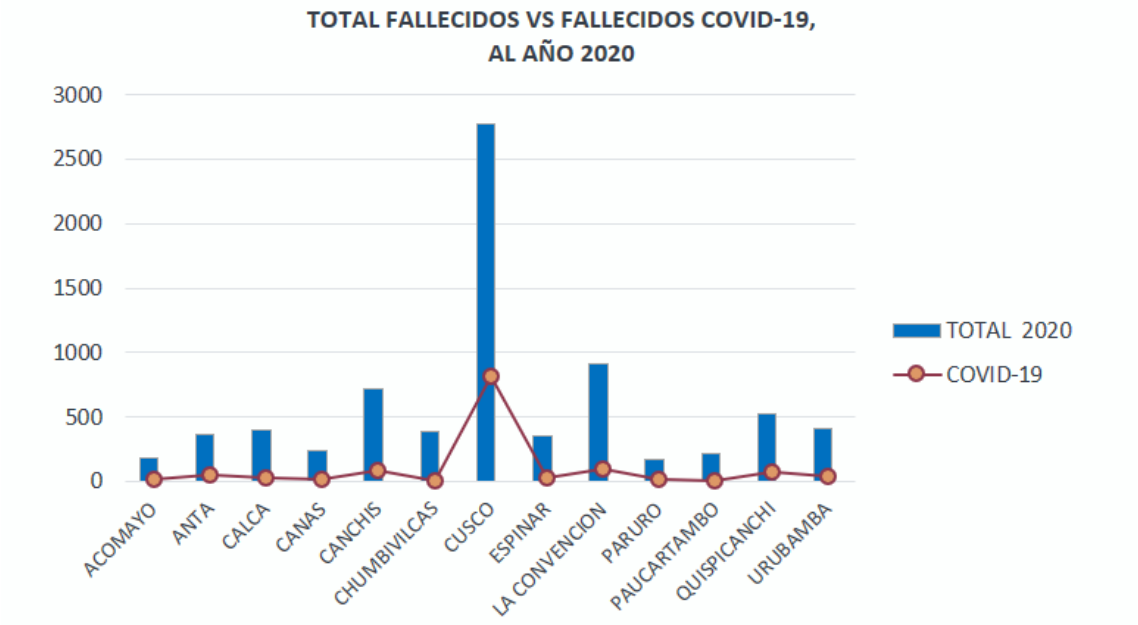
Graph 18: Positive COVID – 19 cases by province, updated December 2020



Graph 19: Deaths by COVID-19



Graph 20: Total deaths vs. COVID-19 deaths by 2020



Graph 21: Total deaths vs. COVID-19 deaths by the year 2021

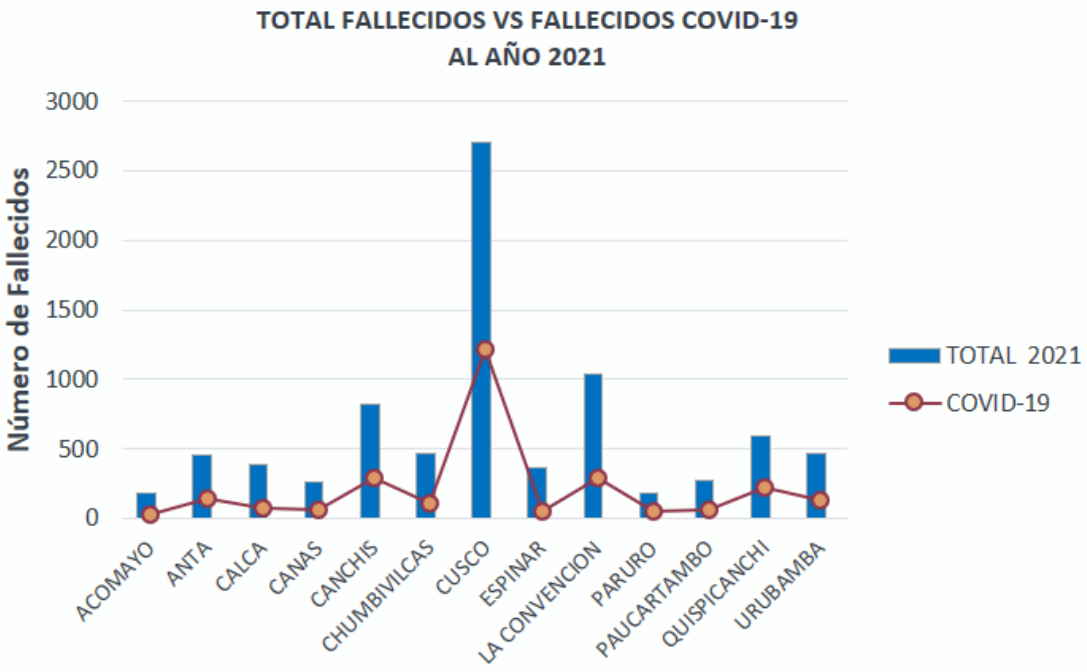
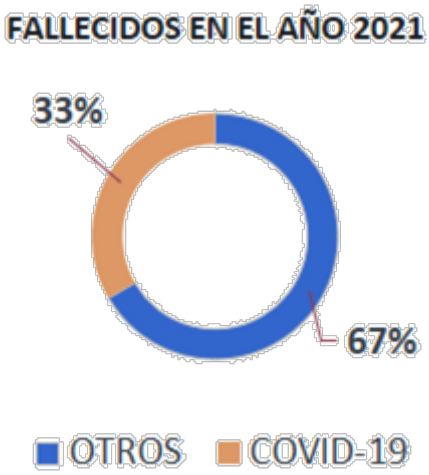


Table 15: TOTAL DEATHS VS DEATHS FROM COVID-19

PROVINCIA	TOTAL 2020	COVID-19 2020	TOTAL 2021	COVID-19 2021
ACOMAYO	184	12	182	33
ANTA	370	53	453	147
CALCA	395	30	386	74
CANAS	237	13	266	65
CANCHIS	721	85	820	288
CHUMBIVILCAS	391	5	462	106
CUSCO	2774	811	2704	1210
ESPINAR	353	23	361	54
LA CONVENCION	917	96	1040	288
PARURO	170	17	179	48
PAUCARTAMBO	211	3	277	66
QUISPICANCHI	522	68	594	217
URUBAMBA	413	45	464	134
TOTAL	**7658**	**1261**	**8188**	**2730**



4. Assessment of Project

a. Update causal loop diagram

The diagram shows the study areas (Annexed 1 "Causal loop diagram for the city of Cusco"), starting at the presence of the pandemic, which lead to declaring a state of emergency at the national level. In turn, this brought measures of contingency or emergency, such as the closure of borders and social

distancing, causing the arrival of virtual activities, both at work and mainly in virtual education; and the reduction in tourism and related activities. The absence of work, job insecurity, confinement, the crossing of schedules between education and work at home, increased stress in people, affecting the physical and mental health at all ages; making people more vulnerable to different diseases. To interactively access the causal loop diagram, visit the following link https://bit.ly/3I4sFhv

b. What was learned? (About the project activity/About second order impacts)

- In the case of the education sector, the data obtained for 2020 was published in the middle of this year, showing inconsistency in the graphic registration of educational centers, as they appear located outside the administrative political limits.
- Despite having the commitment of those in charge of handing the requested information, if not followed up, in many cases we did not received the requested information.
- Most of the information required is at the regional level, which limits an analysis in detail or scale.
- According to the representative of the National Police, she mentioned to us that the classification of cases of family violence responds to an increasing scale, with rape and murder being the last degrees of intensity.

c. Analysis conducted – analytical flowcharts with description

The analysis carried out had the objective of showing the conditions of the educational system before the Pandemic in 2019, and if it has improved by 2020. The number of kilometers of the Energy Network, the number of Educational Institutions, the Fixed Internet connections, and the number of Mobile Telephone Antennas for each province of Cusco were some of the variables.

Taking as reference the weighted overlay and weighted sum methods with GIS software, weights from 1 to 5 were assigned qualitatively for each variable according to how decisive they are for education. The description could be Very Good, Good, Fair, Bad and Very Bad. Later, they would be given a percentage of importance, the highest being 35% for Educational Institutions, because without them there would be no coverage of this service in the territory. The second highest value was 30% for the Energy System, because the following two variables depend on it. Fixed Internet connections were assigned 20% because they are domiciliary and their connectivity is more secure. Finally, Mobile Telephony Antennas were assigned 15%, as they are the scarcest and more difficult to access in the geography. Since there are 4 variables, the total of these must add up to 100%. In this way, when adding the weights multiplied by the percentage of importance, the values would not exceed 5, making their description easy as shown in the following table and maps.

d. Visualizations of results (include how these are disseminated and target audience)

Figure 6: CONDITION OF EDUCATIONAL QUALITY BY PROVINCE AS OF 2019

RESUMEN DE DATOS RELACIONADOS A LA EDUCACIÓN EN LA REGIÓN CUSCO AL 2019

NRO	PROVINCIA	POBLACIÓN Hab.	POBLACIÓN EDUCATIVA Hab.	POBLACIÓN EDUCATIVA BR Hab.	II.EE.			II.EE.BR			INTERNET CONEXIONES FIJA			INTERNET ANTENA MOVIL			SISTEMA ELÉCTRICO LONGITUD			TOTAL PONDERADO	CONDICIÓN
					PESO	%	NRO	PESO	%	NRO	PESO	%	Cfres	PESO	%	NRO	PESO	%	Km		
1	Acomayo	24 251	7 672	7 090	1	0.35	189	1	0.35	178	1	0.20	4	3	0.15	244	1	0.30	225.119	1.3	Malo
2	Anta	62 428	16 199	15 640	2	0.35	305	2	0.35	296	2	0.20	695	5	0.15	558	2	0.30	487.364	2.5	Regular
3	Calca	71 071	19 760	18 661	3	0.35	401	2	0.35	384	1	0.20	236	3	0.15	277	2	0.30	606.227	2.0	Malo
4	Canas	35 024	9 718	9 262	2	0.35	335	2	0.35	322	1	0.20	19	2	0.15	195	2	0.30	609.368	1.8	Malo
5	Canchis	105 685	33 023	26 588	3	0.35	519	3	0.35	484	1	0.20	260	5	0.15	415	2	0.30	414.616	2.6	Regular
6	Chumbivilcas	70 565	21 934	21 245	3	0.35	428	3	0.35	418	1	0.20	84	4	0.15	357	3	0.30	910.710	2.8	Regular
7	Cusco	498 169	141 405	112 234	5	0.35	1 080	4	0.35	956	5	0.20	104 474	3	0.15	267	2	0.30	401.873	3.5	Bueno
8	Espinar	62 108	20 029	17 203	2	0.35	355	2	0.35	334	1	0.20	103	5	0.15	434	4	0.30	1 028.382	2.9	Regular
9	La Convencion	167 846	53 670	47 760	5	0.35	1 013	4	0.35	965	1	0.20	130	5	0.15	553	5	0.30	2 347.889	3.9	Bueno
10	Paruro	26 964	7 456	7 351	2	0.35	252	2	0.35	250	1	0.20	7	2	0.15	174	2	0.30	429.469	1.8	Malo
11	Paucartambo	47 442	14 798	14 392	2	0.35	344	2	0.35	335	1	0.20	41	3	0.15	260	1	0.30	388.068	1.7	Malo
12	Quispicanchi	100 027	30 224	28 746	3	0.35	478	3	0.35	459	1	0.20	143	5	0.15	576	3	0.30	649.649	2.9	Regular
13	Urubamba	69 977	19 218	17 703	2	0.35	273	2	0.35	258	1	0.20	248	5	0.15	401	1	0.30	308.940	2.0	Malo

RESUMEN DE DATOS RELACIONADOS A LA EDUCACIÓN EN LA REGIÓN CUSCO AL 2020

NRO	PROVINCIA	POBLACIÓN Hab.	POBLACIÓN EDUCATIVA	POBLACIÓN EDUCATIVA	II.EE.			II.EE.BR			INTERNET CONEXIONES FIJA			INTERNET ANTENA MOVIL			SISTEMA ELÉCTRICO LONGITUD			TOTAL PONDERADO	CONDICIÓN
					PESO	%	NRO	PESO	%	NRO	PESO	%	NRO	PESO	%	NRO	PESO	%	Km		
1	Acomayo	24 000	7 709	7 192	1	0.35	188	1	0.35	177	1	0.20	8	3	0.15	222	1	0.30	225.119	1.3	Malo
2	Anta	63 131	16 826	16 192	2	0.35	309	2	0.35	297	1	0.20	175	5	0.15	529	2	0.30	487.364	2.3	Regular
3	Calca	71 582	20 301	18 891	3	0.35	405	2	0.35	385	2	0.20	638	3	0.15	272	2	0.30	606.227	2.2	Regular
4	Canas	34 754	9 597	9 088	2	0.35	334	2	0.35	321	1	0.20	29	2	0.15	187	2	0.30	609.368	1.8	Malo
5	Canchis	106 476	32 443	26 366	3	0.35	528	3	0.35	489	5	0.20	3 153	4	0.15	377	2	0.30	414.616	3.3	Bueno
6	Chumbivilcas	70 143	22 007	21 279	3	0.35	433	3	0.35	423	1	0.20	74	4	0.15	335	3	0.30	910.710	2.8	Regular
7	Cusco	511 019	148 786	114 852	5	0.35	1 096	4	0.35	971	5	0.20	55 225	3	0.15	261	2	0.30	401.873	3.5	Bueno
8	Espinar	62 059	19 590	17 495	2	0.35	351	2	0.35	331	1	0.20	391	5	0.15	447	4	0.30	1 028.382	2.9	Regular
9	La Convencion	167 910	55 168	49 628	5	0.35	1 027	4	0.35	973	4	0.20	2 549	5	0.15	461	5	0.30	2 347.889	4.5	Muy Bueno
10	Paruro	26 644	7 819	7 700	2	0.35	254	2	0.35	250	1	0.20	9	2	0.15	138	2	0.30	429.469	1.8	Malo
11	Paucartambo	47 579	15 358	14 719	2	0.35	345	2	0.35	335	1	0.20	52	3	0.15	230	1	0.30	388.068	1.7	Malo
12	Quispicanchi	101 735	31 019	29 445	3	0.35	483	3	0.35	464	1	0.20	296	5	0.15	562	2	0.30	649.649	2.6	Regular
13	Urubamba	70 043	20 024	18 383	2	0.35	275	2	0.35	260	3	0.20	1 442	4	0.15	395	1	0.30	308.940	2.2	Regular

Data taken from the Summary Table of data related to education in the Cusco Region, as of 2019.

Figure 7: CONDITION OF EDUCATIONAL QUALITY BY PROVINCE AS OF 2020

Data taken from the Summary Table of data related to education in the Cusco Region, to the year 2020.

e. Recommendations

- Institutions should socialize the data collected in more detail, if available. If not, then more detailed data should be collected, such as poverty, tourism, employment, etc.

f. Community Impacts and Limitations

- Most of the data obtained are grouped at the regional or national level (by urban or rural area), but there is no more detailed classification (District).
- The institutions do not have permanent personnel in charge of information management.
- The information is treated with secrecy.
- In some cases, there is no commitment to socialize the information.

g. Future Directions (next steps for teams, use of data, local capacity influenced by project)

- Conduct household surveys to parents of Regular Basic Education, in public and private schools, to know and validate the information collected regarding the effect of COVID-19 on Education.

- Conduct Commercial Victimization Surveys to Hotels and Restaurants and Tourism Agencies, to know and validate the information collected regarding the effect of COVID-19 in the Tourism sector.

- Determine the increase in the generation of municipal solid waste by municipalities in the Region, due to the pandemic.

- Evaluate, through surveys, the economic effect on formal ambulatory commerce (traditional breakfasts)

- Socialize the information generated to the institutions involved and the public.

5. Events and activities

a. Arcgis HUB – C2M2 HUB LATIN AMERICA

6. Preparation of comparative dashboards

- Annexed 5: Domestic Violence (Quito and Bello Horizonte)
- Annexed 6: Tourism (Cusco, Santa Cruz and Ouro Preto)
- Annexed 7: Thefts (Quito and Santiago de Chile)

In the future, it is expected to include information on Bello Horizonte that will also be comparative between the cities mentioned.

- The information uploaded to this page, on these topics and other topics relevant to each city within the COVID-19 pandemic, is currently being drafted.
- Once the dashboards are completed and the information that the page will contain has been organized, it will be published in this Arcgis HUB, which will allow better visualization of the data obtained in C2M2.

7. Appendix HUB Latin America

a) Appendix 1: "Data Latin America Hub.xlsx. (Data: Spreadsheet of data for each hub X city project, access and sharing information)
b) Appendix 2: "Tools and methods.pdf. (Tools and Methods used to generate data)

c) Appendix 3: "Method HDX Data". (View and download data on the HDX platform) Hub Latin America - Humanitarian Data Exchange (humdata.org)

d) Appendix 4: "Partnerships established" (Flow diagram of the institutional relationships established during the project)

8. Annexed

1. Annexed 4: Causal loop diagram for the city of Santa Cruz
2. Annexed 5: Domestic violence (Quito and Bello Horizonte)
3. Annexed 6: Tourism (Cusco, Santa Cruz and Ouro Preto)
4. Annexed 7: Thefts (Quito and Santiago de Chile)