

Covid-19 in Latin America countries: Course of the pandemic and the different responses towards control

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**Covid-19 in Latin America countries: Course of the pandemic and the different
responses towards control**

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Abstract

Background: The emergence of COVID-19 in Latin America occurred within a troubled political, economic and social context, with growing trends of poverty and social inequality challenging already overburdened and underfinanced local healthcare systems. In the absence of a vaccine or of any treatment for COVID-19, public health measures such as social distancing had to be adopted. The objective of this paper is to describe the course of the COVID-19 pandemic in Latin American countries and to summarize the social distancing measures implemented in each one of these countries, discussing the changes that took place in the social mobility of the populations and their potential effects on the course of the epidemic up to June 2020. **Results:** Brazil has the highest cumulative number of cases and deaths; however, cumulative incidence rates are higher in Peru and Chile, while the highest cumulative mortality rates are in Ecuador, Peru and Brazil. Some countries implemented social distancing measures before the first case was registered, culminating in lockdown in eight countries before detection of the 100th case. The measures that appear to have had the greatest impact in reducing mobility include, in addition to lockdown, the closure of schools and prohibition of events. In general, the countries that implemented social distancing measures earlier and where the reduction in social mobility was greatest also recorded lower incidence and mortality rates. Brazil and Mexico failed to adopt lockdown and the number of cases of the disease continues to grow. **Conclusions:** As occurred in other continents, control of the COVID-19 pandemic was better in countries that were faster in adopting more restrictive measures. Nevertheless, this equation does not appear to guarantee a positive outcome in all settings, possibly due to the considerable social inequalities and chronic deficiencies of the healthcare systems, with the scenario being even more complex in view of the recurring political crises and the negationist view of some national leaders. The COVID-19 pandemic continues to spread in Latin America

43 and exposes these contradictions. Further studies are required to gain a greater understanding
44 and generate lessons on how to manage such a complex crisis.

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47 **Keywords:** social distancing; Latin America; Covid-19.

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Background

COVID-19, a disease caused by SARS-CoV-2, was first registered in Latin America, in Brazil, on February 26, 2020 [1], almost two months after the initial outbreak was detected in China. On March 11, when the World Health Organization (WHO) declared COVID-19 a pandemic, slightly more than 100 cases had been registered in the region, concentrated in thirteen countries. Although the pandemic reached Latin America later than Europe, the number of confirmed cases as of June 28, 2020 is over 2.4 million, corresponding to approximately 25% of the total number of confirmed cases worldwide, with 110,000 deaths [2]. The emergence of COVID-19 in the region occurred within a troubled political, economic and social context, in which growing trends of poverty and social inequality now run contrary to previous decades of economic growth and inequality reduction [3].

The pandemic has spread throughout the countries of Latin America, where the epidemiological setting is complex [4], characterized by an ageing population, high rates of morbidity and mortality from chronic non-communicable diseases, and high mortality from accidents and violent causes. Hypertension, a disease that has been associated with a greater risk of complications of COVID-19, affects near 18% of the adult population in the Americas [5-7]. In addition, there are the endemic and emerging infectious diseases [8], including the simultaneous circulation of three arboviruses (chikungunya, dengue and Zika) [9,10], a high malaria annual parasite index, a high incidence of tuberculosis and a high prevalence of human immunodeficiency virus (HIV) [11].

The COVID-19 pandemic represents an enormous challenge to the already overburdened and underfinanced Latin American healthcare systems [12]. In addition to the fact that these

systems often operate at the limit of their capacity in terms of the availability of hospital beds, intensive care units (ICUs) and healthcare professionals [13], there are huge inequalities in the geographical distribution of these resources. As the COVID-19 pandemic progresses, the capacity of the healthcare systems becomes overwhelmed, resulting in a high number of deaths not only from this disease, but also from other causes that likewise require hospital care and specialist resources [14,15].

In the absence of a vaccine or of any effective treatment for COVID-19, proven public health measures such as the isolation of cases and quarantining of contacts had to be adopted to reduce transmission of the disease. Since SARS-CoV-2 can be transmitted by asymptomatic individuals and by those with mild symptoms, these strategies need to be combined with social distancing measures to enable COVID-19 to be effectively controlled, with a reduction in transmission, in the number of cases and, consequently, in the number of deaths [14,16,17].

With the epidemic ongoing and still not having reached its peak in several countries, the objectives of the present paper were to describe the course of the COVID-19 pandemic in a selection of 20 Latin American countries and to summarize the adoption of control measures by analyzing the social distancing restrictions implemented in each one of the countries, discussing changes in the social mobility of the population and their potential effects during the epidemic.

Methods

Setting

Latin America and the Caribbean, with a population of over 569 million inhabitants, is characterized by high urban density in its major capitals and metropolitan regions, with a significant segment of the population living in slums and peripheral urban areas characterized by extremely poor life and housing conditions [18,19]. Currently, over 80% of the population live in cities [18], and in 2014 over 20% lived in slums [19]. Although the region's human development index (HDI) had increased substantially up to 2018, reaching 0.759, poverty increased again in 2019, with 30.8% of the population living below the poverty line and 11.5% living in extreme poverty [20]. Serious sanitation problems persist, with 110 million individuals having no access to sewage treatment and 36 million having no access to clean drinking water [21].

A total of twenty countries were included in the present study, 17 of which are in continental Latin America (Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela). The other countries included were the three Caribbean countries with more than 10 million inhabitants (Cuba, Haiti and the Dominican Republic).

These countries are diverse and range from small countries such as El Salvador, Haiti, the Dominican Republic and Costa Rica to Brazil, a country of continental dimensions. The countries with the largest populations are Brazil and Mexico, with 209 and 126 million inhabitants, respectively (see supplementary Table 1). Nevertheless, population density is highest in the smaller countries such as Haiti, El Salvador, the Dominican Republic and Guatemala. These small countries, together with Bolivia, Paraguay, Honduras, Venezuela and Ecuador, share some of the worst socioeconomic indicators, including the lowest HDIs, the lowest per capita gross domestic product (GDP) and the lowest life expectancy at birth. Some

countries, albeit richer, have high inequality rates, particularly Brazil, which has the highest Gini index.

All the countries selected for inclusion in the study share the same language, Spanish, except for Brazil where Portuguese is spoken, and Haiti, where the official languages are Haitian Creole and French. Most of the region is traditionally Catholic; however, there are influences of other religions such as, for example, the African American religions practiced in Cuba, Haiti, in the Dominican Republic, Colombia, Venezuela and Brazil. In addition, there has been an increase in recent years in evangelical groups, which already correspond to one-fifth of the population and have begun to exert a strong conservative influence on party politics and on elections in countries such as Costa Rica, Colombia, Venezuela, Mexico and Brazil [22].

Another characteristic that these countries have in common is the contribution of their original indigenous peoples to cultural traditions and in the formation of their populations. In 2015, the indigenous population of Latin America was estimated at around 45 million individuals (8% of the region's population), ranging from peoples in voluntary isolation to inhabitants of major cities. In Bolivia and Guatemala, 62% and 41% of their populations, respectively, consist of indigenous peoples [23]. Indigenous movements fighting discrimination and demanding recognition of their rights have questioned the historical "invisibility" of these populations. The mark of slavery on the history of various countries in which a considerable proportion of the population is of African descent is also noteworthy, adding inequalities resulting from structural racism to the already existing socioeconomic inequalities. In these regions, the black and indigenous populations are those most vulnerable to COVID-19, while significant gender inequalities add further disparities. This context reconfigures the pattern of occurrence of the

disease and of access to healthcare compared to the experience of Asian and European countries [24].

Data sources

Epidemiological data for each country, including the number of cases and deaths, were extracted from the webpage of the European Centre for Disease Prevention and Control [25]. The total number of COVID-19 tests performed in each country was extracted from the Worldometer webpage [26]. The World Bank population sizes estimates for 2019 were used [27]. Other documents consulted included the epidemiological bulletins issued by the WHO, official documents from governmental agencies such as the Pan American Health Organization and the United Nations Economic Commission for Latin America and the Caribbean (ECLAC). Nationwide laws, decrees and directives on social distancing related to the control of COVID-19 implemented in the twenty countries up to May 15, 2020 were consulted. For Brazil, given the almost total lack of measures taken at federal government level in contrast to the actions taken by state governors and mayors, the specific legislation implemented in the most populous states, representing over 50% of the country's population, was taken into account. In addition, data on mobility, clustered by country, were extracted from Google Mobility Reports [28] with respect to the number and duration of visits individuals made to six distinct groups of locations: 1) Supermarkets and pharmacies; 2) Parks, beaches and public squares; 3) Public transport hubs including bus, train and subway stations; 4) Retail and recreation facilities, including malls, museums, bars and restaurants; 5) Residential; and 6) Workplaces. The figures extracted correspond to changes in mobility at these locations, expressed as percentage changes from the average baseline value for January 3 to February 6, 2020 [28].

Data analysis

The following indicators were constructed to analyze the epidemiological situation in the countries evaluated: the cumulative number of confirmed COVID-19 cases and deaths, the number of cases per 100,000 inhabitants, the number of deaths per 100,000 inhabitants, the case fatality rate, i.e. the ratio between the number of confirmed deaths and the number of confirmed cases of COVID-19, and the number of tests per confirmed case.

To summarize the social distancing measures, the countries were classified according to the degree with which these measures could affect mobility. Measures were classified as: 1) *Mild*: distancing recommended, events banned as a function of the number of attendees, and remote working (or rotating schedules) established for civil servants; 2) *Moderate*: schools closed, borders closed, all events banned, circulation between towns/cities suspended (public transportation and private vehicles) and all leisure spaces closed; 3) *Strict*: activities in the service and industrial sectors suspended, municipal transport (public and private) suspended and curfews implemented; and 4) *Lockdown*: all non-essential activities banned including going out for non-essential activities. These categories were used to classify countries over time as: *null category*, when no measures had been adopted, or *mild*, *moderate*, *strict* or *lockdown* when at least one of the measures listed under the respective classifications had been adopted. In the case of Brazil, the date on which at least half the selected states had adopted at least one measure was taken into consideration when defining the degree of social distancing adopted in the country.

To analyze the data from Google Mobility Reports [28], it was calculated the average data on mobility among the five non-residential categories (supermarkets and pharmacies; parks, beaches and public squares; public transport hubs; retail and recreation facilities; and workplaces) for each day . Mobility in residential locations was separated since it is understood

that the nature of social distancing measures is to encourage individuals to stay at home and to reduce their mobility outside the home. R software, version 4.0.0 was used to process the data and construct the graphs and figures.

Results

The emergence and course of the COVID-19 pandemic in Latin America

The first recorded case of COVID-19 in Latin America occurred in Brazil four days prior to the WHO declaring a public health emergency of international concern [29] and two weeks before declaring a pandemic [30]. The first case, registered on January 26, 2020, consisted of a man living in the state of São Paulo in Brazil who had returned from a trip to Lombardy in Italy [31]. At that time, the WHO had already reported a total of 82,294 confirmed cases in 47 countries, with 96% of cases having been recorded in China [32]. Prior to that, the United States and Canada had notified 59 and 11 cases, respectively, all imported.

After Brazil, other Latin American countries began to report cases to the WHO and, by March 7, eight countries had already registered cases and two, Brazil and Ecuador, had reported local transmission. In Brazil, the second country in the world in terms of number of cases, the progression of the pandemic has been rapid, with more than 1.3 million cases and 57,000 deaths registered (Figure 1A, Table S2). Ecuador was the first country to notify the occurrence of local transmission to the WHO on March 3 when six cases were registered. Ecuador is the fifth country in the region in terms of the number of cases per 100,000 inhabitants (Table S2).

The highest cumulative incidence rates per 100,000 inhabitants are in Chile and Peru, followed by Panama, Brazil, Ecuador, and the Dominican Republic (Figure 1B). Although the absolute

number of deaths is highest in Brazil and Mexico, with 57,070 and 26,381 deaths, respectively, up to the present date, the highest cumulative mortality rates are in Peru (28.6/100,000), Chile (28.5/100,000), Brazil (27.2/100,000) and Ecuador (25.9/100,000) (Table S2 and Figure 1C).

The countries with the highest case fatality rates are Mexico (12.1%) and Ecuador (8.1%), while those with the lowest rates are Costa Rica (0.4%), Paraguay and Venezuela (0.8%). Two different trends can be observed in case fatality rates over time: countries such as Haiti, Bolivia, Honduras and Brazil had a rapid increase followed by a fall, while other countries such as Mexico and Ecuador had a gradual increase followed by stabilization of the case fatality rate (Figure 1D).

The Latin American countries in which more diagnostic testing was performed (reverse transcription polymerase chain reaction [RT-PCR] and rapid testing) per million inhabitants are Chile (56,481), Peru (49,901) and Venezuela (43,613) (Table S2). Compared to those countries, testing is much lower in countries such as Haiti (994) and Guatemala (1,755). In addition, for every three tests performed in Bolivia, Brazil, Guatemala, Haiti, Honduras or Mexico, at least one is confirmed for Covid-19 (Table S2).

The response of Latin American governments in restricting social mobility

With the increase in the number of cases in each country, social distancing measures were progressively implemented, with restrictions increasing over time and with half the countries being under lockdown by the time the thousandth case was detected (Tables S3-4, Figures 1A-D).

At the time of the first confirmed case of COVID-19 in each country, mild social distancing measures had been implemented in Venezuela, Uruguay and Guatemala, and strict measures in El Salvador and Haiti (Figure 2A). By the time the 50th case had been recorded in each country, only Brazil, Mexico and Nicaragua had failed to implement any measures at all, while seven countries (Bolivia, Ecuador, Honduras, Paraguay, Peru, El Salvador and Venezuela) had adopted lockdown (Figure 2B).

Between confirmation of the 50th and 100th cases (Figure 2C, Tables S3-4), the governments of Argentina and Colombia increased the levels of mobility restriction compared to the preceding period. Whereas the Colombian government introduced strict measures, Argentina and Peru proceeded to lockdown.

Mexico and Brazil only began to adopt measures just shortly before confirmation of the thousandth case (Figure 2D), while Nicaragua still had no social distancing policy and Chile, Colombia, Costa Rica and Panama had strengthened their measures. At this time in the epidemic, all the countries with the exception of Nicaragua had already closed all teaching establishments and ten of the twenty countries were in lockdown (Figure 2D). In general, there was agreement regarding the degree of social distancing measures adopted in the different countries.

The first measures to be implemented generally consisted of the quarantining of travelers and of the contacts of patients with confirmed or suspected COVID-19, as well as the isolation of confirmed and suspected cases. All except Cuba, Mexico, Brazil, Nicaragua and Venezuela implemented mandatory quarantine and isolation measures (Table S3). Three countries (Mexico, Panama and Venezuela) failed to adopt any type of border restriction. Nevertheless,

the countries neighboring Panama and Venezuela closed their borders. Furthermore, only three countries (Cuba, El Salvador and Mexico) failed to adopt any measure whatsoever to restrict the entry of foreign nationals and failed to quarantine or isolate individuals arriving from abroad.

Only Costa Rica, El Salvador, Haiti, Mexico, Nicaragua and Paraguay failed to impose restrictions on municipal, intercity and interstate transport. However, Costa Rica, Chile and Uruguay imposed partial restrictions on the circulation of individuals and vehicles in their municipalities.

All countries with the exception of Nicaragua closed their schools, with two (Peru and Venezuela) closing educational activities as part of lockdown.

In ten countries, non-essential public services adopted remote working or the use of rotating work schedules. Furthermore, most of the countries adopted measures regarding the closure of non-essential services. Closure could be total or partial and involve either public or private activities, while in some cases both public and private services were closed. In Mexico, for example, all non-essential activities in both the public and private sectors were closed. In Uruguay, non-essential activities in the public sector were closed, while in the private sector, only those in major retail centers were closed.

In the eleven countries in which lockdown was implemented at some time during the course of the pandemic (Argentina, Bolivia, Colombia, Ecuador, Guatemala, Honduras, Panama, Paraguay, Peru, El Salvador and Venezuela), eight began by introducing nighttime curfews. During lockdown, Panama and Peru introduced a gender-based rotation system in which only

women were allowed out on certain days and only men on the other days. In Bolivia, restrictions to public mobility were based on identity card number.

To ensure social distancing, in addition to imposing fines governments have adopted measures that include using the police and the armed forces to block the roads and highways, closing establishments and confiscating vehicles or documentation, criminalizing non-compliance, implementing prison sentences for individuals who disobey social distancing measures, and imposing mandatory isolation in containment centers (Table S3).

The majority of countries made the use of facemasks obligatory nationwide (Table S2). Venezuela was the first country to adopt this measure (as early as March) followed by Cuba and Colombia. By the end of April, all the other countries had already adopted the use of facemasks except for Bolivia, Brazil, Costa Rica and Nicaragua, where use was, however, recommended in parts of the countries.

In each one of the countries, a strong association was seen between the degree of restrictive measures implemented and the reduction in social mobility outside the home (Figure S1 and Figure 3). Following the emergence of the pandemic in Latin America, social mobility had already decreased in some countries such as Mexico, Peru and Brazil even prior to official implementation of the measures. In Nicaragua, even without an official decree regarding social distancing measures, there was a reduction of around 30% in the average social mobility outside the home. Most countries maintained reductions of 50-80%. Despite the intermittences recorded since March 1, there was a reduction of over 80% in the average social mobility outside the home in Peru, Bolivia and Panama. With the exception of Venezuela and Paraguay, there were reductions of over 60% in the countries that instituted lockdown.

The greatest reductions in social mobility, apart from those resulting from lockdown, occurred following the partial or total prohibition of events (meetings, mass gatherings, sporting fixtures, and cultural and religious gatherings, either banned completely or as a function of the number of participants) and of the suspension of educational activities. In most of these cases, these reductions were achieved when the degree of social distancing implemented in the countries was classified as moderate. Lockdown appears to have contributed not only to reducing mobility in countries such as Argentina, Bolivia, Ecuador, El Salvador, Peru and, later on, in Guatemala, but also to maintaining low levels of social mobility outside the home, as seen in Panama, Colombia and Paraguay.

Relationship between control measures, social distancing and the course of the COVID-19 pandemic

Some countries such as Argentina, El Salvador, Paraguay and Venezuela in which stronger social distancing measures were implemented are among those in which the reduction in mobility outside the home is greatest and where reported cumulative mortality rates are below the median for the region (4.6/100,000 in June 28, 2020). On the other hand, in countries such as Brazil and Mexico, where control measures were adopted later and/or to a lesser extent, the reduction in mobility was less and mortality rates were higher. Nevertheless, exceptions include countries such as Ecuador and Peru where stronger social distancing measures were adopted and a reduction in social mobility was indeed achieved; however, these countries are among those with the highest mortality rates. On the other hand, it is noteworthy that countries such as Uruguay, Costa Rica and Haiti, where lockdown was not adopted, and even Nicaragua, where no measures at all were implemented and where the reduction in social mobility was the smallest, reported mortality rates are low.

Discussion

The later onset of the COVID-19 pandemic in the countries of Latin America compared to those of Europe allowed social distancing measures aimed at controlling the disease to be implemented early in several countries in the region. In general, in the twenty Latin American countries evaluated here, gradual restrictions culminated in lockdown in eight, even before the 100th case was registered. In Brazil, as a result of the attitude of the current president of the republic in denying the risks of the virus and minimizing the seriousness of the problem, it fell to state and municipal governments to implement social distancing measures, which, consequently, were instituted at a later stage compared to the other countries of Latin America [33]. In Brazil and Mexico, which, taken together, account for half the region's population and where lockdown was not adopted, the number of cases of the disease and the cumulative mortality rates are the highest.

In addition to lockdown, the measures that had the greatest impact on social mobility included the restriction of events (meetings banned, restrictions imposed on mass gatherings, sporting fixtures cancelled, cultural and religious gatherings completely banned or as a function of the number of participants) and the suspension of educational activities. In Mexico, for example, social mobility began to decrease in the days that preceded the federal decision to close schools but coincided with school closure in ten states of the country. Religious ceremonies, generally held indoors, constitute an important form of social contact in Latin America and have been strongly associated with high rates of COVID-19 infection [34]. If on the one hand, the closure of schools reduces social interaction among children and young adults, who, since they tend to develop milder or asymptomatic forms of the disease, are more likely to transmit it to their

family members [35,36], on the other hand, school closure affects families' ability to work and may lead to an increase in intergenerational social interactions for the purpose of childcare [37].

Social distancing measures may lead to a decrease in social mobility and social interactions and, consequently, to a reduction in COVID-19 transmission, with these measures being particularly effective when combined with the isolation of cases and quarantining of contacts [33]. A study that investigated the association between the adoption of public health measures and the epidemiological indicators of COVID-19 in twelve countries of South America found that in countries in which measures were adopted within eleven days of the first case, the growth rate in the number of cases was smaller [38]. Another study, conducted using data from Google Mobility Reports for 130 countries between February and May 2020, found that fewer cases of COVID-19 and fewer deaths from the disease were associated with an increased number of individuals staying at home and with a reduction in social mobility outside the home [39].

Caution is required when analyzing and comparing epidemiological indicators in such diverse countries, bearing in mind that there are differences in the detection and registration of cases and deaths, and that the number of tests performed varies from country to country. Generally, in locations where the availability of testing is limited, testing tends to focus on moderate and severe cases, a proportion of whom will die. In this respect, the under-reporting of cases in relation to the number of deaths could lead to biased estimates of case fatality rates [40,41]. Reduced testing capacity, together with delays in data reporting and processing, could also lead to an underestimation of the number of cases and deaths. Some studies have found atypical increases in hospitalizations and deaths due to severe acute respiratory syndrome (SARS),

suggesting that these could have been caused by SARS-CoV-2 [42,43]. These increases in SARS may be the result of lack of testing, false-negative results (poor sensitivity of the tests), delays in processing the tests, delays in processing the epidemiological data, or failures in reporting. Moreover, testing availability is crucial to enable cases to be isolated rapidly, particularly in cases of asymptomatic or pre-symptomatic patients, thus reducing the capacity of the disease to spread [44].

The potential of using mobility data obtained from cellphones and smartphones to improve COVID-19 control strategies is considerable; however, data use may involve ethical issues and privacy concerns [45-47]. Nevertheless, the data from Google Mobility Reports used in the present study refer to users of smartphones who have a Google account and who activated the location history setting [28], and does not refer to the entire population of the countries analyzed. Despite the increase in the use of smartphones over recent years, there are relevant differences with respect to the access and use of this technology in the different countries as a consequence of socioeconomic and cultural aspects [48]. Data from the World Bank for 2018 show that the number of cellphones differs in the different countries of Latin America, ranging from 57.5 per 100 inhabitants in Haiti to 169.9 per 100 inhabitants in Costa Rica [48]. In Argentina, 68% of adults own a smartphone compared to 60% in Brazil and 52% in Mexico, with percentages being higher among the younger populations and those with higher education and income levels [48].

In general, the countries that implemented social distancing measures earlier and where the reductions in social mobility were greatest also had the lowest cumulative incidence and mortality rates, as was the case of Argentina and Uruguay. Argentina, like Brazil and Mexico, is a federal republic; however, the president, Alberto Fernandez, has given priority to

implementing a plan to tackle COVID-19 by working together with the governors of each province, and has launched a package of economic measures aimed at mitigating the effects of the contingency measures, particularly among the poorest segments of the population. Consequently, transmission has been reduced; however, it proved impossible to completely contain spread to the most vulnerable segments of the population in the most densely populated neighborhoods, resulting in the adoption of lockdown [44]. Uruguay is a small country with a population of fewer than 3.5 million inhabitants, 96% of whom live in urban areas. The past fifteen years have seen major investments in health, with advances in ensuring universal access to healthcare services and a strong presence of the state in this sector. Control measures were implemented early in the pandemic and with the compliance of the population, resulting in a positive outcome regarding control of the pandemic without the need for stricter control measures such as curfew or lockdown. This positive response has been attributed to the democratic and civic tradition of the population of Uruguay following a long, hard experience with dictatorship, and also to the relative confidence of the population in the government [49].

Of the Latin American countries with the greatest number of cases and the highest incidence rates of the disease, Chile is the country with the lowest mortality rate from COVID-19. The country, which did not implement the strictest social distancing measures, has a low population density and a high level of social development. Indeed, it has the highest HDI of the region and is the only Latin American country to be included in the World Bank's list of high-income countries [50].

Ecuador and Peru stand out because of the high cumulative mortality rates per 100,000 inhabitants in these countries, despite the fact that they both adopted strict social distancing measures at a relatively early stage, with a marked reduction in the social mobility of their

populations. Peru is one of the countries in the region in which most testing has been performed, which could have contributed to a lower rate of under-reporting of deaths. Despite the rapid response, the considerable proportion of the population living in poverty and in overcrowded housing probably accelerated the spread of the disease, quickly overwhelming the capacity of the already fragmented and inequitable healthcare system [51]. Indeed, the segmentation of the healthcare system has been identified as another major problem in tackling the pandemic in the country. The Ministry of Health covers 65% of the country's population, including the poorest segments, those working in the informal job market, the unemployed and their families, through its Comprehensive Health Insurance System. The Department of Social Security covers formal workers, a segment that corresponds to 20% of the population. Finally, the remaining 15% of the population has no access to healthcare at all [49]. Peru has the equivalent of 5.8 ICUs per 100,000 inhabitants, less than half the capacity of Italy, for example, which has 12.5 ICUs per 100,000 inhabitants [13]. Furthermore, over half the households in the country have no refrigerator, thus increasing the number of visits families have to make to food markets, and almost 60% of Peruvians have no bank account, leading to crowding at banks to receive government aid [50]. The proportion of individuals with no access to sewerage in the country is 26% [19]. Ecuador, where the government is largely unpopular and where there is a significant lack of high complexity healthcare services, with insufficient numbers of ICU beds, mechanical ventilators and intensivists [49], also faces problems related to inequality and poverty and has been highlighted as the country where control measures were implemented in the most unequal manner and where monitoring the disease in vulnerable populations such as indigenous peoples and Venezuelan migrants has proved difficult [52].

Haiti and Nicaragua have reported low mortality rates despite having adopted less restrictive measures or no measures at all. The registration of cases and deaths in Haiti may have been

biased in view of the precarious socioeconomic and health conditions in the country [53]. Haiti has the highest population density, the lowest life expectancy at birth and the lowest HDI of the 20 countries evaluated here. Poverty affects almost 70% of families, while 43% of the population lives in rural areas, and the education and healthcare systems are precarious. Together, these factors hamper prevention, diagnosis and treatment [53,54]. Additionally, Haiti is the country where the fewest tests have been performed up to the present moment (994 per 1,000,000 inhabitants), probably indicating under-reporting of cases. Nicaragua is also one of the poorest countries, with rural residents corresponding to 43% of the population. There are no data on the number of tests performed, which also makes assessing the number of registered cases and deaths difficult. The situation in the country is unstable and the government, in addition to not adopting social distancing measures, has encouraged mass gatherings [55,56]. Interpreting the data on these two countries certainly demands caution and further investigation.

Venezuela is perhaps the country in the region that is in the most critical political situation. The prolonged and complex crisis, with international repercussions and a major ideological debate in the media, hampers interpretation of the country's results. The government adopted social distancing measures at an early stage, and it is one of the countries in the region with the highest number of tests performed, which could explain the low number of reported cases and deaths. Still, these numbers have been questioned [51], largely due to reports that the indicators of maternal and child mortality had almost doubled between 2013 and 2016 and the incidence of infectious diseases such as tuberculosis, HIV infection and vaccine-preventable diseases has increased during the economic and political crisis in the country [57]. Nevertheless, the scientific literature on the epidemiological situation in the country is sparse and, certainly, the

situation in relation to COVID-19 will only be fully clarified following future scrutiny and analyses.

In several countries in the region, the fragility of the healthcare system means that they struggle to cope with the demand for the high-complexity care required by COVID-19. The public and private healthcare costs in Latin America and the Caribbean are around 8.6% of the GDP, whereas in the countries of the Organisation for Economic Co-operation and Development, a group of the world's richest countries, this percentage is 12.6% [18].

The conditions of poverty and social inequality in the populations of Latin America are exacerbated in traditional communities, which are also more vulnerable to mortality from COVID-19. The discrimination of indigenous peoples and the poverty resulting from the systematic expropriation of their lands, the overlap of infectious and non-infectious diseases with the persistently high proportion of malnutrition and obesity, in addition to the difficulties in complying with social distancing and the isolation of cases, and the poor healthcare in these groups, may result in a higher number of deaths compared to the general population [23].

The social vulnerability of the populations of Latin America directly affects compliance with social distancing measures. Restrictions to job-related activities demand government actions to guarantee not only the survival of families during and after the health crisis, but also to ensure compliance with the control policies for COVID-19 [58].

In these Latin American countries, the emergency measures adopted, particularly those aimed at protecting the most vulnerable segments of the population, were, in general, limited, and included: increasing the population already covered by income transfer programs (Brazil and

Guatemala); transfer of additional benefits for families already receiving benefits from other social programs and for population groups or groups of workers in a situation of vulnerability (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, El Salvador, Ecuador, Panama, Paraguay, Peru, Uruguay and Venezuela); distribution of food supplies to more vulnerable segments of the population (Honduras, Panama, Uruguay); disconnection prohibited in cases of non-payment of bills for essential public utility services such as electricity, gas and water supplies (Argentina, Bolivia, Colombia, Ecuador and certain states of Brazil), temporary suspension of utility service charges (El Salvador), control or reduction in the price of these utility service charges (Colombia, Ecuador, Panama and Peru); price controls for essential goods (Argentina, Bolivia, El Salvador, Guatemala and Panama); reimbursement of value added tax for low-income families (Colombia) and early income tax refunds for autonomous workers (Chile); lines of credit (Brazil and the Dominican Republic), and flexibility, refinancing or temporary suspension of debt repayment (Bolivia, Brazil, Chile, Colombia, El Salvador, Ecuador, Haiti, Honduras, Paraguay, Peru, the Dominican Republic and Uruguay), particularly for the poorest segments of the population and for autonomous workers [58].

Although this wide range of measures has been proposed in different countries, the social and economic crisis affecting the countries of this region may have hindered implementation, with the programs failing to benefit all those who need them. In Peru, for example, social care for native peoples was based on a registry that represented only 27% of the population [57]. In Brazil, the government emergency benefit program may exclude 7.4 million eligible individuals who will have difficulty requesting aid due to their problems accessing the Internet (the technological option adopted by the government for the registration of eligible individuals). In addition, 6.1 million workers could be excluded because it is limited to two beneficiaries per household, and the program will not help the 26-million middle-income

workers who in the event of being fired, will be unable to access unemployment benefit [59]. Therefore, the coverage of the actions, the duration of the emergency measures, the value of the resources allocated, and the rules for their implementation, which often include means of distribution that force beneficiaries into crowded situations, are crucial aspects that need to be dealt with for these policies to ensure compliance with social distancing measures.

Under the justification of preserving jobs and protecting companies [59], three Latin American countries (Argentina, Brazil and Chile) opted to relax current employment laws by considering the pandemic a force majeure, allowing the suspension of work contracts, and reductions in working hours and salaries. These measures, as well as constituting a setback in labor relations, are harmful in that they permit salaries to be reduced during the pandemic.

The most vulnerable populations are those most likely to be fired or to suffer cuts to their salaries and in general such individuals are more likely to be in the informal job market. In 2016, 53% of workers in Latin America were informal workers, with women, indigenous people, those of African descent and migrants being over-represented in this the group [61]. According to data from ECLAC and from the International Labor Organization, the recession of 2020 will have a strong impact on the job markets of Latin America and the Caribbean, with estimates suggesting that more than 11.5 million workers have lost or will lose their jobs this year, increasing the number of unemployed from 26.1 to 37.6 million and the unemployment rate from 8.1% to 11.5% by the end of the year. Policies of social protection must be adopted to enable the population to comply with social distancing measures, for these measures to be effective and, principally, to avoid a decline in the life conditions of the population already marked by inequality [2] and avoid increasing food insecurity and malnutrition in vulnerable segments of the population [62].

571

572 Compliance with social distancing measures also depends on coordinated actions by
573 governments and the recommendations of political leaders, who, in some countries, have acted
574 in defiance of the guidelines issued by the health authorities. This is the case in Brazil, Mexico
575 and Nicaragua. The Nicaraguan government failed to adopt any social distancing measures at
576 all. The president, Daniel Ortega, refused to promote social distancing and the Vice-President,
577 Rosario Murillo, organized protest marches under the banner "Love in the Time of COVID-
578 19" [55]. In Brazil, at federal government level, only measures related to border controls and
579 the entry of non-nationals into the country were adopted. The President, Jair Bolsonaro, in
580 addition to minimizing the seriousness of the situation, has opposed social distancing measures
581 and rallied groups of his supporters to protest in the streets [63]. At the beginning of the
582 epidemic, the Mexican President, Andrés Manuel López Obrador, also underestimated the
583 disease and encouraged people to continue frequenting places such as restaurants [64]; however
584 as the pandemic progressed, he changed his discourse and began to endorse the health
585 recommendations.

586

587 Lack of coordinated governmental response has created a scenario in which socioeconomic
588 inequality is reflected in unequal access to information on COVID-19 [65]. People with higher
589 incomes tend to obtain information from various different sources including periodicals and
590 television news programs, while those with lower incomes often obtain information through
591 social media networks and are consequently subject to great level of misinformation and fake
592 news. Nevertheless, although information is important, behavioral aspects can influence
593 compliance with social distancing, particularly the motivation to protect those closest to the
594 individual: people they love, neighbors and family members [66]. Since this pandemic has been

occupying social media on a daily basis, it is possible that people are adopting measures they trust, thus reducing mobility outside the home.

From the results of the present study, it is clear that, in addition to structural factors related to material living conditions and the mechanisms of discrimination in access to healthcare resources, even with the lack of government actions or ambiguity with respect to those actions, behavioral factors can affect compliance with social distancing measures, as shown by the reduction in social mobility in Nicaragua or even in Brazil or Mexico. Another aspect that merits investigation is the contribution of the widespread use of facemasks in the epidemic in Latin America, which, alone or in combination with lockdown, has been indicated as having great potential to reduce the transmission of COVID-19 [67,68].

Conclusions

In general, as in other continents, the Latin America countries that adopted more restrictive measures at an early stage and in a coordinated fashion, achieved the best results in the control of the COVID-19 pandemic. Nevertheless, this equation does not appear to guarantee a positive result across all regional settings, possibly due to the vast social inequalities and chronic deficiencies of the healthcare systems, particularly in those in which the neoliberal policy model of reducing the role of the state in health and social policies was adopted, a scenario that is rendered even more complex due to the recurrent political crises. The COVID-19 pandemic continues to grow in Latin America and exposes these contradictions, with future studies being required to improve understanding and generate lessons on how to manage such a complex crisis.

The immense social, racial and ethnic inequalities present in Latin America confer particular characteristics to the pandemic and the measures necessary to combat it. Many of these aspects differ considerably from those seen in countries of Europe and Asia, representing a huge challenge. Notwithstanding, what appears clear is that to adequately control this epidemic and any future epidemics in Latin America, strengthening the public healthcare systems is crucial, including the provision of universal and equal access to basic and high-complexity services, the availability of high quality, transparent health data and the adoption of intersectoral health policies and social protection aimed at reducing inequalities and achieving greater social justice.

List of Abbreviations

ECLAC	Economic Commission for Latin America and the Caribbean
GDP	Gross domestic product
HDI	Human development index
HIV	Human immunodeficiency virus
ICU	Intensive care unit
SARS	Severe acute respiratory syndrome
WHO	World Health Organization

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877 **Figure Legends:**

878 **Figure 1.** Trends in the number of cases and deaths from COVID-19 in Latin America.

879 *Legend:* (A) Cumulative number of cases; (B) Number of cases per 100,000 inhabitants; (C)
880 Number of deaths per 100,000 inhabitants; (D) Fatality among confirmed cases. The analyses
881 were performed using data from the European Centre for Disease Prevention and Control up
882 to June 28, 2020. Code adapted from Kieran Healy (twitter).

883 **Figure 2.** Restrictive degrees in social distancing measures as implemented in each Latin
884 American country.

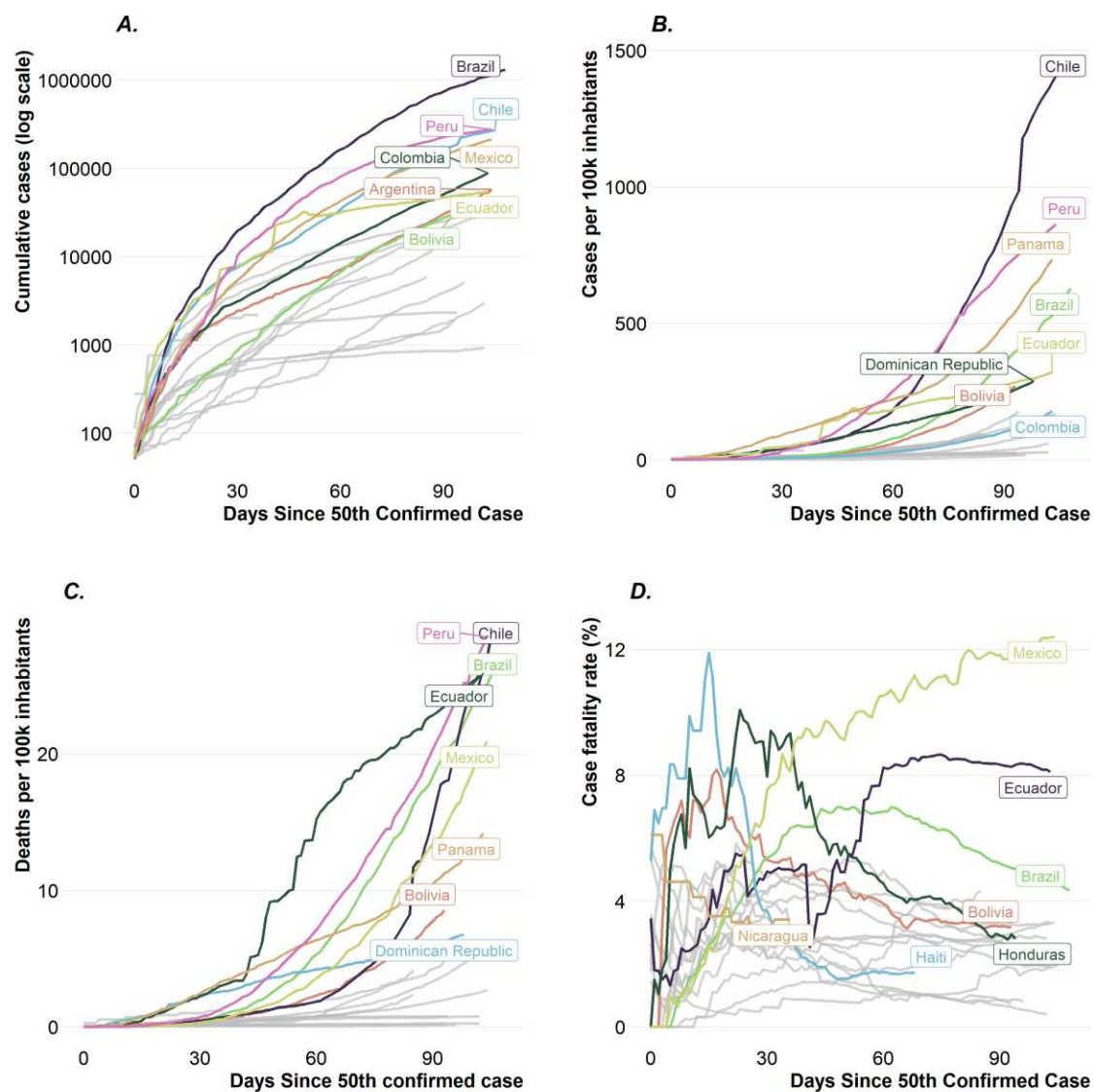
885 *Legend:* (A) At the time of diagnostic confirmation of the 1st case of COVID-19; (B) 50th case;
886 (C) 100th case; (D) 1000th case. Data collected up to May 15, 2020. *White* - no measures; *yellow*
887 - countries with mild restrictions; *orange* - countries with moderate restrictions; *red* - countries
888 with strict restrictions; and *maroon* - countries with lockdown. Up to June 28, 2020, Uruguay
889 had not yet reached 1,000 cases; however, for the purpose of comparison, the same level of
890 restriction in Figure 2C was applied for that country.

891 **Figure 3.** Changes in mobility outside the home in the Latin American countries evaluated.

892 *Legend:* No data available in Google Mobility Reports on social mobility in Cuba.

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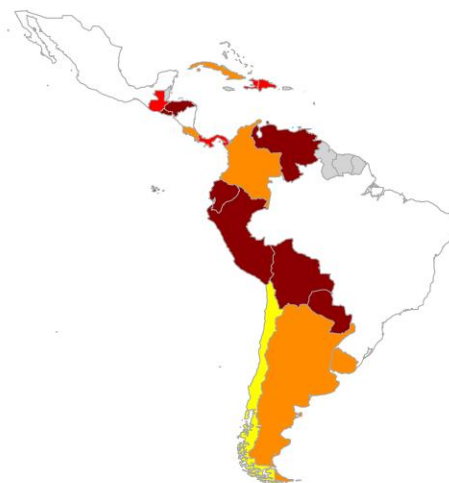
895 **Figure 1.**

905 **Figure 2.**

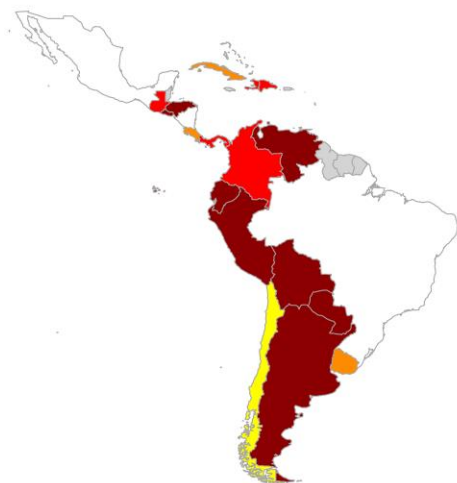
A. At 1st confirmed case of Covid-19



B. At 50th Covid-19 confirmed case



C. At 100th Covid-19 confirmed case



D. At 1000th Covid-19 confirmed case



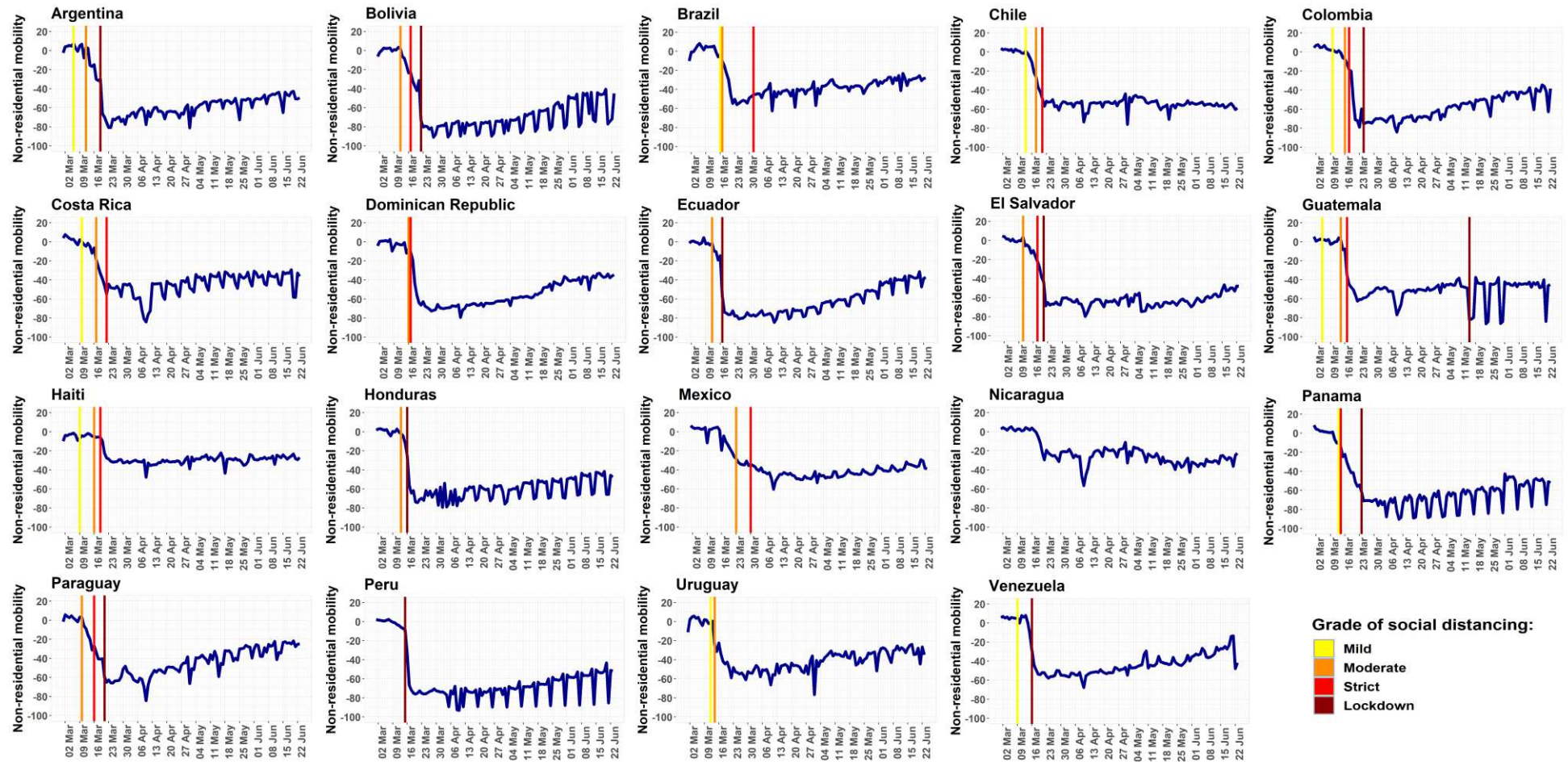
Grade of social distancing

- No measures
- Mild
- Moderate
- Strict
- Lockdown
- NA

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Figure 3



Additional file – Supplementary material

Covid-19 in Latin America countries: Course of the pandemic and the different responses towards control

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Figure S1. Social mobility according to type of location in Latin America.

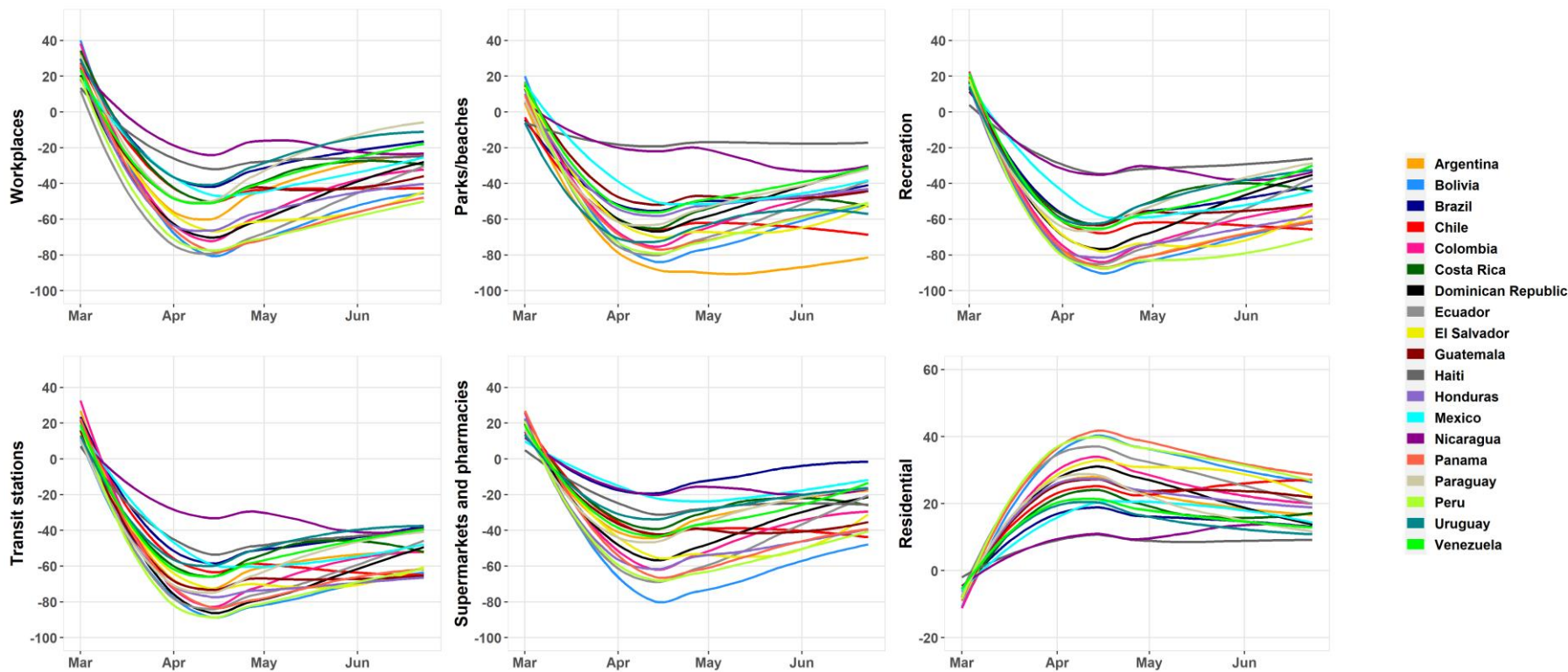


Table S1. Sociodemographic indicators of the 20 Latin American countries included in the study.

Country	Population	Population density	Urban population (%)	Life expectancy at birth (years)	Population aged ≥65 (2018)	Total fertility rate (births per woman)	Poverty headcount ratio at national poverty lines (% of population)	Poverty headcount ratio at \$1.90 a day (2011 PPP) (% of population)	Income share held by lowest 20%	Under-5 mortality rate (per 1,000 live births)	HDI 2019	GINI Index	Mobile cellular subscriptions (per 100 people)
Argentina	44,484,502	16.3	93	76.5	11.1	2.3	32	1	5	9.9	0.830	41.20	132.09
Bolivia	11,353,142	10.5	69	71.2	7.2	2.7	34.6	4.5	4.6	26.8	0.703	44.00	100.82
Brazil	209,469,333	25.1	88	75.7	8.9	1.7	..	4.4	3.1	14.4	0.761	53.30	98.84
Chile	18,729,160	25.2	85	80.0	11.5	1.6	..	..	..	7.2	0.847	46.60	134.44
Colombia	49,648,685	44.7	80	77.1	8.5	1.8	27	4.1	4	14.2	0.761	49.70	129.91
Costa Rica	4,999,441	97.9	80	80.1	9.5	1.8	21.1	1.4	4.3	8.8	0.794	48.30	169.93
Cuba	11,338,138	109.0	78	78.7	15.2	1.6	..	..	..	5	0.778	..	47.39
Dominican Republic	10,627,165	220.0	85	73.9	7.1	2.3	22.8	0.4	5.8	28.8	0.745	45.70	84.10
Ecuador	17,084,357	68.8	63	76.8	7.2	2.4	23.2	3.3	4.6	14.2	0.758	44.70	92.32
El Salvador	6,420,744	309.9	73	73.1	8.3	2.0	..	1.5	6.2	13.7	0.667	38.00	146.92
Guatemala	17,247,807	161.0	52	74.1	4.8	2.9	..	..	..	26.2	0.651	48.30	118.67
Haiti	11,123,176	403.6	57	63.7	4.9	2.9	..	..	..	64.8	0.503	41.10	57.53
Honduras	9,587,522	85.7	57	75.1	4.7	2.5	48.3	16.5	3	17.6	0.623	50.50	79.15
Mexico	126,190,788	64.9	84	75.0	7.2	2.1	41.9	1.7	5.4	12.7	0.767	48.30	95.23
Nicaragua	6,465,513	53.7	57	74.3	5.2	2.4	..	..	..	18.3	0.651	46.20	115.10
Panama	4,176,873	56.2	68	78.3	8.1	2.5	..	1.7	3.6	15.3	0.795	49.90	137.00
Paraguay	6,956,071	17.5	62	74.1	6.4	2.4	24.2	1.6	4.7	20.2	0.724	48.80	106.95
Peru	1,989,256	25.0	79	76.5	8.1	2.3	20.5	2.6	4.9	14.3	0.759	43.30	..
Uruguay	3,449,299	19.7	96	77.8	14.8	2.0	8.1	0.1	5.9	7.6	0.808	49.50	149.90
Venezuela	28,870,195	32.7	NA	72.1	7.3	2.3	..	..	..	24.5	0.726	46.90	71.77

Legend: Population density: people per square km of land area; PPP: Purchasing power parity; HDI: Human development index.

Table S2. First confirmed case, first community transmission, and epidemiological indicators on June 28, 2020.

Country	Date of first confirmed case	Cases	Deaths	Cases/100,000	Deaths/100,000	Case	Tests/million	Tests/cases
						fatality rate (%)		
Argentina	03 Mar	57731	1207	129.7	2.7	2.1	7456	5.8
Bolivia	11 Mar	30676	970	270.2	8.5	3.2	6072	2.3
Brazil	26 Feb	1313667	57070	627.1	27.2	4.3	14196	2.3
Chile	03 Mar	267766	5347	1429.7	28.5	2.0	56481	4.0
Colombia	07 Mar	88591	2939	178.4	5.9	3.3	14266	8.2
Costa Rica	06 Mar	2979	12	59.6	0.2	0.4	7558	12.9
Cuba	11 Mar	2330	86	20.6	0.8	3.7	14685	71.4
Dominican Republic	01 Mar	30619	718	288.1	6.8	2.3	13465	4.8
Ecuador	29 Feb	54574	4424	319.4	25.9	8.1	8223	2.7
El Salvador	19 Mar	5934	152	92.4	2.4	2.6	24329	26.6
Guatemala	13 Mar	16397	706	95.1	4.1	4.3	1755	1.9
Haiti	19 Mar	5777	100	51.9	0.9	1.7	994	2.0

Honduras	11 Mar	17007	479	177.4	5.0	2.8	2175	1.3
Mexico	28 Feb	212802	26381	168.6	20.9	12.4	4314	2.6
Nicaragua	19 Mar	2170	74	33.6	1.1	3.4	-	-
Panama	10 Mar	30658	592	734.0	14.2	1.9	29107	4.1
Paraguay	07 Mar	1942	15	27.9	0.2	0.8	9390	34.5
Peru	06 Mar	275989	9135	862.8	28.6	3.3	49901	6.0
Uruguay	13 Mar	924	26	26.8	0.8	2.8	18593	69.9
Venezuela	13 Mar	5130	42	17.8	0.1	0.8	43613	241.8

* Community transmission is presumed when confirmed cases cannot be linked to chains of transmission in a large number of cases, or from an increase in positive tests using samples from sentinel sites (systematic routine tests of respiratory tract samples from established laboratories), or from clusters of cases, i.e. cases grouped in time, geographical location and/or common exposures.

Table S3. Control measures implemented in each one of the Latin American countries

Country	Social Distancing						Isolation of cases	Use of facemasks ¹	Express use of police power	Other exceptional measures
	Events	Education	Industry and Commerce	Parks, pools, etc.	Mobility	Work				
Costa Rica[1-6]	Mass gatherings banned except in open air (12 Mar). All meetings banned (21 Mar)	All educational activities suspended (17 Mar)	Non-essential services involving face-to-face contact with the public closed (03 Apr)	Access to beaches and parks suspended (24 Mar)	Borders closed to non-resident foreign nationals (19 Mar); Nighttime curfew imposed except for essential transport (22 Mar); Rotating schedules for non-essential vehicles (04 Apr)	Remote working for civil servants (10 Mar); Residence permit withdrawn from non-nationals who leave the country (24 Mar)	Fourteen-day quarantine for anyone coming into the country (19 Mar)	Recommended	Police forces to ensure compliance with measures; The Ministry of Health or the police to close establishments that fail to comply with measures (16 Mar); Traffic fines for unauthorized circulation (24 Mar)	
Cuba[7-8]	Events postponed (19 Mar)	All educational activities suspended (24 Mar)	Cinemas, discotheques, bars and nightclubs closed (24 Mar)	Pools, gymnasiums, parks and camping sites closed (24 Mar)	Borders closed to non-residents (21 Mar); All public and private interstate transport suspended (24 Mar); Borders closed (02 Apr)	Employees with symptoms of the disease banned from frequenting their workplaces (24 Mar)	Centers for the isolation of suspected and confirmed cases (05 Mar); Fourteen-day quarantine for anyone coming into the country (24 Mar); Cordons sanitaires in some communities with confirmed cases (31 Mar)	Mandatory (02 Apr)		

El Salvador[9-12]	<p>Events deemed a health risk banned (14 Mar);</p> <p>All meetings banned (21 Mar)</p>	<p>All educational activities suspended (11 Mar)</p>	<p>Bars, discotheques, gymnasiums and establishments that sell alcoholic beverages or that provide entertainment closed (16 Mar);</p> <p>Restaurants and snack bars closed (17 Mar);</p> <p>Call centers closed (18 Mar);</p> <p>Non-essential businesses and tax-free zones closed (18 Mar);</p> <p>Retail centers closed (19 Mar);</p> <p>All non-essential services closed (30 Mar)</p>	<p>Recreational activities in public places banned (03 Apr)</p>	<p>Borders closed to non-resident foreign nationals (11 Mar);</p> <p>Circulation of individuals other than essential workers banned (21 Mar);</p> <p>Requirement to carry permit to go out, restricted to essential workers (21 Mar)</p> <p>Lockdown in municipalities with high infection rates (17 Apr)</p>	<p>Activities of all civil servants suspended except for those working in health, civil protection and public security (11 Mar);</p> <p>Job and salaries secured for individuals in quarantine (11 Mar);</p> <p>Paid leave for workers in the private sector identified as being in at-risk groups (16 Mar)</p> <p>Circulation of individuals and vehicles banned except for essential workers (21 Mar)</p> <p>Temporary paid leave or remote working for at risk groups (30 Mar)</p>	<p>Isolation of all individuals entering the country (11 Mar);</p> <p>Isolation of suspected and confirmed cases (13 Mar);</p> <p>Creation of cordons sanitaires (14 Mar)</p>	<p>Mandatory (08 Apr)</p>	<p>Isolation for 30 days in containment centers created by the state for individuals who fail to comply with the isolation order, with powers to increase isolation by 6 days if a case of the disease is confirmed in the center (13 Mar);</p> <p>Police forces used to ensure compliance with measures (14 Mar);</p> <p>Individuals who circulate without justification sent to containment center for 30 days' isolation (21 Mar)</p>	<p>Constitutional court banned detention in containment centers determined by the Executive Council;</p> <p>Irregular detentions by the police; State concedes aid to those held in containment centers;</p> <p>Those prevented from working due to obligatory isolation cannot be fired or have their salaries reduced.</p>
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Guatemala [13-14]	Public events cancelled (05 Mar); Events need authorization from the Ministry of Health (05 Mar); Gatherings of more than 100 individuals banned (14 Mar); All events banned (17 Mar)	All educational activities suspended (14 Mar)	Retail centers closed (17 Mar); Businesses and services must close between the hours of 9 pm and 4 am (17 Mar); Consumption and sale of alcoholic beverages at night banned (17 Mar); Businesses and services banned from operating (30 Mar); Municipal markets must close at 1 pm (30 Mar); Consumption and sale of alcoholic beverages banned (06 Apr)	Activities in public places banned (05 Apr); Social visiting outside the municipality banned (05 Apr)	Non-nationals who have been in China in the preceding 15 days not allowed into the country. Nationals in the same situation to be submitted to clinical evaluation, with possible isolation (31 Mar); Individuals arriving from countries with a high number of cases banned from entering the country (12 Mar); Borders closed (17 Mar); Curfew imposed between the hours of 4 pm and 4 am (22 Mar); Municipal and intercity transport suspended (17 Mar); Travel outside the state forbidden (05 Apr)	Non-essential on-site activities in the public sector suspended (17 Mar)	Isolation of suspected and confirmed cases and contacts (05 Mar); Isolation of all individuals entering the country (11 Mar); Institution of cordons sanitaires (21 Mar)	Mandatory (12 Apr)	Restrictions in movement enforced by police (29 Mar); Individuals disobeying obligatory isolation to respond criminally (29 Mar);	

Haiti[15-16]	Meetings involving more than 10 individuals banned (19 Mar)	All educational activities suspended (19 Mar)	Recommendation to limit indoor leisure activities (19 Mar); Businesses closed (19 Mar)		Travelers who have been in areas with high infection rates in the preceding 14 days banned from entering the country (09 Mar); Borders closed (16 Mar); Ports and airports closed (19 Mar); Nighttime curfew (19 Mar)	Rotating schedules for non-essential civil servants (19 Mar)	Fourteen-day preventive isolation for individuals entering the country from an infected area (19 Mar)	Mandatory (11/05)	Public forces to ensure compliance with measures (19 Mar)	
Honduras[17-19]	Events banned (13 Mar); Gatherings of more than 50 individuals banned (13 Mar)	Primary and secondary schools closed (13 Mar); Universities closed (16 Mar)	Retail centers closed (16 Mar); Non-essential activities in the public and private sectors suspended (16 Mar)		Non-residents arriving from Europe, China, Iran and South Korea banned from entering the country (13 Mar); Borders closed (16 Mar); Public transport suspended (16 Mar); Municipal and intercity circulation banned in cities with a greater number of cases (16 Mar)	Remote working for those over 60 years of age (14 Mar); Circulation banned except for essential activities (16 Mar)	Self-isolation at home for residents arriving from Europe, China, Iran and South Korea (13 Mar); Isolation for all entering the country (16 Mar)	Mandatory (13 Apr)	Police to give support to prevent mass gatherings of individuals above permitted levels (15 Mar); Establishments charged with criminal offence for disobeying measures (15 Mar).	

Mexico[20-21]	Recommendation to ban events of more than 100 individuals (24 Mar); Events of more than 50 individuals banned (31 Mar)	All educational activities suspended (23 Mar) — 11 states suspended classes earlier, on dates ranging from 17 Mar to 20 Mar	Non-essential activities in the public and private sectors suspended (30 Mar)			Remote working for civil servants in at-risk groups and rotating schedules for the others (23 Mar); Remote working for all civil servants able to work from home (27 Mar); Voluntary self-isolation at home recommended for non-essential workers (30 Mar)		Mandatory (20/05)	Police forces to ensure compliance with measures (24 Mar);	
Nicaragua[22]								Recommended in parts of the country		
Panama[23]	Events involving more than 50 individuals banned (13 Mar)	All educational activities suspended (20 Mar)	Non-essential businesses and services suspended (19 Mar); Sale of alcoholic beverages banned (24 Mar)	Public and private collective leisure spaces closed (16 Mar)	Disembarking from vessels coming from risk areas banned (13 Mar); Nighttime curfew (14 Mar); International flights suspended (19 Mar); Lockdown (24 Mar); Rotating schedules according to gender for access to on-site retail and other services (30 Mar)	Workers in at-risk groups given the right to bring forward vacation time (16 Mar)	Isolation for suspected and confirmed cases at home or in a hotel designated by the state (23 Mar)	Mandatory (07 Apr)	Sanctions including fines for individuals and fines and closure for establishments not complying with measures	

Dominican Republic[24]	Events banned (17 Mar)	All educational activities suspended (16 Mar)	On-site and non-essential businesses and services suspended (17 Mar)	Access to beaches, rivers and pools banned (02 Apr)	Cruise ships not allowed to dock (16 Mar); Flights from Europe, Iran and South Korea banned (16 Mar); Borders closed (19 Mar); Nighttime curfew (20 Mar)	Remote working and rotating schedules for non-essential civil servants (20 Mar)	Isolation for individuals who have been in Europe, China, Iran or South Korea in the preceding two weeks (16 Mar)	Mandatory (18 Apr)	Enforced by police	

Argentina[25]	Mass gatherings banned, and cultural spaces and establishments closed (12 Mar)	All educational activities suspended (16 Mar)	All non-essential activities suspended (19 Mar)	National parks and protected areas closed (15 Mar)	Flights from affected countries suspended (12 Mar); Borders closed to non-residents (16 Mar); Long-distance public transport suspended and restrictions imposed for permitted vehicles (17 Mar); Circulation banned except for essential activities (19 Mar) Borders closed to residents (26 Mar); Gradual entry of residents into the country through a “sanitary corridor” (01 Apr); Domestic flights suspended (27 Apr)	Special leave of absence for workers in the public and private sector returning to the country from affected places to remain in quarantine (06 Mar); Leave of absence for workers in all teaching institutes and those in the public and private sectors who are in the obligatory isolation group (suspected and confirmed cases, contacts and travelers) (12 Mar); Leave of absence for workers in at-risk groups (17 Mar); Remote working for civil servants (17 Mar)	Isolation of travelers who develop symptoms (11 Mar); Isolation of cases, including suspected cases and contacts (12 Mar); Obligatory quarantine for travelers returning to the country (17 Mar); General preventive isolation including prohibition of circulation in streets and highways in the country, except for essential activities (19 Mar)	Mandatory (20 Apr)	Information that an individual has failed to comply with isolation laws to be evaluated by a specific entity (12 Mar); A special telephone line for individuals to inform cases of non-compliance is created (17 Mar); In cases of infraction, vehicles can be detained (19 Mar)
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Bolivia[26]	Events involving more than 1,000 individuals banned (12 Mar); Events involving more than 100 individuals banned (16 Mar); All meetings banned (25 Mar)	All educational activities suspended (12 Mar)	Opening hours of non-essential activities restricted (17 Mar)	Events in gymnasiums and parks banned (16 Mar); Events in discotheques, bars and cinemas banned (16 Mar)	Flights from Europe suspended (13 Mar); Nighttime curfew (17 Mar); Public transport schedules restricted (17 Mar); Non-nationals arriving from affected areas banned from entry (18 Mar); Travel between provinces banned (20 Mar); Borders closed (21 Mar); International air, sea and road transport suspended (21 Mar); Lockdown (22 Mar); Circulation of unauthorized vehicles banned (22 Mar); One person per household allowed out to purchase basic necessities in the morning (22 Mar); Permission to circulate granted according to a rotating schedule based on identity card number and in close vicinity to home (25 Mar)	Continuous working hours for activities in public and private sector (16 Mar); Leave of absence for the elderly, for pregnant women, those with chronic diseases and for parents of children under 5 years of age (17 Mar); Work activities in public and private sectors suspended (25 Mar)	Fourteen-day quarantine for those entering the country (13 Mar); Isolation of confirmed and suspected cases (17 Mar); Lockdown (22 Mar)	Recommended in parts of the country	Closure of private establishments; Detention of 8 hours, fine and criminal record for offense against public health in cases of non-compliance or of encouraging non-compliance (sentence of 1-10 years); Fine and confiscation of any vehicle circulating without authorization (25 Mar)

Brazil[27-35]	Partial prohibition of events by state governors in the majority of the most populous states (16 Mar)	Educational activities suspended by state governors in the majority of the most populous states (17 Mar)	Non-essential businesses and services closed in the majority of the most populous states (01 Apr)	Parks and beaches closed by state governors in the majority of the most populous states (19 Mar)	All borders closed except for the border with Uruguay (19 Mar); Intercity transport suspended by state governors in the majority of the most populous states (20 Mar); Entry of non-nationals arriving from countries with high infection rates banned (23 Mar); Entry of non-nationals into the country banned (30 Mar)	Remote working for federal and state civil servants belonging to at-risk groups in the majority of the most populous states (17 Mar)		Recommended in parts of the country	Use of police by the states	

Chile[36]	Events involving more than 500 individuals banned (13 Mar); Events involving more than 50 individuals banned (25 Mar)	All educational activities suspended in establishments in which there are cases (13 Mar); All educational activities suspended (25 Mar)	Cinemas, theaters, bars, discotheques, nightclubs, restaurants and cafés closed (21 Mar)	Open-air gymnasiums closed (21 Mar)	All travelers entering the country obliged to complete a self-declaration form on their state of health (28/02); Disembarking from cruise ships banned (15 Mar); Borders closed for air and sea transport (18 Mar); Nighttime curfew and safe-conduct required for circulation nationwide (22 Mar); Curfew restrictions in some places (20 Mar); Cordons sanitaires with entry/exit forbidden (23 Mar); Travelling to places other than main home forbidden (23 Mar)	Remote working for civil servants in at-risk groups and rotating schedules for the remainder (13 Mar)	Isolation of confirmed and suspected cases and of travelers returning from affected areas (13 Mar); Self-isolation of elderly (24 Mar); Isolation sites for those who fail to comply with quarantine (25 Mar); Lockdown in certain districts established by the government (26 Mar)	Mandatory (08 Apr)	Fines and sentences for those who fail to comply with quarantine (25 Mar); Isolation in hostels for those who do not comply with quarantine (25 Mar)	State of exception, with the adoption of nationwide restriction measures and stricter measures in the most affected parts of the country (19 Mar)
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Colombia[37-38]	Events involving more than 500 individuals banned (12 Mar); Events involving more than 50 individuals banned (19 Mar)	Educational activities at primary and secondary school level suspended (16 Mar); All educational activities suspended (20 Mar)	Retail establishments closed, as well as entertainment and leisure activities and face-to-face food outlets (18 Mar)	Lockdown (25 Mar)	Closure of land, river and sea borders with Venezuela (13 Mar); Closure of borders with Panama, Ecuador, Peru and Brazil (16 Mar); Entry of passengers from international flights suspended (20 Mar); All domestic flights suspended (25 Mar); Lockdown, with only one person from each nuclear family being allowed out for essential activities (25 Mar)	Only essential activities. Workers need to be accredited (25 Mar)	Fourteen-day quarantine for individuals entering the country from countries with high infection rates (10 Mar); Elderly asked to self-isolate (20 Mar)	Mandatory (04 Apr)	Fines and sentences (25 Mar)	Decree determining the instructions for governors and mayors to adopt measures to restrict circulation and regarding the opening of establishments, adopted in different ways (18 Mar)
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Ecuador[39-40]	Events involving more than 30 individuals banned (12 Mar)	Educational activities suspended (12 Mar)	Non-essential businesses with more than 30 customers attending simultaneously closed and restrictions regarding the opening hours of restaurants (16 Mar); Non-essential on-site industrial activities and restaurants banned, as well as retail and services with more than 30 individuals (17 Mar)		Disembarking from cruise liners banned (16 Mar); Domestic flights suspended (17 Mar); Rotating schedules of vehicles for municipal and intercity transport (17 Mar); Interstate passenger transport banned (17 Mar); Arrival of international passenger flights banned (17 Mar); Circulation restricted to essential activities and work only (17 Mar); Nighttime curfew (17 Mar); Rotating schedules for all vehicles (18 Mar); Curfew prolonged (24 Mar)	Circulation restricted to essential activities and statement of safe-conduct required to confirm essential activity (17 Mar)	Fourteen-day quarantine for travelers arriving from countries with high infection rates (13 Mar); Fourteen day quarantine for travelers arriving from other countries (17 Mar); Obligatory isolation for confirmed and suspected cases in adults over 60 years of age (20 Mar)	Mandatory (08 Apr)	Police and armed forces to ensure compliance with measures; Fines in cases of non-compliance with rotating schedules based on vehicle license plates (16 Mar); Prison sentence of 1-3 years for misuse of safe-conduct (16 Mar); Fine and prison for non-compliance with restrictions to circulation (16 Mar)	State of exemption decreed
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Paraguay [41-42]	Events banned (10 Mar)	All educational activities suspended (10 Mar)	All non-essential activities suspended (21 Mar)	Circulation in streets prohibited, except in cases of need or emergency (21 Mar)	Borders closed except for residents and members of diplomatic missions (17 Mar); Nighttime curfew except for essential services and nightshift workers (16 Mar); Circulation in streets prohibited except for cases of need, urgency or when performing activities defined as essential (21 Mar) Rotating schedules for private vehicles (09 Apr)	Special working hours for civil servants from 9 am to 4 pm except for essential services (13 Mar); Circulation for work prohibited except for essential services (21 Mar)	Isolation of confirmed cases (15 Mar); Supervised isolation at home for 14 days for all individuals returning to the country (15 Mar); Preventive self-isolation for all for health reasons, nighttime curfew (16 Mar); Obligatory health quarantine for travelers in institutions defined by the government (28 Mar); Supervised isolation of cases in temporary hostels for vulnerable individuals who so wish or who have failed to comply with isolation (09 Apr)	Mandatory (20 Apr)	Sanctions with fines for those not complying with health measures (16 Mar); Police and armed forces can restrict the movement of vehicles and individuals, and breaking the law can result in the vehicle being confiscated following fiscal or judicial intervention (20 Mar); Citizens must carry authorization to circulate, with sanctions that include prison for non-compliance (03 Apr); Individuals testing positive who do not comply with quarantine to be prosecuted (05 Apr)	Senate approves exceptional extension to the mandate of the municipal authorities for one year (01 Apr)
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Peru[43]	Public facilities closed (15 Mar); Parades, festivals, civil and religious activities suspended (15 Mar)	Educational activities suspended (15 Mar)	Access to non-essential establishments suspended and restrictions imposed regarding access to essential services (15 Mar); Restaurants closed (15 Mar)	Circulation in streets prohibited except for cases of need or urgency (17 Mar)	Borders closed and intercity transport prohibited except for cargo (15 Mar); Circulation within towns/cities only for essential activities (15 Mar); Reduction of 50% in availability of urban transport, and interstate air, road and river transport suspended (15 Mar); Nighttime curfew (18 Mar); Use of private vehicles banned except for essential activities and for urgent medical care (18 Mar); Only 1 family member can go out for essential activities, in compliance with rotating schedules based on gender, and never on Sundays (02 Apr); Only 1 family member can go out from Monday to Saturday (10 Apr)	Obligatory registration for workers performing essential activities (17 Mar)	Fourteen-day self-isolation at home for travelers from countries with epidemiological history of the disease (15 Mar)	Mandatory (07 Apr)	During the state of national emergency, restrictions were placed on constitutional rights regarding freedom and personal safety, the sanctity of the home and freedom to meet and of movement within the country; The police can detain individuals and check merchandise, vehicles and establishments to prevent unauthorized services and activities from being performed. The police can confiscate documents of drivers and vehicles (18 Mar); Application of fines to be paid within 5 days. If not paid, individuals will be banned from signing contracts, accessing banking and notarial services and travelling abroad (14 Apr)
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Uruguay[44-45]	Public events suspended (13 Mar); Mass gatherings discouraged (13 Mar)	Educational activities suspended (14 Mar)	All major establishments closed except for grocery stores and pharmacies (17 Mar); Priority opening hours for the elderly in supermarkets (24 Mar)	Public and private thermal tourist attractions closed (13 Mar); Camping sites and public resorts closed (31 Mar)	Disembarking from cruise ships banned (13 Mar); Passengers arriving on flights from abroad allowed to disembark at only two airports (16 Mar); Borders with Argentina closed except for cargo (17 Mar); Cordon sanitaire to evacuate persons from the port of Montevideo to travel to airport (20 Mar); Flights from Europe suspended (22 Mar); Leaving the country for tourism banned (24 Mar); Reduction in the frequency of municipal transport at weekends (27 Mar); Reduction of 50% in the availability of public transport at weekends (01 Apr); Availability of public transport doubled at peak times (10 Apr)	Remote working advised for public and private sectors (15 Mar); Preventive self-isolation for those over 65 years of age (civil servants should stay at home and sick pay to be provided for workers in the private sector) (24 Mar)	Quarantining of passengers returning to the country from affected areas (12 Mar); Isolation of cases, of individuals with respiratory symptoms, of contacts and of individuals returning to the country from areas of risk (13 Mar); Preventive self-isolation for those over 65 years of age (24 Mar); Hostels for the homeless elderly (19 Mar)	Mandatory (23 Apr)	Charges of non-compliance with isolation to be evaluated by a specific entity (13 Mar)
	Recommendation not to have private parties (11 Mar); Public establishments closed (14 Mar)								

Venezuela[46-47]	Events and gatherings in public spaces (museums, concerts, churches, etc.) suspended (12 Mar)	Educational activities suspended (16 Mar)	All non-essential activities closed; restaurants can operate only for home delivery (16 Mar)	Circulation in streets prohibited (16 Mar)	Flights from Europe and Colombia suspended (15 Mar); Interstate travel prohibited (17 Mar); Subway and train services suspended (17 Mar); Lockdown in some regions (16 Mar); National lockdown (17 Mar)	Legal suspension of work activities except for essential activities, with corresponding identification required (16 Mar)	Quarantine for travelers coming from affected areas (09 Mar); Isolation of confirmed and suspected cases	Mandatory (18 Mar)		
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¹ Data obtained from Masks4All. What Countries Require Public Mask Usage To Help Contain COVID-19? <https://masks4all.co/what-countries-require-masks-in-public/>. Accessed June 13, 2020.

Table S4. Control measures implemented in each one of the countries of Latin America over time.

	Costa Rica	Cuba	El Salvador	Guatemala	Haiti	Honduras	Mexico	Nicaragua	Panama	Dominican Republic	Argentina	Bolivia	Brazil	Chile	Colombia	Ecuador	Paraguay	Peru	Uruguay	Venezuela
Previous days							28/Feb ¹			01/Mar ¹	03/Mar ¹		26/Feb ¹	03/Mar ¹		29/Feb ¹				
05/Mar				pBE QUAR																
06/Mar	¹										QUAT							¹		
07/Mar															¹		¹			
08/Mar																				
09/Mar					TRAV															QUAT
10/Mar	FCS								¹						QUAT		BE CTE			
11/Mar		¹	CTE pBOR FCS QUAT	QUAT		¹						¹								
12/Mar	pBE			TRAV							QUIS pBE ITRA	pBE CTE	²		pBE	pBE CTE			QUAT	pBE
13/Mar			QUAR	¹		BE CTE TRAV			pBE ITRA			ITRA QUAT		pBE FCS QUIS	pBOR	QUAT	FCS		pBE ¹ PUBL PRIL	¹

																			ITRA QUIS	
14/Mar			pBE	pBE CTE					CURF										PUAS CTE	
15/Mar										PUBL			³	ITRA ²		ITRA	QUAT QUIS	LDWN		ITRA
16/Mar			PRIL		BOR	pSER LDWN BC QUAT	²		PUBL PRIL	CTE ITRA ITRA QUAT	CTE ² pBOR	pBE PRIL PUBL	Pbe*		CTE BOR	pBOR	CURF	²		LDWN
17/Mar	CTE		pSER	BE pSER BOR CTRA STRA FCS				²		BE SER	STRA FCS QUAT LICN	pSER CURF CTRA LICN QUIS	CTE* FCS	³	²	LDWN ² QUAT	pBOR	BOR	pSER pBOR	
18/Mar	²		INDU									Pbor		BOR	PRIL SER	³		³	²	
19/Mar	pBOR QUAT		pSER ¹		pBE ¹ INDU CTE PORT FCS CURF QUAT		³	¹	SER ³	BOR	LDWN		PUBL* pBOR		pBE ³					
20/Mar									CTE	CURF FCS	³	NTRA	STRA*	CIRT	ISOL ITRA					
21/Mar	BE ³	pBOR	LDWN	CORD								BOR		PRIL			LDWN		³	

22/Mar	CURF			CURF						2,3		LDWN	4	CURF						
23/Mar							CTE FCS		QUIS				TRAV	CORD						
24/Mar	PUBL	CTE PUBL NTRA QUAT							LDWN					ISOL					QUIS	2
25/Mar												IDCR		pBE CTE	LDWN	4				
26/Mar		2				2					BOR			4						3
27/Mar												2						2		
28/Mar																	QUAT			
29/Mar		3				3														
30/Mar			SER	SER			PPAS		GNDR				ITRA							
31/Mar				TRAV			pBE ⁴		4			3							pBE PUBL	
01/Apr										4			SER*					4	CIRT	
02/Apr		BOR								PUBL	4				4			GNDR		
03/Apr	pSER		PUBL																	
04/Apr	CIRT		2	2																
05/Apr				PUBL NTRA													3			
09/Apr			3														QUIS			

10/Apr				³															
17/Apr			CORD																
20/Apr		⁴																	
21/Apr					²														
27/Apr											NAIR								
11/May				CURF ⁴															
15/May				LDWN															
Followin g days	29/May ⁴		13/May ⁴		05/May ³	03/May ⁴		23/May ^{2,3}				28/Apr ⁴					03/Jun ⁴		25/May ⁴
					26/May ⁴			03/Jun ⁴											

¹ 1st confirmed case of COVID-19. ² 50th confirmed case of COVID-19. ³ 100th confirmed case of COVID-19. ⁴ 1000th confirmed case of COVID-19.

Abbreviations for measures related to education, services and industry: CTE - Closure of Teaching Establishments; pBE - Partial Ban on Events; BE - Ban on Events; PUBL - Closure of Public Leisure Spaces; PRIL - Closure of Private Leisure Spaces; PPAS - Public and Private non-essential Activities Suspended; PUAS - Public non-essential Activities Suspended; INDU - Non-essential Industries Closed; SER - All non-essential Businesses and Services Closed; NSER - All non-essential Businesses and Services Closed during nighttime; pSER - partial Closure of non-essential Businesses and Services. **Abbreviations for measures related to circulation:** LDWN - Lockdown; CORD - Cordons Sanitaires; CURF - Night Curfew; GNDR - Gender-based Circulation Control; IDCR - ID-based Circulation Control; CIRT - Intracity Circulation Restrictions; CTRA - Public Urban Transport; STRA - Intercity Transport; NTRA - Interstate Transport; NAIR - Domestic Flights Suspended. **Abbreviations for measures related to quarantine, isolation and international travelling:** BOR - Border Closure; pBOR - partial Border Closure; TRAV - Restrictions for Travelers from High Risk Areas; PORT - Closure of Ports and Airports; ITRA - International Travelers Restrictions; QUAT - Quarantine of Travelers; QUAR - Quarantine of Residents; QUIS - Quarantine and Isolation of residents; ISOL - Isolation of members of Risk Groups. **Abbreviations for measures related to workers:** FCS - Flexible work schedules for Civil Servants (remote working, fewer working hours or suspension of activities); LICN - Leave for Workers in at-risk groups.

The highlighted cells indicate the dates of the 1st, 50th, 100th and 1000th confirmed case in each country. *: Date of adoption of measures at state level in at least 3 of the 5 most populous states in the country.

**: The 50th and 100th cases were confirmed on the same date.

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Figures

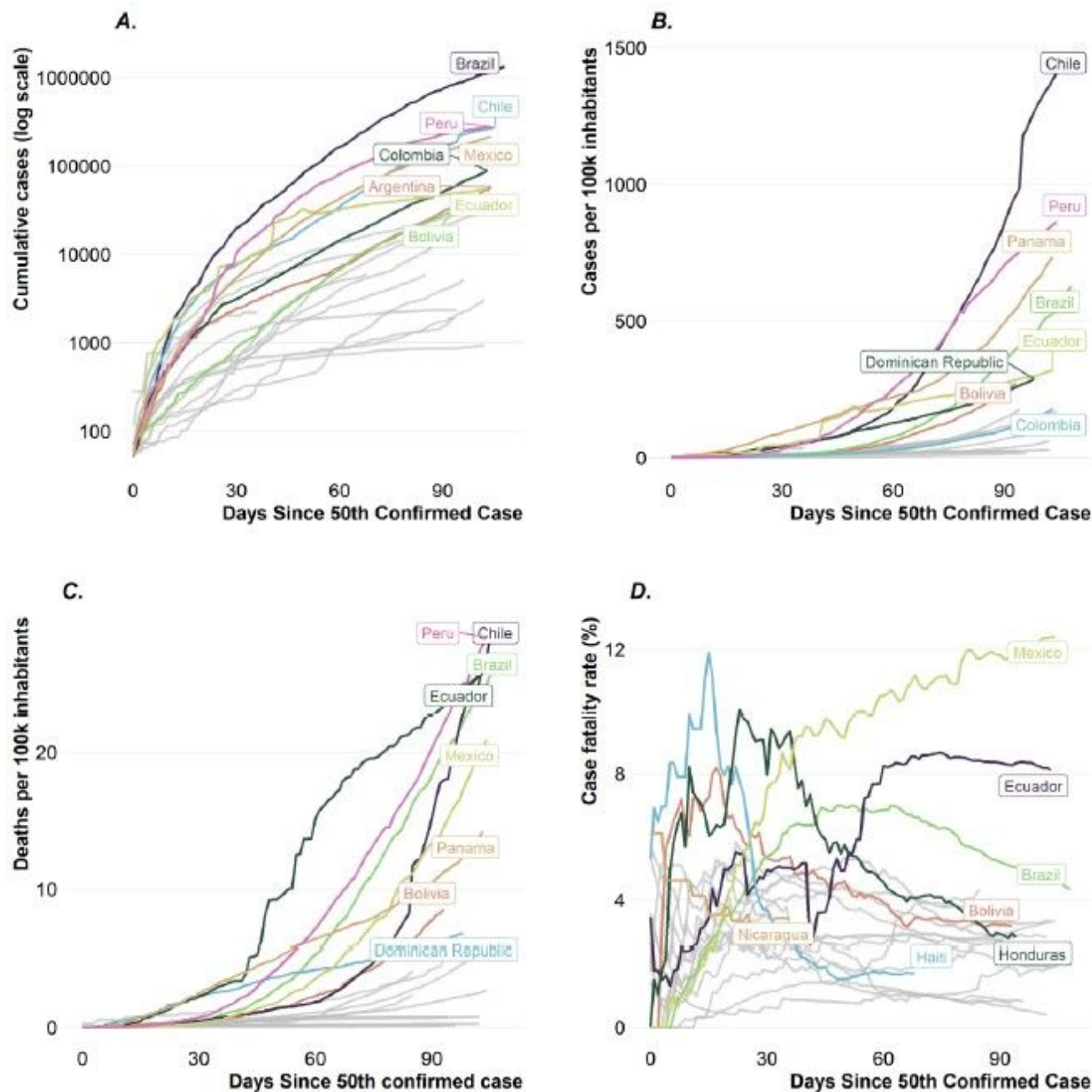


Figure 1

Trends in the number of cases and deaths from COVID-19 in Latin America. Legend: (A) Cumulative number of cases; (B) Number of cases per 100,000 inhabitants; (C) Number of deaths per 100,000 inhabitants; (D) Fatality among confirmed cases. The analyses were performed using data from the European Centre for Disease Prevention and Control up to June 28, 2020. Code adapted from Kieran Healy (twitter).

A. At 1st confirmed case of Covid-19

B. At 50th Covid-19 confirmed case



C. At 100th Covid-19 confirmed case

D. At 1000th Covid-19 confirmed case



Figure 2

Restrictive degrees in social distancing measures as implemented in each Latin American country. Legend: (A) At the time of diagnostic confirmation of the 1st case of COVID-19; (B) 50th case; (C) 100th case; (D) 1000th case. Data collected up to May 15, 2020. White - no measures; yellow - countries with mild restrictions; orange - countries with moderate restrictions; red - countries with strict restrictions; and maroon - countries with lockdown. Up to June 28, 2020, Uruguay had not yet reached 1,000 cases; however, for the purpose of comparison, the same level of restriction in Figure 2C was applied for that country.

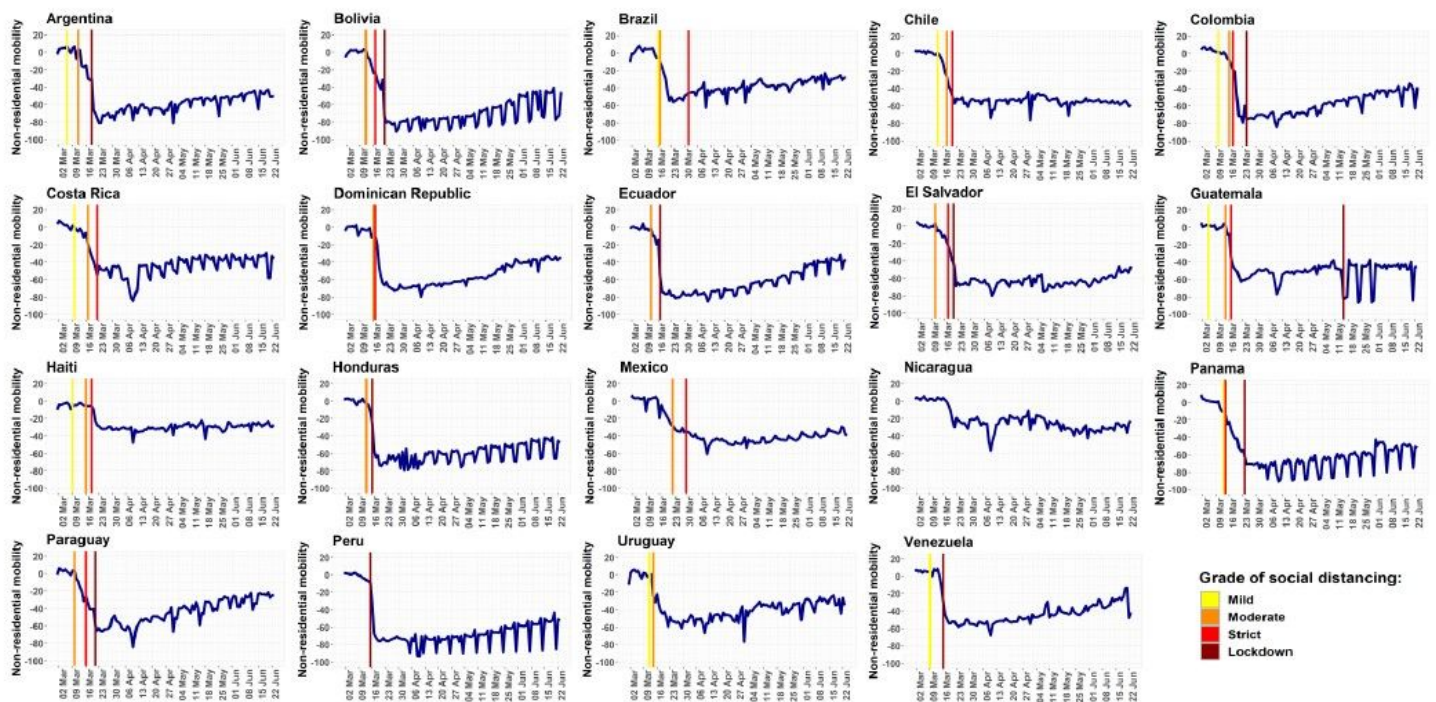


Figure 3

Changes in mobility outside the home in the Latin American countries evaluated. Legend: No data available in Google Mobility Reports on social mobility in Cuba.

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