Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Responses to COVID-19 in five Latin American countries

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ABSTRACT

Background: COVID-19 reached Latin-American countries slightly later than European countries, around February/March, allowing some emergency preparedness response in countries characterized by low health system capacities and socioeconomic disparities.

Objective: This paper focuses on the first months of the pandemic in five Latin American countries: Brazil, Chile, Colombia, Ecuador and Peru. It analyses how the pre-pandemic context, and the government's responses to contain and mitigate the spread together with economic measures have affected the COVID-19 health outcomes.

Methods: Extensive qualitative document analysis was conducted focused on publicly-available epidemiological data and federal and state/regional policy documents since the beginning of the pandemic.

Results: The countries were quick to implement stringent COVID-19 measures and incrementally scaled up their health systems capacity, although tracing and tracking have been poor. All five countries have experienced a large number of cases and deaths due to COVID-19. The analysis on the excess deaths also shows that the impact in deaths is far higher than the official numbers reported to date for some countries.

Conclusion: Despite the introduction of stringent measures of containment and mitigation, and the scale up of health system capacities, pre-pandemic conditions that characterize these countries (high informal employment, and social inequalities) have undermined the effectiveness of the countries' responses to the pandemic. The economic support measures put in place were found to be too timid for some countries and introduced too late in most of them. Additionally, the lack of a comprehensive strategy for testing and tracking has also contributed to the failure to contain the spread of the virus.

Introduction

Coronavirus disease 2019 (COVID-19) has impacted the whole world. The first wave of SARS-CoV-2, the virus that causes the COVID-19 disease, reached Latin American countries later than European nations, allowing more time for the emergency preparedness and response. This paper describes the evolution of government measures and COVID-19 data in five Latin American countries: Brazil, Chile, Colombia, Ecuador and Peru. Brazil and Ecuador were the first to report a positive case in late February (26 and 29, respectively), while Chile, Colombia and Peru reported their first case in early March (3/03 in Chile and 6/03 in Colombia and Peru).

In this paper we analyse how the pre-pandemic context, the mitigation and containment measures, together with the health interventions, technologies and the economic response, have affected the COVID-19 outcomes. We also examine the five countries' profiles regarding epidemiologic and demographic characteristics, health system capacity and socio-economic development, with a view to understanding how these variables have impacted the ef-

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Table 1
Socio-Economic characteristics for the five selected countries [2–11].

	Brazil	Chile	Colombia	Ecuador	Peru
Population (millions)*	210,147+	19,458⊤	50,785	17,510•	32,495
Density (pop/km^2)**	25	25	45	69	25
GDP per capita (US dollars PPP)**	14,952	24,763	14,834	11,854	13,903
Unemployment (%, ILO estimates)**	12.1	7.1	9.7	4.0	6.6°
Informal employment (% of total non-agricultural employment)**	38	28	57	66	59
Poverty rate**	26.5▸	8.6	27.0	25.0	20.5
Income share held by richest 10 %**	42.5	36.3	39.7	34.4	32.1
HDI index***	0.761	0.847	0.761	0.758	0.759
Access to basic sanitation (%)****	88	100	90	88	74
Access to drinking water (%)****	98	100	97	94	91

Source: *(2);**(3); ***(4); ****(10 and 11); +(5); ⊤(6); •(7); °(8);▸(9).
Note: HDI: Human Development Index.

fectiveness of the responses to COVID-19. Our focus is on the first months of the pandemic.

The five selected countries capture different realities across Latin America in terms of population size, area, density, demographic and socio-economic characteristics, health system financing and coverage, and other development indicators. For the five countries studied, we conducted extensive documentary analysis focused on federal and state/regional policies and interventions implemented in these countries since January 2020. We also analyze publicly available epidemiological data (released by the governments).

As described in the paper, the governments of the five selected countries did, to a certain extent, reacted to the pandemic faster than European countries and the United States of America. They implemented movement restrictions and ramped up their health system capacity in response to the arrival of COVID-19 in the continent. Although the adopted measures were stringent and introduced early, the public health response of the five countries have been undermined by pre-pandemic factors, such as a high degree of economic informality, the inability to scale up testing and the lacking of a strategy of contact tracing at an early stage. These broader factors limited the effectiveness of the responses and their ability to contain the spread of COVID-19, resulting in substantial, perverse health outcomes. Only recently Chile is evidencing a constant decrease of positive cases, after the country has implemented an extensive tracing and tracking strategy, tightened the movement restrictions in regions with high incidence of COVID-19 and improved the economic support. Still, until mid-August, these countries are the top five in the region in terms of COVID-19 deaths [1]. In addition, the five countries have also experienced adverse economic impacts, such as high unemployment and a large decline in economic activity.

The paper is organized as follows. Section 'Countries' health and development profiles' presents a brief description of the five countries' socio-economic characteristics, healthcare systems and resources, and health risk factors. These descriptions provide the 'pre-pandemic' context in the five countries. Section 'The response to the pandemic' analyses the public health measures and policies implemented in the five countries, and the healthcare resource implications. Section 'The impact of COVID-19' focuses on the analysis of epidemiological data on cases, deaths and testing, and presents indicators that allow us to assess the economic impact of the pandemic. The final section summarizes the main findings.

Countries' health and development profiles

The characteristics of the countries may define the strategy that each nation can implement, the effectiveness of the measures taken and the health and economic impact of the pandemic itself (and other effects not studied in this paper, such as educational inequalities, gender gap and violence). This section describes the socio-economic and health system characteristics of the five selected countries. It also presents country data on some of the health conditions that have been associated with poor clinical outcomes from COVID-19.

Table 1 summarizes key socio-economic characteristics of the countries. In terms of population, Brazil has by far the largest population, followed by Colombia that has around a quarter of its population. Peru, Chile and Ecuador, in that order, are the ones with lower populations. The large population size may make it more difficult to ramp up the capacity of the health sector. In terms of density, Colombia and Ecuador are clearly outliers, which may impact the ability to mitigate the spread of COVID-19 and maintain social distancing in public areas (such as public transport). With respect to wealth, income inequality and access to basic social infrastructure, Chile is clearly an exception, with the highest GDP per capita and considerably better development indicators, but with a relevant level of inequality, as all the other countries analyzed. We note that a high level of informality is present in all five countries, which implies that for a significant fraction of the population staying at home is not an option unless there is an appropriate level of income support by the government. Also, poor access to sanitation infrastructure and clean water, in all countries except Chile, makes it difficult to take the preventive hygiene required to reduce contagion in certain areas.

Table 2 presents indicators of health system typology, population covered by health insurance, health expenditure and healthcare resources for each country. All five countries are characterized by the existence of a public funded system of healthcare. Brazil is the only country with a national health system with comprehensive free access to healthcare services, while Chile, Ecuador and Peru have mixed systems in terms of health insurance (public and private). Colombia has a Social Health Insurance system, where individuals contribute a fixed amount of their incomes and have access to a defined health plan.

While Brazil and Chile spend a larger fraction of the GDP on health than the OECD average, health expenditures per capita are substantially lower than in developed countries. We also note that the fraction of total public expenditure over the total expenditure on health for the five countries is also far under OECD, and the out of pocket (OOP) health expenditure is higher, except for Colombia.

The health system capacity indicators also raise concerns about the ability of the health sector to achieve a surge in capacity. For example, under-staffing and under-resourcing seem prevalent. Except for the case of nurses in Chile, all workforce indicators are below the World Health Organization benchmark of 2.28 per 1000 population [12] and, including Chile, all are far below OECD health capacity indicators. In addition, there is a large variance in the availability of the equipment required for the treatment of COVID-19 cases. Brazil and Colombia have the greater capacity in terms of Intensive Care Units (ICU) beds and ventilators, while Chile and Ecuador have the lowest capacity.

Table 2
The Health Care Systems of the Five Selected Countries and OECD [3,10,11,13–18].

	Brazil	Chile	Colombia	Ecuador	Peru	OECD
Health system typology	Public SUS (Sistema Único de Saúde, in Portuguese)	Mixed public (Fondo Nacional de Salud) and private (ISAPRES)	Social Health Insurance through Entidades Promotoras de Salud - EPS	Mixed public and private	Mixed public and private	-
Population covered by health insurance (%)	100	•78.8 in public and 14.4% private, 5% reported lacking or not knowing.	+96 (46% in contributory, 45% in subsidized and 5% other)	39.9▸ (universal access in public providers)	80	98.4
HCE (Health Care Expenditure) / GDP***	9.5	9.0	7.2	8.3	5.0	8.8
Health Expenditure (HE) per capita 2017 (current US dollars)*	1,280	2,182	960	954	680	3,994
Public expenditure / Total HE (THE)*	43.0	59.9	73.5	52.8	45.5	71
Out-of-pocket health expenditure (OOP) / THE (%)*	27	34	16	39	28	21
Doctors (per 100,000 hb.)*	1.8	2.5	2.2	2.0	1.3	3.5
Nurses (per 1,000 hb.)*	1.5	2.7	1.3	2.5	2.4	8.8
Beds (per 1,000 hb.)*	2.3	2.1	1.7	1.5	1.6	4.7
ICU beds (per 100,000 hb.)**	17.0	5.2	10.8	6.8	2.5	NA
Ventilators (per 100,000 hb.)*****	29.6	6.8	10.8	10.5	0.9	NA

*(10-11); **(13); ***(14); ****(4); • (15); ▸(16) +(17); *****(18).
Note: NA: not available. Hb.= inhabitants.

Table 3
Health Risk factors for Peru, Chile, Brazil and Colombia [3,10,11,21].

	Brazil	Chile	Colombia	Ecuador	Peru	OECD
Life expectancy at birth*	79.3	83.1	78.2	79.3	77.9	80.7
65 or over (%)*	8.9	10.9	7.9	7.9**	8.0**	17.4
Prevalence of obesity (age standardized, %)*	22.1	28.0	22.3	19.9	23.1	19.5*
Death rate from cardiovascular diseases (age standardized per 100,000 hb.)***	225	139	185	142	109	-
Smoking prevalence (% of age 15+)*	10	25	13	7	4.8	18
Alcohol consumption (liters per capita 15 years+)*	7	8	5	4	6	8.9

Source:* (10) and (11); **(3);***(21).
Note: Hb. = inhabitants.

COVID-19 outcomes are related to the health status of the population. An increase in severity and the likelihood of poor clinical outcomes have been linked to patients' age, comorbidities and overweight. In particular, the older population and those with cardiovascular disease, diabetes and obesity present higher risks [19,20]. Table 3 presents population health risk and life expectancy indicators for the five countries and the OECD averages. The five Latin American countries have a younger population than the OECD, but Chile, Brazil and Colombia have a higher prevalence of obesity and diabetes. Brazil and Chile have also the highest incidence of cardiovascular diseases. In terms of risk behaviors (smoking and alcohol consumption), the five countries perform better than OECD, except Chile with a very high prevalence of smoking.

The high levels of income inequality and informality, alongside health sectors that are under-staffed and under-resourced, suggest that the challenges faced by these five Latin American countries are different from those faced by developed countries and represent a high risk scenario when facing a pandemic like COVID-19. The information presented raises concern about the efforts that these countries must dedicate in the response to COVID-19, which will be analyzed in the following.

The response to the pandemic

This section outlines how the five countries responded to the pandemic. The public health response and interventions were partly drawn from the OECD containment and mitigation strategies [22]. Table 4 provides a summary of the measures adopted in three domains: mitigation and containment, economic and health. Details about each policy can be found in Appendix 1.

Regarding mitigation and containment measures, Colombia, Ecuador, and Peru aimed at containing the spread, while Chile's objective was to mitigate it (reducing the rate of contagion) [23]. Brazil's objective seems unclear, with Brazil's president dismissing COVID-19 as a 'measly cold' at the end of March [24] and later arguing publicly with the Health Minister (who was later fired) over the need for social distancing [25]. Chile, Colombia, Ecuador, and Peru adopted measures that were decided centrally. Brazil, probably influenced by the USA, left the heavy lifting to states and cities, with no known attempts to achieve a nationally consistent approach.[1]

This meant that, excluding Brazil, all four countries closed schools, prohibited massive gatherings and, except for Colombia, implemented curfews. Only Colombia, Ecuador, and Peru declared mandatory nation-wide lockdown. Chile used selective (i.e., by location) and dynamic lockdowns based on incidence rates, confirmed cases per km^2 and health risk of the population. Chile's quarantine strategy, however, did not consider access to basic ser-

[1] For example, despite being a federation, the Australian governments established the National Cabinet as a special Australian intergovernmental decision-making forum composed of the Prime Minister and the premiers and chief ministers of the states and territories, to coordinate the national response to the COVID-19 pandemic.

Table 4
Summary of measures taken in each country by type.

Type	Measure	Brazil	Chile	Colombia	Ecuador	Peru
Mitigation and containment	State of emergency declared	X	X	X	X	X
	Borders closing	X	X	X	X	X
	Lockdown			X	X	X
	Local lockdown centrally defined		X	X	X	X
	National curfew (night)		X		X	X
	School closing		X	X	X	X
	Prohibition of mass gatherings		X	X	X	X
	Flexibilization / reopening		X	X	X	X
Health	Health alert /emergency	X	X	X	X	X
	Central coordination of health		X	X	X	X
	Additional health funds (on top of health sector budget)	X	X	X	X	X
	Massive testing					
	Extensive tracing / tracking		X			X
Economic	National interest rate reduction	X	X	X		X
	Liquidity measures for families/enterprises	X	X	X	X	X
	Tax relief	X	X	X		X
	No disconnection from basic services		X	X	X	X
	Income support	X	X	X	X	X
	Labor protection	X	X	X	X	X
	Food baskets	X	X	X	X	X
	Informal workers support	X	X	X		X
	Support for the vulnerable	X	X	X	X	X

Note: Blue boxes if the country adopted the measure at national level, and white boxes if not adopted at that level. NA means no available information.

vices and sociodemographic vulnerability [26]. In Brazil, there has not been a quarantine mandated by the federal government, only the recommendation for social distancing.

In the economic area, all countries have adopted policies to achieve mainly two objectives. First, to allow for compliance of the measures imposed, which is highly relevant for the health outcomes of the virus, and second, to minimize the negative effects of the containment and mitigation measures to the economy (at the macro and micro level). In practice, this has translated into measures to increase liquidity for enterprises (micro and Small and Medium-sized Enterprises (SME)) and families, to protect labor and the economic activity, and to support the vulnerable population (e.g. income support and food baskets for the informal sector and low socio-economic population). All countries under analysis implemented the range of measures described, except for Ecuador which did not reduce the interest rate, impose tax reductions or support for informal workers.

A third area of response corresponds to the health-related measures, which complement the mitigation and containment strategy. In the studied countries the focus has been on capacities for treating patients. Therefore, hospitals have been reinforced by increasing ICU beds and ventilators, personnel and inputs such as personal protective equipment and other supplies. Nevertheless, extensive testing and tracking strategies have been almost nule or implemented only in one region (in Colombia was achieved in Medellín), except for Chile that began applying them after the peak of COVID-19 cases and deaths. Those measures are necessary to timely isolate the infected population and reduce the spread of the virus.

In the following subsections, we analyze the response to the pandemic in three areas: (1) the timing and stringency of the mitigation and containment as well as the economic measures applied; (2) compliance of the measures, assessing mobility and some possible determinants of it, such as “pandemic management” and the socio-economic context of the countries; and finally, (3) the health system response. These three areas can be identified as determinants leading to the poor outcomes the countries are experiencing when tackling the pandemic (see Section The impact of COVID-19). The analysis of the measures is conceptually framed on the general recommendation published by the OECD [22,27], and the International Development Bank (IDB) for Latin-American countries [28].

Timing and stringency of the country's measures

Mitigation and containment measures

Fig. 1 presents the main mitigation and containment measures in a timeline. In general, countries applied containment and mitigation measures early on (closely after the first confirmed case), being Peru the first country of the group to implement a national lockdown (7 days after the first confirmed case). In contrast, Brazil was the latest of the group to declare state of emergency and closing borders (both towards the end of March), which, together with an ineffective health screening at the international airports, and the carnival celebrations [29] could have contributed to the rapid spread of the virus, especially in international hubs such as Rio de Janeiro and São Paulo.

The level of stringency of the measures can be another determinant of the health outcomes. To measure it, the Oxford index is used and presented in Fig. 2 together with daily new cases and positivity rates. Stringency is lower (around 60-70%) in Brazil relative to the group, as the country applied only ‘soft measures’, and decentralized by region. The other countries closed schools, commerce and prohibited massive gatherings nationwide and imposed national lockdowns, except for Chile, evidencing greater levels of stringency around 80 to 95% for most of the time after the first confirmed case. Chile applied dynamic lockdowns, on which mandatory quarantines for some counties are implemented for a short period (2-3 weeks ideally) and then flexibilized based on epidemiological indicators. In addition, the country did not close public transportation, hence, it presents a lower stringency index, around 70% until the middle of May, when measures were tightened (massive lockdown which affected 60% of Chile’s population [30]), as cases and deaths were increasing steadily as well as health services demand.

Ecuador and Peru evidenced a decrease in the index in the last days of the period studied, as both countries started to lift some measures in May, even though none of them observed a sustained decrease in cases. Ecuador ended its lockdown on May 4 and started a new stage of “social distancing”, where each canton decides about containing measures using the traffic light system for restrictions. This flexibility has been applied also in regions with large numbers of cases and ICU patients, as Pichincha, which might explain the poor health outcomes (see Section The impact

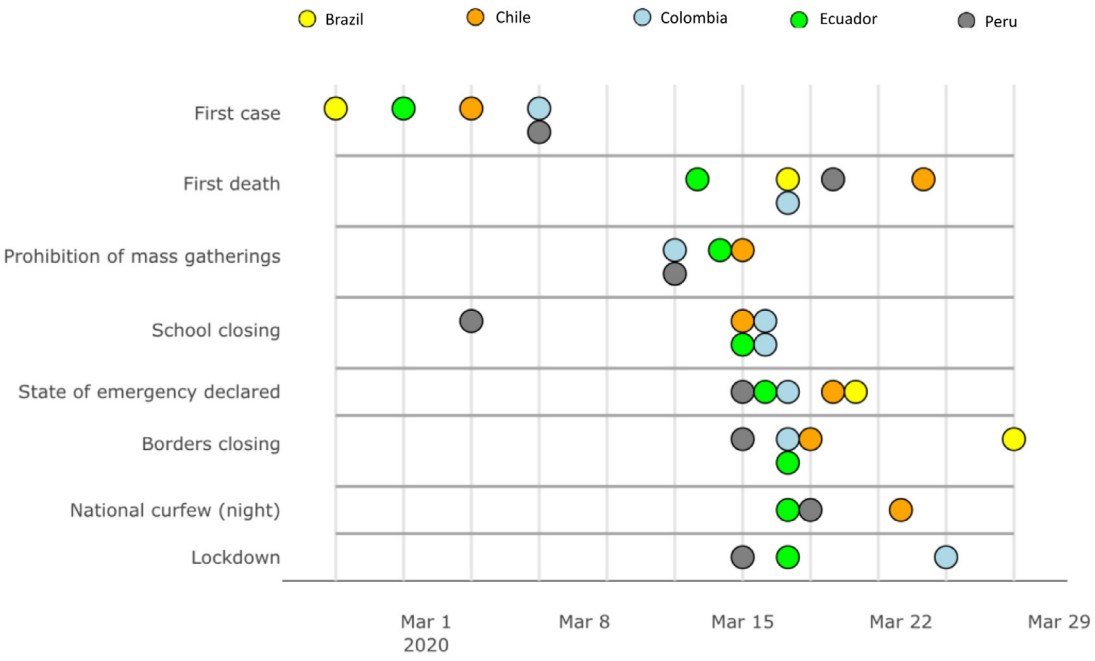


Fig. 1. Timeline with the main mitigation and containment measures by country.
Source: Own elaboration based on Appendix 1.

of COVID-19). On the other hand, in Peru, some industries and services (mining, construction, tourism and retail) resumed their activity in May.

Regarding the rest of the countries, Chile announced the "Paso a paso" (step by step) plan for reopening (based on health indicators) in the middle of July, Brazil opened borders to international air travel tourists at the end of the same month, and Colombia allowed economic activity and internal travel resume in early August, though the activities exempted from the quarantine have been increasing over time.

Although all the countries took most of the recommended mitigation and containment measures at early stages of the pandemic and stringency was relatively high, there is not a clear link between the time and stringency of the measures and the reported health outcomes (daily new cases and positivity rate), as both indicators continued to increase even after policies were implemented. We only observe an increase in the number of cases in Peru after restrictions were lifted from May onwards.

Economic measures

As mentioned, the economic measures are important to ensure that individuals can afford to comply with the imposed measures, especially those who live on daily income, and to counteract the spillover effects of the pandemic and the mitigation and containment measures (e.g. to prevent the collapse of financial and payment systems, promote the rapid reactivation after the crisis, protect employment and activity, and protect the vulnerable [37]. As it was described in Section 'Countries' health and development profiles', Latin American countriesćontext (i.e. low income, high levels of poverty, inequality and informality) conditions the pandemic response, relevating the importance of supporting the vulnerable. IDB specifically recommended for Latin America emphasizing on the fiscal situation (i.e. temporary resources, reassign and develop policies that make more efficient expenditure when possible), as well as the protection of labor, enterprises and vulnerable populations due to the economic crisis generated by the pandemic [28]. This section will analyze the measures in the light of the first objective, focusing on the economic support to those that face more difficulties to comply. We examine the timing and the strictness (in this case referring to the amount and scope of the responses) the measures were implemented.

Fig. 3 shows the economic measures in a timeline. In general, a very responsive support channeled to the formal sector was observed throughout the countries. All countries reduced interest rates at least one time (except for Ecuador), created special conditions for credit during the pandemic (for micro, SME and families), and established measures to protect labor at early stages. However, support for informal workers and the most vulnerable (in cash and in kind) was slower, despite its importance for the household livelihoods. Considering the days after the first case was reported and the average date the measures were taken in each country, Colombia proved to be the fastest with an average of 16 days, almost half of the average of the rest of the countries.

Moreover, there was a delay in the support for households even when comparing with the date when first mandatory lockdowns were taken. It took 6 days to Chile from the date the first quarantine was implemented in a low-income county until the payment of the first income supports for informal workers and 50 days until the delivery of the first food baskets. In the case of Colombia, it took 15 and 9 days, respectively, and for Brazil, 11 and 64 days (in Brazil, considering the date when strict restrictions of movement were imposed in Rio de Janeiro and São Paulo). On the other hand, Ecuador took 12 days to deliver the food baskets since lockdown was imposed and Peru 54 days from lockdown until informal sector support (no support for the informal sector was applied in Ecuador and no food baskets in Peru). Compared with those measures, the support for vulnerable sectors were implemented before the quarantine in Chile and Colombia, and around the lockdown implementations date in Peru, while it took 15 and 19 days for Ecuador and Brazil, respectively.

The sizes and content of the economic packages differ between countries and relate to its pre pandemic reality (i.e. Chile facing social unrest and Ecuador indebtment problems with IMF) and to the evolution of the virus. Indeed, in the majority of the countries have been increasing since March until now (i.e. Brazil announced in early July an important credit program to support SME and Chile

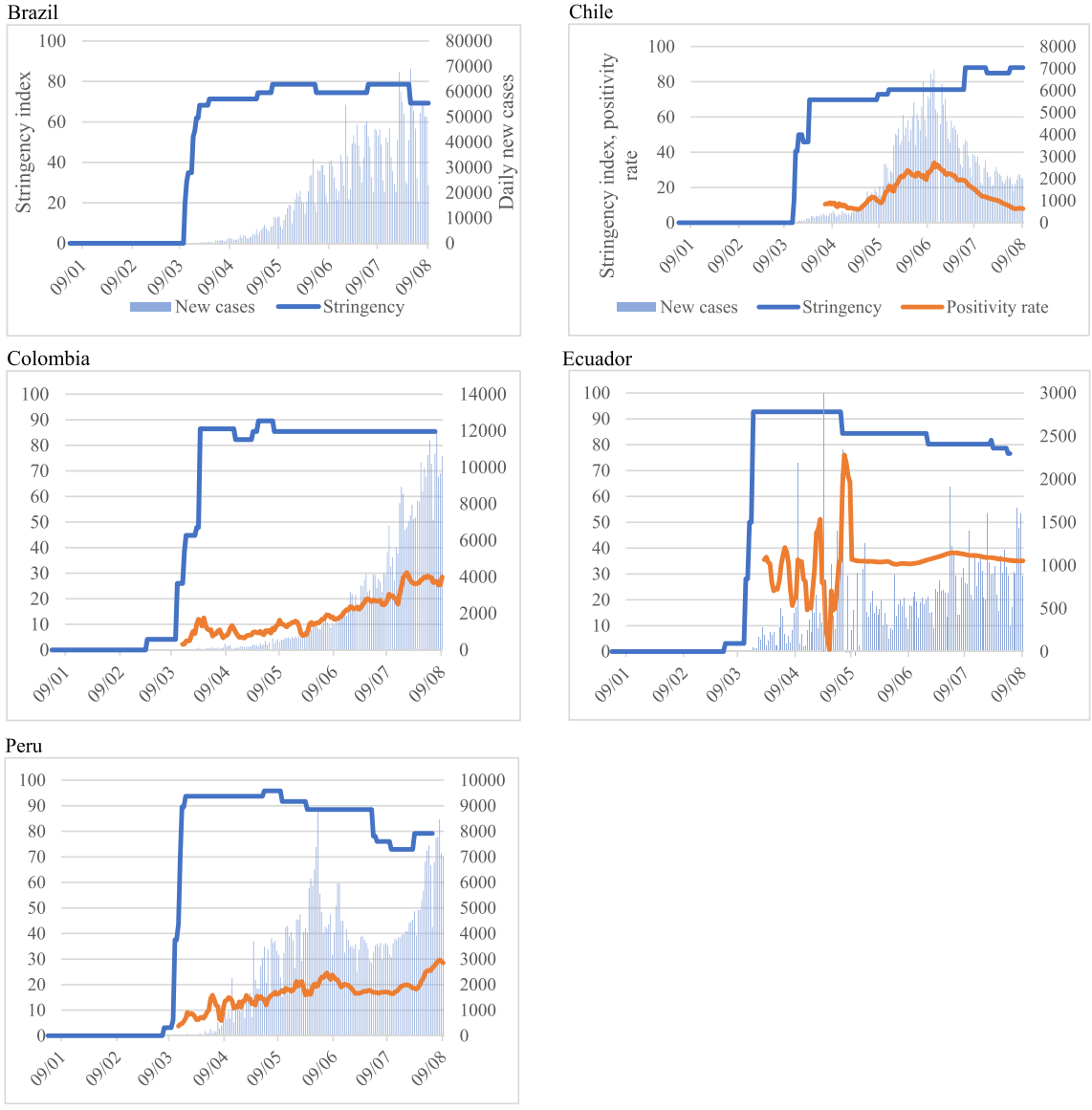


Fig. 2. Evolution of the containment stringency index for each country and COVID-19 cases (new cases and positivity rate) [31–36].

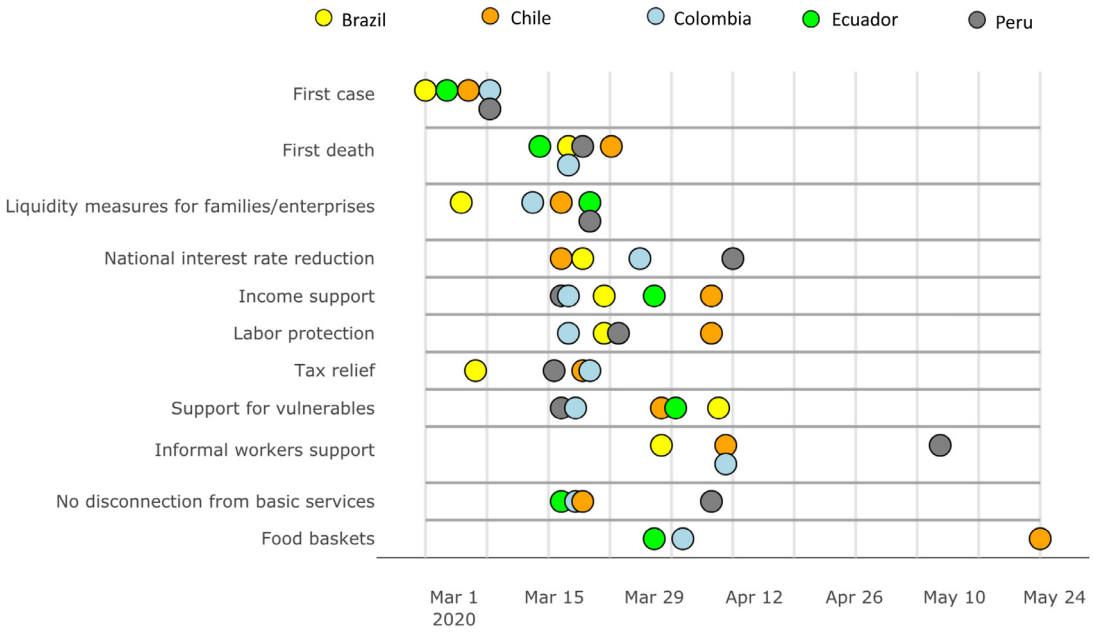
in late July passed an act with measures to support middle class people).

The Oxford tracker of COVID-19 government responses gives also information about the amount of economic stimulus spent by each country. We calculate the amount spent per capita for each country, finding that Brazil is the one among the five countries studied with the biggest effort, spending around US$ 880 per inhabitant (around 10% of the country GDP), followed by Chile, with almost US$ 800 (5.2%). Colombia and Peru spent almost US$ 500 (7.6%) and US$ 380 (5.6%) per population, while Ecuador is by far the country with the lowest stimulus, both per capita and as proportion of GDP, with US$ 24.8 spent for each habitant, that is 0.4% of its GDP [31].

Using the Oxford Stringency index for the economic measures, Fig. 4 plots the evolution of the magnitude and extensiveness of the support given to households (income and credit) against cases and positivity rates. The figure evidences a low economic support for the population in Brazil (score of 50%), and higher scores for Colombia, Ecuador and Peru (around 75%) that have not changed since April. Chile started with low scores (less than 40%) and increased to 75% in the middle of June. As economic support would help people stay at home, especially those without a formal or no job, and living on daily/weekly income, a negative correlation would be expected. However, for the majority of the countries there is no clear relation between the increase of the stringency of the economic support to households and the number of new cases or positivity rate in the following period. On the contrary, cases increased or maintained after the latest increase in the index. That can suggest that the income support was not as effective as intended, not only due to the delay in its implementation as mentioned, but also because of the insufficient magnitude of the support. Only Chile shows a relevant decrease in the positivity rate and in the magnitude of new cases that coincides with a sharp increase in the economic index, and with the period when mitigation and containment measures and the tracing and tracking strategy were strengthened. This might suggest that applying those strategies in a strong magnitude together lead to better outcomes.

Compliance with containment and mitigation measures

As commented before, the reduction in the spread of the virus is crucial, even more in countries with a low level of capacity (ICU



Source: Own elaboration based on Appendix 1.

Fig. 3. Timeline for economic measures by country
Source: Own elaboration based on Appendix 1.

beds, ventilators, health workforce, among others). Thus, high levels of compliance are needed. Data on mobility reported for the countries indicate that this has not been the case. In Ecuador, based on data from a digital application (called "Plataforma Digital COVID-19") that generates information about movement of COVID-19 cases, the country's President reported around 40% of movement of COVID-19 cases in early April in Guayaquil (Guayas) and Quito (Pichincha) during a mandatory lockdown [38]. In Chile, the Institute of Engineering Complex Systems [39] analyzed the change in movement of some counties of the Metropolitan Region, including Las Condes and Santiago presented a reduction of movement near 60% and 40%, respectively. However, in counties with higher vulnerability, such as Puente Alto, El Bosque and La Pintana, the reduction was only between 20 to 30% during the periods of mandatory lockdown. In Peru, which took early strict measures of movement, the closure of public transport and markets generated a massive outflow of workers from Lima (capital) to the periphery of the country, with hundreds of families walking together for days to their residence regions, probably spreading the virus for the rest of the country [40].

In the following subsections, we examined two dimensions that are related to compliance and, therefore, with health outcomes due to COVID-19: "pandemic management" and the socio-economic context paired with the economic measures.

Pandemic management

Blackman et al. [28] state the importance of a coordinated management response for the crisis at a high level in the government, and the continuity, coherence, and complete communication to citizens, since their collaboration is key to compliance. They also stress the importance of not disregarding marginal neighborhoods and rural areas which are more affected by the pandemic, and the access and continuity of provision of essential public services.

Brazil is an example of mismanagement. Public health response was not coordinated, and there was no federal policy enforcing physical distancing and isolation, or even guidelines to the states, since the central government could not agree on the strategy. It resulted in two changes of health ministers in one month (15-05 and 16-04). Population received conflicting and mixed messages [41], impacting the public health response, compliance levels and country's capacity to contain the spread of the virus. Moreover, there was a testing time lag, lack of transparency, authoritarianism and censorship [42] about the truth burden the country is facing has led to an outrage across the political spectrum, particularly from medical professional associations and research institutes.

To some extent a similar situation occurred in Chile between the government and the COVID-19 advisory council in the first period of the pandemic, as well as between the government and majors and other authorities. At the beginning of the pandemic, the sanitary authorities emphasized the good performance of the country compared with other countries. The government announced plans to return to work in late April and talked about "new normality" [43]. Indeed, civil servants began their return in late April. A few days later, the number of cases started to grow rapidly, and more stringent measures were taken. This episode eroded trust and compounded with other data reporting transparency issues can partly explain the resignation of the minister of health (June 14).

Trust in authorities is also important for citizens to comply. Fetzer et al. [44], who surveyed 188 countries, found that 43% of the population reported that the government has not been truthful about COVID-19, while more than 60% of the population of Brazil, and 70% in Chile and Colombia has that perception about their respective country.

Despite countries' efforts to improve their communications, there have been continuous changes in the information provided to the population, the methodologies used to calculate cases, deaths and other relevant indicators. For example, in Brazil the government cancelled the publication of epidemiology reports, a task that was restored after the intervention from the supreme court. In Chile, the ministry was forced to correct the deaths after the publication of studies reporting important data gaps between Civil Registry data and COVID-19 official reports [45]. These events affecting transparency and communication, undermined the public trust

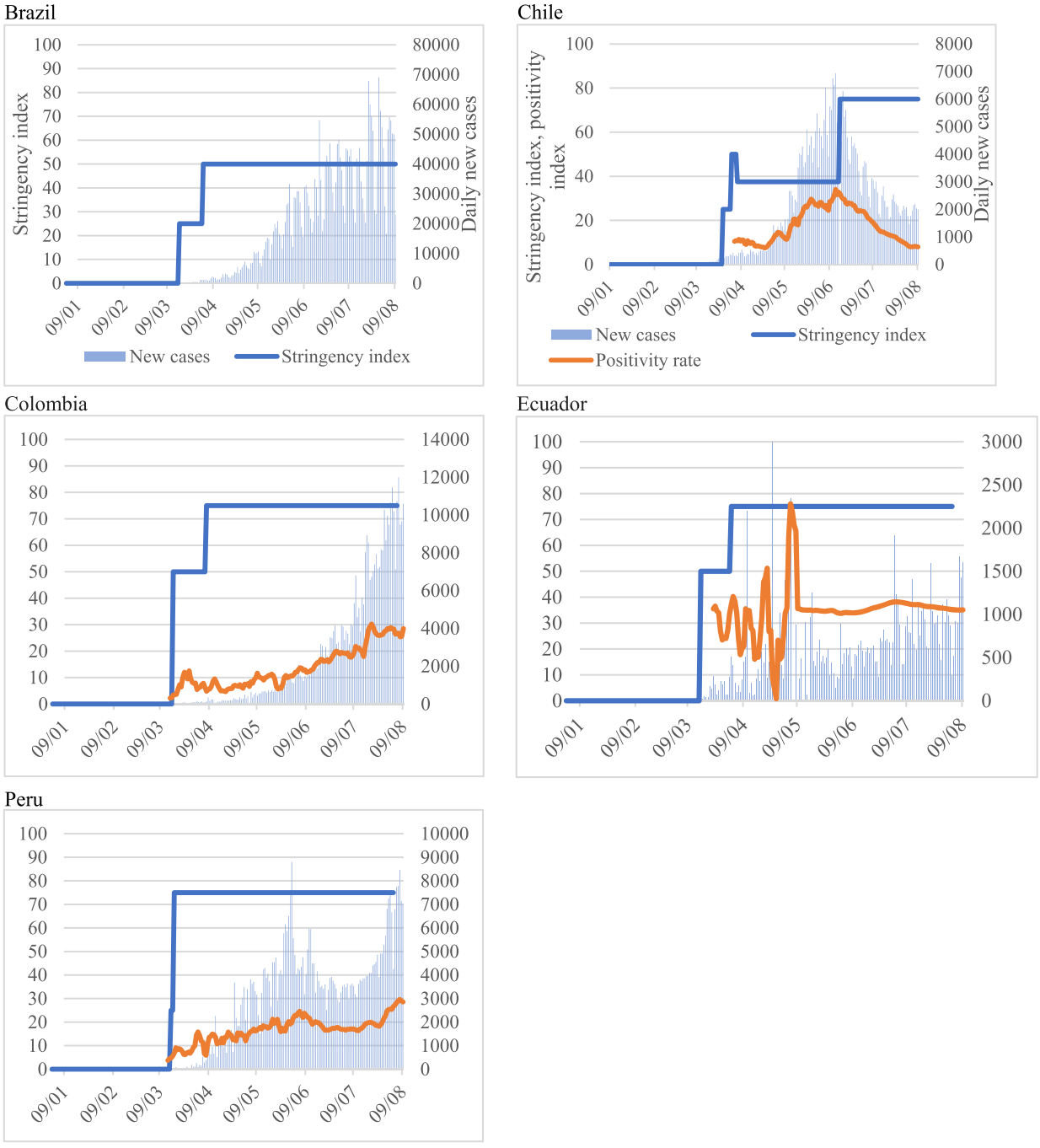


Fig. 4. Evolution of economic stringency index and COVID-19 trends [31–36].

of the ordinary citizen experiencing financial and health hardships, especially during the first stages of the pandemic, but also research and academic institutions that are trying to understand the situation.

Socioeconomic context

The analysis of compliance cannot be dissociated from socioeconomic factors. We have mentioned that a pre-pandemic commonality across the countries (to different extents) is having a high informality rate, poverty, consequently overcrowding, low sanitation systems, among others. We argue that strict measures are less effective in areas with low performing socioeconomic indicators, which can be evidenced when comparing different regions within the countries which have been exposed to similar measures, but obtain different results.

In Chile's Metropolitan region, which gather around 40% of the population of the country and concentrated around 70% of COVID-19 cases to date, those counties most affected in terms of cases and deaths are the ones with lower incomes (average income near US$ 1,000) [46] and living in overcrowding conditions (11%) [47]. As the lockdowns in the country were implemented following a dynamic strategy, which means that the measure was applied at similar levels of incidence of the virus between the counties, the Chilean strategy allows for the comparison of the effects of the lockdown between counties with different income levels. Fig. 5 shows two sets of counties, those with higher income (Vitacura, Lo Barnechea Providencia, Las Condes and Ñuñoa) and those with low income levels (Independencia, San Ramón, La Granja and Recoleta) [46]. It is observed that a decrease in the number of new daily cases (considering date of first symptoms) after one week of quarantine for

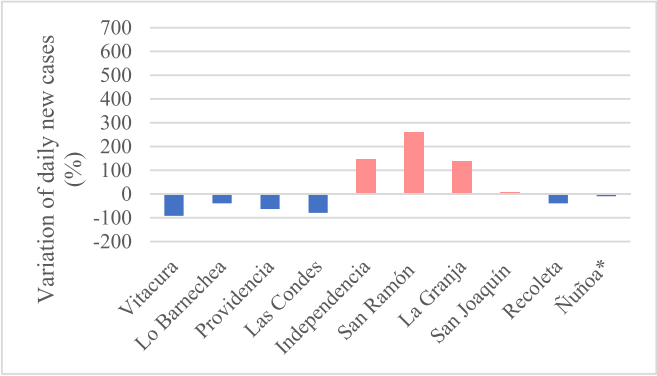


Fig. 5. Growth in the average of new cases (by day of first symptoms) post and pre-quarantine (%) [33].
Note: For each county growth is defined as the variation (%) in the average of daily new cases on the week number 2 after quarantine declaration (week 0) and the average of new cases in the 2 weeks before quarantine was implemented. The average of new cases is corrected by the number of tests taken each week. Pink bars correspond to the counties that increased the daily average of new cases. Blue bars, those that decreased it.

the high-income counties, while those with lower levels of income show an increase in the number of daily new cases. That fact is consistent with the delay in the income support measures for vulnerable groups previously mentioned, for whom the lack of timely economic responses prevents them from staying at home, undermining the impact of lockdowns.

In Colombia, the most affected region in terms of cases and deaths per population is Amazonas (32.9 cases and 1.3 deaths per 1000 inhabitants), located in a province where informality reaches 90% of the labor sector and overcrowding and poverty reaches levels of 16% and 35%, respectively [48]. The department of Atlántico has been very affected too, together with Cartagena (in the department of Bolívar), although much lower than Amazonas. Both departments have high levels of overcrowding (4.0 in Atlántico and 4.7 in Bolívar), workers in the informal sector (around 55%) and poverty (24 and 36%) [49]. In opposition, Antioquia (where Medellín is located) and Valle del Cauca, which present lower rates of death per population, have lower levels of overcrowding (2.7 and 1.4%) and poverty (21.2 and 20.4% respectively) [50].

In Peru, Lima has the largest rate of cases per population (25.9 per 1000) and is one of the departments with the largest rate deaths per population (1.1 per 1000 inhabitants). Lima Metropolitan area has greater population density and a significant informal sector dependent on daily cash payouts. Some of the remote regions do not have the health infrastructure nor health workforce to surge capacity. As an example, in Iquitos (capital of Loreto region, with no connection by road), there were reports of the collapse of the health services, with ICU beds at capacity, and 17 doctors have died of COVID-19 [51] in March. In this region, a significant part of the population is indigenous associated with poorer health outcomes compared to the general population [52].

In Ecuador, the province of Guayas presents the larger total number of cases and deaths (around 18,000 and 1700) and Guayas the rate of deaths per population (82.5 per 100,000) in Santa Helena. Both provinces have levels of underemployment over 20%. Moreover, Guayas have also low levels of population with access to basic services and to the public water systems, (66.6 and 85.7%, respectively). In comparison, Pichincha, which shadowed the cumulative cases of Guayas, has about one third of its total deaths. This capital-province is an important trade center and it has recorded 9% of underemployment, and 92.4 and 85.7% of access to basic services and public water systems [53].

Table 5
Increase in health system capacity around the first 100 days of pandemic [18,33,55–57]

Increase (%) in	Brazil	Chile	Colombia	Ecuador	Peru
ICU beds	20	212	16	63	349
Ventilators	7	121	84	NA	83

Note: For Brazil the initial number of ICU beds has been calculated using the data of deaths per 100,000 population. NA=not available data.

Finally, even in Brazil, where decision making regarding measures have been decentralized, the most impacted region in terms of cases and deaths is the Southeast, which comprises around 35 and 45% of country cases and deaths, respectively . This region accounts for 42% of Brazilian population and holds some of the densest federal units and international travel hubs, such as São Paulo (166.23 pop/km2) and Rio de Janeiro (365.23 pop/km2). Pêgo *et al.* [29] have argued that overcrowded urban spaces with poor systems for water supply, sanitation and waste collection systems were the main determinants that would explain the death and case figures.

Health system response

In addition to the mitigation, containment and economic measures, as commented before, the five countries also applied measures related to health. Mainly, they made a great effort to increase their health systems capacities, which were far lower than those of developed countries, as presented in Section 'Countries' health and development profiles'. A second focus of the health measures was regarding the testing strategy, while all countries fall back in tracking, despite its importance to contain the spread of the virus [54]. Both are analyzed in more detail in the following, and some technological developments, while minor, are also highlighted.

Health system capacity and access

As recommended by OECD [22] and IDB [28], all selected countries have ensured access to diagnostics and treatments, by reducing financial barriers (price capping, mandating insurance coverage, among others). Countries have surged capacity by adding beds (permanent or temporary accommodations), ventilators, purchasing and managing donations of personal protective equipment (PPE) and other medical inputs, hiring more health workers, calling in retired and clinical students. Importantly, Chile, Colombia, and Peru are centrally coordinating public and private providers under the Ministry of Health (during the health crisis).

Nonetheless, the amounts spent differ among countries. Chile announced early (March 19) an increase in the health budget in an amount that corresponds to a 2% of total public budget (US$ 100 per inhabitant approximately). Peru also distributed resources to different institutions of the health system to prepare early in March. Ecuador, later than the others, also increased the health budget (US$ 11 per person) (Appendix 1). Brazil allocated less than 1 dollar per capita in the middle of March for actions related to stopping the spread of COVID-19, although later on the country increased substantially the health package (Appendix 1). The number efforts for the first period of the pandemic regarding ICU beds, ventilators and laboratories can be seen in Table 5.

Despite the country's efforts to increase the number of ICU beds at national levels, their health systems have been overwhelmed. Although Colombia has reported 70% occupancy on August 11 [58], some places have reached capacity (Amazonas, San Andres, Providencia and Santa Cataline archipelago) and had to transfer patients to other regions. Ecuadorś intensive care units were the first being surpassed in March and April, after the rapid spread of the virus in Guayas. In June, occupancy levels are still increasing in Pichin-

cha, reaching 100% in some cities such as Quito [59]. Brazil has the highest rate of ICU beds per population, but the regional distribution is uneven, thus, some states have already reached 100% occupancy in the public system [60]. In Peru, the national ICU occupancy level reached around 93% (August 11) and some reports across the country outline that some services were at capacity [61]. Chile increased its occupancy levels to 88% in late May and have maintained that level since then. Metropolitan,Tarapacá, Antofagasta regions were at high levels of occupation in June, reaching levels around 95% of occupancy of ICU beds, despite a steady increase in the ICU bed count [62].

Even though the analyzed countries have made great efforts to increase the capacity of their health systems, many countries around the world introduced ban export and restriction measures in relation to medical supply products, hand sanitizers and disinfectants, at the same time they introduced a mix of import restriction and liberalization measures too. For low and middle-income countries that were affected slightly later on by the pandemic, these restrictions meant reduced global market access to COVID 19 related products and unfair competition with high-income countries. The global market context meant some medical supplies and protective equipment arrived later, and that governments had to rely on the local industries and innovation to produce these life-saving supplies [63].

Testing and tracing

Testing and tracing strategies are an important complement to containment and mitigation measures and as well as to the strengthening of the health systems in fighting COVID-19 [54]. OECD includes these strategies as one of the five objectives for the pandemic health response, emphasizing the use of technologies for detection, prevention, response and recovery [23,28]. None of the studied countries has had an extensive and systematic testing and tracking approach at a national level for all the period of the pandemic.

In regard to testing, low levels of tests performed and time lag to receive the results, mean that the real number of cases and deaths can be highly underestimated in these countries. As well, it undermines the efficacy of containment and mitigation strategies, as people who have not received their test results and feel fairly well, together with asymptomatic cases not tested, could be moving around and spreading the virus. Related to the time lag, the evidence for Colombia indicates that the time between the symptoms and the diagnosis takes an average of 11.1 days, with 70% of the cases receiving a confirmation over 7 days after the first symptoms [64]. In Chile, the time until the confirmation was estimated to be around 4 to 9 days [65]. Unfortunately, there are no official reports of the time that takes the processing of the results in any of the five countries studied, neither is it evidence for the rest of the countries.

Fig. 6 shows the evolution of the daily tests conducted per population by the studied countries. Chile and Peru are the countries with the highest number of daily tests performed per population (exceeding 50 daily tests per 100,000 inhabitants since late April and early May). Only Chile has reached 100 daily tests per 100,000. Especially because countries are lifting some movement restrictions, high levels of testing are required for the decision making of closing if needed. In contrast, Colombia and Ecuador have had daily testing rates under 25 until June, when the former began to raise the level of testing, reaching an average of almost 75 daily tests per 100,000 per inhabitants in the last days up to August 9, while Ecuador still has low testing rates.

The relatively low numbers of tests conducted in the first stages of the pandemic can be traced in part to poor pre-pandemic laboratory capabilities to meet the demand, as COVID-19 tests require complex equipment, and trained technicians which were not necessarily present in each setting. For this reason, some countries are relying on rapid tests. Nevertheless, the countries have expanded their testing capacity. For example, Chile and Peru had only one laboratory processing PCR tests in March, while 112 and 25, respectively, in August. Additionally, there have been some barriers to access the global markets of COVID-19 related products due to many countries introducing ban export and restrictions measures in relation to supply products which have affected the country's ability to test [63].

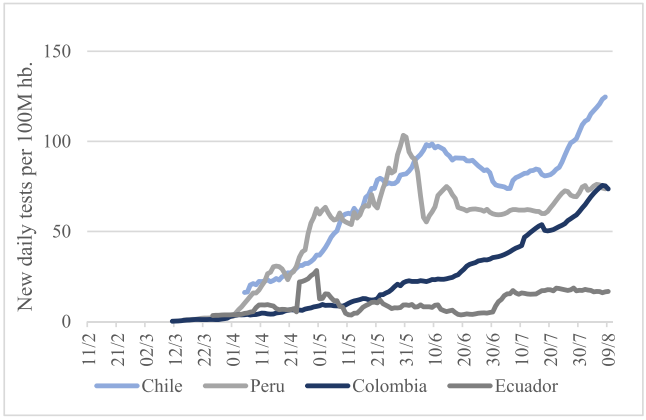


Fig. 6. Evolution of daily tests conducted per 100,000 population (7 days average) [33–36].
Note: No public data for daily numbers of tests realized in Brazil.

However, some innovative testing strategies allow high levels of testing in some groups of the population using less resources. In Chile, pool testing has been implemented for analyzing the incidence of COVID-19 in elderly centers. That strategy combines laboratory samples of a group and analyzes them as one sample, saving resources, while allowing to find if there is one positive case and consequently knowing if other measures have to be implemented.

Regarding tracking of patients, none of the countries had reported to be doing it constantly and thoroughly at early stages, although there are some local initiatives that had resulted in important outcomes as presented later for the case of Medellín in Colombia. Only in early June Chile has announced a more aggressive tracking and surveillance of COVID-19 cases, which also coincides with the time the cases and positivity rates started to decrease, as noted previously. The strategy includes primary health care workforce and an increase in personnel in charge of the tracing (reaching almost 4000 in late July), as well as in the number of places in health residences (for people that cannot safely quarantine in their homes and for those forced to quarantine), with a capacity of 11,000 people in August, according to the official information [33]. The tracing involves call centers dependent on the primary care institutions and on the regional health secretaries (Ministry of Health). They call the confirmed or probable cases (reaching 80% of them in the Metropolitan Region in early August) as well as their contacts (62.4% of the cases were reported to come from a close contact in early August), educating, testing and isolating when necessary.

Innovation and technology

Resource scarcity, barriers and the fast-moving spread of the virus and its severity, also led to a surge of innovations to solve problems and to be scalable [66]. Some interesting cases are local initiatives to produce supplies. In Peru, the government resorted to local procurement strategies for the manufacture and supply of masks and PPEs for the whole country [67]. The production of mechanical ventilators combined efforts from local universities, and some units repaired by the Armed Forces. In Chile, some machines

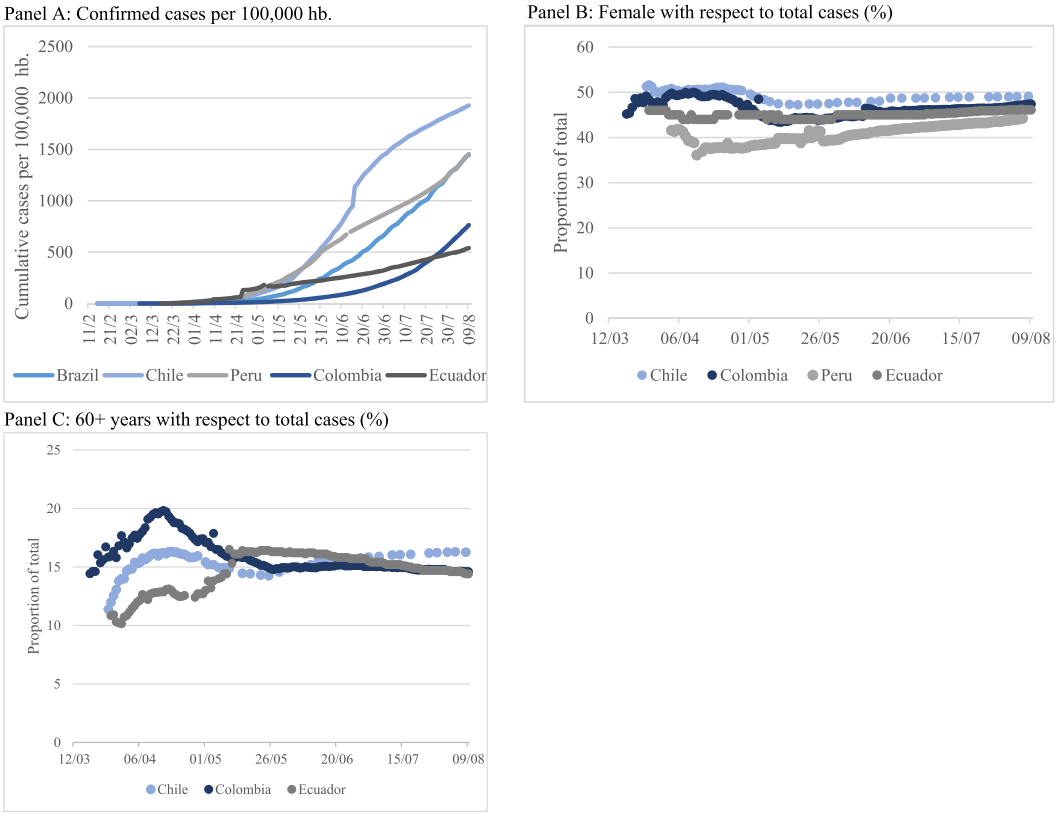


Fig. 7. Evolution of positive cases [32–36,75].

for anesthesia were converted into ventilators and some ventilators were used to supply oxygen to more than one patient. The Production Support Corporation under the Ministry of Economics opened tenders to stimulate the production of sanitary resources, which resulted in late July in the first locally made ventilators [68]. On July 30th, the Nature journal published a paper on the development of low cost tests for COVID 19 [69]. The research developed by Chilean researchers achieves high levels of accuracy and the test costs around US$1. Another interesting and low cost way of detecting COVID-19 outbreaks is the study of wastewater, which has also been being done in Chile [33].

Despite a slow implementation and some resistance (pre-pandemic), telehealth has now been boosted and strongly encouraged in the countries studied. Building on telehealth commission work [70] and Telehealth Law [71], the Ministry of Health of Peru created a National Telehealth Network with country-wide free consultations from all service providers during the Emergency Declaration. The Ministry of Health also created online training courses for healthcare workers on mental health during the pandemic, and the therapeutic management of COVID- 19 cases. In Chile, the incipient telehealth program under the Ministry of Health was extended to forty-one medical specialties to attend people remotely. Similarly, the Peruvian Ministry of Health introduced online courses to health workers in March and April. Brazil passed the Law N° 13.989 on April 15th, which allows the use of telehealth services during the pandemic. Nevertheless, the article of the Law that included the possibility of prescribing medicines by those services was vetoed.

The city of Medellin, Colombia, implemented an intensive health technology plan in January, based on a platform (Ḿedellín me cuidaǴ), where citizens can register and add information related to comorbidities, location, family, contacts, workplace, among others. More than 2 million people had registered [72]. The platform can connect with the travel card and, for example, infected people can be banned from using public transportation. It is also connected to the police system, allowing them to easily know if a person is authorized to circulate. Since the first case, the municipality has been applying COVID-19 tests at home, following the cases with daily calls, and tracking close contacts, in coordination with the civil police. The platform also allows text messaging to people located close to a positive case, the use the information to predict future contagious and risk zones and detect people that must be tested because of their association to a positive case. Medellín has the largest testing rate per infected cases in Colombia [72].

Similarly, Ecuador has developed a digital application that identifies the zones with high levels of cases and the level of movement of COVID-19 (using GPS). The government had open access to the information about the number of cases (movement data is not open) to all the citizens to be aware of the magnitude of active cases in different areas [73]. As well, Brazil has recently added to its app (Coronavirus-SUS) the functionality of alerting people that has been exposed in the previous 14 days to a confirmed case [74].

The impact of COVID-19

This section addresses how COVID-19 has impacted the five countries. First, regarding its health impact, we analyze the so-called “direct effects” based on officially reported data by the health authorities, related to the number of positive cases and deaths (and the age and gender de-aggregations when possible) and the number of patients in ICU. We aim at showing where each country stands in comparison with the others. We also analyze “In-

direct effects", where we study excess mortality, as it may capture spillover effects such as non-COVID related deaths, for which we add some information about non-COVID spillover effects, but also it may show if direct effects are underreported when data availability and transparency cast doubt on official numbers (still, direct). Second, we present some indicators related to the economic impact of the pandemic on the five countries, considering their characteristics and context (i.e. reliance on certain economic sectors and dependency on commodities).

The health impact

Data sources and transparency

While this study relied on official data published by the Ministry of Health of each country, there are several caveats. First, there are many cases under investigation in Brazil and Ecuador. Besides, data inconsistency between the data reported by the Ministry of Health and the analysis of researchers and academics using public data have been evidenced in Brazil, Chile and Ecuador.

In respect to the data breakdowns, Chile, Peru, Ecuador and Brazil publish aggregated data and also include some level of disaggregation (i.e. age, gender, region) for the daily (or periodic) cases and/or deaths. In contrast, Colombia is the only country with detailed micro data for each case (e.g. including demographic variables and information about the health status (hospitalized, recovered, death)). Appendix 2 presents a summary of how and what COVID-19 data has been collected in this study.

Brazil and Ecuador do not publish information on the number of ICU patients, while Chile and Peru publish the total number of ICU patients daily, but there is no information on how many patients have been hospitalized daily due to COVID-19, or the length of stay in the hospitals. Since June, Chile has begun to publish data of total discharges for each week, but the level of aggregation does not allow to analyze daily admissions or length of hospitalization either.

Direct effects

This subsection uses epidemiological data to describe some of the health outcomes from the beginning of the pandemic until August 9. General country-level patterns are presented, as well as the breakdown per gender and age.

Brazil is the country with the highest number of COVID-19 confirmed cases, accounting for around 3 million. The total number of positive cases in Brazil is over five times Peru's cumulative cases, around eight times Chile's and Colombia's and more than 30 times Ecuador's total cases.

Fig. 7 Panel A shows cumulative cases adjusted per population. When accounting for population size, Brazil is no longer the most impacted, as Chile has the highest rate of confirmed cases per 100,000 people, with almost 2,000 cases per 100,000 inhabitants, followed by Peru and Brazil, with 1,500 cases. High levels of testing (Fig. 7 in section Health system response), summed with high positivity rates, underlie the numbers observed in Chile. High testing could also lead to a greater detection of cases in Peru. On the contrary, low levels of testing paired with high positivity rates could suggest an underestimation of cases in Ecuador.

Currently, the only country that seems to be bending the curve is Chile, which, in addition, has been decreasing levels of positivity rates (under 10% in early August). In contrast, Colombia, which remained with a low and stable number of cases for about three to four months, began to increase the number of cases at a fast pace at the end of June, and in early August, is the country that presents the steepest slope. Peru, after relenting the increase in cases is now presenting a higher speed of increase.

Fig. 7 Panel B presents the breakdown of cases according to gender. Cases have been evenly distributed between women and men in Chile, Colombia, Ecuador and Peru through the period (49.1, 47.4, 46.1% and 44.2% of cases are concentrated among women, respectively). Panel C, shows the breakdown for age (cases concentrated in those with +60 years). Positive cases are more concentrated among people aged below 60 (65+ for Ecuador) among the countries. In fact, under 20% of the cases correspond to people older than 60 in Chile, Colombia and Ecuador (that have available data).

Although all countries have increased their health capacity, large numbers of cases could have impacted significantly the occupancy of ICU beds. Fig. 8 shows the initial and current ICU beds, as well as patients in those units for the countries where the data was available (Peru, Chile and Colombia). Chile quickly surpassed initial capacity by May, while its efforts in increasing health system capacity have managed to meet demand, and since June, when the country reached its peak occupancy rate, has been observing, for more than a month, a decreasing number of patients in ICU units. In contrast, Colombia and Peru are still increasing the number of patients that require that level of attention, especially the former, that is doing so rapidly. Nevertheless, Colombia's high capacity has implied that the country is far from reaching its limit. That is not the case for Peru, on the border of collapsing, with only around 100 ICU beds available.

In regard to deaths, Brazil is the country with the highest number of fatal cases, with over 100,000 deaths, while Chile, Colombia and Peru exceeded the 10,000 death mark. Fig. 9 shows the cumulative deaths adjusted per population. Ecuador, had a quick increase of deaths, being the country with the higher death toll per population until mid-June. Peru is the country with the highest number of deaths per population, with 63.4 deaths per 100,000 inhabitants, followed by Chile and Brazil, with 52.1 and 48.1, respectively. Chile's and Colombia's death toll experienced a steeper increase at a later stage than the other countries (Chile in late May and Colombia during July). Indeed, Colombia has observed the fastest increase in total deaths to date, represented by a steep slope of the curve of rate of cumulative deaths in the last period.

While we had observed an even distribution of the cases among genders, in Fig. 9 Panel B, we observe that in Colombia and Peru, the deceases are concentrated among men, accounting nearly 60% and 70% of deaths, respectively. In Panel C of the same figure, where deaths are shown for 60 years old and over, we observe the same as in other countries [20], that the most affected population is gathered in this group. Nevertheless, the percentages vary for the countries, as in Brazil the population over 60 years old represents around 70% of deaths, while in Chile this number is significantly higher, at 80%. Over time, mortality for 60 and over has decreased substantially for the two countries, as this indicator was 90% and 85% respectively.

The fatality rate (deaths per confirmed cases) is obtained combining cases (Fig. 8, Panel A) and deaths (Fig. 9, Panel A). Ecuador is the country with the highest rate on August 9, with 6.3 deaths per 100 confirmed cases, followed by Peru, with 4.4 and with the lowest rate, Chile with 2.7 deaths per 100 confirmed cases [33–36].

While all five countries have been adversely affected so far, as all of them are currently presenting a large number of daily cases and deaths, the cumulative impact of at least the first wave of the pandemic is going to be greater than the impact presented here. Colombia, despite presenting a far lower number of cases and deaths in the first months since the first case, is currently experiencing a rapid increase in those numbers, probably related to the relaxation of measures and lack of an extensive testing and tracing strategy, similar to Perus situation. On the contrary, Chile has managed to sustain in the last month a decreasing rate of new cases and deaths, as well as ICU patients. As presented in section 'The response to the pandemic', that can be explained since during June Chile increased the extent and amount of economic measures,

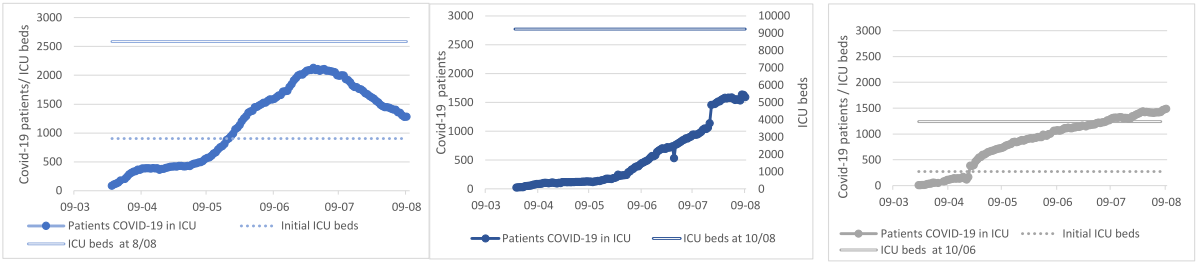


Fig. 8. ICU COVID-19 patients [33,34,36,76,77].

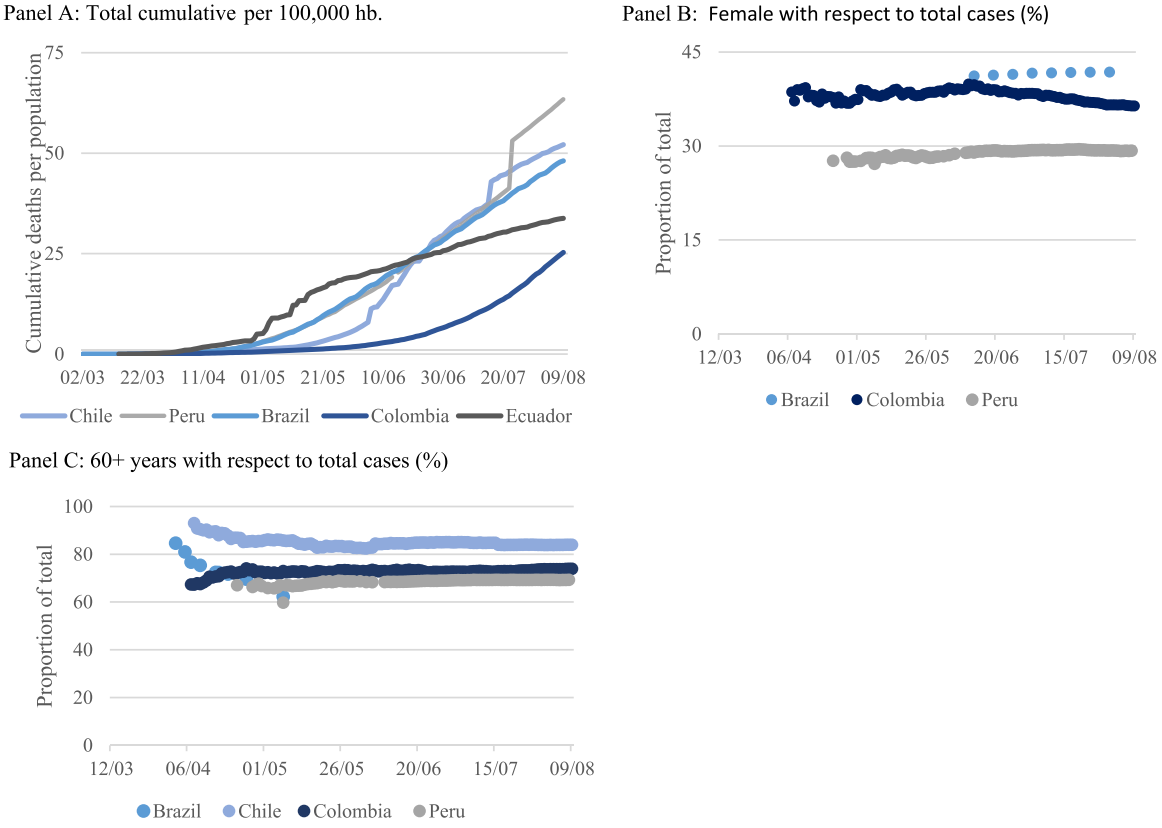


Fig. 9. Evolution of the death toll [32–36,75].

covering the formal and informal sector and vulnerable population, and started an aggressive national strategy of testing, tracing and tracking of confirmed cases and its contacts, reaching a high level of coverage of them along the country. Similarly, during July Chile´containment and mitigation measures stringency increased.

Indirect effects

The deaths due to COVID-19 might be higher than the official number reported by each country due to two reasons. First, some deaths for which the real cause was COVID-19 may be underreported because there was not a positive test that confirmed the diagnosis, because in all the countries analyzed, the deaths reported by governments as COVID-19 deaths are only those with a positive test. Second, the pandemic can have an additional impact on deaths, that is, an indirect effect, increasing mortality for other diagnostics, caused by lower access to health. This can respond to a reduction in the resources for routine and non-emergency healthcare (which are being redirected to COVID-19 patients) and fear and avoidance to seek medical care, as well as to the consequences of containment and mitigation measures on household income that may be leading to situations of food insecurity [78], impacting health outcomes for children and general population. In contrast, the measures can also have some positive effects, decreasing the number of deaths for other causes, for example, reducing the number of preventable accidents (i.e. car accidents) and lower contagion of other viruses and infections.

To assess the overall mortality impact of COVID-19, Fig. 10 presents the calculations of the excess deaths for Chile, Ecuador, Peru and five cities in Brazil (Fortaleza, Manaus, Recife, Rio de Janeiro and São Paulo). For Chile, Ecuador and Peru, we calculated the difference between the observed deaths in the period March to July 2020, and the expected number of deaths according to the average growth of deaths in previous years (2015–2019 in Chile and Ecuador, and 2017–2019 in Peru). Brazil's data was calculated

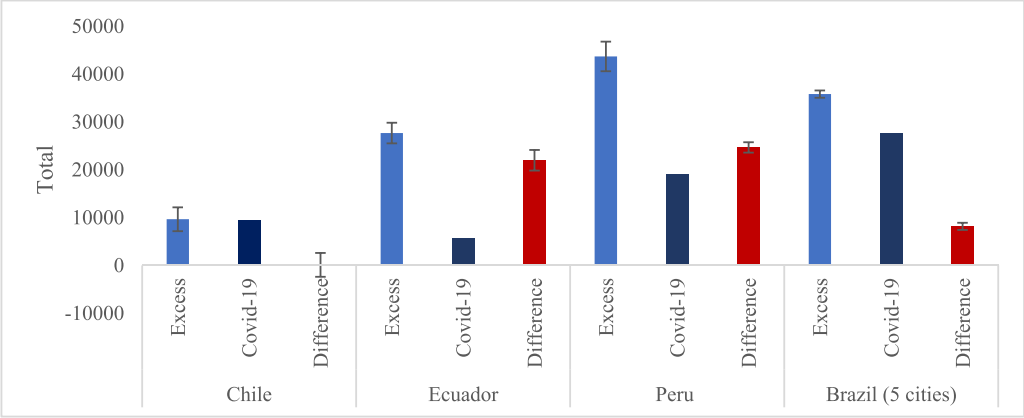


Fig. 10. Comparison between excess of deaths and official report of deaths [80–83].
Note: C19: COVID-19. Two values of cumulative deaths are presented for Ecuador. The lower value is from data on the official daily report. The higher one is the one presented in the website of coronavirus Ecuador and includes deaths defined as COVID-19 probable. * In the case of Brazil the excess and difference is calculated for five cities: Fortaleza, Manaus, Recife, Rio de Janeiro and São Paulo. C19 report also include deaths only in that cities (from The Economist).

with the average of deaths between 2016 and 2019 and assumes a growth of deaths of 2% (and allows an upper bound of 3% and lower bound of 1%).

We contrast the excess deaths data with the official COVID-19 report to estimate the magnitude of the additional impact of COVID-19 in the selected countries. The results show that the impact in deaths in some countries is far higher than the reported officially to date. Peru shows the highest difference between excess deaths and the official COVID-19 deaths, with almost 25,000 deaths. Indeed, the sanitary authorities have announced that they are reviewing the total number with the National System of Deceases of Peru and there are still 15,000 unrevised until August 8 [79]. In terms of the difference magnitud, Peru is followed by Ecuador (21,990) and the Brazilian cities (8,180). Those numbers represent 130%, 386% and 30% of total COVID-19 reported deaths for the period. On the other hand, Chile presents the lowest difference for the period (127 deaths), however, the upper bound for Chile (with a confidence interval of 95%) is around 2,500 (close to 30% of total COVID-19 reported deaths for the period).

As it is not possible to determine whether those deaths correspond only to uncounted COVID-19 deaths or to the indirect effect by priority allocation to COVID-19 and its restrictions, we provide some information to evidence on the effects of COVID-19 on other health areas. The data support a shift in health services utilization and provision of immunization routine programs for Chile, Colombia, Ecuador and Peru. This information is presented in Appendix 4. In Chile, the data shows a reduction in emergency admissions due to respiratory and cardiovascular diseases. Regarding the notification of diseases, in Bogotá (Colombia) there is some evidence of a decrease in the notifications of respiratory diseases, whilst Ecuador also reports a reduction in the notification of vaccine-preventable diseases (chickenpox, mumps). Ecuador evidenced a decrease in the level of the vigilance of diseases of mandatory notification compared with previous years. In Peru, there is also a reduction in the coverage of immunization programs for four different vaccines below 10%. BCG vaccine has a higher coverage as it is administered to newborns immediately after the birth.

The economic implications of COVID-19

This subsection briefly examines the economic implications of COVID-19. Some of these implications followed directly from changes in consumer behavior as a response to the pandemic that occur even in the absence of lockdowns and social distancing rules,

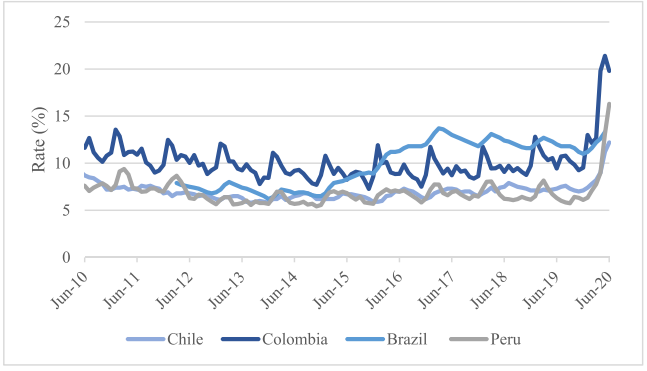


Fig. 11. Evolution of unemployment (%) [84–87].
Note: There is no public data for unemployment after December 2019 for Ecuador.

but also there is an economic impact of the restrictions implemented. Other implications are more indirect, and results from changes in the world economy.

Strict mitigating and containing measures as lockdowns affect all sectors, but specially the service, commerce and tourism [37]. Fig. 11 shows the unemployment rate in the countries. Although countries have adopted measures to protect employment, data shows that unemployment rates increased in all five countries, with spikes in Colombia and Chile. Nevertheless, not all the population is affected in the same way. For example, the gender gap of unemployment increased in June 2020 compared with June 2019 in Chile and Colombia, and the younger population has been most affected [84,85]. Among the economic sectors, commerce, construction and services are the most affected in terms of employment in Brazil, Chile and Peru [84,86,87].

The panorama is not auspicious, and the pandemic is still on course. Inevitably employment and salaries will be affected and, thus, informality and poverty, which, in turn, makes it more difficult to contain the virus. The Organization for Economic Cooperation and Development talks about an “unprecedented global economic crisis” for the region, which was already in a difficult situation, estimating an increase in the population under extreme poverty of Latin-American countries [88].

Unemployment data reflects on some economic indicators such as the economic activity and GDP. Fig. 12 Panel A, shows the index of economic activity for the countries, while Panel B shows

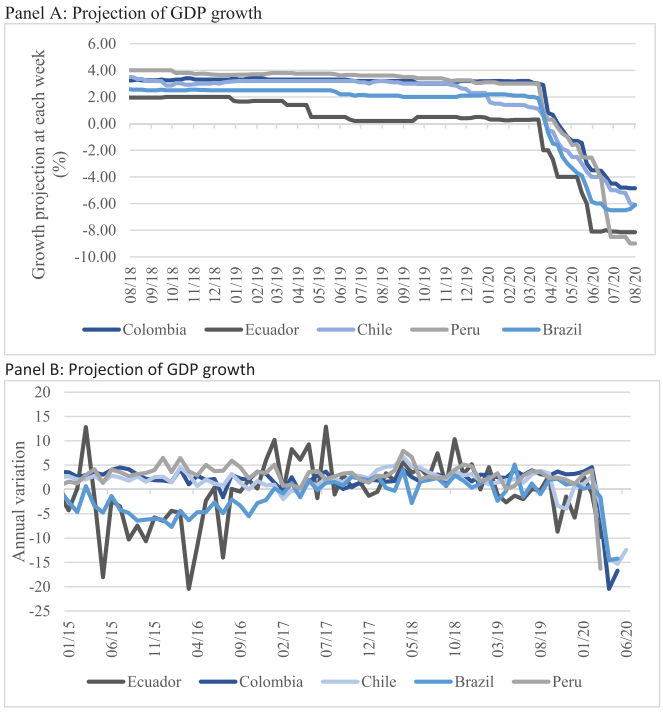


Fig. 12. Evolution of economic indicators [90-95].

the projections of GDP growth. We observe that the decrease in activity has been steeper in Chile, Colombia and Peru, countries that had stable indexes before 2020. As a consequence, GDP projections also dropped heavily for the five countries, turning to negative since March 2020. Ecuador and Peru present the largest decreases up to August, between 8 and 9 points. Countries that were expected to have a higher increase in the annual GDP before the pandemic, such as Colombia and Chile, are now expecting to have a decrease in GDP, but less negative in Ecuador and Peru, as well as Brazil.

As the countries also heavily rely on commodity prices, their reduction as well as decrease in exports has affected the economic indicators presented [89]. Oil price, partly influenced by a decrease in world demand, shows the largest decrease, affecting Brazil's economy but specially Colombia for whom oil represents more than 50% of exports. On the other hand, the evidence shows that exports also decrease due to pandemic. Exports to China are expected to drop 24.4% [88], affecting heavily the revenues of Brazil, Chile and Peru, whose economies rely heavily on China's demand [88].

As analyzed before, governments responded with economic packages which sizes differ, according to their economic reality. In all cases, those efforts implied an increase of fiscal deficit and indebtments. The fiscal deficit is expected to be 9.5% of GDP on average but the proportion debt to GDP can reach more than 90% for Brazil and over 60% for Colombia and Ecuador [96].

Thus, the scenario is negative, as captured by rating agencies, which have been constantly modifying the outlooks of these countries in the last months. For example, S&P modified the outlook of Colombia and Chile from stable to negative (March 26 and April 27, respectively) and for Brazil from positive to stable (April 6) [97].

Concluding remarks

This paper described and analyzed COVID-19 economic and health impacts in Brazil, Chile, Colombia, Ecuador, and Peru. We presented pre-pandemic data on socio-economic development, epidemiologic and demographic characteristics, and health system resources and performance in the five countries. In addition, we conducted extensive documentary analysis focusing on federal and state public health and economic responses covering since the arrival of the virus to the continent in late February until mid-August.

All five countries adopted strict measures early on to contain the first wave of COVID-19, including lockdowns (national or focalized) and curfews. However, the effectiveness of the measures was undermined by the existing fragility of the health systems, which are characterized by insufficient investment in health resources, regional disparities, modest information systems and poor communication and coordination. Indeed, the health systems have been overwhelmed in the first 100 days of the pandemic, with ICU beds reaching nearly 100% occupancy in some regions.

The existence of a large informal sector affected the ability of individuals to comply with the containment and mitigation measures further undermining their effectiveness. While the five countries introduced income support measures, they were by and large too timid or too late to achieve high levels of compliance. Moreover, there was a lack across the five countries of a comprehensive strategy for early detection, isolation, surveillance, and tracking of patients and close contacts.

Our analysis provides an explanation for why, despite their early response, the five countries are facing high incidence rates and deaths per population, especially in regions with lower socioeconomic conditions (dense and overcrowded neighbourhoods and remote areas) and greater concentrations of informal workers. Moreover, the evidence presented on excess mortality and health spillover effects shows that the human cost of the pandemic is far higher than what is currently accounted for in official data. This is due not only to unreported cases and ineffective information systems, but also to the hidden impact on healthcare by the diversion of resources to the COVID-19 response.

To make matters worse, the five countries are also experiencing economic hardship. In addition to the impact on sectors such as retail and tourism, which have been prevalent worldwide, these countries were particularly impacted by the fall in exports of commodities to China. This negative economic outlook will likely persist for a number of years. Of concern is the impact on the vulnerable members of the population, with limited access to social welfare and to well-resourced health services.

Overall, this study highlighted the importance of early emergency preparedness and the need to improve the capacity of health systems to mitigate the spread of the virus. Health system reform that aligns with the WHO health systems building blocks would create resilient health systems that could respond better for disease outbreaks, as well as natural and human-made disasters [98]. In addition, the insights gained from this study reinforce the importance of trustworthy and robust government institutions to lead a successful post-COVID 19 recovery agenda. COVID-19 emerged during a period where government institutions were already in crisis and enjoying low public trust [99,100].

As OECD and IDB recommends [22,28], a comprehensive strategy is needed for facing a pandemic like COVID-19. Otherwise, the effectiveness of the measures can be undermined, because the individuals can not comply with the imposed restrictions. This fact is even more relevant in countries where there are people that live with the daily income and can't stay at home as proposed or mandated by the authorities. Moreover, a reduced impact of measures taken implies a longer time of strict measures, increasing spillover effects in other areas. Among the countries analyzed, the only one that is presenting a constant decrease in COVID-19's incidence is Chile, after the country applied strength mitigation and containment measures, an extensive strategy of tracing and tracking and a substantial improvement on economic support. It is to be ex-

pected that the re-opening measures that are being currently implemented are applied properly, preventing a large second wave. In contrast, the other countries have not enforced a comprehensive strategy yet, failing most notably in the tracing and tracking of contacts measures, which place them in a riskier situation for containing new waves.

Despite its devastating health and economic impact on the five countries, the pandemic has led to positive changes and innovations, which should be harnessed by policymakers and health leaders. Examples include the centralization of information about private and public health resources by Health Ministries, the use of telehealth to bridge the gap in the availability of specialist care between remote and urban areas, the provision of a basic level of primary care, online training for healthcare workers, scale-up of laboratory testing capacity, multisectoral collaboration and making 'healthcare everybody's business', boosting the domestic industry to produce medical equipment, and home delivery of medicines for chronic conditions.

The scope of this study is time-bounded and constrained by the information on the public domain. This implies, for example, that the role of technology is underexploited. The epidemiological data quality and availability is a significant limitation that highlights the disease monitoring shortcomings in the selected countries. This is an important caveat for a well-planned recovery strategy. To ensure decision-making and policies are driven by evidence and focused on the most vulnerable population, further research is required preferably using mixed methods and building on an interdisciplinary approach to assess the mid-term and long-term effects of COVID-19 across the different societal sectors, and the actions needed to recover from this pandemic. The urgency of such pursuing such research cannot be underestimated as the five countries relax restrictions and face a resurgence of infections and deaths' in lieu of talking about a second wave.

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Supplementary materials

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Appendix 1. Policy interventions by category, subcategory and level for each country [101–109]. Only national level measures are reported

Categori-sation	Sub-category		Brazil	Chile	Colombia	Ecuador	Peru
Policy Interventions to contain the spread of the virus (Behaviour, containment, mitigation)		Minimal	Recommendations of hygiene and social distancing Website and App with information on what to do in case of symptoms and nearby health unities. Daily data on the cumulative numbers of cases and deaths. Hotlines - to solve doubts. Inquiry - call to ask if someone feels any symptoms. 17-03 Authorizes switch from face-to-face to digital classes in higher education.	On early March. Wash your hands, work from home if possible, website launch of information about the virus, daily press conference of the Ministry of Health announcing new cases, deaths and total hospitalization and use of ventilators (information included increased with time). 19-03 Public officials older than 70 and those at a risk group may telework. Heads of State Services may flexibilize working hours and encourage teleworking. 20-04 Ministry of Health recommends the flexibilization of social distancing with hygienic measures (masks). Go back to workplace, small gatherings.	25-02 Educational campaign on prevention measures. Detailed information to the population.	28-04 Approval of the progressive plan of return to work. 05-05 Agreement of the Ministry of Labor: (i) creation of the special emergent working day for special cases (geography, shift or night works), (ii) public institutions must ensure compliance of distancing protocols, establish areas for personal cleaning and rest for public servants rest, (iii) no salary recharge, but must be notified to the Ministry of Labor.	Wash your hands, website launch of information about the virus, daily press conference by the President announcing new cases, deaths and total hospitalization and other information. Free phone line 113 and WhatsApp messages for the latest Covid-19 updates Online platform to check Covid-19 results
		Medium	04/05-02 Quarantine Law was sent and approved in congress. 18-03 Declared calamity state until 31/12/20. 20-03 Declaration of nation-wide community transmission and recommends self-isolation of those with symptoms and their contacts. 17-03 Measures to combat coronavirus in Brazil's prison system Suspension of public activities Teleworking for risk groups and those who travelled abroad. 20-03 Decree defines essential public services and activities. 27-03 Federal justice suspended the components of the decree that include religious activities, lottery & others as essential activities. March: School closing between 11-03 and 31-03 by states. Since 01-04 all schools are closed.	29-02 Mandatory submission of a sworn statement to Sanitary Customs for travelers. 15-03 Schools closing (all levels) until new notice. 16-03 Phase 4. 17-03 Closure of commerce, except banks, pharmacies, grocery stores, medical centers and home supply stores. 19-03 State of catastrophe for 90 days. Extended for 90 days on June 15th. 19-03 Closure of places (cinemas, sport events) that gather the public until further instructions. 21-3 Closure of social local (pubs, restaurants, sports events, etc.). 25-03 Advancement of winter break (April 12th - April 24th).	10-03 Sanitization of public places. 14-03 Closure of museums and cultural centers. 16-03 School closing until new notice. 16-04 Commerce, universities, religious places closure 17-03 State of emergency / exception declared. 17-03 Sanitary controls on airports, ports and public places. 19-03 Entertainment businesses closure. 20-03 4 days quarantine simulation in the city of Bogotá. 22-03 Decree to exempt from some restrictions of the quarantine to children, elderly, disabled people, those ill requiring assistance and caregivers. 24-03 Non-essential commercial activities closure. 01-04 Vacations are pushed forward.	15-03 Schools closing until new notice. 15-03 Online classes and via television, telework for staff. 16-03 Declaration of state of exception (extended for 60 days on 15-06). 17-03 Commerce must restrict their occupancy to 50% of the authorized amount. 21-03 Teleworking must be implemented in public and private companies during the health emergency. 21-03 Suspension of regular working hours/conditions is extended for all workers until 5 April. 13-04 A traffic light system was created for restrictions.	31.01 Approval of the National Plan for the preparation and response to Covid-19 (health promotion, epidemiologic surveillance and contact tracing; lab-based surveillance and diagnosis; health service management; risk awareness and communication; health workforce protection) 15-03 Declaration of state of National Emergency (catastrophe) until 31-08. 16-03 School closing (school should have started this date after holidays). 31-01 Approval of the National Plan for the preparation and response to Covid-19 (health promotion, epidemiologic surveillance and contact tracing; lab-based surveillance and diagnosis; health service management; risk awareness and communication; health workforce protection).

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Categori-sation	Sub-category		Brazil	Chile	Colombia	Ecuador	Peru
		Significant	17-03 Restricted entrance in Brazil of nationals from some countries. 19-03 Closing of terrestrial borders. 26-03 Prohibits the disembarkation by waterway. 27-03: All borders closing. 29-07: Reopening border to international air travel and foreign tourists.	Only first and massive quarantines /sanitary cord/others measures are reported. 06-03 Paid sick leave to workers (infected, those with close contact to a case, and qualified cases that must quarantine). 13-03 Enforced quarantine in Caleta Tortel town (south zone) until 28-03. 14-03 Cruise ships banned from docking and passengers from disembarking. 15-03 All cruise ships operations banned until September 30th. 15-03 Enforced quarantine to elderly and infant homes. 15-03 Prohibition of mass gatherings (200+). 16-03 Prohibition of mass gatherings (50+). 16-03 Prisoners that are at risk (elderly, pregnant) allowed to serve sentences at home. 18-03 All borders closing (but freight transport). 18-03 Mandatory 14 days quarantine for travelers. 22-03 National curfew (22:00 to 5:00). 23-03 Sanitary cord (enforced health checks in Sanitary Customs) in the city of Chillán (southern zone) until May 3rd. 23-03 Sanitary customs in all boarders, ports and airports of the southern and northern zones and some parts of the central and insular zones. 24-03 Enforced quarantine to elderly (80+).	06-03 Mandatory isolation of confirmed and suspected cases. 12-03 Prohibition of mass gatherings (500+). 13-03 Cruise ships passengers banned from disembark. 14-03 Closure of venezuelan border (not fully implemented). 16-03 Borders closing for foreigners. 14 days mandatory quarantine for residents. 16-03 Prohibition of mass gatherings (50+). 16-03 Ecuador, Peru and Brazil borders closing. 17-03 All borders closing until new notice. 20-03 Simulacrum of quarantine for Bogotá (until 23-03) 23-03 Closure of airports for passenger transit. 23-03 International flights cancellation. 24-03 Mandatory national quarantine. Last extension: until 01-09. Sectors exempted increased with each extension. 24-03 Safe passage required for- leaving cities. Segmented population displacement regulation. 31-03 Declaration of mitigation phase shifting public policy from the infected to the general population. 03-04 Mandatory use of masks in public transports. 05-04 Capital cities (excluding Bogotá) restrict leaving the house based on ID number.	14-03 Prohibition of mass gatherings (30+) 15-03 14 days quarantine for foreign travellers (not by air). 17-03 National quarantine until May 4th, when decision making was devolved to cantons. 17-03 all borders closing. 17-03 National curfew at night. 17-03 Limit for circulation of private vehicles, closing of public services (with some exceptions), suspension of regular work days for the public and private sector. 17-03 Suspension of international flights (incoming) 25-03 National curfew updated to start at 14:00. 28-03 Circulation of vehicles (for essential needs) based on number of license plate (only two days a week). 02-04 Suspension of regular working hours/conditions is extended for all workers until 12 April. 02-04 all international and interprovincial travel prohibition (until 30 April).	11-03 Travellers from Italy, Spain, France, China must self-quarantine for 14 days 12-03 Prohibition of mass gatherings (500+). 15-03 All borders closing. Mandatory two-week national isolation period (extended five times until 30-06). Restrictions of internal movement. Suspension of the public servant and private sector activities. Deployment of the national policy and defence forces to enforce Covid-19 measures. 18-03 Daily curfew (6pm to 4am). Exceptions for Piura, Tumbes, Lambayeque, La Libertad and Loreto (4pm to 4am). 11-04 Mandatory use of masks. 23-04 Coronavirus amnesty for 3,000 prisoners. 23-03 Funds to the Ministry of Foreign Trade and Tourism to ensure quarantine of travellers (approx.. USD103M). 11-05 Testing of 36 markets throughout the country (Resolución Ministerial 277-2020-MINSA). 22-05 Intervention plan targeting indigenous and remote population. 17-05 Strict quarantine measures for children, teenagers and older people in high risks districts. 02-06 Creation of primary care team to manage and treat COVID-19 cases at the house level. 07-05 Resumption of some economic activity - mining, construction, services, tourism and retail.

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Categori-sation	Sub-category	Brazil	Chile	Colombia	Ecuador	Peru
			24-03 Travels from cities to coastal areas banned (for vacation). Isolation and quarantine must be done in home districts. 31-03 Quarantine for children homes (SENAME). 02-04 Quarantine for long-term establishments for the elderly. 08-04 Mandatory use of masks in public transport. 09-04 Sanitary cord for two big metropolitan zones (central and south) for Easter weekend (until April 12). 17-04 Mandatory use of masks in closed public places and in areas with 10 or more people. 17-04 Internal borders closing. 17-04 Instruction from the central government that established a gradual return to work for public sector workers. 15-05 massive quarantine affecting almost 60% of the population, that has been extended until middle of June at least. 18-06 Enactment of the law that elevates penalties and fines for non compliance of mitigation measures. 01-07 Schools reopening in Easter island (Rapa Nui). 13-07 Flexibilization of measures in two regions (Aysén and Los Ríos). 16-07 Football resume (stage 1 of 4). 19-07 "Step by Step" plan for reopening. 5 stages ranging from quarantine to advanced opening areas, according to health criteria (allows to move forward or backward). 05-08 Reopening of national parks.	06-04 Mandatory use of masks in public places. 13-04 Bogotá restricts leaving the house based on gender. 01-06 Decree establishes 43 exceptions for the national quarantine (43) and that majors of zones with no cases can ask permission for being exceptuated of the quarantine. 01-06 Cities with airports may ask permission to start pilots for reopen. 16-06: Bogota transitions to 'zonal lockdown' (until 14-08). 25-06 Local mayors may reopen restaurants and churches once safety protocols are approved by the ministry of interior. 01-08: Economic activity resumes under extraordinary biosecurity, physical distancing and movement restrictions (Decree 1076) 01-09: Reopening of El Dorado airport to domestic flights.	03-05 Agreement of the Ministry of Labor: (i) Employers must take occupational health and safety measures and will be responsible for the mobility of workers, (ii) Companies will carry out the sanitary guides and trainings, (iii) measures of social distances in common areas, (iv) non compliance sanctions for employers (article 436 of the Labor Code) and workers (grounds for termination of the contract), (v) Teleworking for priority attention groups. 05-05 New stage "Social distancing", where each canton decides about containing measures using the traffic light system for restrictions. 01-06: Approved resumption of commercial flight (limited), requiring PCR tests results to passengers. 03-06: New parameters for the reopening in Quito (productive activities with 50% of the staff, 30% of costumer capacity). 15-06 Resume of terrestrial transportation between yellow cantons. 22-07 Prohibition of social gatherings in most affected provinces. 05-08 Reopening of national beaches (pilot).	16-05 Some immunization program have resume. 02-06 People can go outdoor and exercise (physical distance and mask). 27-06: Protocol for the start of the face-to-face education approved. Starting 01-07 in 9 free regions (two shifts and 50% of classroom capacity). 16-07: Resume of domestic flights to allowed regions. 25-07: Selective quarantines and night curfew.

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Categori-sation	Sub-category		Brazil	Chile	Colombia	Ecuador	Peru
Policy Interventions for prevention and cure (treatments, vaccines, health monitoring)	Health Resourcing for Treatment	Minimal	06-02 Simplified purchase of medical supplies. 17-03 Temporarily simplifies proceedings to approve medicines, biological products and other health products; 18-03 simplifies imports of health products to fight COVID-19. 19-03 Fostering treatment with new medicines under trial. 20-03 Reduces to zero the rate of the tax on manufactured products for health products. 20-05 Health Ministry issues protocol to use chloroquine even in non severe cases. 30-03 Facilities for the process for approval for individual protection products and medical equipment. 16-07 US$ 30.3 million credit for actions to combat the pandemic for long-Term Care Institutions for the Elderly.	1-03 Inclusion of the COVID-19 tests to the benefits covered by health insurances. 01-06 Life insurance for health workers.	19-03 Development of guides, protocols and related courses. 22-03 Guidelines for prevention and treatment of disabled people. 26-03 The period for the approval of medical supplies gets considerably shortened. 26-03 Provisory guidelines for assisting pregnant women, newborns and lactation.	Reduction of tariffs for the imports of medicines and other crisis-related medical inputs. 12-03 Prohibition to export PPE.	Extra payment to health workers in particular services (e.g. ICU, Epi, home visits) 20-05 Relocation of doctors from Lima to regional areas. 22-05 Deployment of specialist doctors to attend COVID 19 patients. (Resolución Ministerial N° 311-2020-MINSA) 24-05 Universal access to a list of 48 essential goods for the prevention, management and treatment of COVID 19 (Resolución Ministerial N° 315-2020-MINSA)
		Medium	03-02 declared emergency in public health of national importance 03-03 Creation of Public Health Emergency Operations Center. 07-02 Health ministry and Fiocruz provide training on laboratory diagnosis for representations from 9 countries (America). 12-03 introduces minimal coverage for private health insurance to testing for COVID-19. 29-03 Financial support for healthcare and life sciences manufacturers to product health equipment. 15-04 Allows the joint purchase by public entities to buy products for response to the pandemic. 16-04 Increase in the number of products with reduced tax rate to zero. 30-04 Reduction of import tax to zero for products needed for combating COVID-19. 17-06 / 24-06 New products for health with import tax reduced to zero and other facilities. 07-07 Plan and measures to confront the virus in indigenous territories (Law N° 1142/20).	08-02 Declaration of Sanitary Alert for one year (extraordinary attributions to Ministry of Health and all other public institutions related to health). 18-03 Free of charge tests for Fonasa (state insurer) beneficiaries. Online training of healthcare workers (i.e. intubation, use of ventilators). 26-03 Postpone health non urgent interventions. 30-03 Price cap for Covid-19 tests in private insurers, mandated financial protection by health insurers. 30-03 Starts testing people with few or no symptoms. 01-04 Public contest for sanitary innovation fund for PPE and other sanitary elements production. 08-04 Suspension of legal guarantees for the health services associated with some health conditions for one month.	11-03 Declaration of sanitary emergency. 20-03 Elimination of tariffs for specific medical elements for treatments (beds, oxygen). 22-03 Elimination of VAT for specific medical elements for treatments (beds, oxygen). 01-04 Surveillance system for suspected and confirmed cases and deaths. Strict tracking system for potential cases (contacts, interactions). 12-04 Transitory permission for health care provision. 12-04 Price caps for some health care inputs and services. 12-04 Exemption of payment for research protocols.	12-03 Declaration of Sanitary emergency 12-03 Mandatory coverage of COVID-19. 17-03 Allow private labs to conduct tests and set maximum prices for the tests: 80 USD for exams authorized by Health Ministry and 120 USD for patients with an order from a private doctor. Tests done by the Health Ministry are free. 16-05 No penalties on health policies due to payment delay for the emergency.	21-02 Mobile hospital unit at the airports. 02-03 Funds for the National Institute of Health for strengthening diagnosis capacity approx.. USD 735k. 16-03 Funds for: - Ministry of Interior and of Defence for the enforcement of measures (approx.. USD36M). - National Institute of Civil Defence (transportation of aid required by the Ministry of Health) for approx.. USD2,4M. 02-03 Funds for the National Institute of Health for strengthening diagnosis capacity approx.. USD 735k. 23.03 Funds to the Ministry of Health for hospital equipment (approx.. USD14M). - National Registry of Identification and Civil Status for the expansion of the online platform and phone communication in the diagnosis of COVID-19 - S/ 4 520 000,00 (approx. USD1.3M) 11-03 Declaration of Health Emergency and coordination shifts for the Presidency Council (until June, 30).

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Categori-sation	Sub-category		Brazil	Chile	Colombia	Ecuador	Peru
				13-04 Maximum price for new agreements between Fonasa and private providers. 03-06 Intensive tracking strategy that will include primary care attention depending on municipalities and isolation of cases in sanitary residences. 06-07 Massive testing starts in Metropolitan Region (where Santiago is located).			
		Significant	Transference of 0.4% of GDP to the public healthcare system. Additional to state and municipal governments transfers. From March: Support for private hospitals in exchange for an increase in beds and equipment, policies to hold medicine prices, and to decrease the costs of the import of medicine, ventilators and PPE, by cutting taxes (until September 2020). 03-07 Credit for Ministry of Defense to combat pandemic (USD 2.2 MM). 13-03 The Health Ministry purchased 10,800 ventilators, to be delivered in April. 13-03 Credit for the Ministry of Education and the Ministry of Health (USD 1,010 millions). 16-03 Decree allocating US$ 87 million (two reais per capita) to actions related to stopping the spread of COVID-19. 16-03 Transfer of funds from federal government to subnacional governments to fight COVID-19 16-03 announcement of 2,000 quick installation ICU beds. 17-03 Allocate the resources from the postponing the census to health programs. 18-03 onwards Series of decrees including early graduation of medical students to help in hospitals and health unities. 25-03 Credits for Ministry of Science, Technology (US$20.5 millions), Innovation and Communication, Ministry of Foreign Affairs (US$ 13 millions) and Ministry of Defense (US$45 millions) for emergency.	13-03 First purchase of ventilators. PPE purchase. 19-03 Announcement of the use of the constitutional 2% (increase in health budget equal to a 2% of total public budget) corresponding to 1,800,000,000 USD. 25-03 USD 220,000 millions for new beds from 37,000 to 41,532 (advancement of 5 new hospitals, 6 medical care posts, 1 ship and a new field hospital with 3,000), purchase of necessary supplies and equipment, the extension of emergency hours, and increase in laboratory capacity. 26-03 Increase of diagnostic capacity with the participation of 15 extra laboratories. 01-04 Public contest for sanitary innovation fund for production of PPE and other sanitary elements. 30-04 73 laboratories processing COVID-19 tests. 01-04 Ministry of Health centralized the coordination of public and private providers (beds and referrals) and asked providers to modify and adequate beds for more complex attention.	16-03 Provisioning on sanitary inputs for health care professionals. 17-03 1 trillion of Colombian pesos ($US 0,3 billion) for health (acquisition of medical equipment, enlarge testing capacities and provide liquidity to the hospital network, among others). 17-03 The government reports a daily testing capacity of 2,200 tests. 22-03 Additional financial resources for health care professionals. 22-03 Increase in recruitment of health care professionals. 24-03 1,500 respirators were purchased and are pending arrival. 01-04 The government articulates efforts with university labs and hospitals to increase testing. Sets a daily goal of 17,000 for April 15th. 04-04 Increase of ICU beds. 12-04 Mandatory call for all doctors and medicine students to be ready to be summoned to work. 12-04 Ministry of Health centralized the coordination of public and private providers (ICU, ITU beds). Transitory permission for health care provision.	March From 1st March to April 2nd, USD 298 million have been disbursed to support the health sector (remunerations, equipment and payments). Loans from the IDB for USD 25 millions and from CAF Development Bank of Latin America for 51 millions for health sector. 22-03: Armed forces requested to manage the province of Guayas as a zone of national security, to enforce confinement measures. 23-03 The new minister announced Approx. USD 120 millions for the emergency. 200,000 tests will arrive. 28-03 Minister announced the USD 75 millions were used for ICU equipment and 40 millions for biosecurity equipment. 29-03 USD 3 millions private donations for PPE and beds. 30-03: Refinancing of debt of decentralized governments (GADs) to free up resources to support the emergency at the regional level. 01-04 Minister updated the amount to health sector to USD 200 millions.	Covid-19. 21-02 Mobile hospital unit at the airports. 16-03 Funds for: - Ministry of Interior and of Defence for the enforcement of measures (approx.. USD36M). - National Institute of Civil Defence (transportation of aid required by the Ministry of Health) for approx.. USD2,4M. 23-03 Funds to the Ministry of Health for hospital equipment (approx.. USD14M). End of May Increase in the number of ICU beds from 100 to 1,238 (June 8). Diagnostic capabilities from 1 to 11 – centralised on National Institute of Health 15-03 All public, private and mixed health entities and workers serving them, are under the direction of the Ministry of Health 26-03 Purchase of 1.4M rapid tests 30-03 3,000 new beds created at the accommodation dedicated to the Pan-American Olympic games (Pan American Villa) in Lima. Donation of rapid tests, masks, PPE by foreign governments, international and national private companies and WHO-PAH. 04-04 Procurement opportunities to produce masks by local suppliers 13-04 Pontificia Universidad Católica starts developing ventilators.

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Categori-sation	Sub-category		Brazil	Chile	Colombia	Ecuador	Peru
			28-03 Three calls of the More Doctors Program (Mais Médicos) were launched to increase doctors' availability. 27-05 Federative program to combat the virus (Law 173). US$ 21.3 billion in cash flow for states and municipalities. 04-06 US$ 864 millions for the federative program. 26-06 New credit for the Ministry of Defense for actions to deal with the pandemic for US$57.7 million. 09-07 US$ 66 millions for the Ministries of Education, Health and Citizenship to fight the pandemic.	20-04 Temporary hospital from the army to help in the emergency. 17-05 Expansion of Health Residences capacity (for people who must be quarantined but do not have appropriate conditions). 11-07 21 million dollars for primary care.	13-04 Complementary rapid tests (non-molecular). Intensive testing.	02-04 World Bank loan for USD 20 millions for prevention and adequate medical treatment and strengthening of the health system. 04-04 Donation from PAO of PPE (5,000 surgical gowns, 10,000 gloves, 200 N-95 and 5,000 surgical masks, 200 glasses, 80 biosecurity bags, and 160 body bags). 08-04 Minister announced that 606 health professionnels had been hired. Private donation of 20 ambulances. 20-04 New strategy for testing: probabilistic for each province. 30-04 Reception of a Chinese government donation of PPE (1,000 protective suits, globes and glasses and 5,000 masks).	20-04 Introduction of measures to facilitate the rapid recruitment of foreign and recently graduated health workers. 08-05 Authorization of an extra credit to the public budget of 2020 (USD 300 millions) for prevention, control, surveillance, and response to sanitary emergency.
	Health Technology	Minimal	06-04 USD 9,3 millions call for research projects to combat COVID-19. Adoption of an App (Coronavirus-SUS) by over 10 million people as of 31 July. Notificates people exposed to the virus.			02-04 Public access will be provided to the technological tool: SOS-COVID, that will allow citizens to directly identify risk zones by agglomeration. Phone number (171) for inquiries about COVID-19 (nurses and doctors answer).	23-03 Funds to the National Registry of Identification and Civil Status for the expansion of the online platform and phone communication in the diagnosis of COVID-19 - S/ 4 520 000,00 (approx. USD 1.3M).

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Categori-sation	Sub-category		Brazil	Chile	Colombia	Ecuador	Peru
		Medium	20-03 Regulates the use of telemedicine services during the health emergency	March: The Ministry of Health authorized the remote attention (i.e. telehealth) of 11 medical specialities (41 in June) while the Alert is in force. Online training for health workers. 25-06 Researchers from 2 universities studying wastewater to detect COVID-19 outbreaks. 01-07 63 projects related to COVID-19 are funded by the government (Ministry of Science and the National Agency of Research and Development). 16-07 Territorial platform with COVID-19 data.	12-04 Implementation of telemedicine.		15-04 Introduction of a Tele-Health with general and specialist appointment, and (09.05) creation of a National Telehealth Network with free consultations Decree N° 1490. Online training for health workers on COVID-related matters.
		Significant	15-04 The government passed the Law N° 13.989 that allows the use of telemedicine. The University of São Paulo is conducting research for vaccine development with a quick response against the virus.	Funds to produce inputs locally. 21-07 First Chilean developed ventilators are presented. 02-08 Announcement of first clinical trial for a COVID-19 vaccine in Chile.	27-01 Technology intensive plan in Medellín for predicting, tracking, surveilling, and treating cases: centralized AI system, App, phone line,text messages, travel card, police software. 25-04 Arrival of 2 Hamilton robots to increase PCR processing capacities. 25-05 Arrival of 1 Hamilton robot to Rosario University.		Incentives and local procurement for the production of masks, PPE, ventilators and oxygen tanks. 22-07: 60 Medical oxygen generator plants to be set up in hospitals around the country.

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Categori-sation	Sub-category		Brazil	Chile	Colombia	Ecuador	Peru
Economic Impact Policy Interventions	Economic Reprieve and Stimulus	Minimal	Suspension of the state's debt payment (US$ 2.6 billion). Renegotiation of the states' debt with federal bank. 02-03 Ministry of Tourism announced credit lines for tourism business. 18-03 40 billion Brazilian reais (around 6.8 billion dollars) in credit with lower taxes for small and medium companies to help the payroll for two months. 22-03 Measures to preserve employment and income. 22-03 BNDES (National Development Bank) approved temporary suspension of payments ("standstill") of installments. 27-03 Federal government announced a credit line for small and medium business for payroll (USD 7.7 billion), Companies that ask for the credit can not fire employees for two years. 30-03 Emergency support for informal workers, unemployed, and single working entrepreneurs that have low income, in the amount of 600 Brazilian Reais (around 120 USD in April 2020) for 3 months. Mothers that are the only responsible for the income in the family will receive R$1,200 (USD 245 approx.) 07-04 3 billion Brazilian reais (around 51million dollars) for Bolsa Família. 07-04 Authorizes the distribution of resources from the National School Feeding Program ("PNAE") to parents or guardians of public school students basic education. 16-04 US$479 millions to strengthen social assistance initiatives (SUAS) for the most vulnerable population in most affected municipalities. 27-04 US$94 million for buying food to family farmers (85,000 families) to benefit 12,500 entities and 11 millions families. 02-06 Extension until December of prohibitions related to remuneration increases in the financial institutions. 04-06 US$3,849 millions to implement the Emergency Credit Access Program for SME enterprises.	6,9% of the GDP for covid-19 related measures. March Postponement of water service payment during the emergency for the 40% most vulnerable people. 16-03 Financial measures for increasing liquidity (facilities and flexibilization for banks, purchase of bonds) until 09-01-2021. 18-03 Continuity of delivery of food for students who received it at school. 19-03 Water service would not be cut for no payment. 19-03 USD 2,000 million for Employment Protection Bill in Congress (started in April). 23-03 Measures to increase liquidity: - solidarity fund of 100,000,000 USD for emergencies derived from declining sales. - Acceleration of payments to State providers. New capitalization of the State Bank for US $ 500 million. - other facilities to banks and clients. 27-03 Agreement with the electric companies for suspension of the cut of service for no paying for the 40% most vulnerable. 30-03 Flexibility in deadlines to implement Basilea III. 30-03 Covid-19 bonus announcement (USD 65 per household plus USD 65 per dependant) for the 60% most vulnerable (2 million people without formal work). Started on April 20th approx. 31-03 Purchase of bonds US$ 4,000 millions and elimination of some restrictions.	2.7% of GDP to spend in covid-19 related measures. (27-04) 12-03 Credit line for the tourism sector, better tax deadlines are established. 16-03 15% governmental reduction of gasoline price. 17-03 Employers allowed to give early collective vacations. 17-03 Financial compensation (7 days of the minimum legal daily wage) for one time and per family, for affiliates of the subsidized health regime diagnosed with COVID-19. 18-03 Suspension of eviction and basic services supply cuts. 18-03 Increase to the limit for repurchase agreements. 18-03 Acceptance of private bonds with good ratings (as complement of public bonds). 18-03 Auctions are reduced; treasury bonds purchase suspended in March; 0% operation cost for the first market sale transaction of the day; increased upper threshold for simultaneous operations. 18-03 Credits lines to employers. 18-03 Extra income for families in conditional cash transfers programs (480,000,000,000). 18-03 A 1,000,000 dollars auction. 19-03 Credit line for the agriculture sector. 19-03 COVID-19 is not an acceptable reason to fire employees. 21-03 An emergency fund (FOME) was created to finance expenditure during the crisis (USD 3,700 millions aprox.).	16-03 Guaranteed access to basic services during quarantine (payment exemption varies according to consumption). 20-03 Announced a 50 million line of credit for SMES through the Bank of the Ecuadorian Social Security Institute and the National Financial Corporation. 20-03 Postponed payments for clients of BanEcuador and the National Financial Corporation (CFN) for March, April and May (no interest). 29-03 Government reports 727,536 food baskets delivered; 346,949 Family bonuses. April Cash transfer to be paid in April and May to those that earn less than $400 per month (aprox. 400,000 families). 16-04 Announcement of no increase in basic services during the next six months. Reviews of prices to ensure that price gouging is not taking place. There are sanctions. 16-04 Companies will pay a contribution of 5% installments as long as they had a profit in 2018 greater than one million dollars. 16-04 Educational institutions cannot suspend students due to delay in pension payments. 16-04 Temporary suspension of eviction in the matter of tenancy during the health emergency and after 60 days of its conclusion.	16-03 Government has approved approximately 3.4 billion soles/USD1000 million (0.4 percent of GDP) in direct transfers (cash out) to support poor households during the four-week national isolation period. 24-03 Employers must grant paid work leave when teleworking is not possible during the emergency. Social Health Insurance is authorized to grant workers, with low remuneration diagnosed with COVID-19, the 20-day temporary disability benefit. Amplification of CRECER fund that gives credits to micro and SME until 30-09. 27-03 35% subsidy to companies' payroll for workers who have low salaries (total of USD 175 millions). 01-04 Decree 034. Workers affiliated to a private pension fund can withdraw for one time up to 2,000 soles ($US 560) from their account. 03-04 Decree Basket with basic goods will be distributed by local governments. Monetary subsidy to independent workers in economic vulnerability. during the emergency. Workers (formal sector) can withdraw money from their Compensation for Time of Service to have liquidity. 03-04 Program "Reactiva Peru" including 30,000 millions soles (USD 8,700 millions) in government-backed loans to small and medium-sized businesses channelled through banks and cooperatives. The amount increased later. 06- 04 4.8 million households will see postponed the payment of water, gas and mobile phone bills. 14-04 Decree 038 Workers not included in the Decree 034 can withdraw money for one time.

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Categori-sation	Sub-category	Brazil	Chile	Colombia	Ecuador	Peru
		08-06 BNDES support and credit program for ethanol sector, SMEs from the production chain and vital sectors companies (starting with health sector). Total of US$1.3 billions. Also includes transferences to 13 states. 08-06 BNDES suspends payments from state and municipal contracts until december. 23-06 Suspension of payments of financing for urban public sector providers. 30-06 Support for the cultural sector for US$0.6 billion. 01-07 Preparation of Global Credit Program for micro and SME enterprises with State as guarantor. $US 900 million. 01-07 Exceptional Transaction in the collection of the Union's active debt (reduced entry, discounts and different terms) until 31-07, but extended to 31-08. 03-07 Extension of the reduction in the tax rate on credit operations until 02-12 (started on 03-04). 05-08 Emergency measures for Brazilian civil aviation (Law), such as loans from the National Civil Aviation Fund (Fnac).	02-04 Freezing of provision required by banks in reprogramming mortgage, commercial and consumption credits until 31-07. 03-04 / 08-04 Expansion of flexibilities for credit to other financial institutions (i.e. cooperatives). 06-04 Publication of Employment Protection Bill (private sector). Allows suspension of workers and reduction of working hours. Salaries are paid by the unemployment insurance (the law adds USD 2,000 millions to it). Started 15-04. 07-04 3,000 millions USD for new lines of financing (with state guarantees) for entrepreneurs and enterprises. In force until 30-09. Credit conditions: (i) 6 months of grace and 24 to 48 quotas. (ii) Interest rate same to monetary policy (iii) postponement of any amortization of other pre-existing credits. 08-04 Income protection fund for 2,000,000,000 USD for informal workers. 16-05 Publication of Law that creates Family Emergency Income for informal workers and the elderly pertaining to the 60% most vulnerable population (1.9 millions households) for 3 months. 18-05 Solidarity Fund of USD 100 millions for municipalities to help vulnerable people. 22-05 Food baskets to 2.5 million vulnerable families (almost 8 million people). 02-06 National plan to reactivate SME related to tourism.	24-03 School feeding programs delivered directly to the households. 27-03 New credits for firms (USD 12,500 millions). Condonation of 50% if they do not fire workers. 27-03 Workers can access savings if fired. (otherwise only to housing and education). 23-03 Central bank purchases government bonds and private bonds. 23-03 Extended deadlines for education credits (ICETEX). 25-03 Economic assistance to vulnerable population. 27-03 Six months extension of credits for the unemployed. 27-03 Approval of economic incentive for the rural elderly. 28-03 Dividends from state companies used for the crisis. 28-03 No report of late / miss / suspension of payments to risk credit databases during the crisis. 02-04 Unemployment insurance for workers affiliated to a Caja de Compensación. 2 minimum wages paid in 90 days. 02-04 1 million food baskets for vulnerable populations. 07-04 26 basic products monitored and regulated to prevent price speculations. 08-04 Extra income of 160,000 pesos ($US 42) for 3 million families in the informal sector (not beneficiaries of cash transfers (480,000 millions). 09-04 Donation of 10% to 15% of public salaries to finance the crisis for 4 months.	16-04 Permanently 10% salary reduction for officials of the Executive Function and Public Companies earning USD 1,000 or more. Health, Education, Armed Forces and Police personnel are excepted. (it was not approved) 16-05 Extension of the health benefits of the Ecuadorian Social Security Institute for 60 days for the unemployed (until July). Facilities for the payment of social security micro and small companies (March to June). 19-05 Reduction of the working day and salaries in the public sector to six hours to save money (some exceptions i.e. health sector). 25-05 "Reactivación Ecuador" credit will be available to cover payrolls and operating costs for small or medium-sized companies (rates of up to 5%, a 36-month term and a 6-month grace period). 22-06 Humanitarian Support Law passed, including measures related to debtors (companies, individuals, and public sector); working hours and remunerations (reduction); leases (suspension of eviction); tuition payments (discounts and no suspension). 28-07 Advance tax collection from companies that generated profits in the first half of 2020.	16-04 Sell of bonds for 3,000 million dollars to give liquidity to the economic plan. 08-05 Resources destined to create temporary jobs in the rural sector (150 millions soles /$US 40 million).

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Categori-sation	Sub-category	Brazil	Chile	Colombia	Ecuador	Peru
			10-06 First payment of family emergency income. 14-06 National agreement to create a temporary 2 years COVID-19 fund (USD 12,000 millions) to face the emergency and for the reactivation of the economy in a flexible way. 19-06 Approval of a new design of the Emergency Family Income, (income supplement for 3 months). 03-07 Second payment of family emergency income. 05-07 Measures for middle-class families (temporary rental subsidies and extension of credits for higher education). 28-07 Passage of the Middle Class Income Protection Act (a bond, state solidarity loan). 28-07 Extra 3 months leave for newborn parents and the unliterally use of the Employment Protection Law for parents and carers of preschool children.	29-04 Firing public contractors forbidden. 01-05 Pensions payments are suspended for 3 months. 03-06 Employers allowed to re accommodate workload to reduce the agglomeration of the workforce. 03-06: Transference to companies with a 20% reduction in sales to pay first "prima" (an extra salary that is paid to formal workers). 03-06: Rescue and recovery operations are put in place to aid firms facing bankruptcy due to covid-19. In June an extra support for unemployed for a maximum of 3 months was put in place.		
	Medium	04-03 deferral of payment of taxes and social security for employees. 18-03 Emergency measures for the aviation sector. 29-03 Financial support for airlines. 01-04 Postponed tax declaration deadline in 2 months. 17-06 Postponement of the deadline for payment of social security contributions to November (from employers). 07-07 Law that creates the Emergency Job and Income Maintenance Program (states benefits to workers who have reduced working hours or suspended a contract, intermittent workers with a formalized employment contract. Initially for 60 days, extended to 120.	19-03 Tax postponement for SMEs, other bigger companies and people with properties up to a defined amount. 19-03 Flexibility and facilities to agreements with the government, and temporary suspension of judicial actions and auctions for tax debts. 19-03 Tax rebate for independents, Tax relief for families (contribuciones) and SME. For the latter also tax rebates, condonation of interests and penalties for delayed payments.	20-03 Tax deferrals for national taxes payments. Each private bank decides the conditions. 01-04 Return a percentage of VAT tax to families of lower incomes (USD123 millions) 03-06: A pack of tax reliefs for the creative economy sector, tourism industry; fabrication of medicines, food and beverages.	Delay of payments to Social security institute for 90 days (April, May and June).	15-03 to 27-03 Postponement of tax payment. Facilities to those in debt. 27-03 For the period of April 2020, the obligation to withhold and pay the mandatory 10% contribution of workers affiliated to the private pension system (AFP) is suspended

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Categori-sation	Sub-category		Brazil	Chile	Colombia	Ecuador	Peru
				22-07 Approval of constitutional reform that allows an exceptional withdrawal of 10% of accumulated funds from individual capitalization. 31-07 Announcement of a reactivation program (recovery of 1.8 million jobs): employment subsidies and a plan for public investments.			
		Significant	19-03 Central Bank reduced the annual interest rate "Selic" (Sistema Especial de Liquidación y Custodia) from 4.25 to 3.75%. 07-05 New reduction of interest rate to 3%. 17-06 New reduction of interest rate to 2.25%. 06-08 New reduction of interest rate to 2%.	16-03 Reduction of the monetary policy interest rate by 75 basis points up to 1%. 31-03 Reduction of the monetary policy interest rate by 50 basis points up to 0,5%.	27-03 Lowers interest rate from 4,25% to 3,75%. 31-03 Loan of 250,000,000 USD from the world bank. 30-06 New reduction of interest rate to 2.5%. 03-08 New reduction of interest rate to 2.25%.	19-05 Measures to reduce public spending for USD 4 billion (wage bill 980 million, goods and services 400 million, capital spending 1.3 billion, interest savings on renegotiation debt 1.3 billion): Elimination of Public Companies and the rest will substantially reduce their expenses, closure of embassies. New fuel price-setting regime (to start on 01-07).	09-04 The Central Bank lowered the reference rate from 2.25 to 0.25% 16-04: Perú's central bank sold bonds for 3,000 million dollars to give liquidity to the economic plan. 04-06: Investments are made in key sectors. Transportation and communications (3,897 million soles/ $US1,000 million); Housing (1,472 million soles/ $US 412 million); and, Agro (377 million soles / $US 105 million).
Self-regulations	Industry Mitigating measures	Minimal	Brands are selling their products and converting sales to informal workers https://www.b9.com.br/126556/antarctica-parceria-biscoito-globo-venda-ambulantes/Brands are changing their production lines to produce PPE or buying and donating PPE. Some of these initiatives are advertised in this website: https://www.b9.com.br/marcascontrapandemia/	Restriction on access to supermarkets, banks, among others (one person by household, with mask). Mandatory use of masks (by local governments).			
		Medium		Protection measures on delivery. Increase delivery capacity.			
		Significant					
	Industry Stimulus	Minimal					
		Medium					
		Significant		Private funds for health. Some companies agreed not to furlough their employees. Private enterprises donated ventilators.			

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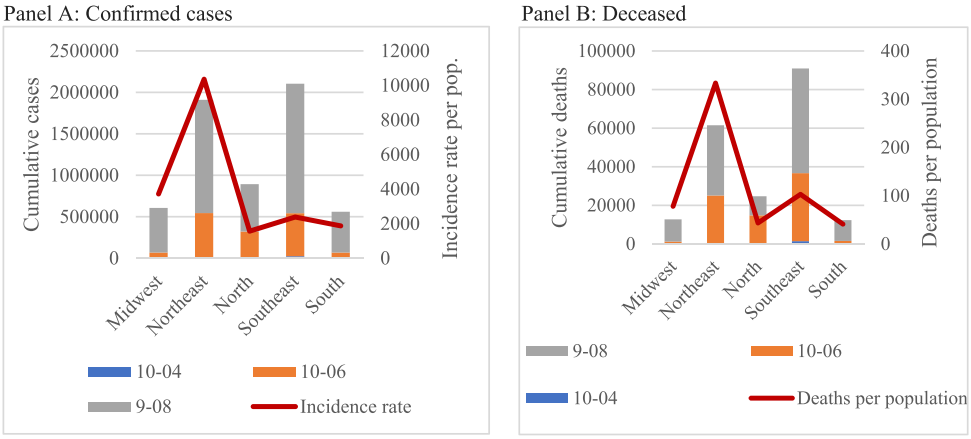
Categori-sation	Sub-category	Brazil	Chile	Colombia	Ecuador	Peru
Other		26-02 First confirmed case (in SP). 17-03 First death. 22-03 - Online platform with free services.	03-03 First confirmed case. 23-03 First death. 18-03 Limits for the sale of some basic goods.. 20-03 Free online educational platform (aprendo en línea). 31-03 Actions to ensure continuity of attention, protection and repair of women victims (and potential) of violence. Employers and workers may mutually agree to work remotely or another alternative arrangement. 01-06 Announcement of a mental health programme.	06-03 First confirmed case. 17-03 First death. 16-03 National program (from the ministry of education) for homeschooling. 16-03 Bogotá program for home schooling. 21-03 Only people that have been abroad, or to people who are symptomatic are tested. 21-03 The Attorney general announced hoarding products during this crisis would be penalized (4 to 9 years of jail). 22-03 Decree to guarantee service from family police station (gender violence). 03-04 Criteria to distribute resources for assisting women who are victims of violence.	29-02 First confirmed case. 13-03 First death. 20-03 It is prohibited to export antibacterial gel, masks and other disinfectants that are needed to supply the country. 27-03 Imports of perishable goods will be processed immediately and free of charge if their destination is for priority social attention. 27-03 Protocol for gender and intrafamilial violence attention.	06-03 First confirmed case. 19-03 First death.

Appendix 2. Data availability and transparency [32–36]

		Brazil	Chile	Colombia	Ecuador	Peru
Since when information is being reported. Source of COVID-19 data (press conference, website, etc., periodicity).		Since February 26th (first confirmed case) on the Health Ministry website. The Ministry of Health also produces periodical epidemiological reports (Last one with data up to May 23th). Regional authorities produce their own information. Other agencies as the Civil Registry account for deaths in further detail.	Since April 1st. Daily report. Press conference and report at Health Ministry website.	Daily at the website of the Health Ministry and periodical reports.	Since March. Daily. Report on twitter account of the Health Ministry. Periodical epidemiological bulletin (until 5/5).	Since March 17th at Ministry of Health and regional health directorates websites and twitter accounts and press with the President and all Ministers.
Test	Who are being tested	Symptomatic cases (Health minister orientation defined as symptoms such as fever and cough for 7 to 10 days) that need to be hospitalized or at private laboratories by payment	Symptomatic cases that ask for tests in hospitals. Since late April, also asymptomatic (but mainly symptomatic).	Symptomatic, in hospital and residence. Test to possible positive cases after death.	Symptomatic cases.	Symptomatic cases with specific symptoms.
	Detail of report	No information about the number of tests performed.	Daily. Tests processed the day before (national level, regional since April 9th). No report of daily performed tests.	Daily tests.	Daily report of PCR and rapid tests. Report of confirmed and suspected cases.	Daily report of PCR and Rapid tests.
	Delay on tests processing	Not public	Not public.	Not in official website, only announced by Health Ministry.	Not public.	Not public, some newspapers reported a delay of over 10 days.
Confirmed cases	New cases	Daily.	Daily.	Daily.	Daily.	Daily.
	Recovery	The Ministry of Health Twitter account, daily numbers are shared, with no definition.	Daily. Recovery defined as cases that have been diagnosed 14 days before, subtracting deaths.	Daily. Patients with negative results in second exam. Patients recovered of Covid may be hospitalized for other morbidities.	Daily. Hospital discharges and patients with epidemiologic release.	Daily. Includes: (i) hospital discharged; (ii) recovered at home (contacted every 24h); (iii) test after 14 days only to health.
	Disaggregation	Region and federal units (Ministry of Health).	Region, age and gender.	Region, age and gender.	Region, age, gender and occupation.	Region, age and gender.
ICU patients	Information reported	No. “Severe acute respiratory syndrome” (epidemiological bulletins).	Daily. ICU patients. No report of beds availability (only daily survey of Chilean Society of Intern Medicine).	Daily. ICU patients and bed availability.	No. Total number of inpatients and inpatients with reserved diagnosis.	Daily. ICU patients and beds occupancy.
	Patients with ventilator	No	Daily. Total and occupied (Covid and non Covid).	No.	No.	Daily. Occupied and available (only Covid-19).
	Disaggregation ICU	No. “Several acute respiratory syndromes” by age and gender.	Region, age and gender.	Region, gender and age.	No.	No.
Deaths	Definition of COVID-19 death.	Tested positive. Also, suspected cases are registered.	Tested positive. No test after death.	Tested positive.	Tested positive. Report probable deaths as those with symptoms but not confirmed test.	All people dead that were once positive to COVID-19 testing.
	Disaggregation	Region and federal units (Ministry of Health). Age and gender (Suspected cases, Civil Registry). Age also in epidemiological bulletin.	By region and age group.	Region, gender and age.	Occupation.	Gender and region.

Appendix 3. COVID-19 trends disaggregation by country

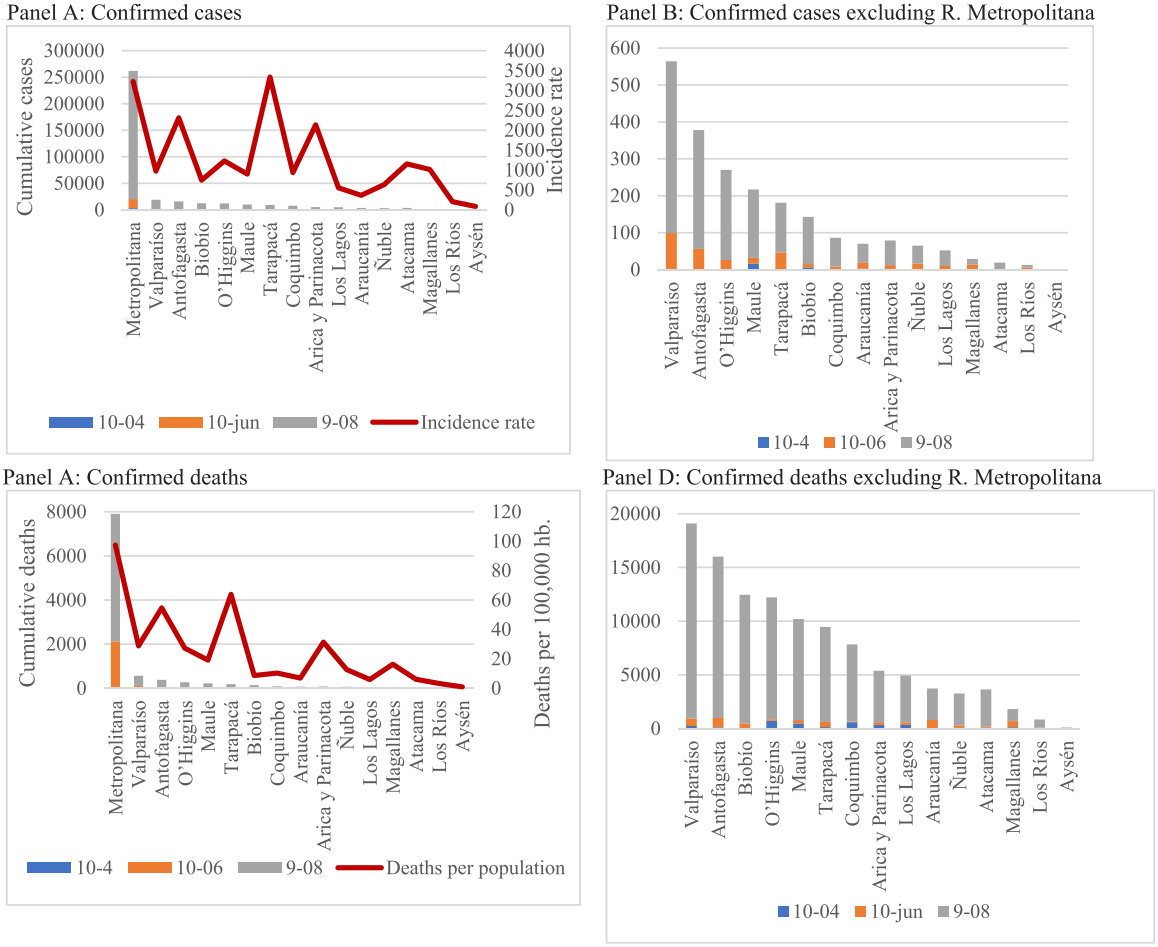
Brazil
Fig. A1



Source: Brazilian Health Ministry

Fig. A1. Daily cases and deaths and rates per 100,000 hb. until June 10th, by state [32].

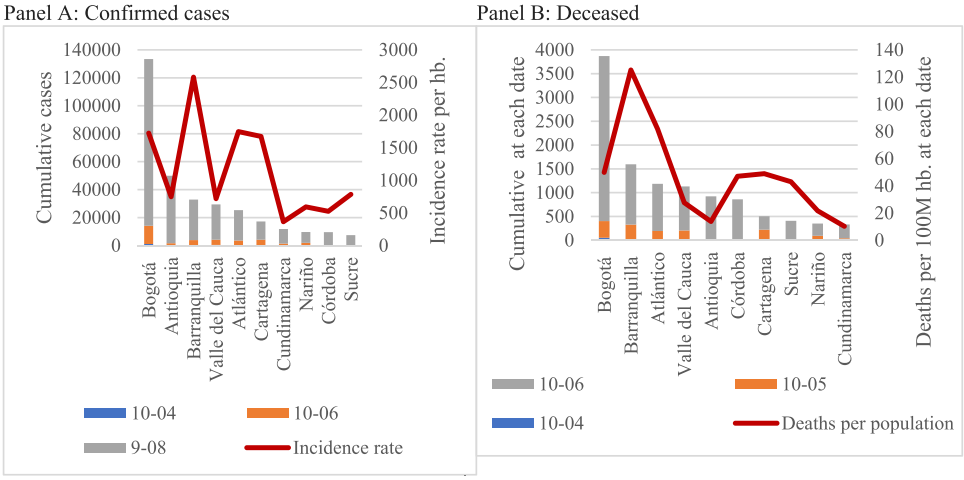
Chile
Fig. A2



Source: Health Ministry of Chile

Fig. A2. Evolution of Covid-19 cases in Chile, by region [33].

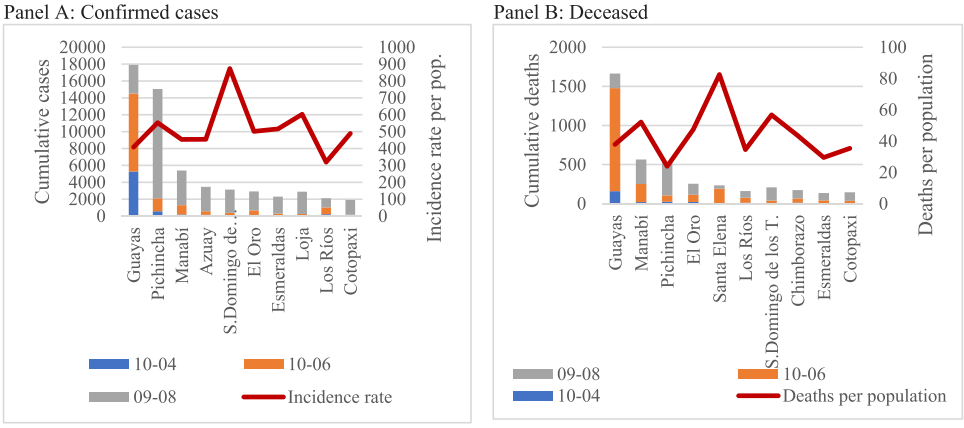
Colombia
Fig. A3



Source: Ministry of Health Colombia

Fig. A3. Evolution of Covid-19 in Colombia, by department [34].

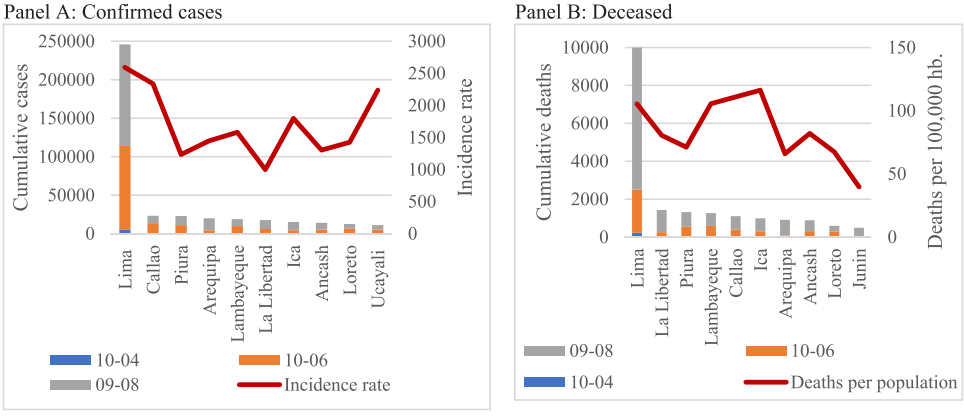
Ecuador
Fig. A4



Source: Ministry of Health Ecuador

Fig. A4. Evolution positive Covid-19 cases and deaths, cumulative and per 100,000 hb., per province [35].

Peru
Fig. A5

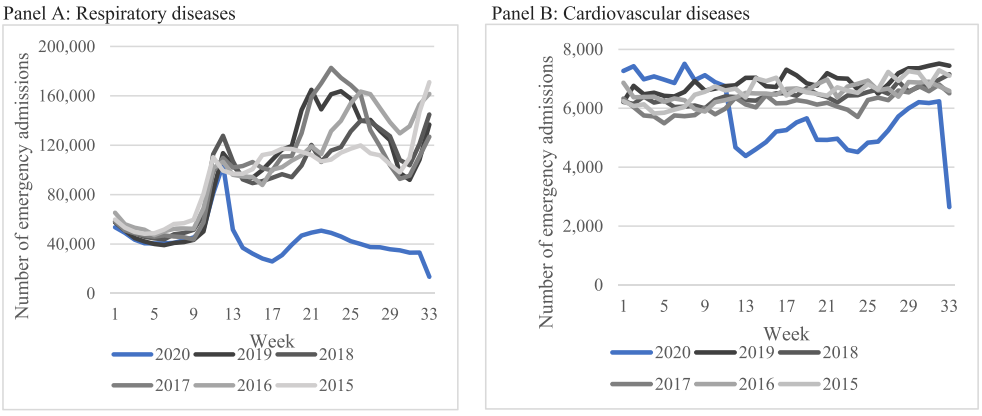


Source: Ministry of Health Peru

Fig. A5. Evolution of Covid-19 cases in Peru, by region [36].

Appendix 4. Health Spill-over effect

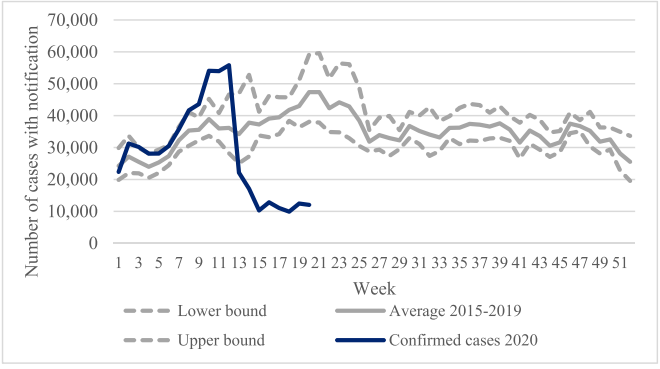
Fig. A6



Source: Ministry of Health Chile

Fig. A6. Emergency admissions in Chile (112).

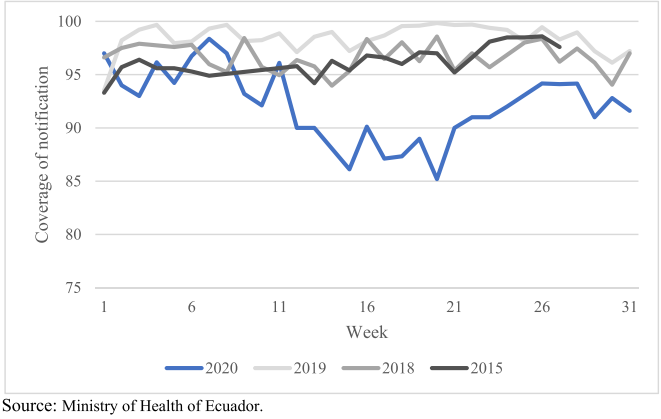
Fig. A7



Source: Bogotá Health Observatory

Fig. A7. Respiratory diseases Colombia (Bogotá) (113).

Fig. A8



Source: Ministry of Health of Ecuador.

Fig. A8. Coverage of notifications of diseases with mandatory notification (Ecuador) (114).

Fig. A9

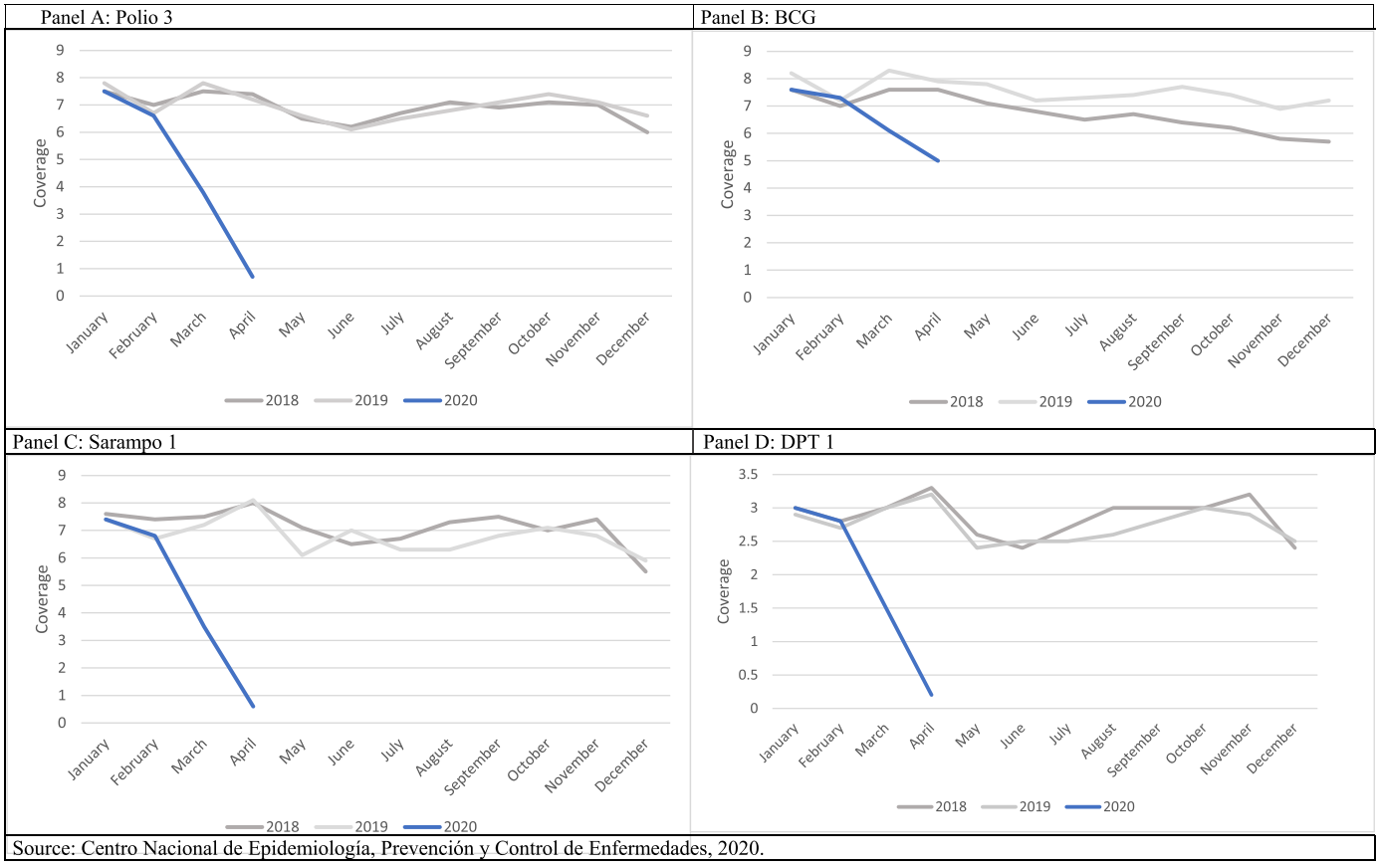


Fig. A9. Immunizations (Peru) (115).

References

[1] John Hopkins University of Medicine. Coronavirus resource center [Internet]. 2020. [cited 2020 Aug 10]. Available from: https://coronavirus.jhu.edu/map.html.

[2] Worldometers. Countries in the world by population (2020) [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://www.worldometers.info/world-population/population-by-country/.

[3] World Bank Group. World Bank open data [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://data.worldbank.org/.

[4] United Nations Development Program 2019 human development index ranking. New York: United Nations; 2019.

[5] Brazilian Institute of Geography and Statistics. Population estimates sent to TCU [Internet]. 2019 [cited 2020 Jun 10]. Available from: https://www.ibge.gov.br/en/statistics/social/population/18448-population-estimates.html?edicao=18446&t=resultados.

[6] National Institute of Statistics Chile. Population projections [Internet]. 2017 [cited 2020 Jun 10]. Available from: https://www.ine.cl/estadisticas/sociales/demografia-y-vitales/proyecciones-de-poblacion.

[7] National Institute of Statistics and Census Ecuador. Population projections [Internet]. 2010 [cited 2020 Jun 10]. Available from: https://www.ecuadorencifras.gob.ec/proyecciones-poblacionales/.

[8] National Institute of Statistics and Informatics Peru. Informe de empleo N°01 – Trimestre Oct-Nov-Dic 2019 [Internet]. 2019 [cited 2020 June 10]. Available from: http://m.inei.gob.pe/media/MenuRecursivo/boletines/empleoene.pdf.

[9] Knoema. Atlas mundial de datos [Internet]. 2017 [cited 2020 Jun 10]. Available from: https://knoema.es/atlas/Brasil.

[10] OECD Health at a glance: Latin America and the Caribbean 2020. Paris: OECD Publishing; 2020.

[11] OECD Health at a glance: OECD indicators 2019. Paris: OECD Publishing; 2019.

[12] Cometto G, Witter S. Tackling health workforce challenges to universal health coverage: setting targets and measuring progress. Bull World Health Organ 2013;91:881–5.

[13] Inter-American Development BankMedidas de política y evolución de la pandemia en América Latina y el Caribe. Red Criteria 2020 (to be published in website).

[14] WHO. World Health Data Platform [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://www.who.int/data.

[15] Ministry of Social Development Chile. Encuesta de Caracterización Socioeconómica 2017 [Internet]. 2018 [cited 2020 Jun 10]. Available from: http://observatorio.ministeriodesarrollosocial.gob.cl/casen-multidimensional/casen/casen_2017.php.

[16] National Institute for Statistics and Census from Ecuador. Encuesta Nacional de Empleo, Desempleo y Subempleo [Internet]. 2019 [cited 2020 Jun 10]. Available from: https://www.ecuadorencifras.gob.ec/documentos/web-inec/EMPLEO/2019/Diciembre/201912_Mercado_Laboral.pdf.

[17] Ministry of Health Colombia. 2017. Boletín del aseguramiento en salud [Internet]. 2017 [cited 2020 Jun 26]. Available from: https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/VP/DOA/boletin-aseguramiento-i-trimestre-2017.pdf.

[18] The Economist. Latin America's health systems brace for a battering. 2020 [cited 2020 Jun 10]. Available from: https://www.economist.com/the-americas/2020/04/11/latin-americas-health-systems-brace-for-a-battering.

[19] Guan W, et al. Comorbidity and its impact on 1590 patients with COVID-19 in China: a nationwide analysis. Eur Respir J 2020 May;55(5):2000547.

[20] Stefan N, Birkenfeld AL, Schulze MB, Ludwig DS. Obesity and impaired metabolic health in patients with COVID-19. Nat Rev Endocrinol 2020:1–2.

[21] OurWorldinData. Age-standardized death rate from cardiovascular diseases, per 100,000 individuals, 1990 to 2016 [Internet]. 2020 [cited 2020 Jun 18]. Available from: https://ourworldindata.org/grapher/age-standardized-death-rate-cardiovascular-disease?country=BRA~CHL~COL~PER~ECU.

[22] OECD. Flattening the COVID-19 peak: Containment and mitigation policies. Updated 24 March 2020 [Internet]. 2020 [cited 2020 Jun 10]. Available from: http://www.oecd.org/coronavirus/policy-responses/flattening-the-covid-19-peak-containment-and-mitigation-policies-e96a4226/.

[23] La Tercera. Mañalich y el coronavirus. Press release 2020 [cited 2020 Jun 10]. Available from: https://www.latercera.com/nacional/noticia/manalich-y-coronavirus-el-destino-de-esto-es-que-toda-la-poblacion-mundial-se-infecte-no-hay-ninguna-manera-de-evitarlo-a-menos-que-exista-una-vacuna/V3JSQMZ62JC3NN6VXQMDCYNP3E/

[24] NYT. Bolsonaro isolated and defiant, dismisses Coronavirus threat. Press release 2020 [cited 2020 Jun 10]. Available from: https://www.nytimes.com/2020/04/01/world/americas/brazil-bolsonaro-coronavirus.html

[25] The Washington Post. Brazil's Bolsonaro fires Health Minister Mandetta after differences over coronavirus response. Press release 2020 [cited 2020 Jun 10]. Available from: https://www.washingtonpost.com/world/the_americas/coronavirus-brazil-bolsonaro-luiz-henrique-mandetta-health-minister/2020/04/16/c143a8b0-7fe0-11ea-84c2-0792d8591911_story.html

[26] Inostroza, V. Vulnerabilidad urbana y accesibilidad en las comunas con cuarentena parcial. Press reléase 2020 [2020 cited Jun 10]

[27] OECD. Beyond Containment: Health systems responses to COVID-19 in the OECD [Internet]. 2020 [2020 cited Jun 10]. Available from: http://www.oecd.org/coronavirus/policy-responses/beyond-containment-health-systems-responses-to-covid-19-in-the-oecd-6ab740c0/.

[28] Blackman A, Ibáñez AM, Izquierdo A, et al. La política pública frente al Covid-19. Recomendaciones para América Latina y el Caribe [Internet]. International Development Bank; 2020. [cited Jun 10]. Available from: http://dx.doi.org/10.18235/0002302 .

[29] Pêgo B., Moura R, Nunes M, et al. Pandemia e fronteiras brasileiras: análise da evolução da Covid-19 e proposições. 2020.

[30] Ministry of Interior. Ministro Blumel encabeza reunión de coordinación con alcaldes de las comunas que entran en cuarentena. Press release 2020 [cited 2020 Jun 10]. Available from: https://www.interior.gob.cl/noticias/2020/05/14/ministro-blumel-encabeza-reunion-de-coordinacion-con-alcaldes-de-las-comunas-que-entran-en-cuarentena-2/.

[31] Hale T, Webster S, Petherick A, et al. Oxford COVID-19 Government Response Tracker [Internet]. Blavatnik School of Government; 2020. [cited on 2020 Jun 10]. Available from: https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker [Dataset].

[32] Ministry of Health Brazil. Coronavirus panel [Internet]. 2020 [cited 2020 Aug 10]. Available from: https://covid.saude.gov.br/. [Dataset]

[33] Ministry of Health Chile. Official statistics COVID-19 [Internet]. 2020 [cited 2020 Aug 10]. Available from: https://www.gob.cl/coronavirus/ and Ministry's of Science, Technology, Knowledge and Innovation website http://www.minciencia.gob.cl/covid19 (compiled). [Dataset]

[34] National Institute of Health Colombia [Internet]. 2020 [cited 2020 Aug 10]. Available from: https://www.ins.gov.co/Noticias/Paginas/Coronavirus.aspx and Ministry's of Information Technology and Communication website https://www.datos.gov.co/Salud-y-Protecci-n-Social/Casos-positivos-de-COVID-19-en-Colombia/gt2j-8ykr/data#post (compiled)[Dataset].

[35] National Health of Information Ecuador. Informes de Situación e Infografías COVID-19 [Internet]. 2020 [cited 2020 Aug 10]. Available from: https://www.gestionderiesgos.gob.ec/informes-de-situacion-covid-19-desde-el-13-de-marzo-del-2020/ and Governments website https://coronavirusecuador.com/data/ (compiled and corrected). [Dataset]

[36] Ministry of Health Peru. Sala Situacional COVID-19 Perú [Internet]. 2020 [cited 2020 Aug 10]. Available from: https://covid19.minsa.gob.pe/sala_situacional.asp. [Dataset]

[37] Benítez A, Velasco C, Vergara R. Coronavirus: antecedentes sanitarios y económicos para la discusión. Punto de Referencia N° 532, Centro de Estudios Públicos. 2020 [cited 2020 Jun 10]. Available from: https://www.cepchile.cl/cep/puntos-de-referencia/puntos-de-referencia-2010-2020/puntos-de-referencia-2020/coronavirus-antecedentes-sanitarios-y-economicos-para-la-discusion.

[38] Elcomercio.com. Presidente revela que enfermos de covid-19 rompen cuarentena y se mueven en Guayaquil y Quito. Press release 2020 [cited 2020 jun 10]. Available from: https://www.elcomercio.com/actualidad/enfermos-covid19-cuarentena-quito-guayaquil.html.

[39] Institute of Engineering Complex Systems. Impact of the first days of massive quarantine in Metropolitan Region [Internet]. 2020 [cited on 2020 Jun 8]. Chile. Available from: https://isci.cl/wp-content/uploads/2020/06/Reporte-2-ISCI-movilidad-4-de-junio.pdf.

[40] NYT. Highways of Peru Swell With Families Fleeing Virus. Press release 2020 [2020 cited Jun 10]. Available from: https://www.nytimes.com/2020/04/30/world/americas/20virus-peru-migration.html.

[41] Capponi G. Overlapping values: religious and scientific conflicts during the COVID-19 crisis in Brazil. Soc. Anthropol./Anthropologie Sociale 2020(0):1–2.

[42] The Guardian. Judge orders Bolsonaro to resume publishing Brazil COVID-19 data. Press release 2020 [cited 2020 Jun 10]. Available from: https://www.theguardian.com/world/2020/jun/09/judge-orders-bolsonaro-to-resume-publishing-brazil-covid-19-data.

[43] BBC. Coronavirus en Chile. Press release 2020 [cited 2020 Jun 10]. Available from: https://www.bbc.com/mundo/noticias-america-latina-52394763).

[44] Fetzer TR, Witte M, Hensel L, et al. Global Behaviors and perceptions at the onset of the COVID-19 pandemic. National Bureau of Economic Research; 2020.

[45] Arroyo C, Díaz J, Engel E, Pardow D, Simonetti P. Informe sobre la evolución de la epidemia de COVID-19 en Chile [Internet]. 2020 (June 3) [cited 2020 Jun 10]. Available from: https://www.espaciopublico.cl/wp-content/uploads/2020/06/CoVidChile0306.pdf

[46] Gajardo, S. Región Metropolitana de Santiago: Índice de prioridad social de comunas 2019. Seremi de Desarrollo Social y Familia Metropolitana [Internet]. 2020 [cited 2020 Jun 10]. Available from: http://www.desarrollosocialyfamilia.gob.cl/storage/docs/INDICE._DE_PRIORIDAD_SOCIAL_2019.pdf.

[47] Ministry of Housing and Urbanism. Estadísticas Habitacionales [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://www.observatoriourbano.cl/estadisticas-habitacionales/.

[48] National Administrative Department of Statistics Colombia. Pobreza Multidimensional Región Amazonía-Orinoquía. Boletín técnico [Internet]. 2018 [cited 2020 Jun 10]. Available from: https://www.dane.gov.co/files/investigaciones/condiciones_vida/pobreza/2018/Region_bt_pobreza_multidimensional_18_amazonia-orinoquia.pdf.

[49] National Administrative Department of Statistics Colombia. Statistics by topic [Internet]. 2018 [cited 2020 Jun 10]. Available from: https://www.dane.gov.co/index.php/estadisticas-por-tema.

[50] National Administrative Department of Statistics Colombia. Incidencia de la pobreza monetaria [Internet]. 2018 [cited 2020 Jun 10]. Available from: https://dane.maps.arcgis.com/apps/MapSeries/index.html?appid=3cf1a2caae9d4cd6954e84fa1a7ec9e9.

[51] Rosales S. Coronavirus: Se necesitarían al menos 1,200 respiradores al 26 de abril, pero solo hay 500 en el país. Press release 2020 [cited 2020 Jun 10]. Available from: https://gestion.pe/peru/coronavirus-se-necesitaria-1800-respiradores-al-26-de-abril-pero-solo-hay-500-en-el-pais-pandemia-ventiladores-mecanicos-colegio-medico-del-peru-noticia/?ref=gesr.

[52] Aste N, Yeckting F. Pueblos Indígenas y Amazónicos y COVID-19: La urgencia de una respuesta diferenciada de la emergencia. coords. Por una nueva convivencia. La sociedad peruana en tiempos del COVID-19: Escenarios, Propuestas de Política y Acción Pública. Burga M, Portocarrero P, Aldo P, editors. MINSA: Grupo temático de Ciencias Sociales; 2020.

[53] National Institute of Statistics and Census Ecuador. Employment National Survey [Internet]. 2018 [cited 2020 Jun 10]. Available from: https://www.ecuadorencifras.gob.ec/documentos/web-inec/Sitios/ENEMDU_ACUMULADA/index.html#principales.

[54] Li Z, Chen Q, Feng L, et al. Active case finding with case management: the key to tackling the COVID-19 pandemic. Lancet North Am Ed 2020.

[55] Rosales S. Coronavirus: Se necesitarían al menos 1,200 respiradores al 26 de abril, pero solo hay 500 en el país. Press release 2020 [cited 2020 Jun 10]. Available from: https://gestion.pe/peru/coronavirus-se-necesitaria-1800-respiradores-al-26-de-abril-pero-solo-hay-500-en-el-pais-pandemia-ventiladores-mecanicos-colegio-medico-del-peru-noticia/?ref=gesr.

[56] Ministry of Health Brazil. Gobierno de Brasil entrega 16 ventiladores más a Amazonas. Available from: https://www.saude.gov.br/noticias/agencia-saude/47097-governo-do-brasil-entrega-mais-16-ventiladores-pulmonares-para-o-amazonas.

[57] EFE Bogotá. Nuevo record de casos COVID-19 en Colombia: 1,888 para un total de 48,746. Press release 2020 [cited 2020 Jun 15]. Available from: https://www.eldiario.es/sociedad/Nuevo-record-casos-COVID-19-Colombia_0_1037996201.html.

[58] Ministry of Health Colombia. Capacidad de UCIs en Colombia [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://minsalud.maps.arcgis.com/apps/opsdashboard/index.html#/ee50239596654cf8930d105c970037b3

[59] Edición Médica Ecuador. Las hospitalizaciones en Quito están en niveles críticos y las UCI prácticamente copadas. Press release 20200 [cited 2020 Jun 10]. Available from: https://www.edicionmedica.ec/secciones/salud-publica/mas-que-dar-un-mensaje-de-control-hay-que-trabajar-en-promocion-y-prevencion–95977

[60] La Tercera. Camas comienzan a escasear en América Latina. Press reléase 2020 [cited 2020 Jun 10]. Available from: https://www.latercera.com/mundo/noticia/camas-comienzan-a-escasear-en-america-latina/7MTVL6QDJRGRJFJU5FM2SSGQCE/.

[61] Agencia EFE. Perú se acerca al límite de su capacidad de atención por la COVID-19. Press reléase 2020 [cited 2020 Aug 10]. Available from: https://www.efe.com/efe/america/sociedad/peru-se-acerca-al-limite-de-su-capacidad-atencion-por-la-covid-19/20000013-4226269.

[62] Chilean Society of Intensive Medicine. Daily survey intensive national reality [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://www.medicina-intensiva.cl/site/.

[63] ECLAC. Las restricciones a la exportación de productos médicos dificultan los esfuerzos por contener la enfermedad por coronavirus (COVID-19) en América Latina y el Caribe. Informes COVID-19 [Internet]. Ed. CEPAL. 2020 [cited Jun 10].

[64] PAHO. Reporte situación COVID-19 Colombia.Actualización situación COVID-19 Colombia. Corte 09 Agosto. SITREP 118 [Internet]. 2020 [cited 2020 Aug 10]. Available from: https://www.paho.org/es/reportes-situacion-covid-19-colombia.

[65] Arroyo C., E. Engel, D. Pardo et al. Informe sobre la situación de la pandemia COVID-19 en Chile. Informe 10 de junio de 2020 [Internet]. 2020 [cited 2020 Aug 10] Available from: https://www.espaciopublico.cl/wp-content/uploads/2020/06/CoVidChile1006.pdf.

[66] Harris M, Bhatti Y, Buckley J, et al. Fast and frugal innovations in response to the COVID-19 pandemic. Nat Med 2020:1–4.

[67] Ministry of Health Peru. Adquisiciones COVID 19 Nacional [Internet]. 2020 [cited on Jun 10]. Available from: http://www.cenares.minsa.gob.pe:8080/covid19.xhtml.

[68] Ministry of Science Chile. Reto de innovación COVID-19. Press reléase 2020 [cited 2020 Jun 10]. Available from: http://www.minciencia.gob.cl/noticias/reto-de-innovacion-covid-19-ministerio-de-ciencia-y-corfo-destinaran-800-millones-proyectos-que-protejan-del-contagio-al-personal-de-salud.

[69] Nachtigall F, Pereira A, Trofymchuk OS, et al. Detection of SARS-CoV-2 in nasal swabs using MALDI-MS. Nat Biotechnol 2020.

[70] Murrugarra L. A panoramic view of telehealth activities in Peru. Latin Am J Telehealth 2020;4(1):3–14 2017.

[71] El Peruano. Nuevo reglamento dará un fuerte impulso a la telesalud. Press release 2019 [cited 2020 Jun 10]. Available from: https://elperuano.pe/noticia-nuevo-reglamento-dara-un-fuerte-impulso-a-telesalud-76024.aspx.

[72] El tiempo. ¿Por qué la curva de Medellín es menor que la de otras capitales?. Press release 2020 [cited 2020 Jun 10]. Available from: https://www.eltiempo.com/colombia/medellin/alcalde-de-medellin-daniel-quintero-habla-de-medidas-contra-coronavirus-492260.

[73] Ministry of Telecommunications. El presidente Lenin Moreno presentó al país la app SaludEc. Press release 2020 [cited 2020 Jun 10]. Available from: https://www.telecomunicaciones.gob.ec/el-presidente-lenin-moreno-presento-al-pais-la-app-saludec/.

[74] Ministry of Health of Brazil. Coronavirus-SUS application will alert close contacts of Covid-19 patients. Press release 2020 [cited 2020 Aug 10]. Available from: https://www.saude.gov.br/noticias/agencia-saude/47292-aplicativo-coronavirus-sus-vai-alertar-contatos-proximos-de-pacientes-com-covid-19.

[75] Ministry of Health Brazil. Boletines epidemiológicos [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://www.saude.gov.br/boletins-epidemiologicos.2020.

[76] Ministry of Health Colombia. Capacidad de UCIs en Colombia [Internet]. 2020 [cited 2020 Aug 11]. Available from: https://minsalud.maps.arcgis.com/apps/opsdashboard/index.html#/ee50239596654cf8930d105c970037b3.

[77] Chilean Society of Intensive Medicine. Daily survey intensive national reality [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://www.medicina-intensiva.cl/site/.

[78] FAO, IFAD, the World Bank Group and WFP. Joint Statement on COVID-19 Impacts on Food Security and Nutrition [Internet]. 2020 [cited 2020 Jun 10]. Available from: http://www.fao.org/news/story/en/item/1272058/icode/.

[79] Gestión Perú. COVID-19: este miércoles se volverá a actualizar cifra de fallecidos, adelanta Minsá. Press release 2020 [cited 2020 Aug 10]. Available from: https://gestion.pe/peru/covid-19-este-miercoles-se-volvera-a-actualizar-cifra-oficial-de-fallecidos-adelanta-minsa-nndc-noticia/.

[80] Civil Registry Chile. Registered deaths [Internet]. 2020 [cited 2020 Aug 10]. Available from: https://estadisticas.sed.srcei.cl/defcom. [dataset]

[81] Civil Registry Ecuador. Deaths statistics [Internet]. 2020 [cited 2020 Aug 10]. Available from: https://www.registrocivil.gob.ec/cifras/. [dataset]

[82] Ministry of Health Peru. National Informatic System of Deaths [Internet]. 2020 [cited 2020 Aug 10]. Available from: http://www.minsa.gob.pe/reunis/data/defunciones_registradas.asp. [dataset]

[83] The Economist. Excess deaths tracker [Internet]. 2020 [cited 2020 Aug 10]. Available from: https://github.com/TheEconomist/covid-19-excess-deaths-tracker. [dataset]

[84] National Institute for Statistics of Chile. Ocupación y desocupación [Internet]. 2020 [cited 2020 Aug 12]. Available from: https://www.ine.cl/estadisticas/sociales/mercado-laboral/ocupacion-y-desocupacion. [dataset]

[85] Administrative National Administrative Department of Statistics of Colombia. Gran encuesta integrada de hogares (GEIH) Mercado laboral [Internet]. 2020 [cited 2020 Aug 12]. Available from: https://www.dane.gov.co/index.php/estadisticas-por-tema/mercado-laboral/empleo-y-desempleo. [dataset]

[86] Brazilian Institute of Geographic and Statistics. Panel de indicadores [Internet]. 2020 [cited 2020 Aug 12]. Available from: https://www.ibge.gov.br/indicadores#desemprego. [dataset]

[87] National Institute for Statistics and Information of Peru. Informe de empleo [Internet]. 2020 [cited 2020 Aug 12]. Available from: https://www.inei.gob.pe/biblioteca-virtual/boletines/informe-de-empleo/. [dataset]

[88] OECD. COVID-19 in Latin America and the Caribbean: Regional socio-economic implications and policy priorities. OECD Policies Responses to Coronavirus (COVID-19) [Internet]. 2020 [cited jun 10]. Available from: http://www.oecd.org/coronavirus/policy-responses/covid-19-in-latin-america-and-the-caribbean-regional-socio-economic-implications-and-policy-priorities-93a64fde/

[89] World Bank Group Commodity markets outlook, April [Internet], Washington DC: World Bank; 2020. License: Creative Commons Attribution CC BY 3.0 IGO[cited Jun 13]. Available from: https://openknowledge.worldbank.org/bitstream/handle/10986/33624/CMO-April-2020.pdf .

[90] Central Bank Ecuador. Índice de Actividad Económica Coyuntural IDEAC [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://www.bce.fin.ec/index.php/component/k2/item/313-indice-de-actividad-econ%C3%B3mica-coyuntural-ideac.

[91] National Administrative Department of Statistics Colombia. Indice de Seguimiento a la Economía ISE [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/indicador-de-seguimiento-a-la-economia-ise.

[92] Central Bank Chile. Índice Mensual de Actividad Económica IMACEC [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://www.bcentral.cl/areas/estadisticas/imacec

[93] Portal Brasileño de datos abiertos. Indice de actividad IBC [Internet]. 2020 [cited 2020 Jun 10]. Available from: http://www.dados.gov.br/dataset/24363-indice-de-atividade-economica-do-banco-central-ibc-br/resource/04085278-5a8a-4eae-b12a-a46c4ba92bf7.

[94] National Institute of Statistics and Informatics Peru. Indice Mensual de Producción Nacional [Internet]. 2020 [cited 2020 Jun 10]. Available from: http://m.inei.gob.pe/biblioteca-virtual/boletines/produccion-nacional-cifras-desestacionalizadas-9646/1/#lista.

[95] Bloomberg. Bloomberg consensus estimates as of August 2020. 2020.

[96] Ramsey B, Fernández C, Lozano G, et al. Latin American Mid-Year Outlook. Banco J.P. Morgan S.A.

[97] Standard and Poors (S&P). Extracted from website. 2020 [cited 2020 Jun 10.]. Available from: https://www.standardandpoors.com/en_US/web/guest/home.

[98] WHO Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies. Geneva: WHO; 2010.

[99] Lora E. State of state reform in Latin America. Herndon: World Bank Publications; 2006.

[100] Macchia L, Plagnol AC. Life satisfaction and confidence in national institutions: evidence from South America. Appl Res Qual Life 2019;14:721–36.

[101] OECD. Tackling coronavirus (COVID-19): contributing to a global effort [Internet]. 2020 [cited 2020 jun 10]. Available from: https://www.oecd.org/coronavirus/country-policy-tracker/.

[102] UNESCO. La educación en América Latina y el Caribe ante el COVID-19 [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://es.unesco.org/fieldoffice/santiago/covid-19-education-alc/monitoreo.

[103] CONSED.info. Monitorear la suspensión de clases [Internet]. 2020 [cited 2020 Jun 10]. Available from: https://consed.info/about/.

[104] KPMG. Brazil government and institutions measures in response to COVID-19 [Internet]. 2020 [cited Jun 15]. Available from: https://home.kpmg/xx/en/home/insights/2020/04/brazil-government-and-institution-measures-in-response-to-covid.html.

[105] Gobierno de Chile. Plan de acción por coronavirus [Internet]. 2020 [cited Jun 15]. Available from: https://www.gob.cl/coronavirus/plandeaccion/.

[106] Ministry of Health Chile. Información Técnica [Internet]. 2020 [cited 2020 Jun 15]. Available from: https://www.minsal.cl/nuevo-coronavirus-2019-ncov/informe-tecnico/.

[107] Biobio Chile. Por COVID-19: empresas de agua potable reactivarán suministro de clientes vulnerables pese a deudas. Press release 2020 [cited 2020 Jun 10]. Available from: https://www.biobiochile.cl/noticias/economia/negocios-y-empresas/2020/03/19/ante-crisis-por-covid-19-empresas-de-agua-potable-reactivaran-suministro-pese-a-deudas-pendientes.shtml.

[108] La Tercera. Medellín: un plan tecnológico para COVID-19. Press release 2020 [cited 2020 Jun 10]. Available from: https://www.latercera.com/la-tercera-domingo/noticia/medellin-un-plan-tecnologico-contra-el-covid-19/ARVHWA7ZKZG6BLRVCRVTZRKD54/?utm_medium=mail-editorial&utm_source=mail&user=90e5496eeccd4eda44b5fab6991a2875.

[109] Cámara de comercio de Cuenca. Decreto presidencial N° 1017. Press release 2020 [cited 2020 Jun 10]. Available from: https://www.cccuenca.com.ec/noticias/106-decreto-presidencial-n-1017-estado-de-excepcion#:~:text=Decreto%20N.,1017&text=Art%C3%ADculo%201.,sanitaria%20que%20vive%20el%20pa%C3%ADs.