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Racial Disparities in Cancer Care | Access to Care for Transgender Veterans | Hepatitis C Among US Veterans | Battling Tobacco Use at Home | [illegible] | How Might the Provision of Culturally Competent Services Be Enhanced for American Indian and Alaska Native Veterans? | Improving Trends in Gender Disparities | Suicidality Among Hispanic and African American Veterans Following Surgery

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COVER: Nurses prepare syringes and paperwork for people getting vaccinated against COVID-19 at the biggest vaccination center in Colombia, located in the Corferia's parking lot in Bogotá, were kids and adults get their first doses of Moderna, as well as boosters of SINOVAC and AstraZeneca novel COVID-19 vaccines, on January 12, 2022.
Cover concept and selection by Aleisha Kropf. Photo by Sebastian Barros/NurPhoto via Getty Images. Printed with permission.
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Health Emergency Preparedness and Response Capacity in Latin America and the Caribbean

Latin America emerged as one of the epicenters of the COVID-19 pandemic. As of March 2022, the region, representing only 8.4% of the world's population, had more than 65 million confirmed cases, or 15% of cases worldwide, and more than 1.6 million deaths, or 28% of deaths worldwide. Latin America's gross national product contractions resulting from the pandemic are estimated to be between 7% and 10%; these contractions have increased unemployment and poverty and exacerbated income inequality. Moreover, as in other countries, the disease has disproportionately affected the poorest and most vulnerable populations.

In the past 50 years, Latin America has experienced more than 4500 disasters that have caused the death of almost 600 000 people and injured more than 3 million, in addition to causing significant economic losses. The COVID-19 pandemic has increased these figures and has further challenged health systems' capabilities in various settings. Researchers have had to rapidly study diagnosis, treatment, and immunization for a new pathogen. Health care personnel have had to cope with a large and prolonged emergency, which has involved a shortage of ventilators, intensive care unit beds, and personal protective equipment at different times. Health authorities have needed to frequently issue updated guidelines in a context of rapidly changing scientific evidence. It has been necessary to communicate key information to the population and counter misinformation and social movements opposed to preventive care or vaccination. Diagnostic tests have had to be manufactured in sufficient quantity, and laboratory capacity has had to be increased, and the integration of mechanisms at the global, regional, and national levels was required to guarantee the availability of basic medical, diagnostic, and therapeutic supplies and vaccines, among others.

At the international level, sharing health information, resources, and vaccines in a broad, transparent, and timely manner has become a priority. National health systems' performance and, ultimately, the global population's health, morbidity, and mortality have resulted from the complex interactions between interdependent systems, such as those described. However, the COVID-19 pandemic has also exacerbated preexisting gaps in social protection strategies.

The response to and mitigation of the COVID-19 pandemic have been uneven, varying dramatically by social and economic conditions and governments' actions. Almost 60% of employment in Latin America is "informal," with 140 million people who must report to work to earn a living, making social distancing nearly impossible for many. Going further, 21% of people live in urban slums, informal settlements, or precarious housing, with overcrowding and lack of basic services such as clean water and sanitation. These conditions have facilitated the spread of the disease, as well as the accompanying traumas of life and service interruption, interpersonal violence, and mental health challenges.

Going forward, addressing the current health care crisis and preparing for future emergencies will require that each government build resilience by implementing structural reforms to improve fiscal sustainability and strengthen the infrastructures required for public health, communications, and social programs. These include universal health care coverage and access. Digital tools can provide a helpful solution to access to care provision for remote populations while improving education and health literacy as well as tackling misinformation and disinformation spread among the masses.

Scientists and health care professionals must also take a proactive role in communication and providing information and evidence to the public, limiting the distance between professionals and other members of society. Finally, the improvement of regional infrastructure and the preparedness for health crises are fundamental to Latin America's ability to improve its preparation for future health challenges. This will require generating the required infrastructure for health care, research, and medicine production and improving health care professionals' education and working environment and the conditions affecting their well-being.

These initiatives will be costly and require political will. We hope this joint *AJPH* and *Pan American Journal of Public Health* supplement will contribute to shedding light on Latin America's emergency preparedness and its experience with the COVID-19 pandemic and will aid us in identifying solutions to its complex challenges. AJPH

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6 Years Ago

Preparedness for Emerging Infectious Diseases in Latin America and the Caribbean

The current epidemics of dengue and chikungunya in several countries of the region . . . are some of the examples of health events that can . . . benefit from strong preparedness efforts across the region. Furthermore, sound preparedness efforts will mitigate the potential economic impact of such health events. Dengue illness in the Americas has been estimated to cost 2.1 billion dollars per year on average. . . . [A recent] chikungunya virus outbreak . . . incurred substantial medical expenses estimated at 43.9 million euros, of which 60% were attributable to direct medical costs related to consultations, hospitalizations, and drugs. A study on the 2009 H1N1 influenza outbreak in Mexico estimated that by losing almost a million overseas visitors, the country lost approximately 2.8 billion dollars, suggesting that the wider economic implications of health-related emergencies need to be considered in preparedness planning.

From AJPH, *February 2016*, p. 282

17 Years Ago

Lessons Learned From the Brazilian Response to HIV/AIDS

[T]he Brazilian National AIDS Program (NAP) [is] a widely recognized, leading example of the feasibility and effectiveness of an integrated approach to the epidemic in the setting of a middle-income country characterized by significant levels of social inequality. . . . [Yet] the impact of the Brazilian response to AIDS has been impressive: incidence rates of HIV are much lower than projected a decade ago, and mortality rates have fallen by 50% and inpatient hospitalization days by 70% to 80%. . . . [T]he most basic lesson from the Brazilian experience may well be that there is no homogeneous HIV/AIDS epidemic nor a prepackaged approach to dealing with it. The way in which a nation responds to the social, political, economic, and human stress . . . will be shaped by the country's unique history, culture, governmental institutions, . . . economic resources and . . . diverse social forces. . . . The NAP has become a source of national pride for the Brazilian people. . . . To control HIV, we must first admit that the problem belongs to all of us.

From AJPH, *July 2005, pp. 1162, 1171 passim*

Emergency Preparedness: A Shared Effort

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The COVID-19 pandemic has exposed gaps and weaknesses in health care systems worldwide, but it has also highlighted countries' capacity to respond and provided valuable lessons for the future. The pandemic has highlighted the need for countries to work together on scientific evidence production and vaccine development and elucidated the commonality of pandemic-related challenges, such as personal protective equipment unavailability and supply chain disruptions. International cooperation has been key to tackling COVID-19 and continues to be a fundamental pillar of emergency preparedness and response in circumstances when synergy among countries is more important than individual efforts.

In a context of cooperation, the American Public Health Association (APHA) and the Pan American Health Organization (PAHO) have collaborated for more than 100 years to promote health and address emerging public health threats. This year, APHA celebrates its 150th anniversary, and PAHO its 120th. This joint special issue produced by *AJPH* and the *Pan American Journal of Public Health* (*PAJPH*) commemorates the achievements of our partnership.

A JOINT SPECIAL ISSUE

The supplement focuses on Latin America (i.e., the cultural region of the Americas in which Romance languages are spoken, generally comprising South America, Central America, and the Caribbean islands). Although it is not possible to present research from all countries in the region, the articles offer a representative perspective of emergency preparedness from different parts of Latin America. The articles cover three main topics: the pandemic's impact on countries, the essential public health function response, and the digital transformations needed to improve the resilience of health care systems. To facilitate access to the information in the supplement, all articles are published in English in *AJPH* and in Spanish in *PAJPH*.

Impact of the Pandemic

Health insurance scheme in Colombia. To quantify socioeconomic disparities in COVID-19 mortality, Garzón-Orjuela et al. (p. S586) analyzed factors in a Colombian cohort in relative and absolute terms and found that type of health insurance is by far the main contributor to inequalities among both genders and especially among young adults. Urgent structural changes are required in the Colombian health care system to confront future public health challenges and inequality.

Cancer care access in Chile. Although directly affecting millions around the world, COVID-19 also has had an enormous indirect impact, particularly on health care. Cuadrado et al. (p. S591) evaluated the impact of the pandemic on cancer care access in Chile. Oncology services suffered a sharp drop in March 2020, when Chile was most affected. After March, oncology services utilization improved slowly but did not completely recover in 2020. The pandemic has put health care systems under pressure and has had a profound impact on cancer and overall care, especially among women and state-insured populations. Cancer care programs should secure financial mechanisms to compensate for the impact of the pandemic and to prepare for future disruptions.

Guatemalan health care workers' mental health. In a groundbreaking study named HEROES (COVID-19 Health Care Workers Study), Paniagua-Avila et al. (p. S602) describe the prevalence of mental health conditions and associated exposures during the COVID-19 pandemic in a Guatemalan cohort of health workers. Among participants, mental distress (59%) and moderate or severe depressive symptoms (23%) were highly prevalent. Additional surveillance and attention are warranted to preserve the mental health of these essential workers.

Response

The role of essential public health functions in addressing the challenges of the COVID-19 pandemic are also considered in this issue. Through the lens of the renewed essential public health functions framework, Báscolo et al. (p. S615) reviewed the institutional capacities of several health authorities in Latin American countries to respond to the needs of their populations during

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the COVID-19 pandemic before vaccination programs started. Responses were grouped into prevention, prioritization, and mitigation strategies, and challenges were identified to propose an agenda to strengthen the stewardship function of the health authorities.

Strengthening the System

Digital transformation is essential for more equitable and sustainable public health in the age of digital interdependence. In their article, García Saisó et al. (p. S621) emphasize the importance of digital connectivity as a tool to improve health care access and coverage and to better prepare for future health crises. They consider eight guiding principles for the digital transformation of the health care sector, identifying their relationship with the COVID-19 pandemic in Latin America, where 30% of the population has no access to the Internet.

NEW EVIDENCE FOR DECISION-MAKING

The COVID-19 pandemic will not be the last. Latin America's health systems will face future health emergencies, including the reemergence of infectious diseases, the effects of climate change on health, and the spread of health misinformation. To address these threats, public health decision-makers require appropriate, relevant, and timely information to devise measures that can influence tangible changes at the population level.

This new scientific evidence will guide public health preparedness for future emergencies, which will affect health care systems and population health in an increasingly interconnected and interdependent world. AJPH

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The Fight Against COVID-19: A Perspective From Latin America and the Caribbean

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Countries in Latin America and the Caribbean (LAC) have made great efforts over recent decades to increase effective coverage of health services although large inequities persist among and within the countries.[1] The urban–rural gap is the most notable inequity in this region. However, unlike most of the public health problems that are predominant in LAC,[2] COVID-19 has primarily affected urban areas, especially areas of concentrated poverty.[3]

Managing the pandemic has primarily been an urban challenge that has substantially affected the most marginalized areas of the most densely populated cities and municipalities. In those areas, the COVID-19 crisis has predominantly affected the poorest populations, which is owing to the size of the informal workforce, health service access barriers, and malnutrition.[4] Compared with high-income countries, LAC presumed early on that it was relatively protected from COVID-19 because the region is more geographically dispersed and its populations tend to be younger. However, it turned out to be one of the areas that is most vulnerable to the pandemic because of regional disparities in health capacities, weak health authority, and structural and historical inequalities that undergird social determinants of health. The role of health systems has been fundamental, but the structural determinants put the region in a sociohistorical position of vulnerability, particularly for the large metropolitan regions.

The H1N1 (influenza A virus subtype H1N1), Zika, and Chikungunya pandemics provided important lessons.[5] However, the lessons learned were insufficient in the face of COVID-19, with its magnitude and duration and the deep social complexity of mitigation measures that were to be adopted in highly uncertain contexts—many of which had not been used for several decades. Nonetheless, the region's countries had prepared antipandemic response plans, including improvements in its epidemiological surveillance systems, information systems, and alert and response systems, which made it possible to adapt the response quickly. Although these plans were unevenly executed, the impact undoubtedly would have been worse without these resources, the experience, and the preparation.

Unfortunately, during the first months of the pandemic, there was little scientific evidence of the effectiveness and applicability of control measures, particularly nonpharmacological measures (e.g., hand washing, mask wearing) in contexts such as LAC. Most of the evidence that was initially available came from high-income countries. Opportunely, the evidence base was supplemented by scientific publications led primarily by Chile, Brazil, and Colombia. As decision makers, we were faced not only with developing interventions to protect life and the capacities of the health system but also with preventing our decisions from deepening inequalities—inequalities that also determine opportunities for health and well-being for individuals and populations as well as public health over the medium and long terms.

Implementing COVID-19 control measures in LAC has not been easy. It has involved a battle that we knew from the very beginning nobody would win. Historical structural determinants in the region, such as the informal workforce, affected the impact of the virus by producing the incidence of severe cases and a clear socioeconomic gradient of mortality, as we have previously shown in Colombia.[3] Garzón-Orjuela et al. (p. S586) drew similar conclusions in their study about the effects of socioeconomic inequalities on COVID-19 outcomes.

Those structural determinants also affected the effectiveness of measures, such as contact-tracing programs, that promised to be less detrimental than general quarantines. Nevertheless, contact tracing depended on isolating suspected cases, which was impossible for

some people because of their socioeconomic situation.[6] The measures could not be expected to have the same effectiveness as in high-income countries, nor could the implementation be expected to not involve problems with adherence, acceptability, and applicability among a population facing food insecurity, employment insecurity, hopelessness and uncertainty about the future, desperation, and a lack of social well-being.

As mentioned, the socioeconomic conditions in the LAC region influenced the effectiveness of the measures and intensified their indirect consequences. Compared with high-income countries, the social cost of restrictions on mobility was more significant, the resources available to mitigate their impacts were fewer, and citizens were less willing or able to comply with the measures. Closing airports, businesses, educational institutions, and other entities had a greater impact on deepening inequalities and on economic growth in our countries. Furthermore, with an economy that was less resilient and less able to recover,[7] the impact of the measures in our context had more weight. Another difference was owing to the model of the state in most LAC countries versus the impositions and control of measures by authoritarian governments. Although these can be effective in terms of temporarily suppressing transmission, they have a high social cost and are incompatible with the principles and guarantees of modern democracies.

The COVID-19 pandemic and its measures have had a large impact on health systems throughout LAC countries. In one notable example, Cuadrado et al. (p. S591) examined the impact of the pandemic on access to cancer care in Chile. Additionally, health personnel have had to take on heavy workloads, which both puts them at risk for COVID-19 and affects their mental health, as shown by Paniagua-Avila et al. in their study in Guatemala (p. S602).

Today, more than two years since the first case of COVID-19 was reported in LAC, it is clear that the restrictions on mobility in the LAC region had high social, human, and economic costs. The decision of some countries, such as Colombia, to open their economy early, just when cases began to decrease, likely saved thousands of lives, decreased the impact on inequalities, and contributed to the future quality of life of the most vulnerable. Proof of this is that Colombia quickly recovered thousands of jobs and income increased when the economy opened, although the country has not yet been able to reach 2019 levels.[8]

When the vaccines were approved for emergency use, they quickly became precious and scarce, and market logic imposed by high-income countries spread to the LAC region, outstripping international cooperation capacities. Existing mechanisms were insufficient for ensuring earlier access for countries that were less able to sign bilateral agreements—such as Haiti, Jamaica, Bolivia, Paraguay, and Nicaragua, where vaccination started to ramp up between the second and the third quarters of 2021 (with the exception of Haiti, where, to date, coverage with the full scheme still does not rise above 1%). In the end, those agreements ensured early access for most middle- and high-income countries but were never a good alternative for low-income countries. Donations of vaccines were valuable, being the only source of vaccines in some countries, and arrived during the most critical vaccination times for others. However, for certain nations, donations were not enough, and they have suffered more from the limitations of the well-intentioned multilateral COVAX (COVID-19 Vaccines Global Access) cooperation mechanisms, as well as from noncompliance by some of the laboratories. A reflection of these facts is the global inequity that is currently observed, particularly that which was seen during the first quarter of 2021 when saving lives was more urgent.[9]

In high-income countries, nationalism displaced global health principles of solidarity and equity, creating excessive vaccine concentrations in those countries and diminishing the effectiveness of multilateral mechanisms. Additionally, although there is more inequity on the global scale than in the LAC region, inequity threatens the LAC region's ability to reactivate commercial activities; it clearly should be a political priority for the global health of the region now and over the coming years.

Today, the pandemic clearly cannot be controlled across the world, and low vaccination coverage and the circulation of the virus through the poorest regions are obviously not safe for high-income countries themselves, because globalization processes necessarily determine that transmission in an affected country will inevitably affect others. Likewise, the pandemic's economic ramifications for one country have regional and global effects. For this reason, it is ethical and fair to control the pandemic throughout the world, and there is no controlling it without global action.[10]

It is necessary to continue to strengthen basic public health capabilities, epidemiological surveillance, local capacity to produce vaccines, health information systems, health authority, and health governance. Under this framework, the digital

transformation of the health sector is one of the most important challenges in the LAC region, as discussed in this supplement by García Saisó (p. S621).

Over the coming decades, there is still much to be understood and to work toward, including redressing the other impacts that the pandemic has had on public health. As Báscolo et al. discuss in this supplement (p. S615), the future agenda needs to prioritize improving structural elements while strengthening the stewardship capacities of health authorities and developing institutional structures to achieve universal health care coverage in the LAC region.

COVID-19 has been a trial by fire for global health, especially for the LAC region. It is evident that the response to new pandemics requires stronger international cooperation within and outside the region, cooperation that moves beyond discourse and translates into effective mechanisms to achieve equity in health. AJPH

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Lessons From the COVID-19 Pandemic in Latin America: Vulnerability Leading to More Vulnerability

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The COVID-19 pandemic struck the world in 2020 and was particularly harsh in Latin America, where a combination of social disparities and vulnerabilities led to unprecedented health and economic crises.[1] One remarkable impact is the exceedingly high death toll in the region, especially given the "excess mortality rate," which is probably the measure that best reflects the total numbers of direct and indirect deaths during the COVID-19 pandemic.[2,3]

When the pandemic hit Latin America, there was a misconception that its effect in the region would be lighter than that in Europe, considering the younger Latin American population. However, after accounting for the population age difference, the infection fatality rates were worse in Latin America and in low- and middle-income countries compared with higher-income European nations.[2,4] Although age is an objective measure, different life course stressors could mean that individuals (and populations) with the same biological age will have extremely different health risks.[5,6] Vulnerable individuals in low- and middle-income countries are commonly exposed to hazardous nutritional, environmental, and occupational factors and suffer from social marginalization, structural racism, and poverty. Therefore, comparing countries with large inequities with those with much less inequity based solely on age addresses the life course history and risks of populations facing COVID-19 only superficially. The implementation of social protection systems is a way to tackle vulnerabilities in the region. A governmental commitment to fiscally support such efforts and actively work with vulnerable populations to solve constraints and disparities is critical for Latin American states to adequately respond to future health crises.

Unequal health care access clearly plays an important role in the increased COVID-19 mortality rates seen in vulnerable populations.[7] However, the coexistence of this new, unexpected pandemic and other chronic diseases, has worsened this scenario, resulting in what is referred to as a "syndemic."[8,9] Poor nutritional status probably contributes to this problem[10] in low- and middle-income countries, where obesity and malnutrition (both associated with COVID-19 severity) frequently coexist.[11–13] As a component of social protection strategies, the transformation of health systems toward universal coverage is warranted. Additionally, a health care shift from disease treatment to health promotion and illness prevention in the near future would allow the regional states to save money that can be reinvested in implementing additional social and equitable policies.

Children and adolescents also comprise a vulnerable population that has been disproportionately affected by the COVID-19 pandemic in Latin America, and they are affected by life factors related to the disease.[14–16] The United Nations Children's Fund estimates that, for nearly a year, more than 168 million children were out of school because of closures related to the COVID-19 pandemic. Two thirds of the countries where schools were fully closed during this period were located in Latin America.[16] These closures affect not only learning and development but also nutrition, as many families in low- and middle-income countries rely on schools to provide daily meals to children. Expectedly, several reports have highlighted a decrease in the overall food quality among poor individuals during the pandemic,[13,15,17] which may lead to increased malnutrition and childhood obesity rates, with long-lasting consequences.

Reopening schools while monitoring children's and educators' health status is an urgent need for all the countries in the region to minimize the impacts mentioned earlier. Therefore, education and health systems must work collaboratively to develop plans for a safe and healthy return to onsite schools.

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Moreover, future health crises such as the current pandemic may again occur; hence, governments should plan for future disruptions and invest in social programs that benefit students and the educational community.

Finally, another important lesson from the pandemic is that medical schools urgently need to improve evidence-based science and statistics education. Dangerous misinformation regarding "early treatment" for COVID-19 in Latin America was widespread[18] by individuals with large communication platforms and economic conflicts of interest. Furthermore, a large portion of the medical community broadly adopted clinical practices that were not based on evidence, unveiling these practitioners' poor scientific backgrounds. Medical and other health sciences schools must be made aware of the importance of well-designed studies, notions of probability, and behavioral biases in clinical practice.

We believe that the misinformation spread is another symptom of "vulnerability leading to more vulnerability." By communicating the false idea that COVID-19 was easily treatable with drugs, millions of people were unnecessarily exposed to the virus (increasing the transmission rate and, consequently, the total burden of COVID-19 in the region), not to mention the potential health consequences of the drugs themselves and the economic costs of ineffective treatments. In addition, misinformation created vaccine hesitancy in Latin America, a region that has historically had high vaccine uptake.[19] The public health sector should coordinate action that focuses on training to improve communication and supporting it during health crises, which might lead to broader public trust in science and adherence to effective public health measures. AJPH

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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COVID-19 in Colombia and Venezuela: Two Sides of the Coin

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Over the past two years the world and its different regions, including Latin America, have been suffering from the enormous burden and impact of the COVID-19 pandemic, which is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Colombia and Venezuela have been greatly affected.[1,2] Despite sharing historical and cultural roots and similarities, each nation has entirely different sanitary conditions, especially regarding infectious, tropical, and reemerging illnesses, including vaccine-preventable diseases. Such differences have increased especially during the past two decades.

Major infectious diseases in Colombia, such as tuberculosis, HIV, and malaria, are under reasonable control. Malaria, in particular, has significantly decreased during the past decade.[3] Conversely, in Venezuela, all of these diseases are rising, especially malaria, which is shifting the country from being the former leader in vector-borne disease control to the nation with the highest morbidity in the Americas.[4] Vaccine-preventable illnesses, such as measles, diphtheria, mumps, pertussis, and hepatitis A, show a similar picture, with high vaccination coverage in Colombia and sustained outbreaks across multiple years in the past decade in Venezuela.[5]

In addition, the risk and occurrence of imported cases of these diseases in Colombia, Brazil, Ecuador, Panama, and other countries in Latin America and beyond also increased because of critical Venezuelan migration in the region.[6–8] The arrival of COVID-19 to Latin America has compounded existing health crises in Venezuela. The COVID-19 pandemic has required different surveillance, diagnostic, and management approaches as well as marked differences in the national vaccination plans. Therefore, the COVID-19 crisis in these two Andean countries shows two different sides of the coin.

After the first case in Latin America, reported in Brazil on February 25, 2020, multiple countries in the region rapidly detected SARS-CoV-2 or COVID-19 cases.[9] In Colombia, initial cases were noted on March 6, 2020, and in Venezuela, on March 13, 2020.[10] Going further, as the pandemic emerged, Colombia was a country with high international air traffic. Alternatively in Venezuela, even before the pandemic, there were significant decreases in the number of international flights, as many airlines left the country and discontinued regular flights to the capital Caracas and other cities. Additionally, Venezuela suffers from long and profound political and economic crises, which contributed to truncating internal mobility because of fuel and electricity shortages and a high percentage of poverty.[4,7] Differences in international travel and population mobility likely promoted the rapid spread of COVID-19 in Colombia and a slower spread in Venezuela. It is important to note the paradoxical benefits of the airline crisis and economic challenges in Venezuela.

Furthermore, it was suspected from the beginning that the surveillance and reporting of COVID-19 cases in Venezuela were not accurate, similar to gaps in data collection of multiple other notifiable communicable diseases that were not publicly available. This is in contrast with Colombia and other countries, where the leading epidemiological indicators are online (www.ins.gov.co). Thanks to the long history of public health surveillance for tropical infectious diseases, Colombia has managed the challenge of implementing the key recommendations for COVID-19 surveillance promoted by the World Health Organization via Colombia's National Institute of Health.[11] In addition, Colombia rapidly established molecular diagnostic laboratories and was the first to have the reverse transcription–polymerase chain reaction (RT-PCR) test for SARS-CoV-2 available in Latin America. As of October 13, 2021, Colombia had collected 16.5 million samples by RT-PCR for SARS-CoV-2 and 9.5 million samples by antigen testing (available in all the country departments) and had installed 21 laboratories across the country with genome-sequencing capacities. In Venezuela, by November 2020, the molecular

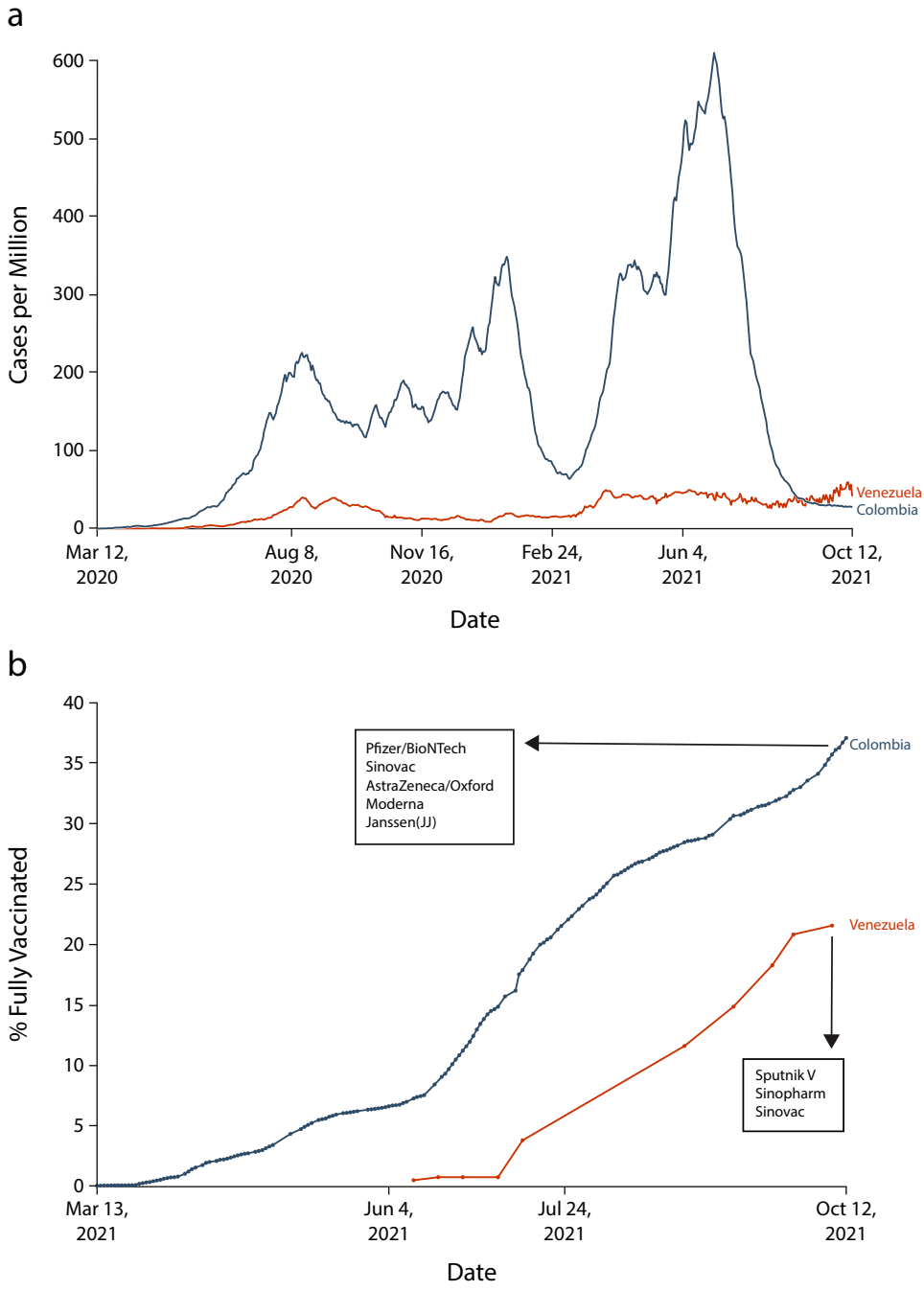

FIGURE 1— COVID-19 (a) Cases per Million Over Time, and (b) Proportion of People Fully Vaccinated: Colombia and Venezuela, 2020, 2021

Source. Johns Hopkins University CSSE COVID-19 Data.
Note. The inserted boxes list vaccines used in each country.

diagnosis was available at only five public reference laboratories, limiting the country's diagnosis capacity.[12]

Another critical aspect to consider is the capacity of the hospital network in these two countries and how it has adapted to deal with the current pandemic. When cases escalated in March 2020 and patients required hospitalizations, Colombia had 43 935 hospital beds and 5346 beds in intensive care units (ICUs). This capacity increased up to 83% in the case of ICU beds in August 2020, turning Colombia into the Latin American country with the highest

number of ICU beds per 100 000 inhabitants at that time. Moreover, to support adequate attention to critical COVID-19 patients, Colombia acquired 6313 ventilators and trained 45 000 health care workers in the management of intensive care patients.[13] Unfortunately, the situation across the Venezuelan border was dramatically different. At the pandemic's beginning, Venezuelan authorities reported 23 000 hospital beds and 1200 ICU beds for COVID-19 patients, although more realistic estimates reported by health care workers indicated only 80 ICU beds in the entire country.

The Venezuelan government designated 46 hospitals to respond to the crisis. According to the authorities, these hospitals were fully equipped, but this was denied by health workers of these same health centers, indicating that half of them could not meet aseptic and antiseptic conditions and lacked equipment such as gloves, masks, and soap. Besides, 30% and 40% of the facilities reported water and electric services problems, respectively.[14] Regarding vaccination, Colombia began its program in March 2021, Venezuela in June 2021. Up to October 2021, only 36% of the Colombian population have been fully vaccinated with five different available vaccines, whereas only 22% of Venezuelans were inoculated with three vaccines available (Figure 1).

Lastly, it is important to mention that Colombia has been coping with the humanitarian migration crisis generated in Venezuela before the pandemic. This included a national plan in cooperation with national and international organizations to integrate Venezuelans into the national COVID-19 response through health care access disregarding their migratory status and their inclusion in economic support programs. The plan included the application of biosecurity protocols in human corridors established at the Venezuelan frontier; attention to irregular status immigrants through emergency mechanisms offered by local authorities; the strengthening of cooperation programs to provide housing, shelter, and food to refugees and migrants; and the enrollment of vulnerable migrants in governmental assistance programs with a particular focus on border departments.[15]

The differences in the COVID-19 situations and responses between Colombia and Venezuela show us two sides of a coin. Colombia has managed so far with international aid and the effort of national health authorities and health care workers to adapt its health system and meet the demands of this crisis. Meanwhile, the situation in its neighboring country has been exacerbated by a government in denial of its internal political and social crises. Reaching conclusions about a more exact state of the situation would be risky, as accessing accurate statistics about the COVID-19 pandemic seems impossible. Hopefully, both countries will collaborate more closely in a future health crisis. AJPH

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A. J. Rodriguez-Morales developed the first draft of the editorial and conceptualized the idea. M. E. Figuera contributed significantly to the editorial in subsequent versions. Both authors approved the final submitted version.

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We would like to dedicate this editorial to the memory of Barbara Bisiacchi, who passed away in February 2022. Bisiacchi was a significant medical educator for multiple generations of physicians at the Jose Maria Vargas Medical School, Universidad Central de Venezuela, in Caracas.

CONFLICTS OF INTEREST

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How We Faced the Challenge of COVID-19 in Antioquia, Colombia

Aníbal Gaviria Correa

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Before COVID-19 reached Colombia and the World Health Organization (WHO) declared the pandemic, in Antioquia, Colombia, we were already strengthening our capacity to face it. Seeing the experiences in other countries, we took this threat seriously from the onset. Our departmental government declared a health emergency and public disaster to provide better tools to tackle the situation. We created a first-level management structure that was pioneered in Colombia. A professional with proven experience over a long career and the necessary social sensitivity and organizational ability to coordinate staff led this response with a clear mandate to protect life.

We made difficult political decisions. In Colombia, the first lockdowns were ordered and protocols such as the use of face masks were implemented before WHO recommended them. The pandemic showed us that we needed to be united, so we invited citizens to practice physical distancing and change their habits—but to stay united. Our premise was that together we are more powerful than the disease. By caring for ourselves, we care for others.

We quickly understood that the priority was to ensure health system capacities and increase the number of intensive care units. With the support of the national government and the private business sector, we managed to go from 480 intensive care beds to 1474. This 308% increase required an investment of US $26 million from the public sector and US $10 million from the private sector.

There were many expressions of solidarity, and we were unified as we advanced, but this has not been enough. We still have social debts, such as imbalances in vaccination: whereas 60% of the world's population has received at least one dose of the COVID-19 vaccine, only 10% of people in low-income countries have received a dose. The pandemic has clearly been a wake-up call showing us that the world has many gaps to close.

On the positive side, science has played a key role. We were aware of its importance in everyday life, and the dedication of scientists to developing a vaccine and producing scientific data helped us in the most complex periods. More global resources will need to be devoted to scientific research and to the development of technologies that allow us to inhabit the planet in more intelligent and balanced ways. Technological tools were fundamental in offsetting the downsides of physical distance: Web platforms, public radio, and television, among other media, were helpful vehicles for information, education, and companionship, offering meeting places and social movement.

But although science and technology made important contributions, they also revealed risks in how information is handled, threats to privacy, and opportunities for social control and manipulation. The ethical challenge today is to ensure connectivity without invading private spheres while managing information in a transparent manner.

There are many challenges, and technology has gradually allowed a certain balance between development in urban areas and outside cities. For more than 5000 years, since social agglomerations in cities began, great advances have been made on all fronts, but development has concentrated on urbanization that has transformed villages inhabited by dozens of people into metropolitan areas that are home to millions. The pandemic and the challenges of climate change are two major forces that will help balance development in urban and nonurban areas, moderating the frenzy of crowding.

It is too early to talk about a trend toward deurbanization, but the speed of urbanization has slowed for the first time, and it will continue to do so. The pandemic has given us a warning. It is an alarm we need to heed if we are to correct our course and steer toward the equitable protection of life. AJPH

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Health Insurance Scheme: Main Contributor to Inequalities in COVID-19 Mortality in Colombia

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Objectives. To quantify socioeconomic inequalities in COVID-19 mortality in Colombia and to assess the extent to which type of health insurance, comorbidity burden, area of residence, and ethnicity account for such inequalities.

Methods. We analyzed data from a retrospective cohort of COVID-19 cases. We estimated the relative and slope indices of inequality (RII and SII) using survival models for all participants and stratified them by age and gender. We calculated the percentage reduction in RII and SII after adjustment for potentially relevant factors.

Results. We identified significant inequalities for the whole cohort and by subgroups (age and gender). Inequalities were higher among younger adults and gradually decreased with age, going from RII of 5.65 (95% confidence interval [CI] = 3.25, 9.82) in participants younger than 25 years to RII of 1.49 (95% CI = 1.41, 1.58) in those aged 65 years and older. Type of health insurance was the most important factor, accounting for 20% and 59% of the relative and absolute inequalities, respectively.

Conclusions. Significant socioeconomic inequalities exist in COVID-19 mortality in Colombia. Health insurance appears to be the main contributor to those inequalities, posing challenges for the design of public health strategies. (*Am J Public Health*. 2022;112(S6):S586–S590. https://doi.org/10.2105/AJPH.2021.306637)

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The current COVID-19 pandemic has posed significant and unprecedented challenges for nations, which have implemented different strategies to save lives and avoid the collapse of health systems.[1] Some of those strategies have the potential to widen social and health inequality gaps, especially in low- and middle-income countries where the resources and infrastructure needed to adequately respond to the COVID-19 emergency are scarce.[2] Within countries, studies have found differences by socioeconomic position (SEP) and ethnicity in various COVID-19 outcomes, including mortality.[3,4] In Colombia, a survival analysis identified inequalities in COVID-19 mortality by age, gender, ethnicity, and SEP.[3] Building on that evidence, our analysis aimed to quantify socioeconomic inequalities in COVID-19 mortality in Colombia in both relative and absolute terms, and to assess the potential role of health insurance type, comorbidity burden, area of residence, and ethnicity to explain such inequalities.

METHODS

We carried out a retrospective cohort study of confirmed cases of COVID-19 in Colombia from March 2, 2020, to October 17, 2020. This nationwide cohort was based on individual-level data provided by the National Institutes of Health,[5] which published anonymized data of COVID-19 cases up to mid-October 2020. After that, only aggregate information is available.

The primary outcome was mortality, treated as a time-to-event outcome (date of death). We censored participants if no event (death) was observed by October 17, 2020. We measured inequalities by the SEP variable available in the COVID-19 cases data set. This is an area-level SEP measure that

classifies zones where people live according to characteristics such as transport roads, access to public services, and commercial value of the land.[6] This measure, which is used in Colombia to define the provision of subsidies for public services, goes from 1 (lowest) to 6 (highest). In our analysis, 5 categories were used: lowest (1), low (2), medium-low (3), medium (4), and high/highest (5). Age and gender were covariates included in all models. Factors that could potentially explain the inequalities were as follows: type of health insurance (contributory, subsidized, special or exceptional [petroleum industry workers, armed forces members, and teachers in the public sector, among others], and uninsured); diabetes; hypertension; other comorbidities (arthritis, disability, cancer, orphan diseases, and HIV); any vulnerability situation (prisoner, former member of an illegal armed group, displaced, migrant, victim of the armed conflict); belonging to an ethnic minority; and area of residence (urban or rural).

We explored relative and absolute inequalities through the relative index of inequality (RII) and the slope index of inequality (SII).[7] We ran survival models (Cox regression) in which RII was estimated through a log-linear relationship between the hazard rate and the exposure, and the SII was estimated by fitting an additive model for the hazard rate.[7] Given the age and gender differences in COVID-19 mortality,[8,9] we stratified RII and SII estimates by age groups (< 25, 25–44, 45–64, ≥ 65 years) and, in a separate analysis, by gender (female or male). We ran a crude model, but our base model was adjusted for age and gender. We further adjusted this base model for other covariates—one at a time and then all together. From these results, we used the percentage reduction in the coefficient for RII and SII to calculate the mediation proportion (attenuation) for each adjustment using the formula $100 \times (B_0 - B_1)/B_0$, where B_0 is the coefficient for the SEP variable in the base model and B_1 is the coefficient for the SEP variable in a model with the contributory factor. We carried out the analysis in R software, using the commands recommended by Moreno-Betancur et. al.[7]

RESULTS

We analyzed data from 763 885 confirmed cases of COVID-19 in Colombia that had complete information on the study variables. Of these cases, 50.65% were men and 26 064 (3.41%) resulted in death. Base models showed significant relative and absolute inequalities, both for the whole cohort and by subgroups (age and gender; Table 1 and Table A, available as a supplement to the online version of this article at http://www.ajph.org). Such inequalities were all in the expected direction (i.e., higher mortality at successively lower SEP levels). The magnitude of inequalities was higher among young adults and gradually decreased with age; for example, relative inequalities went from an RII of 5.65 (95% confidence interval [CI] = 3.25, 9.82) in participants younger than 25 years to an RII of 1.49 (95% CI = 1.41, 1.58) in those aged 65 years and older.

Overall, type of health insurance was the single most important factor, accounting for 19.9% and 58.8% of the relative and absolute inequalities, respectively. The role of health insurance was equally important for women and men; it was particularly relevant among younger adults, whereas it was significantly lower among those aged 65 years and older. Among those aged 25 to 44 years, health insurance explained 57.5% of the relative inequalities; this proportion was 47.9% for the youngest group and 36.8% for those aged 45 to 64 years. In the youngest group, living in an urban area, having hypertension, and belonging to an ethnic minority explained some of the relative inequalities (16.4%, 4.7%, and 6.6% lower RII, respectively). We observed a similar pattern for absolute inequalities (SII). The contribution of other factors was either of very low magnitude or not significant (Table 1).

DISCUSSION

Our findings provide evidence that significant socioeconomic inequalities exist in COVID-19 mortality in Colombia, both in relative and absolute terms. This is in line with studies from other settings showing similar social gradients.[3,4] Our results agree with those of Cifuentes et al., who provided evidence of differential mortality risk associated with age, gender, ethnicity, and SEP level in Colombia.[3] Importantly, our findings showed that type of health insurance was particularly relevant in explaining socioeconomic inequalities in COVID-19 mortality.

Although cardiovascular disease was not assessed because of lack of information, we included hypertension as a potentially relevant factor. Moreover, although we could not analyze more up-to-date data, recent higher daily death rates might have deepened inequalities, and the role of health insurance is likely to remain relevant as no structural changes to the health system have occurred in the past few months (at time of writing). Previous analyses have emphasized that the Colombian health insurance scheme does not seem to be helping to address

TABLE 1— Relative and Absolute Socioeconomic Inequalities in COVID-19 Mortality: Colombia, March 2–October 17, 2020

	RII (95% CI)	% Attenuation	SII (95% CI)	% Attenuation
All (n = 763 885)				
Crude model	2.13 (2.03, 2.23)	. . .	34.84 (24.80, 44.88)	. . .
Baseline model[a]	1.86 (1.77, 1.94)	. . .	37.83 (27.51, 48.15)	. . .
Health insurance[a]	1.49 (1.41, 1.57)	19.89	15.60 (9.98, 21.22)	58.76
Diabetes[a]	1.92 (1.84, 2.01)	−3.67	37.54 (27.27, 47.81)	0.78
Hypertension[a]	1.88 (1.79, 1.96)	−1.19	37.29 (27.05, 47.53)	1.43
Other comorbidities[a]	1.88 (1.80, 1.96)	−1.24	38.24 (27.83, 48.65)	−1.08
Any vulnerability situation[a]	1.93 (1.84, 2.01)	−3.80	41.53 (30.52, 52.53)	−9.76
Ethnicity (minorities, yes/no)[a]	1.85 (1.77, 1.93)	0.36	37.76 (27.56, 47.97)	0.19
Area of residence (urban/rural)[a]	1.88 (1.79, 1.96)	−1.22	38.12 (27.66, 48.58)	−0.75
All factors	1.60 (1.52, 1.69)	13.74	19.57 (13.17, 25.97)	48.26
Aged 0–24 y (n = 145 624)				
Crude model	5.64 (3.24, 9.82)	. . .	2.78 (1.32, 4.25)	. . .
Baseline model[a]	5.65 (3.25, 9.82)	. . .	2.78 (1.32, 4.24)	. . .
Health insurance[a]	2.94 (1.55, 5.57)	47.88	1.50 (0.43, 2.56)	46.12
Diabetes[a]	5.61 (3.22, 9.76)	0.71	2.75 (1.30, 4.21)	0.98
Hypertension[a]	5.38 (3.08, 9.38)	4.71	2.68 (1.24, 4.13)	3.54
Other comorbidities[a]	5.74 (3.31, 9.96)	−1.73	2.81 (1.34, 4.28)	−1.09
Any vulnerability situation[a]	5.74 (3.29, 10.03)	−1.70	2.80 (1.32, 4.28)	−0.68
Ethnicity (minorities, yes/no)[a]	5.27 (3.04, 9.14)	6.60	2.66 (1.24, 4.09)	4.15
Area of residence (urban/rural)[a]	4.72 (2.77, 8.04)	16.44	2.49 (1.15, 3.83)	10.42
All factors	2.33 (1.22, 4.43)	58.80	1.19 (0.19, 2.18)	57.35
Aged 25–44 y (n = 338 642)				
Crude model	3.96 (3.25, 4.83)	. . .	8.51 (5.39, 11.36)	. . .
Baseline model[a]	3.96 (3.25, 4.82)	. . .	8.60 (5.45, 11.75)	. . .
Health insurance[a]	1.68 (1.36, 2.09)	57.46	2.98 (1.46, 4.50)	65.34
Diabetes[a]	3.92 (3.22, 4.77)	1.08	8.47 (5.36, 11.57)	1.53
Hypertension[a]	4.01 (3.29, 4.88)	−1.15	8.59 (5.44, 11.74)	0.09
Other comorbidities[a]	4.01 (3.29, 4.88)	−1.23	8.68 (5.51, 11.84)	−0.90
Any vulnerability situation[a]	4.36 (3.56, 5.33)	−9.97	9.21 (5.88, 12.55)	−7.15
Ethnicity (minorities, yes/no)[a]	3.94 (3.24, 4.80)	0.52	8.56 (5.42, 11.70)	0.47
Area of residence (urban/rural)[a]	4.06 (3.33, 4.96)	−2.58	8.73 (5.53, 11.94)	−1.54
All factors	1.92 (1.54, 2.41)	51.41	3.91 (2.19, 5.62)	54.59
Aged 45–64 y (n = 196 176)				
Crude model	2.68 (2.62, 3.12)	. . .	51.83 (38.55, 65.12)	. . .
Baseline model[a]	2.73 (2.51, 2.98)	. . .	50.54 (37.47, 63.62)	. . .
Health insurance[a]	1.73 (1.57, 1.91)	36.76	25.43 (17.45, 33.41)	49.7
Diabetes[a]	2.73 (2.50, 2.97)	0.33	49.44 (36.60, 62.29)	2.18
Hypertension[a]	2.75 (2.52, 3.00)	−0.58	50.17 (37.16, 63.18)	0.74
Other comorbidities[a]	2.76 (2.53, 3.00)	−0.78	50.90 (37.75, 64.05)	−0.70
Any vulnerability situation[a]	2.93 (2.69, 3.19)	−7.13	54.30 (40.57, 68.02)	−7.42
Ethnicity (minorities, yes/no)[a]	2.71 (2.49, 2.96)	0.76	50.17 (37.27, 63.07)	0.74
Area of residence (urban/rural)[a]	2.78 (2.55, 3.02)	−1.52	51.17 (37.99, 64.36)	−1.25
All factors	1.86 (1.68, 2.06)	31.93	28.86 (20.36, 37.35)	42.91

Continued

TABLE 1— Continued

	RII (95% CI)	% Attenuation	SII (95% CI)	% Attenuation
Aged ≥ 65 y (n = 83 443)				
Crude model	1.56 (1.48, 1.65)	. . .	148.10 (115.52, 180.67)	. . .
Baseline model[a]	1.49 (1.41, 1.58)	. . .	135.84 (104.03, 167.64)	. . .
Health insurance[a]	1.44 (1.35, 1.54)	3.70	117.98 (88.03, 147.94)	13.14
Diabetes[a]	1.54 (1.45, 1.62)	−2.88	140.70 (108.47, 172.92)	−3.58
Hypertension[a]	1.50 (1.42, 1.59)	−0.61	136.33 (104.51, 168.16)	−0.37
Other comorbidities[a]	1.50 (1.42, 1.59)	−0.71	137.74 (105.64, 169.83)	−1.40
Any vulnerability situation[a]	1.53 (1.45, 1.62)	−2.58	144.74 (112.12, 177.35)	−6.55
Ethnicity (minorities, yes/no)[a]	1.49 (1.41, 1.58)	0.15	135.11 (103.83, 166.40)	0.53
Area of residence (urban/rural)[a]	1.51 (1.43, 1.59)	−0.92	138.29 (105.78, 170.81)	−1.81
All factors	1.52 (1.42, 1.63)	−1.98	132.15 (100.74, 163.57)	2.71

Note. CI = confidence interval; RII = relative index of inequality; SII = slope index of inequality. "All factors": age, gender, health insurance, diabetes, hypertension, other comorbidities, any vulnerability situation, ethnicity, and area of residence. "% attenuation": $100 \times (B_0 - B_1)/B_0$, where B_0 is the coefficient for the socioeconomic position (SEP) variable in the baseline model and B_1 is the coefficient for the SEP variable in a model with the contributory factor.

[a]Models adjusted by age and gender.

health inequalities, with systematic inequalities affecting the uninsured and those in the subsidized scheme (a scheme mainly funded through tax revenue for those without formal employment and classified as "poor" based on a proxy means test).[10]

The Colombian health system has been long recognized as fragmented and segmented. There is fragmentation in the care delivery processes, and coverage is different for those formally employed versus informal workers or those unemployed.[11] The COVID-19 pandemic has highlighted inequalities with differential access to preventive and testing measures and quality treatment, causing higher rates of COVID-19 infection and fatality rates among those from lower socioeconomic levels.[3]

PUBLIC HEALTH IMPLICATIONS

Disadvantaged populations are disproportionately burdened by COVID-19 mortality, and in Colombia, health insurance appears to be the main contributor to those inequalities. This poses a particular challenge for the design of public health strategies, with a structural change of the health system (needed for a long time) being more urgent than ever. Specifically, shifting toward universal coverage and high levels of integration and focusing on primary health care should be prioritized, as these features have been identified as key to developing strategies aimed at controlling emerging diseases and tackling social determinants of health inequalities.[12] This aim is crucial in order to make the country more equitable in the context of numerous challenges occasioned by the pandemic and a long-lasting internal conflict. AJPH

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N. Garzón-Orjuela and C. G. Guarnizo-Herreño drafted the article. N. Garzón-Orjuela and J. Eslava-Schmalbach analyzed the data. F. Gil contributed to data acquisition, analysis, and interpretation. All authors conceptualized and designed the study, interpreted the results, contributed to writing the article, gave their final approval, and agree to be accountable for all aspects of the work.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

The protocol was approved by the Ethics Committee, Medical School, National University of Colombia (minutes No. 011-091, June 2021).

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Cancer Care Access in Chile's Vulnerable Populations During the COVID-19 Pandemic

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Objectives. To examine the COVID-19 pandemic's impact on cancer care access in Chile, analyzing differential effects by insurance type, gender, and age.

Methods. We conducted a quasi-experimental study using interrupted time series analysis. We used multiple data sources for a broad evaluation of cancer-related health care utilization from January 2017 to December 2020. We fit negative binomial models by population groups for a range of services and diagnoses.

Results. A sharp drop in oncology health care utilization in March was followed by a slow, incomplete recovery over 2020. Cumulative cancer-related services, diagnostic confirmations, and sick leaves were reduced by one third in 2020; the decrease was more pronounced among women and the publicly insured. Early diagnosis was missed in 5132 persons with 4 common cancers.

Conclusions. The pandemic stressed the Chilean health system, decreasing access to essential services, with a profound impact on cancer care. Oncology service reductions preceded large-scale lockdowns and supply-side disruptions. Importantly, not all population groups were equally affected, with patterns suggesting that gender and socioeconomic inequalities were exacerbated. (*Am J Public Health*. 2022;112(S6):S591–S601. https://doi.org/10.2105/AJPH.2021.306587)

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Over 1.3 million COVID-19 cases and 37 000 COVID-related deaths were confirmed in Chile by May 2021.[1] The pandemic has deepened existing health inequalities, with evidence of a strong association between socioeconomic status and COVID-19–related mortality.[2]

Health service utilization has decreased during the pandemic, even for serious conditions. The main drivers of this trend are fear of contracting COVID-19 and disruptions caused by diversion of resources to address the pandemic.[3,4] The countries most affected are those with persistent community transmission,[4] such as the majority of Latin American nations, including Chile.

Cancer produces a substantial disease burden globally and is the second-leading cause of death in Chile.[5] Survival outcomes remain poor, with little improvement over the last decade.[6] Therefore, cancer care disruptions are worrisome, particularly in communities such as low-income groups that face access barriers.

A growing body of literature is beginning to evaluate the pandemic's impact on cancer care.[3,7] A systematic review reported up to 26.3% reductions in cancer treatment and up to 30% decreases in hospitalizations compared with prepandemic figures; although there were no country restrictions, most of the studies included took place in North America and Europe, with a few from India and Indonesia.[3] Breast and colorectal cancer screening rates fell by 86% to 94% in April 2020 in the United States,[8] and cancer diagnoses decreased by 33% in Denmark[9] by May 2020. Although this research focused on a single phase of the care continuum, it provides some evidence of an unequal impact of the pandemic, especially among disadvantaged populations.[10,11] However, it is important to note that most studies to date have

analyzed only the early effects of the pandemic, and few have considered later stages of the pandemic.[12,13] Additionally, there is scarce evidence from Latin America,[3,7] one of the regions worst hit by COVID-19.[14] This region suffered from highly unequal health systems[15] and large gaps in cancer care access before the pandemic.[16] The most recent regional studies reported 1-year comparisons, limited to a small sample of health care centers, and did not include cancer diagnoses.[17,18]

This study aimed to examine the impact of the SARS-COV-2 (severe acute respiratory syndrome coronavirus 2) pandemic on cancer care access, analyzing disruption of health service utilization, diagnostic confirmations, and cancer-related sick leave in Chile, a country with a highly unequal health system and low cancer care performance. This setting is comparable to the realities of other low- and middle-income countries in Latin America and other regions with scarce evidence on the impact of the pandemic on cancer care. We used several data sets to assess whether effects have varied by insurance type—a proxy of socioeconomic status in Chile—or demographic characteristics such as gender and age.

METHODS

We conducted a quasi-experimental study using an interrupted time series analysis approach to examine changes in cancer service access attributable to the pandemic, including outpatient care, laboratory and imaging tests, diagnostic confirmations, and sick leave. The next sections provide an overview of the study setting, data sources, and statistical analysis.

Study Setting

Chile has a fragmented health care system, with public and private actors serving as payers and providers. Around 78% of the population is enrolled in public health insurance (Fondo Nacional de Salud, or FONASA), with private insurance companies (Instituciones de Salud Previsional, or ISAPREs) covering another 17%.[19] FONASA beneficiaries are mainly low- and middle-income groups, whereas ISAPRE beneficiaries tend to have a higher income.[19] Hence, insurance type can be used as a proxy of socioeconomic status in the context of health care access.[20]

In 2005, Chile implemented a health reform known as GES (Garantías Explícitas en Salud) that ensures timely, affordable, and quality access for 80 prioritized health conditions, including several cancers.[20] Case reports for these conditions are mandatory for public and private providers, but submissions were suspended during the pandemic for all but the 7 cancers included in this study.

Data

We used 3 data sets containing anonymized administrative records with national coverage for individual-level data. The digital health platform IMED shared data on outpatient services (10 873 188 individuals, 7 031 064 cancer-related service claims) and sick leaves (2 903 956 individuals, 111 758 cancer-related sick leaves) from January 1, 2018 to December 31, 2020. IMED handles 82.2% of private outpatient service claims for publicly and privately insured persons and 58.6% of sick leaves issued for formal workers under FONASA or ISAPREs. Further details on data coverage are available in Part 1 of the Appendix (available as a supplement to the online version of this article at http://www.ajph.org). We obtained other data sets from FONASA, including the GES database of confirmed cases (187 343 records) for the publicly insured population from January 1, 2017 to December 31, 2020. We also used 2 aggregate data sets. The first was provided by the health regulatory agency[21] and includes aggregate quarterly GES diagnostic confirmations via public and private insurers (see the Appendix, Part 2 for details), as the latter was unavailable at the individual level. Finally, because sick leave figures are applicable only to the economically active population, we used official employment data[22] to explore whether changes in sick-leave patterns could be explained by unemployment levels.

We grouped the data into 3 categories:

1. oncology health services,
2. sick leaves, and
3. diagnostic confirmations.

We analyzed the pandemic's impact on each of these factors for

1. all cancers,
2. colorectal,
3. cervical,
4. stomach,
5. breast, and
6. prostate cancer.

We also assessed other cancer sites when data were available. More information on case definitions is available in Part 3 of the Appendix.

Statistical Analysis

Our outcome variable was the number of outpatient health services performed, diagnostic confirmations

reported, and sick leaves issued per week, aggregated by service or cancer type. We fit generalized linear models with a negative binomial distribution using a log link function based on a segmented regression analysis approach[23] (Appendix, Part 1). The pandemic starting date, defined as the intervention or exposure event, was March 15 (week 11), when the first public health interventions were implemented.

Our complete model included variables for time (weeks since the start of the study); a dummy variable for the pandemic period, to capture the level change immediately following pandemic onset; the interaction between pandemic and number of weeks since intervention onset (to assess the slope change following pandemic onset); gender; insurance (public or private); age by decade; and variables to adjust for seasonal trends. Because of data limitations, we used counts per quarter as outcomes and did not include gender or age when analyzing diagnostic confirmations by insurance type.

We ran separate models for the aggregated series and by cancer or service type, stratifying for gender, age, and insurance to test for heterogeneity. Models stratified by gender did not include gender-specific cancers. We also ran an aggregated model for newly issued sick leaves. More information about models and assumptions can be found in Parts 1 and 2 of the Appendix.

To complement our main analysis, we measured the effect of COVID-19 on formal employment, to rule out the hypothesis that changes in sick leave could be completely explained by reduced numbers of formal workers, the only group eligible for this benefit (Appendix, Part 4). We used screening test detection rates to estimate missed cancer diagnoses because of reduced screening and diagnostic capacity[24–27] (Appendix, Part 5).

For all regression models, we report incidence rate ratios (IRRs), cumulative absolute (counts), and relative effects with 95% confidence intervals (CIs). Goodness-of-fit statistics are reported in Appendix, Part 6. We conducted the health service, sick-leave, and employment analyses in R 4.0.2. We performed the diagnostic confirmation analysis in Stata version 16.0 (StataCorp LP, College Station, TX). We followed the RECORD statement for reporting[28] (Appendix, Part 7).

RESULTS

A significant decrease in access to outpatient services (Table 1) occurred immediately after pandemic onset (IRR = 0.23; 95% CI =0.21, 0.25), followed by a significant recovery slope over the rest of the year (IRR =1.05; 95% CI =1.04, 1.05). The recovery in service delivery during the final months was insufficient to compensate for the initial loss. The abrupt reduction in cancer service utilization was related to school closures (March 16) and preceded stay-at-home mandates (March 26), supply-side interventions (April 9), and national lockdowns (May 13; Figure 1). We estimated that over 819 941 consultations, diagnostic tests, and other outpatient services were not performed in 2020 by private providers, equivalent to a 34.87% reduction from expected numbers of cancer-related services (Table 1).

Similarly, we identified a large reduction in diagnostic confirmations (Table 1) by public providers for 7 cancers immediately after initiation of the outbreak (IRR =0.33; 95% CI =0.29, 0.37). Even with a slow but significant recovery slope over the following weeks (IRR =1.03; 95% CI =1.02, 1.03), cancer diagnoses at the end of the year remained below expected numbers for 2020 in a normal-year scenario. We estimated a cumulative decrease of 22 838 diagnostic confirmations, equivalent to a 34.82% reduction from expected figures (Table 1).

We found a significant decrease in cancer-related sick leaves (Table 1) attributable to the pandemic as well (IRR =0.81; 95% CI =0.73, 0.90), although the reduction was not as abrupt as that for outpatient services and diagnostics. There was no observable recovery over the year for this variable (IRR =0.99; 95% CI =0.99, 0.99). We estimated that 6071 persons in the employed population with incident cancers went undiagnosed because of the pandemic, equivalent to a 30.83% reduction from the expected number of cancer-related sick leaves (Table 1). The pandemic also affected formal employment, and it should be noted that sick leave after cancer diagnosis is only applicable to formal workers. However, our results cannot be completely explained by this phenomenon, suggesting that an actual reduction in access to cancer services occurred for patients in the early phases of their disease (Appendix, Part 4).

Although the peak of service reductions preceded the peak of COVID-19 cases, reactivation of the health care provision was closely related to reduced COVID-19 incidence (Figure 2). Interestingly, at the beginning of the second epidemic wave in Chile, later in 2020, service provision dropped again, reinforcing the close link between the magnitude of COVID-19 case incidence and reduction in the utilization of cancer-related health services.

TABLE 1— Impact of the COVID-19 Pandemic on Cancer-Related Outpatient Services, Diagnostic Confirmations, and Sick Leaves, Shown in Model Coefficients and Cumulative Reduction of Services: Chile, 2020

	Cancer-Related Outpatient Services[a]				Cancer Sick Leaves				Cancer Diagnostic Confirmations			
Models	Pandemic Immediate Effect, IRR (95% CI)	Pandemic Trend Effect, IRR (95% CI)	Cumulative Absolute Effect, No. (95% CI)	Cumulative Relative Effect, % (95% CI)	Pandemic Immediate Effect, IRR (95% CI)	Pandemic Trend Effect, IRR (95% CI)	Cumulative Absolute Effect, No. (95% CI)	Cumulative Relative Effect, % (95% CI)	Pandemic Immediate Effect, IRR (95% CI)	Pandemic Trend Effect, IRR (95% CI)	Cumulative Absolute Effect, No. (95% CI)	Cumulative Relative Effect, % (95% CI)
General	0.23 (0.21, 0.25)	1.05 (1.04, 1.05)	819 941 (704 556, 953 067)	34.87 (33.89, 35.84)	0.81 (0.73, 0.90)	0.99 (0.99, 0.99)	18 621 (15 687, 22 071)	30.80 (29.80, 31.80)	0.33 (0.29, 0.37)	1.03 (1.02, 1.03)	22 838 (19 002, 26 674)	34.82 (33.91, 35.5)
Gender[b]												
Female	0.17 (0.16, 0.19)	1.05 (1.05, 1.06)	192 870 (170 962, 217 479)	43.65 (42.92, 44.37)	0.75 (0.67, 0.83)	0.99 (0.99, 1.00)	3 916 (3 296, 4 645)	29.88 (28.88, 30.87)	0.29 (0.27, 0.31)	1.03 (1.03, 1.03)	20 031 (18 569, 21 493)	38.34 (38.17, 38.48)
Male	0.22 (0.21, 0.24)	1.05 (1.04, 1.05)	92 785 (82 381, 104 439)	38.94 (38.19, 39.68)	0.86 (0.77, 0.95)	0.99 (0.98, 0.99)	7 490 (6 247, 8 964)	30.18 (29.11, 31.23)	0.34 (0.35, 0.44)	1.02 (1.02, 1.03)	3 510 (3 014, 4 007)	30.15 (29.38, 30.75)
Insurance[c]												
Private	0.18 (0.16, 0.20)	1.05 (1.05, 1.05)	533 693 (446 563, 637 120)	42.95 (41.86, 44.01)	0.80 (0.71, 0.89)	0.99 (0.99, 1.00)	6 218 (5 101, 7 559)	26.85 (25.65, 28.03)	0.10 (0.08, 0.11)	2.45 (2.23, 2.69)	1 203 (659, 1 746)	17.99 (11.89, 22.32)
Public	0.28 (0.25, 0.32)	1.04 (1.04, 1.05)	293 061 (232 588, 367 478)	26.01 (24.44, 27.54)	0.82 (0.71, 0.95)	0.99 (0.98, 0.99)	12 961 (10 210, 16 416)	34.15 (32.77, 35.51)	0.56 (0.30, 1.06)	1.36 (0.95, 1.95)	415 433 (366 791, 464 074)	52.95 (52.22, 53.54)
Age, y[d]												
0–10	0.29 (0.26, 0.33)	1.03 (1.03, 1.03)	7 344 (6 226, 8 655)	45 (44.02, 45.96)	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
10–20	0.21 (0.19, 0.24)	1.05 (1.04, 1.1)	12 366 (10 328, 14 786)	41.59 (40.42, 42.74)	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
20–30	0.27 (0.24, 0.30)	1.042 (1.039, 1.046)	56 545 (45 929, 69 389)	31.06 (29.58, 32.51)	0.83 (0.68, 1.02)	0.99 (0.98, 0.99)	732 (529, 1 008)	30.69 (28.81, 32.53)	0.49 (0.39, 0.61)	1.01 (1.01, 1.02)	1 712 (1 249, 2 175)	27.65 (25.54, 28.81)
30–40	0.26 (0.23, 0.30)	1.05 (1.04, 1.05)	102 400 (82 245, 126 978)	28.99 (27.42, 30.53)	0.79 (0.70, 0.91)	0.99 (0.99, 1.00)	2 265 (1 785, 2 863)	27.52 (26.02, 28.98)	0.36 (0.30, 0.44)	1.02 (1.02, 1.03)	3 125 (2 382, 3 868)	33.73 (32.17, 34.77)
40–50	0.23 (0.20, 0.26)	1.05 (1.05, 1.05)	165 540 (134 574, 202 908)	29.32 (27.84, 30.77)	0.81 (0.71, 0.93)	0.99 (0.99, 1.00)	3 555 (2 844, 4 429)	27.9 (26.51, 29.26)	0.30 (0.26, 0.35)	1.03 (1.02, 1.03)	4 612 (3 872, 5 352)	37.70 (37.11, 38.14)
50–60	0.22 (0.19, 0.24)	1.05 (1.05, 1.06)	166 707 (137 395, 201 697)	30.81 (29.43, 32.16)	0.84 (0.73, 0.96)	0.99 (0.98, 0.99)	5 467 (4 377, 6 810)	30.97 (29.6, 32.31)	0.30 (0.26, 0.34)	1.03 (1.02, 1.03)	4 780 (4 077, 5 483)	37.63 (37.21, 37.95)

Continued

TABLE 1— Continued

	Cancer-Related Outpatient Services[a]				Cancer Sick Leaves				Cancer Diagnostic Confirmations			
60–70	0.2 (0.178, 0.225)	1.05 (1.05, 1.06)	156 161 (128 977, 188 676)	35.78 (34.45, 37.08)	0.80 (0.71, 0.90)	0.99 (0.98, 0.99)	4 917 (4 024, 5 996)	32.66 (31.46, 33.85)	0.31 (0.27, 0.36)	1.03 (1.02, 1.03)	3 840 (3 288, 4 393)	35.48 (34.85, 35.97)
70–80	0.17 (0.15, 0.19)	1.06 (1.05, 1.06)	97 257 (80 074, 117 923)	39.97 (38.67, 41.24)	0.79 (0.66, 0.95)	0.99 (0.98, 0.99)	1 309 (981, 1 741)	33.66 (31.92, 35.37)	0.30 (0.26, 0.34)	1.03 (1.02, 1.04)	2 853 (2 468, 3 236)	33.94 (33.63, 34.19)

Note. absolute effects = difference between adjusted counts and counterfactual scenarios in 2020; CI = confidence interval; IRR = incidence rate ratio; pandemic immediate effect = level change at the beginning of the pandemic; pandemic trend effect = recovery slope since the beginning of the pandemic; relative effects = absolute effect divided into the counterfactual estimate; time trend = secular tendency slope. Cancer-related outpatient services includes 17 cancer-related health services grouped in stomach cancer, colorectal cancer, cervical cancer, breast cancer, prostate cancer, and nonspecific cancer-related services. Cancer-related sick leaves incorporate all sick leaves with C00-C97 *International Classification of Diseases, 10th Revision* (*ICD-10;* Geneva, Switzerland: World Health Organization; 1992) codes. Diagnostic confirmations refer to medical diagnosis for stomach cancer, colorectal cancer, lymphoma, leukemia, cervical cancer (includes dysplasia), breast cancer (includes carcinoma in situ), and testicular cancer. Models adjust for gender, insurance, and age.

[a]Cancer-related outpatient services include data only from private providers. Data for sick leaves and diagnostic confirmations in age groups younger than 20 years were not included because of small sample size. Diagnostic confirmation model stratified by insurance used quarterly aggregated data.
[b]Stratified by gender and adjusted for insurance and age.
[c]Stratified by insurance and adjusted for gender and age.
[d]Stratified by age and adjusted for gender and insurance.

Differential Impact by Population Subgroup

The impact of the pandemic on utilization of cancer-related services was heterogeneous across population subgroups (Table 1). The reduction was more pronounced among females, leading to a reduction of 43.65% (95% CI =42.92%, 44.37%), compared with 38.94% (95% CI =38.19%, 39.68%) for males. Effects on diagnostic confirmations were also greater in females (females: 38.34%, 95% CI =38.17%, 38.48%; males: 30.15%, 95% CI =9.38%, 30.75%). We found no significant differences by gender for sick-leave claims.

There were significant differences by insurance type. The publicly insured population suffered a greater impact in terms of diagnostic confirmations and cancer-related sick leaves, suggesting that the pandemic imposed steeper access barriers for lower- versus higher-income groups. The relative decrease in diagnostic confirmations among the publicly insured was 3 times the reduction observed for the privately insured group, for all cancer sites (Table 1). Similarly, we found a larger reduction in cancer-related sick leaves among the publicly insured (34.15%; 95% CI =32.77%, 35.51%) than among private insurance beneficiaries (26.85%; 95% CI =25.65%, 28.03%).

Nevertheless, reductions in utilization of private outpatient services (data for public providers not available; see Methods) were greater for the privately insured, at 42.95% (95% CI =41.86%, 44.01%) versus 26.01% (95% CI = 24.44%, 27.54%; Table 1) for the publicly insured. This seemingly contradictory finding could be explained by increased demand for private care

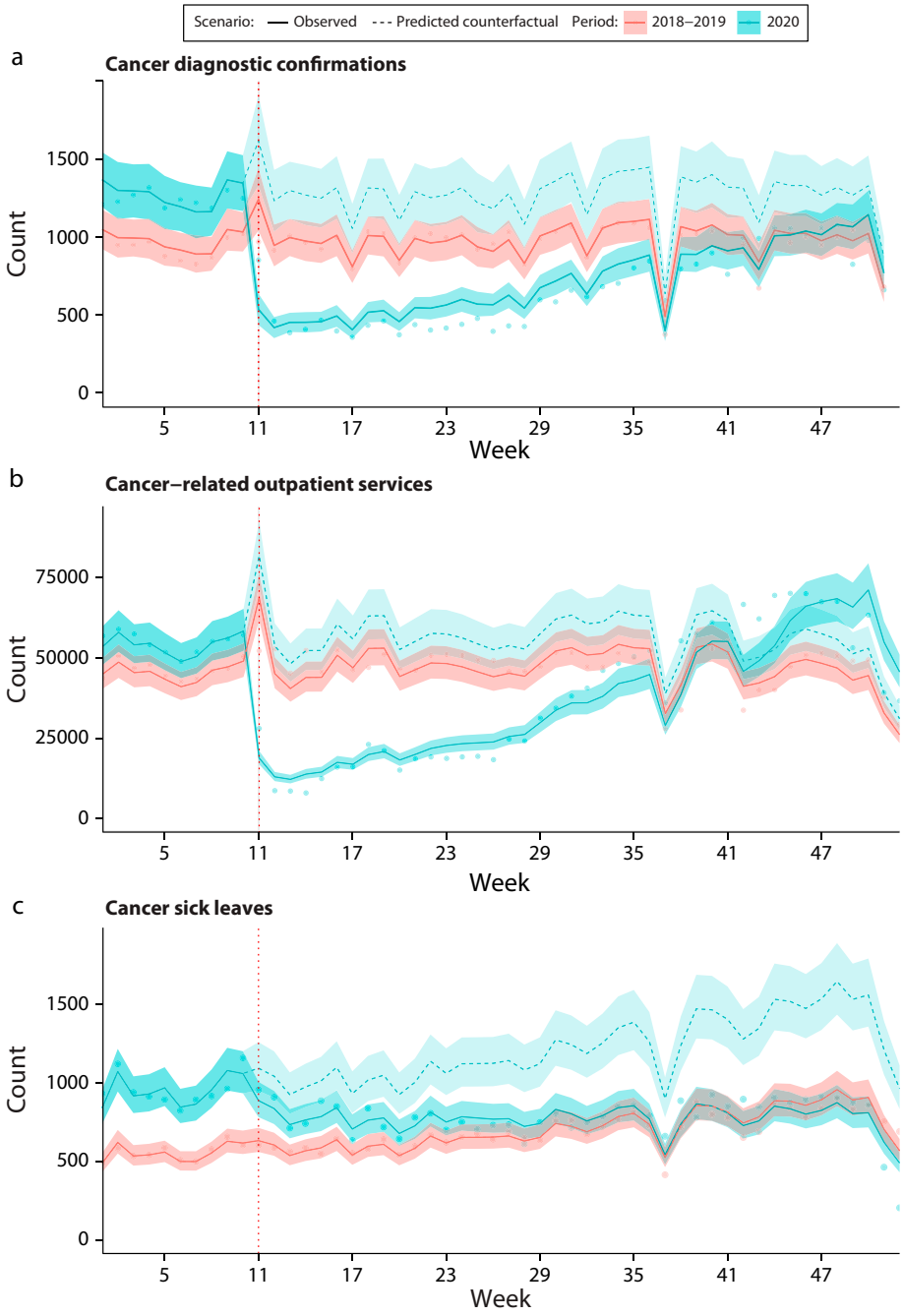

FIGURE 1— Oncology Health Care Utilization Before and After Pandemic Onset for (a) All Cancer Diagnostic Confirmations, (b) All Cancer-Related Outpatient Services, and (c) All Cancer-Related Sick Leaves: Chile, 2018–2020

Note. Points represent the observed numbers of diagnostic confirmations reported, health services performed, and sick leaves issued (counts) per week. Cancer-related outpatient services include 17 cancer-related health services grouped into stomach cancer, colorectal cancer, cervical cancer, breast cancer, prostate cancer, and nonspecific cancer-related services. Cancer-related sick leaves incorporate all sick leaves with C00-C97 *International Classification of Diseases, 10th Revision* (*ICD-10;* Geneva, Switzerland: World Health Organization; 1992) codes. Diagnostic confirmations refer to medical diagnosis for stomach cancer, colorectal cancer, lymphoma, leukemia, cervical cancer (includes dysplasia), breast cancer (includes carcinoma in situ), and testicular cancer. Solid lines are the point estimates for the fitted model, and segmented lines represent the predicted counterfactual after pandemic onset (intervention). Colored areas around the lines are 95% confidence intervals for the fitted models. In red, we show the average counts observed in years 2018 and 2019. In blue are counts observed during 2020 and the predicted counterfactual for 2020 after the intervention. The vertical dotted line represents the first week of population-level interventions for COVID-19 in Chile (week 11), used as the reference date for pandemic onset.

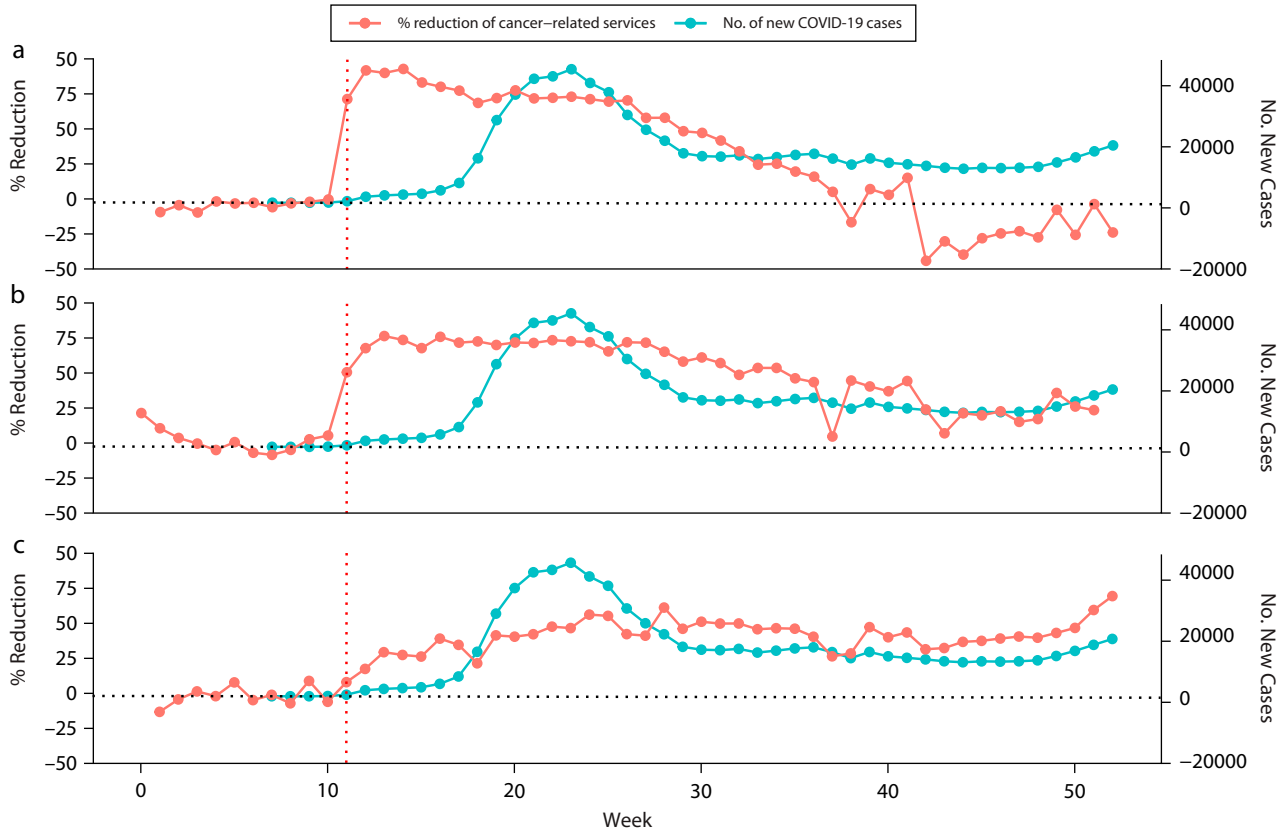

FIGURE 2— Weekly Number of New COVID-19 Cases vs Weekly Percent Reduction in (a) Cancer-Related Outpatient Health Services, (b) Diagnostic Confirmations, and (c) New Sick Leaves: Chile, 2020

Note. The percent reduction compares the weekly number of health services performed against the counterfactual predicted by the statistical model for the aggregated data. The vertical dotted line represents the first week of population-level interventions (such as school closures) for COVID-19 in Chile (week 11), used as the reference date for pandemic onset. Other relevant measures adopted later were stay-at-home mandates (week 12); supply-side interventions (week 14), such as human resource diversion and surgery suspension; and lockdowns (week 19).

among the publicly insured. We found evidence of a substantial growth in the number of publicly insured persons seeking care at private providers since the beginning of the pandemic (Appendix, Part 8).

A U-shaped effect by age was observable for outpatient health services and sick leaves, with a greater impact on the youngest and oldest age groups (Table 1). In contrast, more significant reductions in diagnostic confirmations occurred in the middle-aged population (40–60 years), with a 37.7% reduction, which suffered the highest number of missed diagnoses.

Heterogeneity Across Specific Cancers

The absolute and relative reductions in health care access by cancer type are shown in Table 2 for selected cancers (see Appendix, Part 9 for other cancer sites). The greatest impact was for cervical cancer. Cervical cancer diagnostic confirmations, including for premalignant lesions, fell by 42.84% in 2020. Rates for diagnostic tests such as Papanicolaou smear tests, colposcopies, and cervical biopsies were reduced by 33.84%, 28.30%, and 15.06%, respectively. The milder impact on biopsies compared with smear tests could suggest that low-risk individuals decreased access to screening more sharply than high-risk women, or that the health system adequately fast-tracked more severe clinical cases to biopsy. The impact on diagnostic and treatment initiation among middle-aged women (active workers) measured using sick-leave data were equivalent to a 24.63% drop.

We found that there was a minor—but still sizable and significant—pandemic-related reduction in access to diagnostic and treatment services for cancers that often have an acute

TABLE 2— Absolute and Relative Reduction in Cancer Diagnostic Confirmations and Sick Leave by Insurance Type: Chile, 2020

Cancer Type and Access Indicator	Public Insurance		Private Insurance		RRR (95% CI)
	Absolute Effect (95% CI)	Relative Effect, % (95% CI)	Absolute Effect (95% CI)	Relative Effect, % (95% CI)	
All cancers					
Diagnostic confirmations	415 433 (366 791, 464 074)	52.95 (52.22, 53.54)	1 203 (659, 1746)	17.99 (11.89, 22.32)	2.94 (2.4, 4.39)
Sick leaves	12 961 (10 210, 16 416)	34.15 (32.77, 35.51)	6 218 (5 101, 7 559)	26.85 (25.65, 28.03)	1.27 (1.27, 1.28)
Cervical cancer (includes dysplasia)					
Diagnostic confirmations	401 475 (356 593, 446 356)	54.90 (54.24, 55.44)	373 (352, 394)	20.49 (20.41, 20.59)	2.68 (2.66, 2.69)
Sick leaves	373 (226, 609)	35.71 (32.07, 39.14)	38 (13, 94)	15.97 (9.68, 21.75)	2.24 (1.8, 3.31)
Colorectal cancer					
Diagnostic confirmations	6 029 (5 042, 7 016)	36.78 (34.72, 38.42)	26 (–5, 56)	4.11 (–0.01, 7.97)	8.95[a]
Sick leaves	1 609 (1 253, 2 060)	36.01 (34.37, 37.6)	406 (278, 581)	19.37 (16.81, 21.84)	1.86 (1.72, 2.04)
Stomach cancer					
Diagnostic confirmations	4 606 (4 071, 5 141)	28.76 (27.67, 29.69)	17 (2, 33)	8.62 (0.96, 13.98)	3.34 (2.12, 28.82)
Sick leaves	584 (416, 816)	35.69 (33.69, 37.62)	115 (59, 215)	21.82 (17.4, 25.96)	1.64 (1.45, 1.94)
Breast cancer					
Diagnostic confirmations	2 712 (860, 4 564)	17.44 (7.65, 22.98)	698 (407, 988)	22.33 (15.84, 26.87)	0.78 (0.48, 0.86)
Sick leaves	2 056 (1 629, 2 589)	37.55 (36.08, 38.98)	1 169 (898, 1 512)	28.31 (26.39, 30.17)	1.33 (1.29, 1.37)
Lymphoma					
Diagnostic confirmations	421 (172, 670)	7.61 (5.15, 9.67)	39 (–46, 124)	23.61 (–7.38, 36.54)	0.32[a]
Sick leaves	436 (290, 647)	28.61 (25.71, 31.39)	80 (31, 157)	7.12 (3.65, 10.45)	4.02 (3, 7.04)
Leukemia					
Diagnostic confirmations	99 (61, 137)	15.02 (7.29, 20.68)	54 (–10, 177)	9.13 (–19.2, 20.14)	1.65[a]
Sick leaves	23 (–1, –75)	5.4 (–0.46, 10.89)	77 (33, 153)	11.89 (7.53, 16.03)	0.45 (–0.06, 0.68)
Testicular cancer					
Diagnostic confirmations	90 (–10, 189)	7.29 (–1.2, 11.73)	−4 (–41, 33)	−1.68 (–23.69, 9.71)	. . .[a,b]
Sick leaves	149 (74, 275)	19.57 (14.69, 24.14)	104 (49, 202)	18.91 (13.93, 23.56)	1.03 (1.02, 1.05)
Prostate cancer[c]					
Sick leaves	1 071 (796, 1 436)	39.97 (38.06, 41.81)	298 (193, 455)	29.1 (26.1, 31.96)	1.37 (1.31, 1.46)

Note. CI = confidence interval; RRR = relative reduction ratio between public and private insured populations; absolute effect = difference between adjusted counts and counterfactual scenarios in 2020; relative effect = absolute effect divided into the counterfactual estimate. Negative values indicate an increment instead of a reduction.

[a]RRR confidence interval was not calculated since private insurance reported an increment instead of a reduction.
[b]RRR for testicular cancer diagnostic confirmation was not calculated since private insurance reported an increment instead of a reduction.
[c]Diagnostic confirmation data for prostate cancer is unavailable. Cancer-related sick leaves for all cancers incorporate sick leaves with C00-C97 *International Classification of Diseases, 10th Revision* (*ICD-10*; Geneva, Switzerland: World Health Organization; 1992) codes. Diagnostic confirmations for all cancers refer to medical diagnoses for stomach cancer, colorectal cancer, lymphoma, leukemia, cervical cancer (includes dysplasia), breast cancer (includes carcinoma in situ), and testicular cancer. Diagnostic confirmation results by insurance used quarterly aggregated data from the *Superintendencia de Salud*.

clinical presentation in younger populations, such as leukemia, lymphoma, or testicular cancer. Additionally, we observed substantial differences in diagnostic changes for colorectal, cervical, and gastric cancers between publicly and privately insured populations. This unequal impact was as great as a 9-fold difference for reductions in colorectal cancer diagnoses and a 3-fold difference for stomach cancer (Table 2). Similar patterns were observable for

sick leave in terms of the most markedly affected cancer types.

On the basis of the observed reduction in diagnostic and screening services, we estimated 848 breast, 300 cervical, 1784 stomach, and 2200 colorectal cancers could have been missed because of limited access to cancer-screening services in privately and publicly insured populations during 2020 (Appendix, Part 5). Considering the expected incidence for the Chilean population during 2020, we projected a 33.54% (95% CI =31.17%, 34.83%) reduction in diagnoses for these 4 cancers during the 2020 pandemic period.

DISCUSSION

Our study confirmed a large reduction in oncology health service utilization, diagnostic confirmations, and sick leaves because of COVID-19. The number of services not provided, a proxy of unmet need, was 33.9% to 35.8%, suggesting that a substantial number of cancer patients faced disruptions in access to essential services. The reduction in new sick leaves (related to incident cancers) was similar, at 32.1% to 34.1%, as well as the reduction in diagnostic confirmations, at 34.8%. Moreover, on the basis of GLOBOCAN's projected number of incident cancers in Chile for 2020,[29] we estimated a 33.54% reduction in incident cancer diagnoses. These consistent findings underline the magnitude of the problem, which could exact long-standing effects on morbidity and mortality for cancer patients who missed timely diagnoses and early treatment. The findings are particularly worrisome in the context of a health system with low baseline levels of early detection and treatment, leading to poor cancer survival outcomes.[6]

In this study, oncology health service utilization dropped precipitously in the middle of March, when the first control measures were established. Interestingly, the response preceded the stay-at-home mandates (March 26) and lockdowns (May 13). Furthermore, supply-side interventions (human resource diversion and surgery suspension, among others) that could reduce access to non-COVID-19 health services were implemented later, on March 24. Therefore, at least in the very early phase of the pandemic, the abrupt reduction in service utilization could be attributed largely to demand-side factors such as fear of contagion. This idea is compatible with data from Chilean surveys.[30]

Importantly, these data confirmed an unequal impact of the pandemic. Effects on diagnostic confirmations and sick leaves revealed a major impact on public insurance beneficiaries. The milder impact on private outpatient service utilization among the publicly insured could be a consequence of migration to private care attributable to diminished availability in the public sector. Although there was some limited migration from private to public insurance affiliation during the pandemic,[31] our data suggest that the publicly insured also sought care in the private sector in the face of inadequate access to public providers. Decreased service availability was more pronounced in publicly insured populations, who were more likely to experience cancelled appointments compared with privately insured groups.[30]

Women were another group especially affected, suffering more severe reductions in cancer care access than men. This finding could be a consequence of measures adopted to control the pandemic, such as school closures, which increase caregiving responsibilities that disproportionately fall on women, combined with higher unemployment rates and greater reductions in income.[32] Both mechanisms could explain decreased access to health services.

The age groups most affected by the reductions in outpatient service and sick-leave utilization were the youngest and oldest; however, the opposite occurred for diagnostic confirmations. This divergent impact could be linked to patterns of clinical presentation at diagnosis. Diagnostic confirmations for severe symptomatic cases are less prone to be disrupted, potentially explaining a more pronounced drop in diagnostic tests that did not translate into a similar effect on cancer detection in the older age group.

Our findings on the early impact of the pandemic on outpatient services are on the higher end of estimates in other contexts. For example, previous studies found that mammogram rates dropped by 32% to 98%[12,17] and colonoscopies 55% to 95%[12,33] in March and April 2020, whereas we identified early effects of 85.2% and 69.0%, respectively. Studies in the United States and the Netherlands found that cancer services returned to normal rates by June or July 2020,[12,13] which we did not see in our data. COVID-19 cases in Chile were at the highest levels of 2020 at that time, with lockdowns in place, unlike countries in the Northern Hemisphere, which could explain the discrepancies. The longer period of disruption in Chile compared with high-income countries suggests a greater burden from cancer in the foreseeable future.

Relatedly, we found a greater decrease in overall cancer diagnoses in the early phases of the pandemic than

other studies. The average reduction between March and May was 64.8% for our publicly insured population, whereas previous analyses found effects of 24% to 51%.[9–11] The same pattern was observed by cancer type. For instance, we found a greater impact for breast cancer than other reports (30%–51% decrease in prior studies[9,10] vs 61.8% in our population). The greater impact observed in Chile could be attributed to the relatively higher levels of SARS-CoV-2 transmission compared with other countries,[34] producing a more profound disruption on health service access.

Strengths and Limitations

Among the strengths of our study are the consistent results obtained from multiple information sources. Furthermore, the robust empirical strategy was supported by access to individual-level data with a sample size large enough to perform subgroup analyses by cancer type, gender, insurance, and age. However, it should be noted that because the data come from administrative sources, coverage for some population groups was incomplete. In addition, because of the observational nature of the data, we cannot rule out significant residual confounding. Nevertheless, the consistency and robustness of our results suggest that the limitations were properly mitigated, and our conclusions are unlikely to change substantially. Our estimates of potentially missed diagnoses should be interpreted cautiously, as our cancer incidence and missed screening test figures may differ from those of population samples from previously published studies. Finally, we were not able to include data on inpatient services. This area may have suffered significant disruptions, even for previously diagnosed patients, limiting access to surgeries and other cancer therapies. Future research to analyze the impact of the pandemic on the continuum of care for cancer patients after diagnosis is needed.

Public Health Implications

The pandemic stressed the Chilean health care system, reducing access to cancer services. It is likely that the same issues affected other chronic diseases, with fear of contagion and resource diversion to cope with COVID-19 patients as the most likely drivers. Supply-side factors, which are potentially modifiable and could amplify inequities between population subgroups, require special consideration. We found that public insurance beneficiaries increased their utilization of private providers, incurring out-of-pocket expenses. Policy responses must address these issues, vis-à-vis ongoing efforts to mitigate the pandemic. We recommend regular surveillance of cancer and other chronic disease services disaggregated by age, gender, and insurance (or other proxies for socioeconomic status) during the pandemic. Not all groups are equally affected, and the response must take these differential consequences into account.

Developing a strategic plan for reintroducing activities for early detection of cancer should be a priority.[17] Primary and specialist oncology care should be included in this effort, allocating the appropriate resources to expand capacity. Offering cancer screenings in community settings whenever possible could make these services more easily accessible to those most affected. In addition, a robust communication campaign could be implemented to address fear of contagion and provide information about the risks of delayed cancer diagnosis. In the long term, the National Cancer Control Program should consider this new public health context, providing the financing mechanisms and flexibility both to address the backlog of cancer patients and prepare for future disruptions.

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CONTRIBUTORS

C. Cuadrado was responsible for conceptualization, funding acquisition, investigation, methodology, project administration, supervision, and writing (original draft, review, and editing). F. Vidal was responsible for data curation, formal analysis, investigation, software, visualization, and writing (original draft, review, and editing). J. Pacheco was responsible for data curation, formal analysis, investigation, software, and writing (original draft, review, and editing). S. Flores-Alvarado was responsible for data curation, formal analysis, investigation, methodology, software, validation, visualization, and writing (original draft, review, and editing).

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Statistical code and aggregated data used in this study are available indefinitely for anyone who wishes to access them at https://github.com/CoV-IMPACT-C/cancer-impact-covid.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

Because we used anonymized administrative data available upon request to the responsible institutions or publicly available, we did not require institutional review board approval.

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Mental Health of Guatemalan Health Care Workers During the COVID-19 Pandemic: Baseline Findings From the HEROES Cohort Study

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Objectives. To assess the baseline prevalence of mental health conditions and associated exposures in a cohort of health care workers (HCWs) in Guatemala.

Methods. We analyzed baseline information from the 2020 Web-based COVID-19 Health Care Workers Study (HEROES)–Guatemala. Outcomes included mental distress and depressive symptoms. Exposures included COVID-19 experiences, sociodemographic characteristics, and job characteristics. We used crude and adjusted Poisson regression models in our analyses.

Results. Of the 1801 HCWs who accepted to participate, 1522 (84.5%) completed the questionnaire; 1014 (66.8%) were women. Among the participants, 59.1% (95% confidence interval [CI] = 56.6, 61.5) screened positive for mental distress and 23% (95% CI = 20.9, 25.2) for moderate to severe depressive symptoms. COVID-19 experiences, sociodemographic characteristics, and job characteristics were associated with the study outcomes. Participants who were worried about COVID-19 infection were at higher risk of mental distress (relative risk [RR] = 1.47; 95% CI = 1.30, 1.66) and depressive symptoms (RR = 1.51; 95% CI = 1.17, 1.96). Similarly, the youngest participants were at elevated risk of mental distress (RR = 1.80; 95% CI = 1.24, 2.63) and depressive symptoms (OR = 4.58; 95% CI = 1.51, 13.87).

Conclusions. Mental health conditions are highly prevalent among Guatemalan HCWs. (*Am J Public Health.* 2022;112(S6):S602–S614. https://doi.org/10.2105/AJPH.2021.306648)

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COVID-19 was first detected in Guatemala on March 13, 2020, 2 days after the World Health Organization declared it a pandemic.[1,2] One year after the pandemic, evidence on the extent and severity of mental health conditions among health care workers (HCWs) coming from Latin American and low-and middle-income countries is scarce and limited by issues such as low response rates, nonprobabilistic samples, selection bias, and lack of prepandemic and pandemic comparisons.[3,4]

Guatemala's health system, with among the lowest public health investments (1% of gross domestic product) and HCW densities (12.5 per 100 000 population) in the Latin American region, had limited capacity to respond to the COVID-19 pandemic.[5–7] Guatemala's category as an upper-middle-income country masks marked inequalities in income distribution and human development across the population.[8,9] Multiple surges of COVID-19 cases have overburdened HCWs, and their opportunities to seek mental health services are reduced.[10] There is only 1 report to our knowledge regarding Guatemalan HCWs' mental health, a government-led cross-sectional survey showing that 25% of HCWs screened positive for depressive symptoms during a peak in COVID-19 cases.[11]

Similar to the general population, HCWs responding to COVID-19 are exposed to multiple stressors, including lockdowns, economic instability, and uncertainty.[5] Also, HCWs experience job-specific stressors such as fear of infecting themselves or their loved ones, isolation, increased workload stress, stigma, and harassment.[12] Recent country-specific studies have shown that COVID-19 is already affecting the mental health of HCWs.[13–16] According to a review of the literature, most HCWs had reported adverse psychological experiences during previous epidemics, and a significant subset exhibited mental health sequelae after the emergency.[12] Considering all of the characteristics related to the current pandemic, including generalized lockdowns and economic effects, an understanding of the frequency and severity of mental health issues among HCWs, as well as their long-term mental health, is essential.

More research is needed to close the gap in knowledge about the mental health status of HCWs during the COVID-19 pandemic in countries with vast health inequalities (e.g., countries of the Latin American region).[17] In this cross-sectional study, we analyzed baseline findings from the COVID-19 Health Care Workers Study (HEROES)–Guatemala, part of a larger investigation assessing the mental health of HCWs during the COVID-19 pandemic in 26 countries.[18]

METHODS

We used Guatemalan baseline data collected between July and September 2020 from a multicountry prospective cohort study assessing the mental health of HCWs at baseline, 6 months, and 12 months. Participants were recruited through health care institutions and union organizations with contact information (e-mail addresses or telephone numbers) databases of affiliates or employees working in health care settings across the country. The study team contacted each entity about the study objectives, design, and procedures. After authorization had been obtained, each entity sent out online invitations to potential participants via e-mail or social media. Invitations contained information about the study objectives and informed consent along with a self-administered Web-based survey. Approximately 2 to 3 weeks after the initial invitation to participants, reminders were sent to nonresponders in an attempt to achieve a higher participation rate.

Participants

Eligible individuals included adult HCWs (aged 18 years or older) affiliated with institutions serving patients suspected of having or diagnosed with COVID-19; these individuals were contacted through entities that agreed to participate in the study. All HCWs were eligible to participate, including health care professionals, technicians, support staff, and administrative personnel. Participants did not need to be deployed as frontline COVID-19 workers to be eligible to enroll, although we targeted entities involved in the COVID-19 response. Recruitment sites included public and private health services such as clinics, health posts, health centers, and hospitals (department, national, and specialized).

Sample Size

We used a nonprobabilistic purposive sampling approach to recruit participants. We calculated our target sample size with the formula $N = Z_{\alpha}{}^{2}P(1 - P)/d$.[2] Following the study conducted by Lai et al., we computed α as 0.05, $Z\alpha$ as 1.96, and a percentage of participants (P) with mental health conditions of 35% and calculated an estimated acceptable margin of error for proportion d ± 3%.[15] Accounting for 75% follow-up, we needed a total of at least 1423 completed questionnaires. Although this study was designed to be longitudinal, we report only on the first assessment here.

Measurements

The primary exposures were experiences with COVID-19 at work and outside work. Specifically, exposures included contact with patients with COVID-19 at work (yes, no, does not know), availability of personal protective equipment (PPE) at work (sufficient, insufficient), having a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) test result (if available; negative, positive, unknown result), concerns about contracting COVID-19 (not worried, somewhat worried, very worried), and experiencing the death of a relative from COVID-19 (yes, no).

We also explored associations of our outcomes with sociodemographic and job characteristics and previous mental health disorders. With respect to sociodemographic and job characteristics, participants provided information about their age (continuous and 5 categories), sex (male or female), education (4 categories), and number of people living at home (total number, minors, adults older than 65 years, people with disabilities). The questionnaire also asked about the participant's job sector (private or public), job location, and

occupation. Questions on previous mental health disorders focused on prior mental disorder diagnoses (yes, no, prefers not to answer) and use of psychotropic medications (yes, no, prefers not to answer).

Outcomes

We assessed mental distress via the General Health Questionnaire (GHQ-12) and severity of depressive symptoms through the Patient Health Questionnaire (PHQ-9).

Developed by Goldberg in 1972, the GHQ is a widely used screening instrument for recognizing and measuring mental distress.[19] The GHQ-12 is a short version comprising 12 items (6 phrased positively and 6 phrased negatively), each scored from 0 to 3. We used the 0 to 12 scale and the bimodal scoring method whereby "less than usual" and "no more than usual" are scored as 0 and "rather more than usual" and "much more than usual" are scored as 1.[20] Items are summed to estimate a total score between 0 and 12. To our knowledge, there have not been previous validations of the GHQ-12 cut-off points in Guatemala. We used the standard two thirds cut-off point validated in multiple Spanish-speaking countries to classify individuals as having mental distress.[20–23] Our survey's 12 items had high internal consistency, as revealed by a Cronbach α value of 0.86 (95% confidence interval [CI] = 0.85, 0.87; Appendix A, available as a supplement to the online version of this article at http://www.ajph.org).

The PHQ-9 is a 9-item self-report instrument that screens for depressive symptoms and focuses on the preceding 2 weeks.[24] Items are rated on a Likert-type scale ranging from 0 (not at all) to 3 (nearly every day). Total scores range between 0 and 27. Total scores for depression are as follows: 0 to 4, minimal or none; 5 to 9, mild; 10 to 14, moderate; 15 to 19, moderately severe; and 20 to 27, severe. To our knowledge, no study has evaluated the optimal PHQ-9 cut-off points in Guatemala. As recommended in other Latin American surveys, we used a cut-off of 10 or more to classify individuals as having depressive symptoms.[24–26] The 9 items in our survey had high internal consistency, as shown by the Cronbach α value of 0.90 (95% CI = 0.89, 0.91; Appendix B, available as a supplement to the online version of this article at http://www.ajph.org).

Statistical Analysis

We collected data on participants' sociodemographic and job characteristics, COVID-19 experiences, and previous mental disorders. We examined the distributions between people who did and did not complete the survey. Item mean values for both outcome scales were examined for the overall sample and selected group categories. We performed unadjusted bivariate Poisson regression analyses with robust error variance to estimate relative risks (RRs) between predictors, COVID-19 exposures, mental distress, and depressive symptoms. Multivariable Poisson regression analyses with robust error variance were used to examine relative risks between each predictor and study outcomes adjusted for age, sex, education, and occupation. The sample of completed surveys was used in both unadjusted and adjusted models. (For details on the item–scale analyses, see Appendixes A and B. Appendixes C and D, available as supplements to the online version of this article at http://www.ajph.org, show the prevalence and distribution of the 2 study outcomes across the different sociodemographic and predictors.)

We assessed study outcomes with different cut-off thresholds and COVID–related exposures (Appendix E, available as a supplement to the online version of this article at http://www.ajph.org). We used a threshold wherein a score of 2 or above signifies risk for mental distress. This threshold has been recommended if the goal is to screen for psychiatric disorders in primary care settings. In contrast, the more stringent threshold of 3 points or above is preferred to discriminate between mood disorders and anxiety disorders.[27,28] We used Stata version 14 to conduct our statistical analyses.[29] Statistical significance was set at $P < .05$, and all tests were 2-tailed.

RESULTS

Of the 1801 individuals who agreed to participate, 1522 (84.5%) completed the online questionnaire. Table 1 shows distributions of sociodemographic characteristics, previous mental disorders, and COVID-19 experiences among the overall sample of participants, those who completed the survey, and those who agreed to participate but did not complete the survey. With the exception of job location, no differences were found between respondents who did and did not complete the survey.

Sociodemographic and Job Characteristics

Participants in the analytical sample (n = 1522) were mostly aged 49 years or younger (n = 1273; 87.2%), female

TABLE 1— Distribution of Exposure Variables Among the Total Sample of Participants, Those Who Completed the Survey, and Those Who Did Not Complete the Survey: HEROES–Guatemala Study, 2020

Characteristic	No./Total No. (%) or Median (IQR)			χ^2; *P*
	Total Sample (n = 1801)	Complete Surveys (n = 1522)	Incomplete Surveys (n = 279)	
Age, y				3.56; .31
18–34	898/1688 (53.2)	765/1461 (52.4)	133/227 (58.6)	
35–49	574/1688 (34.0)	508/1461 (34.8)	66/227 (29.1)	
50–59	162/1688 (9.6)	142/1461 (9.7)	20/227 (8.8)	
≥60	54/1688 (3.2)	46/1461 (3.1)	8/227 (3.5)	
Sex				2.36; .12
Female	1164/1762 (66.1)	1014/1519 (66.8)	150/243 (61.7)	
Male	598/1762 (33.9)	505/1519 (33.2)	93/243 (38.3)	
Education[a]				.65
Incomplete primary	3/1758 (0.2)	3/1522 (0.2)	0/236 (0.0)	
Primary	14/1758 (0.8)	14/1522 (0.9)	0/236 (0.0)	
High school	115/1758 (6.5)	103/1522 (6.8)	12/236 (5.1)	
Technical degree	293/1758 (16.7)	256/1522 (16.8)	37/236 (15.7)	
Professional degree	790/1758 (44.9)	680/1522 (44.7)	110/236 (46.6)	
Postgraduate degree	543/1758 (30.9)	466/1522 (30.6)	77/236 (32.6)	
No. of people living at home				
Total	4 (3–5)	4 (3–5)	4 (3–5)	
Minors	2 (1–2)	2 (1–2)	2 (1–2)	
Adults > 65 y	1 (1–2)	1 (1–2)	1 (1–2)	
People with disabilities	1 (1–1)	1 (1–1)	1 (1–1)	
Health care sector				0.32; .57
Public	1266/1735 (73.0)	1114/1522 (73.2)	152/213 (71.4)	
Private	469/1735 (27.0)	408/1522 (26.8)	61/213 (28.6)	
Job location by region				34.11; < .001
Metropolitan	876/1734 (50.5)	765/1522 (50.3)	111/212 (52.4)	
North	55/1734 (3.2)	49/1522 (3.2)	6/212 (2.8)	
Northeast	140/1734 (8.1)	127/1522 (8.3)	13/212 (6.1)	
Southeast	47/1734 (2.7)	38/1522 (2.5)	9/212 (4.2)	
Central	219/1734 (12.6)	190/1522 (12.5)	29/212 (13.7)	
Southwest	334/1734 (19.3)	305/1522 (20.0)	29/212 (13.7)	
Northwest	49/1734 (2.8)	42/1522 (2.8)	7/212 (3.3)	
Petén	14/1734 (0.8)	6/1522 (0.4)	8/212 (3.8)	
Occupation				15.10; .09
Physician	647/1708 (37.9)	566/1522 (37.2)	81/186 (43.6)	
Nurse	377/1708 (22.1)	326/1522 (21.4)	51/186 (27.4)	
Psychologist	28/1708 (1.6)	25/1522 (1.6)	3/186 (1.6)	
Social worker	24/1708 (1.4)	23/1522 (1.5)	1/186 (0.5)	
Hospital technician	99/1708 (5.8)	91/1522 (6.0)	8/186 (4.3)	
Nutritionist	31/1708 (1.8)	30/1522 (2.0)	1/186 (0.5)	
Dentist	125/1708 (7.3)	110/1522 (7.2)	15/186 (8.1)	
Administration	310/1708 (18.2)	289/1522 (19.0)	21/186 (11.3)	
Hospital staff	60/1708 (3.5)	55/1522 (3.6)	5/186 (2.7)	

Continued

TABLE 1— Continued

Characteristic	No./Total No. (%) or Median (IQR)			χ^2; *P*
	Total Sample (n = 1801)	Complete Surveys (n = 1522)	Incomplete Surveys (n = 279)	
Other	7/1708 (0.4)	7/1522 (0.5)	0/186(0.0)	
Contact with COVID-19 patients				0.81; .67
Yes	1038 (62.4)	954 (62.7)	84 (59.6)	
No	287 (17.3)	259 (17.0)	28 (19.9)	
Does not know	338 (20.3)	309 (20.3)	29 (20.6)	
SARS-CoV-2 test result[a]				.3
Negative	496/674 (73.6)	464/627 (74.0)	32/47 (68.1)	
Positive	161/674 (23.9)	146/627 (23.3)	15/47 (31.9)	
Unknown	17/674 (2.5)	17/627 (2.7)	0/47 (0.0)	
Personal protective equipment				0.11; .73
Insufficient	859/1621 (53.0)	792/1498 (52.9)	56/123 (45.5)	
Sufficient	762/1621 (47.0)	706/1498 (47.1)	67/123 (54.5)	
Worried about COVID-19 infection				0.31; .58
No or not a lot	400/1485 (26.9)	369/1379 (26.8)	31/106 (29.2)	
A lot or very worried	1085/1485 (73.1)	1010/1379 (73.2)	75/106 (70.8)	
Relative deceased because of COVID-19				0.27; .6
No	457/606 (75.4)	427/568 (75.2)	30/38 (79.0)	
Yes	149/606 (24.6)	141/568 (24.8)	8/38 (21.0)	
Prior mental disorder				
No	1235/1312 (94.1)	1234/1311 (94.1)		
Yes	59/1312 (4.5)	59/1312 (4.5)		
Prefer not to answer	18/1312 (1.4)	18/1312 (1.4)		
Taking medication for mental disorders				
No	1215/1312 (92.6)	1214/1311 (92.6)		
Yes	83/1312 (6.3)	83/1311 (6.3)		
Prefer not to answer	14/1312 (1.1)	14/1311 (1.1)		

Note. HEROES = COVID-19 Health Care Workers Study; IQR = interquartile range; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

[a]*P* value is from the Fisher exact test.

(n = 1014; 66.8%), and highly educated (professional or postgraduate degree; n = 1146; 75.3%); most worked in public health institutions (n = 1114; 73.2%), and half worked in Guatemala City (n = 765; 50.3%). The most frequent occupations were physician (n = 566; 37.2%) and nurse (n = 326; 21.4%). Only 4.5% of participants (n = 59) reported having a diagnosis of a previous mental disorder, and 6.3% (n = 83) reported having taken psychotropic medications.

COVID-19 Experiences

Regarding COVID-19 experiences, almost two thirds of participants reported having had contact with patients diagnosed with COVID-19 in the previous week (n = 954; 62.7%), and more than half reported insufficient PPE at work (n = 792; 53%). Approximately three quarters reported being very worried about contracting COVID-19 (n = 1010, 73.2%), and around a quarter reported having experienced the death of a relative from COVID-19 (n = 141; 24.8%). Of those who reported having been tested

for SARS-CoV-2 (n = 627; 41.2%), 23.3% (n = 146) had a positive result.

Outcomes

Table 2 shows mean scores for GHQ-12 items, overall and by gender, occupation, health care sector, and whether HCWs reported having had contact with patients diagnosed with COVID-19. Positive screens for mental distress were common, with 899 (59.1%; 95% CI = 56.6, 61.5) participants scoring 3 or more on the GHQ-12. Participants' mean GHQ-12 score was 3.88 (interquartile range [IQR] = 1–6), higher than the cut-off for positive mental distress screening. The most common negative mood symptom was feeling under stress (mean = 1.75). The most common positive mood symptom was being able to enjoy day-to-day activities (mean = 1.8). Mean tests for each GHQ-12 item revealed differences within all group categories. For example, physicians reported higher distress than nurses and those employed in other occupations (e.g., administrative staff, dentists, nutritionists) on all GHQ-12 items. HCWs who reported contact with patients diagnosed with COVID-19 had higher distress scores with the exception of the usefulness, making decisions, worthlessness, and happy feelings items.

Table 3 shows means for the PHQ-9 items, also by group characteristics. Depressive symptoms were prevalent among HCWs, with 22.9% (95% CI = 20.9, 25.2) reporting moderate, moderate to severe, or severe depression. The average PHQ-9 score for the sample overall was 6.11 (IQR = 1–9). The most common depressive symptom was feeling tired or having little energy (mean = 1.17). Mean tests also revealed differences for PHQ-9 items, with the prevalence of differences being highest for occupation and contact with patients diagnosed with COVID-19.

Appendix C shows the mean values and percentages of positive mental distress (GHQ-12) and moderate to severe depressive symptoms (PHQ-9) for the total sample of participants and by each exposure. Appendix D displays the distribution of depressive symptoms by severity category for each COVID-19–related exposure. Percentages of moderate to severe depressive symptoms were higher among those who had contact with COVID-19 patients, an unknown COVID-19 test result, and insufficient PPE and those who worried about being infected with COVID-19. In contrast, percentages of moderate to severe depressive symptoms were similar among those who had and had not experienced the death of a relative from COVID-19.

Associations Between Exposures and Outcomes

Table 4 shows crude and adjusted relative risks for the associations between exposures (sociodemographic characteristics, job characteristics, and COVID-19 experiences) and mental health conditions (mental distress and depressive symptoms).

Crude relative risks for mental distress and moderate to severe depressive symptoms were higher among participants 18 to 34 years of age (vs those aged 60 years or older), those with a postgraduate degree (vs those with a high school degree), physicians (vs administrative HCWs), and those working in the public sector (vs private sector workers). After adjustment, associations of mental distress and depressive symptoms with younger age (mental distress RR = 1.80; 95% CI = 1.24, 2.63; depressive symptoms RR = 4.58; 95% CI = 1.51, 13.87), holding a postgraduate degree (mental distress RR = 1.45; 95% CI = 1.16, 1.83; depressive symptoms RR = 2.31; 95% CI = 1.31, 4.07), being a physician (depressive symptoms RR = 1.58; 95% CI = 1.16, 2.16), and being a hospital technician (mental distress RR = 1.33; 95% CI = 1.10, 1.60) were attenuated but remained significant.

Associations between mental health conditions and being 35 to 49 years old, being a hospital technician, having an unknown SARS-CoV-2 test result, having a central region job location, experiencing the death of a relative from COVID-19, and taking medication for a mental disorder moved away from the null after adjustment. No associations were found with respect to sex, private versus public health care sector, number of people living at home, job location, or mental health conditions after adjustment.

In terms of COVID-19–related experiences, crude relative risks for mental distress and moderate to severe depression were higher among participants who reported contact with patients diagnosed with COVID-19 during the preceding week, those with insufficient PPE, and those who reported feeling somewhat or very worried about acquiring COVID-19 infection. After adjustment for age, sex, education, and occupation, relative risks for mental health conditions among those who reported contact with patients with COVID-19 (mental distress RR = 1.30; 95% CI = 1.13, 1.51; depressive symptoms RR = 1.96; 95% CI = 1.34, 2.87), insufficient PPE (mental distress RR = 1.25; 95% CI = 1.14, 1.36; depressive symptoms RR = 1.24; 95% CI = 1.02, 1.51), and feeling somewhat or very

TABLE 2— Mean Values for Each GHQ-12 Item, by Group Category: HEROES–Guatemala Study, 2020

GHQ-12 Item	Overall, Mean	Gender, Mean		Occupation, Mean			Health Care Sector, Mean		Contact With COVID-19 Patients, Mean	
		Female	Male	Physician	Nurse	Other	Public	Private	Yes	No
1. Able to concentrate	1.42	1.45	1.37	1.61	1.35	1.29*	1.46	1.32*	1.46	1.30*
2. Lost much sleep	1.41	1.46	1.32*	1.59	1.42	1.28*	1.46	1.29*	1.53	1.08*
3. Playing a useful part	0.70	0.69	0.72	0.88	0.48	0.62*	0.70	0.69	0.67	0.76
4. Capable of making decisions	0.86	0.87	0.85	0.99	0.65	0.83*	0.86	0.87	0.85	0.91
5. Under stress	1.75	1.80	1.64*	1.90	1.78	1.63*	1.79	1.65*	1.87	1.42*
6. Could not overcome difficulties	0.89	0.92	0.84	1.07	0.81	0.78*	0.91	0.85	0.94	0.76*
7. Enjoy your day-to-day activities	1.80	1.81	1.77	1.88	1.78	1.75*	1.83	1.71*	1.84	1.64*
8. Face up to problems	1.15	1.18	1.10	1.29	1.06	1.08*	1.18	1.08	1.20	1.04*
9. Feeling unhappy and depressed	1.14	1.18	1.07*	1.37	1.05	1.00*	1.18	1.05*	1.26	0.84*
10. Losing confidence	0.64	0.67	0.57	0.82	0.62	0.50*	0.66	0.56	0.70	0.48*
11. Thinking of self as worthless	0.35	0.33	0.37	0.50	0.32	0.24*	0.36	0.31	0.38	0.25
12. Feeling reasonably happy	1.10	1.11	1.10	1.25	1.09	1.00*	1.14	1.00*	1.13	1.03
Full sample statistics										
GHQ-12, mean (SD); median (IQR)	3.88 (3.14); 3 (1–6)									
GHQ-12, Cronbach α (95% CI)	0.86 (0.85, 0.87)									
Mental distress, no. (%; 95% CI)	899 (59.07; 56.57, 61.51)									

Note. CI = confidence interval; GHQ-12 = General Health Questionnaire; HEROES = COVID-19 Health Care Workers Study; IQR = interquartile range. The sample size was 1522. GHQ-12 scale items range from 0–3, with 0 representing nondistressed answers and 3 representing distressed answers. The distribution of responses to each of the items is shown in Appendix F (available as a supplement to the online version of this article at http://www.ajph.org).

*$P < .05$.

TABLE 3— Mean Values for Each PHQ-9 Item, by Group Category: HEROES–Guatemala Study, 2020

PHQ-9 Item	Overall, Mean	Gender, Mean		Occupation, Mean			Health Care Sector, Mean		Contact With COVID-19 Patients, Mean	
		Female	Male	Physician	Nurse	Other	Public	Private	Yes	No
1. Little interest or pleasure in doing things	0.72	0.73	0.70	0.95	0.58	0.59*	0.75	0.66	0.80	0.54*
2. Feeling down, depressed, or hopeless	0.68	0.71	0.63	0.88	0.58	0.56*	0.72	0.58*	0.78	0.47*
3. Trouble falling or staying asleep or sleeping too much	0.94	0.97	0.87	1.20	0.83	0.77*	0.96	0.88	1.05	0.65*
4. Feeling tired or having little energy	1.17	1.21	1.07*	1.45	1.10	0.97*	1.21	1.06*	1.30	0.76*
5. Poor appetite or overeating	0.87	0.91	0.81	1.16	0.77	0.68*	0.90	0.80	0.99	0.53*
6. Feeling bad about yourself	0.49	0.51	0.45	0.69	0.42	0.35*	0.51	0.43	0.57	0.32*
7. Trouble concentrating on things	0.65	0.68	0.61	0.88	0.62	0.49*	0.69	0.56*	0.75	0.44*
8. Moving or speaking slowly or fidgety or restless	0.45	0.45	0.46	0.52	0.48	0.39*	0.48	0.37	0.53	0.23*
9. Thoughts that you would be better off dead	0.13	0.12	0.16	0.20	0.09	0.10*	0.15	0.10	0.15	0.08
Full sample statistics										
PHQ-9, mean (SD); median (IQR)	6.11 (5.52); 5 (1–9)									
PHQ-9, Cronbach α (95% CI)	0.90 (0.89, 0.91)									
Depression moderate to severe, no. (%; 95% CI)	340 (22.97; 20.90, 25.19)									

Note. CI = confidence interval; HEROES = COVID-19 Health Care Workers Study; IQR = interquartile range; PHQ-9 = Patient Health Questionnaire. The sample size was 1480. PHQ-9 scale items range from 0–3, with 0 representing no days and 3 representing nearly every day. The distribution of responses to each of the items is shown in Appendix G (available as a supplement to the online version of this article at http://www.ajph.org).

*$P < .05$.

TABLE 4— Associations Between Sociodemographic and Job Characteristics, COVID-19–Related Exposures, and Mental Health Conditions Among Health Care Workers in Guatemala: HEROES–Guatemala Study, 2020

Characteristic	Positive for Mental Distress[a]		Positive for Moderate/Severe Depressive Symptoms[b]	
	Bivariate Model, RR (95% CI)	Multivariable Model,[c] RR (95% CI)	Bivariate Model, RR (95% CI)	Multivariable Model,[c] RR (95% CI)
Age, y				
18–34	1.69 (1.18, 2.44)	1.80 (1.24, 2.63)	4.51 (1.50, 13.54)	4.58 (1.51, 13.87)
35–49	1.43 (0.99, 2.07)	1.49 (1.02, 2.18)	2.94 (0.97, 8.90)	3.19 (1.05, 9.63)
50–59	1.04 (0.69, 1.57)	1.05 (0.69, 1.59)	1.06 (0.31, 3.70)	1.11 (0.32, 3.88)
≥ 60 (Ref)	1	1	1	1
Sex				
Male (Ref)	1	1	1	1
Female	1.06 (0.96, 1.16)	1.07 (0.98, 1.17)	1.08 (0.88, 1.32)	1.17 (0.96, 1.43)
Education				
High school or less (Ref)	1	1	1	1
Technical degree	0.99 (0.78, 1.26)	0.94 (0.73, 1.22)	1.22 (0.67, 2.23)	1.17 (0.62, 2.22)
Professional degree	1.40 (1.14, 1.71)	1.33 (1.07, 1.66)	2.22 (1.30, 3.76)	1.89 (1.09, 3.28)
Postgraduate degree	1.45 (1.18, 1.79)	1.45 (1.16, 1.83)	2.59 (1.52, 4.41)	2.31 (1.31, 4.07)
No. of people living at home				
Total	0.98 (0.96, 0.99)	0.99 (0.97, 1.01)	0.95 (0.90, 0.99)	0.98 (0.94, 1.03)
Minors	1.02 (0.96, 1.09)	1.03 (0.97, 1.09)	1.12 (0.98, 1.28)	1.13 (1.00, 1.26)
Adults aged > 65 y	1.05 (0.91, 1.22)	1.00 (0.86, 1.16)	0.94 (0.63, 1.41)	0.76 (0.52, 1.12)
People with disabilities	0.94 (0.66, 1.33)	0.90 (0.73, 1.12)	1.17 (0.61, 2.23)	0.96 (0.70, 1.32)
Health care sector				
Private (Ref)	1	1	1	1
Public	1.14 (1.03, 1.27)	1.10 (0.99, 1.23)	1.35 (1.07, 1.71)	1.21 (0.94, 1.54)
Job location by region				
Metropolitan (Ref)	1	1	1	1
North	0.83 (0.62, 1.11)	0.77 (0.56, 1.07)	0.64 (0.32, 1.28)	0.52 (0.25, 1.11)
Northeast	0.95 (0.81, 1.12)	1.07 (0.90, 1.26)	0.71 (0.48, 1.06)	0.87 (0.58, 1.31)
Southeast	1.21 (0.98, 1.49)	1.15 (0.93, 1.42)	1.53 (0.98, 2.40)	1.28 (0.87, 1.88)
Central	1.09 (0.97, 1.23)	1.15 (1.01, 1.30)	0.98 (0.74, 1.31)	1.02 (0.76, 1.36)
Southwest	0.98 (0.87, 1.09)	1.05 (0.94, 1.18)	0.87 (0.67, 1.12)	0.89 (0.68, 1.17)
Northwest	1.09 (0.87, 1.38)	1.06 (0.84, 1.34)	0.84 (0.45, 1.59)	0.86 (0.46, 1.59)
Petén	0.85 (0.38, 1.90)	0.82 (0.38, 1.76)	1.37 (0.44, 4.29)	1.35 (0.44, 4.15)
Occupation				
Administration (Ref)	1	1	1	1
Physician	1.36 (1.20, 1.54)	1.14 (1.00, 1.31)	2.24 (1.66, 3.02)	1.58 (1.16, 2.16)
Nurse	1.03 (0.88, 1.21)	1.05 (0.90, 1.24)	1.23 (0.86, 1.76)	1.14 (0.78, 1.67)
Psychologist	1.28 (0.93, 1.75)	1.07 (0.76, 1.51)	0.78 (0.26, 2.35)	0.42 (0.10, 1.72)
Social worker	1.3 (0.94, 1.79)	1.21 (0.86, 1.70)	0.31 (0.05, 2.15)	0.31 (0.05, 2.08)
Hospital technician	1.29 (1.07, 1.56)	1.33 (1.10, 1.60)	0.94 (0.53, 1.67)	0.93 (0.53, 1.63)
Nutritionist	1.33 (1.01, 1.75)	1.07 (0.81, 1.42)	2.10 (1.15, 3.84)	1.34 (0.75, 2.41)

Continued

TABLE 4— Continued

Characteristic	Positive for Mental Distress[a]		Positive for Moderate/Severe Depressive Symptoms[b]	
	Bivariate Model, RR (95% CI)	Multivariable Model,[c] RR (95% CI)	Bivariate Model, RR (95% CI)	Multivariable Model,[c] RR (95% CI)
Dentist	1.11 (0.90, 1.35)	1.05 (0.85, 1.30)	0.92 (0.53, 1.58)	0.89 (0.51, 1.53)
Hospital staff	0.98 (0.73, 1.31)	1.09 (0.81, 1.47)	0.83 (0.39, 1.75)	0.97 (0.46, 2.05)
Other	0.28 (0.05, 1.76)	0.28 (0.05, 1.66)		
Contact with COVID-19 patients during preceding week				
No (Ref)	1	1	1	1
Yes	1.38 (1.20, 1.58)	1.30 (1.13, 1.51)	2.65 (1.83, 3.84)	1.96 (1.34, 2.87)
Does not know	1.25 (1.06, 1.47)	1.24 (1.05, 1.46)	1.49 (0.96, 2.31)	1.34 (0.87, 2.07)
SARS-CoV-2 test result				
Negative (Ref)	1	1	1	1
Positive	0.78 (0.65, 0.93)	0.82 (0.69, 0.97)	0.90 (0.64, 1.26)	1.00 (0.72, 1.40)
Unknown	1.08 (0.79, 1.48)	1.07 (0.79, 1.46)	1.61 (0.89, 2.90)	1.72 (1.09, 2.74)
Personal protective equipment				
Sufficient (Ref)	1	1	1	1
Insufficient	1.35 (1.23, 1.47)	1.25 (1.14, 1.36)	1.52 (1.25, 1.85)	1.24 (1.02, 1.51)
Worried about COVID-19 infection				
No or not a lot (Ref)	1	1	1	1
Somewhat or very worried	1.53 (1.35, 1.74)	1.47 (1.30, 1.66)	1.65 (1.27, 2.15)	1.51 (1.17, 1.96)
Relative deceased because of COVID-19				
No (Ref)	1	1	1	1
Yes	1.10 (0.95, 1.27)	1.15 (1.00, 1.33)	1.15 (0.82, 1.60)	1.49 (1.09, 2.03)
Prior mental disorder				
No (Ref)	1	1	1	1
Yes	1.39 (1.20, 1.61)	1.26 (1.11, 1.44)	1.84 (1.32, 2.58)	1.44 (1.02, 2.03)
Prefer not to answer	1.39 (1.08, 1.78)	1.30 (0.96, 1.74)	0.53 (0.14, 1.95)	0.48 (0.13, 1.75)
Taking medication for mental disorders				
No (Ref)	1	1	1	1
Yes	1.51 (1.35, 1.68)	1.40 (1.24, 1.58)	2.21 (1.70, 2.88)	1.92 (1.45, 2.54)
Prefer not to answer	1.68 (1.44, 1.96)	1.75 (1.53, 2.01)	1.42 (0.61, 3.27)	1.51 (0.62, 3.70)

Note. CI = confidence interval; HEROES = COVID-19 Health Care Workers Study; RR = relative risk; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2. The sample size was 1522. Data are from bivariate and multivariable models.

[a]General Health Questionnaire score ≥ 3.
[b]Patient Health Questionnaire score ≥ 10.
[c]Multivariable models adjusted for age category, sex, education, and occupation.

worried about acquiring COVID-19 infection (mental distress RR = 1.47; 95% CI = 1.30, 1.66; depressive symptoms RR = 1.51; 95% CI = 1.17, 1.96) moved toward the null but remained significantly higher than risks among those who did not report COVID-19–related experiences.

The risk of mental distress, but not depression, was lower among those with a positive SARS-CoV-2 test result (RR = 0.82; 95% CI = 0.69, 0.97) than among those with a negative result. Depression was associated with experiencing the death of a relative from COVID-19 (RR = 1.49; 95% CI = 1.09, 2.03). Finally, adjusted models showed that mental distress was

associated with having a prior mental health diagnosis (RR = 1.26; 95% CI = 1.11, 1.44) and taking medication for a mental disorder (RR = 1.40; 95% CI = 1.24, 1.58). Depressive symptoms were also associated with a prior mental health diagnosis (RR = 1.44; 95% CI = 1.02, 2.03) and medication for a mental disorder (RR = 1.92; 95% CI = 1.45, 2.54).

Examinations of 2 cut-offs for classifying positive and negative cases revealed consistent associations between mental distress and COVID-19–related exposures (Appendix E). With respect to depression, mild and moderate cases were more consistent in being associated with COVID-19–related exposures.

DISCUSSION

We assessed the mental health of a cohort of Guatemalan HCWs during the height of the COVID-19 pandemic in Guatemala. Two important findings emerged from our baseline assessment. First, mental disorder symptoms were highly prevalent among Guatemalan HCWs, with close to 60% of the participants screening positive for mental distress and 23% for moderate to severe depressive symptoms. Second, mental distress and depressive symptoms were associated with sociodemographic and job characteristics such as younger age, higher education, and being a physician, as well as COVID-19 experiences such as potential exposure to COVID-19, concerns related to COVID-19 infection, and insufficient PPE. Having a history of a mental health disorder also was associated with mental distress and depression symptoms.

Most participants in this study were young, female, highly educated, and affiliated with a public health institution. Physician, nurse, and administrative staff were among the most common professions. Our sample comprised a more diverse health care workforce, including administrators, dentists, and hospital technicians, than most studies on this topic conducted in Asia, Europe, and the United States.[3,4,30–33] Moreover, whereas most studies have enrolled participants involved in the COVID-19 response at hospitals and emergency services, ours enrolled any HCW and included large and small health care facilities.

Our findings share similarities with those of systematic reviews and meta-analyses assessing the mental health of HCWs during COVID-19, despite methodological differences such as measurement scales, locations, and sampling strategies.[3,4] First, our prevalence estimates were somewhat similar to those found in pooled analyses, especially for depression (with a range of 24% to 30%).[3,4,31] Second, meta-analyses and systematic reviews have consistently shown that COVID-19–related exposures such as having contact with COVID-19 patients, having a COVID-19 infection, and having insufficient PPE seem to increase a broad spectrum of mental health conditions, including mental distress and depressive symptoms.[4,30,32] Our findings also revealed associations between mental health conditions and COVID-19–related exposures.

Third, regarding sociodemographic characteristics, Serrano-Ripoll and colleagues' meta-analysis revealed that younger HCWs seem especially vulnerable to depression and mental distress. We also found that younger populations were at higher risk of mental health conditions. Contrary to our results showing higher risks of mental health conditions among physicians and similar risks according to sex, other studies generally reveal that nurses and female HCWs fare worse than their counterparts.[4,30,32] This suggests that Guatemalan physicians may have other risk factors for mental health conditions in addition to COVID-19–related exposures. Contextual risk factors for mental health conditions such as low compensation or recognition for work during the pandemic, lack of support from government authorities, unequal allocation of resources, and nonexistence of mental health treatment options may play a role in these associations.

Studies from previous epidemics showed that HCWs with prior mental disorders were at increased risk of exhibiting severe and long-lasting mental health symptomatology during and after crises.[12] Reports of having prior mental diagnoses or taking psychotropic medications were associated with mental distress and depressive symptoms among Guatemalan HCWs. Although estimates were significant, less than 7% of participants reported having a history of a mental health disorder or taking medication, a result that warrants precaution when interpreting our findings.

To our knowledge, no prior study has documented the mental health of HCWs in Guatemala; thus, we compared our findings with those of previous Guatemalan studies focusing on other populations to shed light on the burden of mental health conditions. For example, the prevalence of depressive symptoms among HCWs during the COVID-19 pandemic was 12 times that of the general population.[34] Interestingly, our estimate of depressive symptoms was also 1.4 times higher than that shown among Guatemalan civil war refugees.[35] Although the

general and refugee populations of Guatemala do not represent an accurate comparison with HCWs working during the pandemic, they provide a reference to understand the potentially severe effects of COVID-19 on the health care workforce's mental well-being.

Limitations

Our results must be considered within the context of several limitations. First, we used a nonprobabilistic sampling technique for the enrollment of participants, meaning that our sample may not be representative of the universe of HCWs in Guatemala. However, given the pandemic's rapid evolution from week to week, the decision was made to sample HCWs via a nonrandom approach. A comparison of those who did and did not complete the survey revealed that only 1 variable differed between the 2 groups. While a generalization of our results to the universe of Guatemalan HCWs may be inaccurate, our findings shed light on the pandemic's potential mental health consequences.

Second, the cross-sectional design of this initial analysis limits our ability to assess time-variant associations between exposures and outcomes. However, 1500 participants will be followed at 6 and 12 months, and we will examine associations with longitudinal data methods.

Third, given that participants were recruited through academic institutions, union organizations, and associations, we did not have access to estimates of the numbers of HCWs who received the invitation to participate, preventing us from calculating a response rate. However, there was an 84% survey completion rate among those who received the invitation and agreed to participate in the study.

Fourth, the screening tools and cut-off points for the GHQ-12 and PHQ-9 have not been validated for Guatemala. However, both instruments and their cut-off points have been previously validated for many Latin American countries and Spain and have shown good psychometric properties.[20–26] According to our estimations, items in both scales had high internal consistency, as revealed by the Cronbach α values of 0.86 for the GHQ-12 and 0.90 for the PHQ-9 (Appendixes A and B).

Finally, despite our use of robust error variance, associations for depression models, especially the models for age categories, still showed wide 95% confidence intervals, which may indicate low precision and weak power. This limitation warrants caution when interpreting our depression results.

Public Health Implications

This report sheds light on mental health conditions and COVID-19–related factors among HCWs during the pandemic in Guatemala. Our estimates of the prevalence of mental health conditions among HCWs were higher than previous estimates among the Guatemalan general population and civil war refugees. Our descriptions of the characteristics of the most affected groups may guide surveillance efforts and direct psychological interventions to preserve HCWs' mental well-being. AJPH

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CONTRIBUTORS

A. Paniagua-Avila, D. E. Ramírez, F. Mascayano, E. Susser, R. Alvarado, and V. Puac-Polanco substantially contributed to the work's conception. A. Paniagua-Avila, D. E. Ramírez, A. Barrera-Pérez, E. Calgua, C. Castro, A. Peralta-García, and V. Puac-Polanco worked on acquiring the data. A. Paniagua-Avila, D. E. Ramírez, A. Barrera-Pérez, E. Calgua, and V. Puac-Polanco worked on analyzing and interpreting the data. A. Paniagua-Avila, D. E. Ramírez, A. Barrera-Pérez, E. Calgua, A. Peralta-García, and V. Puac-Polanco drafted the text. All of the authors reviewed the final version.

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CONFLICTS OF INTEREST

The authors report no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

This study was approved by the Health Research Bioethics Committee of the Facultad de Ciencias Médicas, Universidad de San Carlos de Guatemala, and the Pan American Health Organization's

Ethics Review Committee. All participants provided informed consent.

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Contributions of the New Framework for Essential Public Health Functions to Addressing the COVID-19 Pandemic

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This article uses a health stewardship perspective to interpret the strengths of and challenges to national health authorities' capacities to respond to the COVID-19 pandemic through the renewed essential public health functions (EPHF) framework. Based on a literature review, this article argues that the institutional capacities required by countries to respond to the COVID-19 pandemic in the Americas included all 4 stages of the new EPHF policy cycle: assessment, policy development, allocation of resources, and access. While health authorities provided these key functions (e.g., data analysis, intersectoral policy dialogues, allocation of additional funds), the interventions implemented depended on each country's own institutional structures. Health authorities faced significant challenges including fragmentation and the lack of institutional and personnel capacities, thus compromising the delivery of an effective and equitable response. In addition, the response to the pandemic has been uneven because of weaknesses in central leadership and coordination capacity, the politicization of the response, and differences in the capacity to respond at subnational levels. Such challenges reflect structural weaknesses that existed before the onset of the pandemic, as well as the low prioritization of public health in agendas for health systems strengthening. A future agenda should prioritize improving structural elements while strengthening the stewardship capacities of health authorities and developing institutional structures that guarantee access to and universal coverage of health services. (*Am J Public Health*. 2022;112(S6): S615–S620. https://doi.org/10.2105/AJPH.2022.306750)

Countries in the World Health Organization's Region of the Americas have been hit the hardest by the coronavirus disease 2019 (COVID-19) pandemic. This can be attributed to the structural deficiencies of health systems in the Region, including segmentation, limited resources, and the fragmented organization and delivery of health services, all of which are aggravated by high levels of informal labor and social inequities.[1–5] In addition, health authorities have lacked sufficient capacities to lead a comprehensive and integrated response, meaning that the Region has experienced delayed response measures, disruptions in the continuity of essential public health services, exacerbations of barriers to access, and low rates of COVID-19 vaccination.[1–3,6] This situation has brought into question the scope of functions that countries should assume to influence the determinants of health and to guarantee health as a fundamental human right. Gaining a better understanding of which institutional capacities are needed to ensure coordinated actions by countries, and especially by health authorities, is crucial to building an agenda to strengthen public health and meet the health needs of the population.[7,8]

Within this context, the renewed essential public health functions (EPHF) framework serves as a useful tool for understanding the underlying institutional capacities that countries need when responding to disruptive health crises.[7,9,10] To this end, this article interprets the strengths and challenges of national health authorities' capacities to respond to the pandemic through the new EPHF framework.

RENEWING THE ESSENTIAL PUBLIC HEALTH FUNCTIONS IN THE AMERICAS

In December 2020, the Pan American Health Organization launched a renewed EPHF approach that considers institutional capacities of health authorities as conditions necessary to guarantee a comprehensive and integrated response to the health needs of a population.[9] Rather than providing a list of public health interventions to be promoted, the new approach defines the EPHF as capacities to be used by health authorities to strengthen a health system's ability to meet the health needs of the population, including ensuring access to a broad range of public health interventions, such as population-based interventions and individual health services.[9,11]

Therefore, the framework emphasizes the need to expand the stewardship role of health authorities to ensure that a coordinated response is taken by strengthening the institutional capacities necessary to support the process of formulating and implementing public health policies.[11] These capacities are embedded in 4 stages that are part of the policy cycle (Figure 1): an assessment of the health conditions of the population and their causes, the development of policies to address problems identified by the assessment, the provision and regulation of the necessary resources to carry out the interventions, and the management of interventions to ensure access to health services for the population.[9]

PUBLIC HEALTH RESPONSES TO THE PANDEMIC IN THE AMERICAS

A literature search was performed using PubMed and Google Scholar. Selection criteria included any publicly available peer-reviewed publications that analyzed health systems' and governments' responses to the COVID-19 pandemic in multiple countries in the Region of the Americas. The 6 documents selected were analyzed to identify the responses and intervention approaches used by each country, and these were categorized within the 4 stages of the policy cycle. The countries for which information was available that met the selection criteria were Argentina, Bolivia (Plurinational State of), Brazil, Chile, Colombia, Costa Rica, Ecuador, Honduras, Mexico, Panama, Paraguay, Peru, and Uruguay. The literature reviewed the interventions used by countries at different moments during the pandemic, some assessing measures taken within the first few months and others assessing measures taken several months into the pandemic. However, all of the included literature addressed the period before the development of effective COVID-19 vaccines.

Countries' responses were grouped into 3 types of interdependent strategies: prevention, prioritization, and mitigation. The first strategy sought to reduce or prevent transmission of the disease, while the second sought to prioritize resources to improve and ensure the service capacity to manage COVID-19 cases. At the same time, it was necessary to apply other types of interventions to mitigate the negative

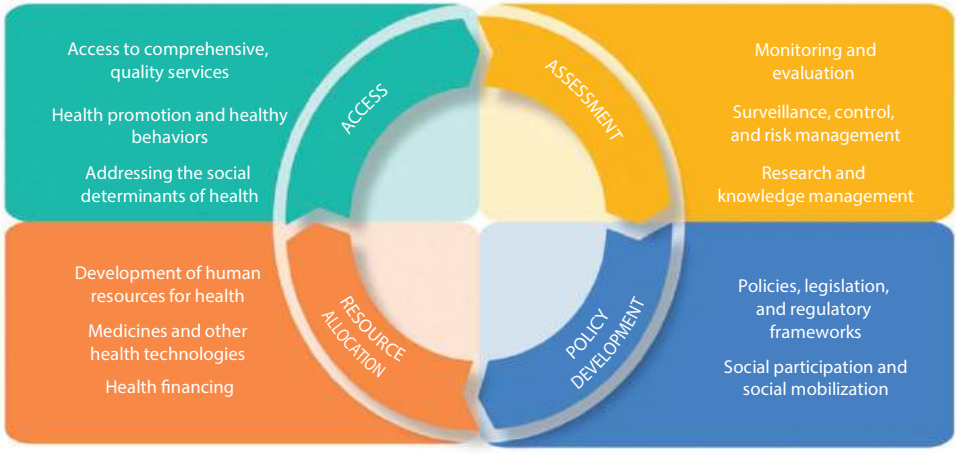

FIGURE 1— The Essential Public Health Functions Within the Integrated Approach to Public Health

Source. Pan American Health Organization.[9]

socioeconomic effects of mobility restrictions and social distancing.[9,11–15]

Strategies to prevent or reduce the spread of the pandemic, or both, included interventions such as encouraging voluntary or compulsory isolation, encouraging remote work, implementing a national curfew, closing borders, providing free testing, undertaking epidemiological and health surveillance activities, case reporting, and increasing the delivery of emergency assistance. These interventions were part of a central strategy that should have been carried out collectively by the country. Such interventions not only addressed behavioral changes and individual responsibility but also implemented logistical measures to monitor patients during their isolation, as well as instituted regulations that altered forms of consumption and production in the economic and social systems.

Prioritization strategies were implemented to address bottlenecks affecting a health service's capacity to respond to the pandemic. These strategies included interventions that increased the capacity to provide medical care (e.g., the number of beds in intensive care units, the building and operating of modular hospitals, the delivery of emergency assistance), provided guidelines for the management of suspected cases, and allocated and prioritized critical human resources for health. These interventions aimed at ensuring that services provided at the first level of care had the capacity to manage COVID-19 cases and any potential increases in the demand for critical services.

Strategies to mitigate or compensate for the negative effects of these prevention strategies included implementing economic stimulus measures, providing economic relief to the most vulnerable populations, increasing social assistance, providing food baskets, and ensuring labor protection.

The degree of effectiveness of these strategies depended on the public health capacities of the health authorities.[1] In this way, the EPHF framework was used to identify the capacities that support the interventions included in such strategies (Table 1). First, capacities related to assessment, including surveillance and knowledge management, were needed to provide scientific evidence to design mitigation strategies. Capacities related to policy development allowed the scope of COVID-19 response measures to be defined and responsibilities to be assigned to different institutions, structures, and agencies. The effectiveness of these measures was then ensured by allocation of the necessary human resources, health technologies, and financial support. Finally, institutional capacities were necessary for ensuring that the population had access to COVID-19 response measures and other health services.[4,5,12–15]

The literature review also allowed for the identification of important challenges countries in the Region faced in trying to achieve a comprehensive and equitable response. These challenges, shown in Table 2, were exemplified by fragmentation among the different levels of decision-making and a lack of institutional and staff capacities. In addition, the response to the pandemic has been uneven because of weaknesses in leadership and coordination capacity at the central level, the politicization of the response in many countries in the Region, and differences in the response capacity at the subnational levels.

An example of coordination challenges can be seen through Mexico and its federal Traffic Light System. This system was intended to assess the risk from COVID-19 and determine the type

TABLE 1— Characterization of Responses to the COVID-19 Pandemic by Countries in the Region of the Americas Within the Renewed Essential Public Health Functions Framework, by Stage of Policy Cycle, 2020–2021

Stage of Policy Cycle	Intervention
Assessment	Preventive assessment, self-reporting, voluntary or compulsory isolation, ban on public events, remote work, border closures, assessment of transmission risks, promotion of personal hygiene measures, free testing, implementation of epidemiological and health surveillance systems, development and implementation of online case-notification systems
Policy development	Intersectoral consultive processes for policy development, guidelines for managing suspected cases, national curfew, communication campaigns, central coordination of health sector
Resource allocation	Construction of field hospitals, conversion of existing hospital beds to increase medical capacity (e.g., number of beds in intensive care units), allocation and prioritization of human resources for health in critical resources, economic relief for the most vulnerable groups, additional health funding, purchase of medical supplies
Access	Free testing, economic relief to the most vulnerable groups, strategies for communicating risks to communities, increased social assistance, increased delivery of emergency assistance, promotion of personal hygiene measures, tax relief, operation of modular hospitals, economic stimulus measures (e.g., income transfers or reductions in interest rate), labor protections, food baskets, informal support for workers, support for vulnerable sectors

TABLE 2— National Challenges to COVID-19 Responses and to Strengthening Health System Capacities Within the Renewed Essential Public Health Functions Framework, by Stage of Policy Cycle

Stage of Policy Cycle	Challenges to COVID-19 Response	Examples	Challenges to Strengthening Capacities
Assessment	Delays in case reporting, limited testing capabilities, inadequate isolation measures, lack of information on mortality, lack of preventive measures	Argentina, Bolivia (Plurinational State of), Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay	Weak health surveillance and analysis of health determinants
Policy development	No central coordination of the health sector, lack of cooperation between federal and local governments, strict measures resulting in unemployment and strained economies	Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Peru	Weakness of social protection schemes and institutional fragmentation in the health sector
Resource allocation	Scarce medical supplies and resources	Brazil, Chile, Costa Rica, Honduras, Peru	Deficit of resources (human, financial, and technological) aligned with public health priorities
Access	Lockdowns creating access difficulties for essential services, such as food and health care	Argentina, Bolivia (Plurinational State of), Brazil, Chile, Colombia, Costa Rica, Ecuador, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay	Weak management and poor coordination of health services and public policies

of nonessential businesses that needed to be closed by using the colors red, yellow, and green as indicators. According to the authors who reported on the system, it faced challenges in terms of adherence to the closures because of a fragmented and inconsistent response by the different states at the subnational level.[14]

Similarly, Brazil initially lacked the central coordination of the health sector necessary to execute a consistent response, as it did not have a federal policy to enforce measures such as social distancing and isolation, and there were delays in distributing guidelines to the subnational-level states. The case of Brazil highlights the need to have established and coordinated plans, committees, or response systems that allow for the development of decisive policies.[5] For example, Argentina, Mexico, and Peru have made efforts to respond to health and other needs in a more collaborative and communicative manner through intersectoral and subnational interstate meetings held to discuss COVID-19 response strategies.[13]

A common challenge for many of the countries was resource scarcity related to health supplies and human resources. Peru, for example, had only limited supplies of personal protective equipment and ventilators. To address this challenge, the government used a local procurement strategy to manufacture masks and personal protective equipment.[5,13] Likewise, at the beginning of the pandemic, Chile struggled with poor management of case tracking because of a lack of personnel and the unavailability of tests. As the pandemic continued to grow, the country relied on primary health care workers to conduct contact tracing and used pool testing to combat limits on resources while low-cost tests were being developed.[5] However, these strategies resulted in unintended disruptions to continuity of access to other essential health services not related to COVID-19.[5]

To overcome access barriers to health services that arose during the pandemic, some communities in Brazil encouraged workers at the first level of care, in coordination with community health workers, to conduct home visits to ensure the continuity of care. This, however, was not implemented at a state or national level because in part of the delay in agreeing a national COVID-19 strategy among national authorities. This left states without guidelines for managing COVID-19.[5,13] The challenges in responding to the pandemic experienced by countries in the Region reflect the structural weaknesses that existed before its onset, as well as the low prioritization of public health in agendas for strengthening health systems in the Region of the Americas.[1–3,15–18]

FUTURE AGENDA TO STRENGTHEN THE STEWARDSHIP FUNCTION IN THE AMERICAS

The renewal of the EPHF offers a comprehensive and integrated approach for analyzing the capacities of health authorities that are necessary for ensuring an effective response to COVID-19. The comprehensive part of the approach allows for inclusion of all

interventions needed to meet a population's health needs and to address the determinants of health, while the integrated part of the approach emphasizes the capacities needed to coordinate the 3 types of strategies, which depend on the particular characteristics of each context: prevention, prioritization, and mitigation.[7,9,11]

The analysis of the public health responses that were implemented in the Region shows that although most countries sought to deliver a comprehensive response to the pandemic, one of the most important challenges involved the coordination of that response in the context of fragmentation and a lack of essential health care resources. The success of such coordination depended on the political and institutional capacities of the health authorities to implement EPHF as they relate to the 4 stages of the policy cycle: analysis, policy development, resource allocation, and access.

One of the most important challenges in responding to the pandemic was related to difficulties in guaranteeing sustained access to public health interventions, including individual, collective, and intersectoral services.

In this regard, the stewardship role of the health authorities is a fundamental political and institutional dimension of an intersectoral agenda to promote resilient health systems. This agenda must both respond to the public health interventions that have been recommended to address the COVID-19 crisis, as well as tackle existing deficiencies in health systems and the capacities of health authorities.[4,5,7,12,13]

In addition, the response to the challenges of the pandemic brought to the forefront 2 structural factors that should be included in future agendas to sustain resilient health systems. First, strengthening social protection systems is indispensable for guaranteeing conditions of social inclusion and reducing the vulnerability of populations. Second, institutional capacities to assess the social determinants of health in different crisis contexts must be strengthened while implementing response activities with existing mechanisms and resources.

Both factors foster a country's roles of stewardship and governance of the health system, and strengthening the resilience of health systems provides conditions for ensuring access to and universal coverage of health care,[19] as well as a comprehensive and integrated response to health emergencies.[7,11]

Finally, this work was based on information from publications that addressed a limited part of the response to the COVID-19 pandemic—that is, before the campaigns that aimed at promoting herd immunity through ensuring access to effective COVID-19 vaccines. Although the topic of COVID-19 vaccination was not included in the literature review, and, thus, an assessment of global inequity in access to vaccines was not incorporated, vaccination has been crucial to the effectiveness of the pandemic response. The lack of technological innovation to ensure the mass production of safe and effective COVID-19 vaccines has been a critical factor in the evolution of the pandemic in Latin American and Caribbean countries.[4,5,11–13,20] Future studies should consider this issue, recognizing the institutional capacities that need to be strengthened in a future agenda.[6,7] AJPH

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CONFLICTS OF INTEREST

The authors declared no conflicts of interest.

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No human participant protection review was required because no human participants were involved.

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Digital Transformation for More Equitable and Sustainable Public Health in the Age of Digital Interdependence

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This article describes 8 guiding principles for the digital transformation of the health sector and identifies their relationship with the COVID-19 pandemic, as well as highlights their importance to countries undergoing digital transformation processes. In the Region of the Americas, among other gaps, 30% of people do not have access to the Internet, which is why it is mandatory to develop policies and actions to deliver public health interventions equitably and sustainably to ensure that no one is left behind. The 8 principles focus on the 4 areas of a sustainable health system—human, social, economic, and environmental—and highlight the broader possibilities for using digital technology to have an impact on the sustainability of health systems. (*Am J Public Health*. 2022;112(S6):S621–S624. https://doi.org/10.2105/AJPH.2022.306749)

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The current coronavirus disease 2019 (COVID-19) pandemic has exposed structural deficiencies in health, social, and economic leadership globally and especially in the World Health Organization's Region of the Americas, highlighting the lack of resilience of health systems and societies. In this context, information exchange and information systems have proved crucial to the delivery of care at all levels of the health care system: the patient, the care team, the health care organization, and the encompassing political and economic environments. Overlooked for decades, information exchange and information systems have now emerged as a cornerstone for providing universal access to health care and ensuring continuity of care, drastically changing the way we think about the delivery of health services.

A more holistic approach is needed in public health to ensure effective responses to current and new threats. Putting information systems at the center of the game so they act as both an orchestrator and catalyst of responses will enable us to successfully engage and have greater possibilities for dealing with health emergencies by using modern tools that complement the traditional approaches epidemiologists have used for centuries. A truly digital society can enable a remarkably better understanding of people's health through real-time epidemiological surveillance, as well as provide precise data registration and disaggregation, all without neglecting particularly vulnerable at-risk populations.

The objective of this article is to describe the 8 guiding principles for the digital transformation of the health sector and identify their relationship with the COVID-19 pandemic, as well as highlight their importance for countries undergoing digital transformation processes.

DIGITAL TRANSFORMATION AND PUBLIC HEALTH

Implementing digital transformation for health means standing at the vanguard of the age of digital interdependence. This new approach to public health is fully aligned with the United Nations Secretary-General's Roadmap for Digital Cooperation.[1] This report reinforces a series of regional and global

TABLE 1— Eight Guiding Principles for the Digital Transformation of Health

Guiding Principle	Description	Relation to COVID-19
1. Achieving universal connectivity in the health sector by 2030	Connectivity for all must be a new social determinant of health because its establishment or lack of it will increasingly affect health outcomes. It is necessary to ensure adequate connectivity for both the beneficiary population and the health sector.	This pandemic caused many activities to be totally or partially transferred online quickly, and interventions were developed that depend on connectivity. However, because of a lack of infrastructure, knowledge, and opportunities, many people no longer receive essential services or are left out of epidemiological calculations.
2. Promoting digital public health goods to cocreate a more equitable world	Digital public health goods can increase the number and quality of services provided, and improve the accountability, collection, processing, and analysis of data crucial for health policy, as well as help reduce inequities in access arising from licensing and a lack of infrastructure and digital literacy.[8]	A good number of digital health initiatives to address the pandemic have been partially designed using the characteristics of digital public health goods. A particular example is the effort to ensure that data and content are freely accessible, downloadable, and analyzed using open-source software in a sustained and sustainable way.[9]
3. Ensuring inclusive digital health for all, including the most vulnerable people	Vulnerable populations, such as elderly people, indigenous and rural populations, or those with poor access to formal education, benefit less from digital health interventions because they are digitally excluded, meaning that they lack access to basic infrastructure (e.g., electricity) or they do not have the appropriate skill set (e.g., culture or literacy).	Various measures to address the health crisis depend on digital data from the Internet, social networks, and cell phones. Yet, in low-income areas, there are still gaps in access to these media and to the skills necessary to use them.[10]
4. Implementing interoperable, open, and sustainable digital health and information systems	Information systems provide immediate data and essential evidence for acting, informing decisions, and adjusting policies. With properly disaggregated data, it is possible to plan actions that give visibility to and reduce potential health inequities at all levels of care and that facilitate strategies to address such inequities.	During an emergency situation like a pandemic, more than in any other public health situation, information systems play a critical role in managing data and other information at the speed the situation requires. The use of technologies and automation have the potential to improve the public health response like never before.[11]
5. Mainstreaming human rights in all areas of the digital transformation of health	Health data are so sensitive, it is imperative to handle them safely and to prevent leaks, external attacks, and loss of confidentiality. This is challenging as the number of actors increases. Ensuring ownership of health-associated data by individuals presents a huge legal and logistical challenge.	Tools to help with contact tracing for exposure notification and symptom verification, and to check compliance with quarantine, among others, have been developed rapidly in response to the emergency. Therefore, there is a higher risk that they are a source of discrimination and digital inequity and may contribute to a loss of data privacy.
6. Participating in global cooperation on artificial intelligence and any emerging technology	Big data, artificial intelligence (including machine learning), the Internet of things, virtual and augmented reality, and blockchains are among the technologies that have emerged in recent years and can be used to revolutionize the well-being of people.	This pandemic has catalyzed the adoption of new technologies in health and also led to unprecedented collaboration and discussion about experiences and best practices. It has also increased access to research data and knowledge and to publications previously limited by licenses, among other examples.
7. Establishing mechanisms for trust and information security in the digital environment of public health	The integration of various information services has led to privacy and confidentiality concerns as well as concerns about the quality and veracity of the data shared. Thus, a robust scheme to ensure security and trust must exist to fight misinformation and ensure good-quality evidence is used for decision-making.	An infodemic developed parallel to the current pandemic in which an excess of valid information was shared together with incorrect information or fake news (i.e., a mixture of scientific and technical data shared along with purposeful disinformation) about treatments, vaccine development, and even doubts about the existence of the virus. This situation confuses the population, so the public is unsure which information to trust and which institutions to follow.[12–15]
8. Designing public health care architecture in the era of digital interdependence	Renewing public health architecture to aid digital cooperation means having processes, policies, human resources, infrastructure, and decision-support systems that permit effective and rapid adoption of digital solutions, whether transdisciplinary or interinstitutional, for public health.	The COVID-19 pandemic has shown the potential of digital health technologies, but it has also revealed the weaknesses of current public health architecture in various regions. This has had an impact on the timeliness and appropriateness of the interventions adopted for mitigation and containment.

commitments made by the Pan American Health Organization, the World Health Organization, and the United Nations.[2–4] Interdependence among stakeholders becomes essential in the digital age, given that no single entity has all the required knowledge, creativity, or human, financial, or technological resources.

ENSURING NO ONE IS LEFT BEHIND OR DISCONNECTED

In a region where 30% of people do not have access to the Internet, it is crucial to ensure that no one is left behind by ensuring that public health interventions are equitable and sustainable.[5] The path to a truly digital society requires a sensitive balance between state-of-the-art technology and striving to connect the unconnected. It will also require global agreements on new indicators that will allow progress toward an inclusive digital transformation to be measured.[6]

EQUITABLE AND SUSTAINABLE DIGITAL TRANSFORMATION IN HEALTH

Frequently, those who need the most from the health system are those who have the least access to it. In digital health, this is amplified because the vulnerability of the population and their lack of connectivity usually go hand in hand, and a nonequitable approach could end up being counterproductive, pushing vulnerable populations into an even more precarious situation, thus increasing the generational, economic, and geographical gaps for entire population groups. We are proposing an equitable approach to digital inclusion that has a strong focus on connecting the 250 million unconnected inhabitants in our Region. This approach can also help accelerate the reach of universal health access and coverage through faster, cheaper, and more efficient health processes, from the use of teleconsultations in primary care facilities to the automation of drug manufacturing and the delivery and logistics of health services.

GUIDING PRINCIPLES FOR THE DIGITAL TRANSFORMATION OF HEALTH

The proposed principles focus on the 4 areas of a sustainable health system—human, social, economic, and environmental—and these highlight the broader possibilities for using the digital transformation to have an impact on the sustainability of health systems. This approach specifically focuses on building local capacity in digital public health goods and human resources through continuing professional development and local training. New societal capabilities must be developed to capitalize on the full potential of these digital tools. However, today in health informatics we lack the shared goals and common language that we take for granted in other spheres. Table 1 describes the proposed guiding principles and their relationship with the COVID-19 pandemic.[7]

CONCLUSIONS

The potential of the digital transformation for health during this and future public health emergencies is indisputable, yet it is essential that it is accompanied by digital inclusion and the goal of ensuring that no one is left behind. Agile digital systems are essential to facilitate cocreation and cooperation among all relevant actors regarding the development, evaluation, and safe adoption of innovative technologies. Sustainable strategies are key to strengthen information services and to ensuring the analysis of critical real-time and disaggregated data during a health emergency, especially in the areas of interoperability, data exchange, and the use of nontraditional data sources. Some challenges are associated with ensuring privacy and confidentiality, as well as the secondary use of data for which consent has not been obtained; thus, it is crucial to develop appropriate regulatory frameworks. A critical factor for success is the establishment of digital public health goods that support and promote technological development, including regulatory frameworks, to ensure an equitable distribution of these positive interventions. It is imperative to incorporate rapidly, but safely and ethically, open-source technologies to accelerate research, collaboration, and innovation in the public health sector as a whole. Finally, given current developments and looking ahead, the development of new public health digital competencies should be part of an ongoing educational strategy through continuing professional training for anyone who decides to work in this field. AJPH

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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