

We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

186,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com



The MONITOR Ecosystem: A Digital Health Intervention for the Early Detection, Control, Follow-Up, and Management of COVID-19 in Mexico

*Miguel Betancourt-Cravioto, Jorge Falcón-Lezama,
Fernando Rojas-Estrella, Rodrigo Saucedo-Martínez
and Roberto Tapia-Conyer*

Abstract

In fighting infectious disease outbreaks, a basic epidemiological principle is to detect cases quickly and to isolate each case, to interrupt transmission. This principle has been the cornerstone of the Carso Group (CG) COVID Protocol, a systematic blueprint for the reopening of operations of workplaces in the context of ongoing disease transmission in Mexico. The CG comprises over 50 companies with approximately 180,000 employees engaged in economic activities including telecommunications, retail, construction, banking, mining, and manufacturing, among others. To cope with the COVID-19 pandemic within the CG, the Carlos Slim Foundation designed, developed and implemented MONITOR, a digital health ecosystem comprising a mobile phone application, web portal, and analytics platform, to assess the infection risk of each employee, follow-up their health status, and detect early symptoms of COVID-19. MONITOR provides daily notifications for any suspected cases and activates a COVID-19 testing request and follow-up of results. This intervention helps rapidly identify and isolate suspected cases, as well as follow-up of work and family contacts, to prevent further outbreaks. Use of MONITOR has thus enabled containment of COVID-19 in workplaces and safe return to work. MONITOR is an example of the implementation of public health practices in workplaces and can serve as the basis for larger deployment in population-wide settings.

Keywords: COVID-19, SARS-CoV-2, digital health, outbreak, prevention, pandemic, surveillance

1. Introduction

1.1 The SARS-CoV-2 outbreak

A cluster of cases of pneumonia with unknown etiology was first reported in Wuhan, Hubei Province, China in December 2019. Subsequent analysis identified

a novel coronavirus, later named severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). The disease caused by the virus was eventually called coronavirus disease 2019 (COVID-19) [1, 2]. On January 30, 2020, the World Health Organization (WHO) declared the outbreak a Public Health Emergency of International Concern; on March 11, a pandemic was declared [3].

Coronaviruses are widely distributed globally [2]. Most human coronavirus infections are mild; however, two previous outbreaks led to many illnesses and deaths. The epidemics of severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002–2003 and Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012 resulted in many people developing severe pneumonia, with mortality rates of 10% and 36%, respectively [4].

According to the WHO, a patient with suspected COVID-19 infection is anyone meeting the clinical criteria with respect to signs and symptoms associated with the disease, including fever, dry cough, and fatigue. Other less common symptoms include myalgia, nasal congestion, headache, conjunctivitis, sore throat, diarrhea, and smell or taste disorders (anosmia and dysgeusia). Epidemiologic criteria include exposure to an area with a high risk of viral transmission or community transmission owing to work, residence, or travel [5].

COVID-19 infection exhibits different effects in different groups and individuals. Most infected people have mild- or moderate-intensity symptoms and approximately 80% recover without the need for hospitalization. One in five people develop severe illness and experience breathing difficulties, among other serious symptoms. Importantly, it is possible that transmission can occur from someone who either has mild symptoms, remains asymptomatic, or is in the incubation period [6].

According to the United States Centers for Disease Control and Prevention (CDC), the incubation period (time from infection to illness onset) is from 2 to 14 days after exposure, and symptoms develop in 97.5% of infected individuals within 12 days [7]. Adopting a 14-day period of quarantine has become the standard procedure for individuals who have been in contact with someone with a confirmed COVID-19 diagnosis or who have traveled to high-risk areas [8].

SARS-CoV-2 is transmitted through droplets produced when an infected person coughs, sneezes or talks, which are ingested or inhaled by an individual nearby (within a distance of approximately 2 meters). A person can also become infected by touching a contaminated surface or object that has been contaminated with the virus and subsequently touching the mouth, nose, or eyes [9]. The diagnosis of COVID-19 is confirmed via a positive nucleic acid test result using sputum, a throat swab, or lower respiratory tract secretion sample [10].

The Lancet COVID-19 Commission has offered a list of practical solutions to the challenges during the current pandemic. One set of solutions is focused on non-pharmaceutical interventions in which governments, non-governmental organizations (NGOs), and the private sector collaborate to mitigate negative consequences of the pandemic [11]. In line with this, the WHO has recommended the use of face masks, proper hand hygiene, physical distancing and mobility restrictions, among other measures [12–14]. In Mexico, the federal government announced the National Social Distancing Period Intervention, which included closure of non-essential public and private activities with the objective of reducing population mobility to limit community transmission, especially among those with a high risk of developing complications (age 60 years and older; people with hypertension, type 2 diabetes, obesity, respiratory diseases, or immunosuppression [15–17]; and pregnant women) [18].

2. About the Carso Group

The Carso Group (CG) is a Mexico-based conglomerate of companies spanning five sectors: commercial, infrastructure and construction, industrial, energy, and banking [19]. CG comprises more than 50 companies, with operations in over 5000 locations throughout Mexico and approximately 180,000 employees. CG companies are located in 1333 municipalities (54.2% of the total municipalities) within the 32 Mexican states, and 83% of these are located in 20 metropolitan areas: 45.6% in the Mexico City Metropolitan Area, 4.1% in Puebla-Tlaxcala, 4.1% in Guadalajara, 3.9% in Tijuana, and 3.8% in Monterrey.

The COVID-19 pandemic has affected all economic activities globally, forcing governments and entities to implement actions to contain its transmission [20–22]. Among the most important of these, most economic activity has shifted to telework, with the exception of activities that are deemed essential [12, 15, 23]. Importantly, some CG companies are engaged in essential economic activities in areas such as telecommunications, banking, mining, and energy. In addition, CG employees have varying levels of risk, either owing to older age or underlying non communicable diseases (NCDs). Some employees are more vulnerable because the nature of their work requires constant interaction with others, such as those working in retail stores, or because their household or workplace is located in a municipality with a high risk of contagion.

In response to the COVID-19 pandemic, the CG Board of Directors commissioned the Carlos Slim Foundation (CSF), a non-profit independent organization linked with the Group, to design and implement a comprehensive response protocol to contain the spread of COVID-19 in the workplace, with the goal of protecting the health of employees and their families, as well as suppliers and clients.

The CSF was founded in 1986. Its aim is to address social inequalities by improving quality of life for the most vulnerable populations by training human resources and promoting greater opportunities. The scope of work of the CSF spans education, employment, health, nutrition, social justice, culture, human development, natural disaster support, economic development, and environmental protection [24].

The Carso COVID Protocol is the result of the abovementioned efforts. The protocol is divided into two components, launched at different times during the COVID-19 pandemic in Mexico; Annex 1 provides greater detail regarding the policies and recommendations outlined in the Protocol:

- Prevention and containment of COVID-19, launched on March 13, 2020
- Safe return to work, launched on May 22, 2020.

The CSF has extensive expertise in the design, development, implementation, and scale-up of digital health (DH)-based solutions aimed at improving health care service delivery to strengthen primary care, with a strong focus on prevention [25]. Hence, the CSF convened a team of experts in different disciplines to design a COVID-19 digital health ecosystem to facilitate implementation of the Carso COVID Protocol.

3. Digital health in the response to viral outbreaks

One of the basic epidemiological principles in mitigating infectious disease outbreaks is to stop transmission through timely detection and isolation of cases [26]. Hence, leveraging DH contributes to an effective public health strategy to prevent and mitigate the spread of an infectious disease [27].

DH is the new paradigm in health care, defined as “the convergence of four disruptive technologies: 1) the use of digital platforms, connected through micro-services, 2) cloud-based services with robust infrastructure to support big data transactions, 3) use of inter-connected wearables, devices and tracers, and 4) connecting communities through mobile phone apps and social media. These technologies are enhanced by Artificial Intelligence.” [28]. The potential of DH has been demonstrated in detecting and mitigating infectious disease outbreaks and epidemics in countries worldwide [29]. Some examples of successful DH-based strategies include the 2014–2016 Ebola outbreak across West Africa [27] and the 2003 global outbreak of SARS-CoV [29]. In Mexico, there is evidence of the benefits of a mobile phone-based intervention to support surveillance during the H1N1 influenza pandemic in 2009 [30].

The current COVID-19 pandemic highlights the need for innovation in continuous surveillance, rapid diagnosis, and real-time contact-tracing of emerging infectious diseases. Health systems are structured around face-to-face medical visits, which involve direct interaction between patients and their health care providers [31]. This operating model can contribute to faster spread of infection among uninfected individuals, quickly overwhelming available critical care services [31, 32]. Additionally, health care providers are at high risk of exposure to COVID-19 infection, which leads to reduced availability of skilled clinicians over time. When health care resources are strained to a breaking point, patient care may be compromised, which is associated with negative outcomes and increased mortality rates [33].

Given the aforementioned scenario, there is a window of opportunity to implement, expand, and integrate DH technologies across the health care system [34]. The use of digital platforms has become the primary means of communication whereby people, governments, organizations, and health institutions can communicate, work, interact, share and exchange knowledge and information, and generate data [35].

DH has become increasingly instrumental in the response of governments and organizations to COVID-19 [36]. DH solutions include, but are not limited to, telemedicine/telehealth, electronic medical records, public health surveillance leveraging on big data and AI algorithms, wireless health sensors, georeference-based tracing technologies, mobile health applications (apps), and health analytics platforms for public health and clinical decision-making [33]. In the case of

Type of solution	Type of tool	Country and developer
A. COVID-19 general information		
Coronavirus symptoms	Government websites, apps, chatbots, forums, SMS text messaging, call centers	WHO: Chatbot [38], website [39] PAHO: Website [40] Uruguay: Call center [41] Paraguay: Ministry of Health free call center [42] Mexico: COVID-19MX App [43], chatbot [44], websites [44–46] Trinidad and Tobago: Website [47] Argentina: Chatbot [48] Jamaica: Website [49] USA: CDC website [8] Spain: Ministry of Health website [50] and AsistenciaCOVID19 App [51] Canada: COVID-19 Virtual Assistant and website [52] Colombia: Government website, telephone lines, and virtual assistant [53] Bolivia: Government COVID-19 call center and BoliviaSegura App [54]

Type of solution	Type of tool	Country and developer
Real-time information regarding the status of the epidemic in each country	Dashboards, websites, apps	WHO: Interactive dashboard [55] PAHO: Big data tool [56] Google: COVID-19 Situation Dashboard [57] Humanitarian response: Interactive map [58] HealthMap: Interactive map [59] Johns Hopkins: Interactive dashboard [60, 61] Spain: Ministry of Health website [62] Brazil: Ministry of Health Interactive map [63] Mexico: COVID-19 Situation Dashboard UNAM [64] and COVID-19 Traffic Light Monitoring System SSA [65] Jamaica: Interactive dashboard [66] Colombia: Interactive map [67]
General questions regarding COVID-19	Government websites	PAHO: COVID-19 website [68] WHO: COVID-19 website [39] Mexico: COVID-19 web page [44] Spain: Ministry of Health website [62] USA: CDC website [69] and Department of Health and Human Services [70] Canada: COVID-19 website [71] Colombia: Government website [53] Bolivia: Government COVID-19 website [54]
Self-diagnosis support to seek medical care	Apps, chatbots, websites, call centers, self-assessment tools	WHO: Chatbot [38] Google: COVID-19 self-assessment [72] Johns Hopkins: Coronavirus self-checker tool [73] Peru: COVID-19 coronavirus evaluation CDC: Coronavirus self-checker tool [74] Jamaica: Call centers [75] MAYO Clinic: Coronavirus self-assessment tool [76] Canada: COVID-19 self-assessment tool [77] Colombia: COVID-19 self-diagnosis tool [78] and virtual assistant [53] USA: Veterans Crisis Line Veterans Health Administration - COVID-19 Response Plan [79]
General guidance from health care professionals	Apps, call centers	Argentina: National call center [80] Uruguay: Chatbot and call center [81] Mexico: National Call Center [82], UNAM call center [83]
B. Teleconsultation and patient monitoring		
Patient monitoring and follow-up, contact tracing	Apps, call centers, teleconsultations	Brazil: Monitora COVID-19 App [84] Uruguay: Coronavirus UY App [85] France: StopCovid App [86] China: Beijing Cares App [87] Australia: COVIDSafe App [88] South Korea: Self-quarantine Safety Protection App [89] India: AarogyaSetu App [90] USA: Veterans Health Administration - COVID-19 Response Plan [79] Indonesia: PeduliLindungi App [86] Germany: Corona-Datenspende [91] and Corona-Warn-App [86] Hong-Kong: StayHomeSafe App [92] Colombia: CoronApp [93]

Type of solution	Type of tool	Country and developer
Clinical support from health professionals	Apps, call centers, teleconsultations	Guatemala: Online doctor app [94] Peru: Telephone line [95] USA: Veterans Health Administration - COVID-19 Response Plan [79] USA: Department of Health and Human Services [70]
Follow-up of suspected cases in quarantine	Apps, call centers, teleconsultations	Brazil: Monitora COVID-19 App [84] Colombia: CoronApp [93] Costa Rica: EDUS COVID-19 app [96] Poland: Kwarantanna domowa App [86]
Remote clinical management	Call centers, teleconsultations	Mexico: phone line, WhatsApp for emotional, nutritional, and medical attention for TecSalud workers [97]
C. Education and training		
Evidence-based public health information regarding COVID-19	Web-based information, specialized interactive websites for researchers	WHO: Virtual Health Library COVID-19 [98] Cochrane Library on COVID-19 [99] PubMed: LitCovid literature hub [100] OAS: Organization of American States COVID-19 Repository [101] Elsevier: National Library of Medicine Elsevier Information Center [102]
Evidence-based materials for ongoing training	Virtual campuses, webinars, interactive platforms	WHO: Virtual Campus [103] PAHO: Virtual Campus [104] Mexico: Mexican Government website COVID-19 courses [105] Coursera: Virtual Campus [106] CDC: Virtual Campus [107]

Table 1.
Digital solutions developed to prevent and manage COVID-19 around the world.

COVID-19, DH can offer real-time access to comprehensive individualized reliable data, to enable personalized monitoring and provide AI-based assistance. DH can also be implemented to access reliable data and information, participate in social media, use risk-based algorithms to support self-diagnosis, seek health professionals to receive clinical support, and maintain work activities, among other applications [35, 37]. **Table 1** shows some DH solutions that have been developed and are being used by institutions, governments, and NGOs around the world to prevent, manage, and mitigate COVID-19.

4. MONITOR digital health ecosystem

The first case of COVID-19 in Mexico was reported on February 27, 2020 [108, 109]. Fully aware of the benefits of DH, the CSF had begun to work on the design of a robust response plan in January 2020. On March 13, 2020, the Carso COVID Protocol was launched, including a comprehensive set of actions and recommendations to prevent and contain COVID-19 in the workplace. As part of implementation of the Protocol, the CSF launched the MONITOR digital health ecosystem (MDHE), aimed at monitoring the wellbeing of CG employees and their families.¹

¹ Annex 1 provides a detailed description of the recommendations and actions in the Carso COVID-19 protocol.

MONITOR was initially designed based on WHO and CDC guidelines, and its recommendations are in compliance with current regulations of Mexico's Ministry of Health. Furthermore, MONITOR has been continuously updated with the latest available scientific evidence.

The MDHE comprises three interconnected platforms operating concurrently: a mobile phone application and a web portal for employees and their families to register and report symptoms on a daily basis, the Integrated Measurement for Early Detection (MIDO)-COVID Platform to assess NCDs and COVID-19 serological status among employees at worksites, and the Health Intelligence Platform with robust analytics to support decision making. Importantly, the MDHE is compliant with Mexico's regulatory standards in terms of confidentiality, security and privacy.

4.1 Prevention and containment of COVID-19 in the workplace

MONITOR enables the implementation of a COVID-19 prevention and containment strategy according to the following stepwise process:

1. An employee registers in MONITOR using either the mobile phone app or a secure web portal. During registration, the employee is asked to provide information on any existing NCDs.
2. On a daily basis, individuals report whether they have any symptoms and if so, describe those symptoms. Using a point-based risk algorithm, MONITOR automatically assesses and classifies each person's risk and provides immediate recommendations, as follows:
 - a. No risk (no symptoms): the employee is encouraged to continue notifying on a daily basis.
 - b. Mild risk: the employee is encouraged to increase the number of notifications to twice a day and to continue monitoring.
 - c. Moderate risk: the employee is encouraged to increase notifications to twice a day and if necessary, to call a dedicated call medical center operating 24/7/365.
 - d. Severe risk: the employee is encouraged to increase notifications to twice a day and to call a medical call center. In addition, an alert is triggered to the human resources (HR) department of the employee's company, to signal a potential complication.
3. At the medical call center, a general physician provides remote counseling, and assesses whether the employee requires a reverse transcription polymerase chain reaction (RT-PCR) test to confirm a diagnosis of COVID-19 infection, or whether they need to be referred for immediate medical assessment.
4. If a person is referred for an RT-PCR test, the general physician schedules an appointment at any of the CG-dedicated lab facilities in Mexico City and 27 cities throughout the country. Once the employee has been tested, they are instructed to remain in isolation until their test results are obtained, within 24–48 hours.
5. Upon confirmation of COVID-19 infection:
 - a. The employee receives a pulse oximeter for self-monitoring during the 14-day isolation period. The employee is required to notify symptoms via MONITOR.

- b. The CSF epidemiology team, in coordination with company HR departments, conducts an outbreak investigation for each employee with confirmed COVID-19 infection, including tracing of all work and family contacts. A contact is defined as someone who has remained in close proximity (less than 2-meter distance) with the employee for at least 15 minutes while not wearing personal protective equipment; this definition is in line with WHO recommendations [9, 10].
 - c. All identified contacts are sent for confirmatory laboratory testing and are closely monitored throughout the period in which they are ill.
6. All collected data are available through the Health Intelligence Platform for real-time analytics, follow-up, and clinical support, for both HR departments and the CSF epidemiology team.

4.2 Safe return to work with MIDO-COVID

With ongoing transmission of SARS-CoV-2 during the phased reopening of non-essential activities in Mexico, a series of measures were implemented in CG's workplaces to ensure the safe return of employees. These measures are described in Annex 1.

There is ample scientific evidence demonstrating that the presence of comorbidities increase the risk of severity and complications of COVID-19, particularly cardiovascular disease, diabetes, hypertension, chronic lung or renal disease, and obesity [17]. In light of this evidence and building on previous experience [110–112], the CSF designed and developed the MIDO-COVID Digital Platform, aimed at assessing NCDs and COVID-19 serological status among employees resuming operations in the workplace.

Like MONITOR, MIDO-COVID is implemented following a stepwise process, performed by a MIDO expert²:

1. Registration of employees in MIDO-COVID, retrieving their data from the MDHE.
2. Measurement of weight/waist circumference and height, blood pressure, and capillary blood glucose, either fasting or random.
3. Performance of rapid antibody tests.
4. Recording of measurements and serologic test results.
5. Analytical algorithm with integrated risk profiling:
 - a. NCDs profile with interpretation and recommendations.
 - b. Serology test results with interpretation and recommendations.

The MIDO-COVID Digital Platform automatically delivers certified serologic test results. Importantly, this assessment confirms the presence of NCDs and

² In each workplace, employees are chosen to be trained as MIDO-COVID experts. These employees complete an online course in which they learn to measure weight, height, blood pressure, and capillary blood glucose; and how to record these measurements in the digital platform, perform serological tests, and provide brief counseling when informing employees of their test results.

Registrants in MONITOR	N = 254,043
Employees	184,117
Family relatives	69,926
1. Prevention and containment of COVID-19 in workplaces	
Medical call center calls	257,803
Laboratory tests performed	29,693
Positive cases (positivity rate)	5124 (17.2%)
Outbreak studies in workplaces	1840
2. Safe return to work with MIDO-COVID	
Total assessments	46,740
Main results of serology tests	
IgM – / IgG – (not exposed)	39,505 (84.5%)
IgM + / IgG – (early-stage infection)	322 (0.7%)
IgM + / IgG + (acute infection)	2013 (4.3%)
IgM – / IgG + (past infection)	4812 (10.3%)

Table 2.
Main results of the MONITOR digital health ecosystem (13 march to 31 October, 2020).

validates the self-reports provided by employees using the mobile phone app. Finally, in the case of active COVID-19 infection, the employee is quarantined and the contact tracing protocol is begun, as described above.

In sum, joint coordination of the HR department at each company with the epidemiology team at the CSF has enabled effective deployment of the Carso COVID Protocol through the use of MONITOR. **Table 2** shows the main results of the MDHE as of October 31, 2020.

5. Permanent strategies following the current public health emergency

Given that the COVID-19 pandemic has changed the way that companies function, the CG intends to retain certain strategies to protect employees’ health. The COVID-19 pandemic has provided an excellent opportunity to improve the workplace environment in terms of health and safety at every worksite. The CG is fully committed to providing every employee with all the preventive tools, measures, and strategies needed to maintain a physically and mentally healthy community. In this sense, the CSF encourages joining MONITOR together with MIDO, with the recognition that poor control of NCDs increases the risk for COVID-19 complications [113]. MIDO screening can facilitate early detection of type 2 diabetes, hypertension, and dyslipidemia, focusing specifically on pre-disease stages and early treatment. MIDO offers a systematic risk assessment of screened individuals, identifying those with a healthy, at-risk (pre-disease), or disease status [112].

Inter-connecting MONITOR and MIDO-COVID in a digital ecosystem allows HR personnel to identify COVID-19 positive employees or those with high-risk of complications. Daily information can be used to better monitor, diagnose, track and control employees’ infection risk and overall health. Moreover, data are stored in a secure cloud, where it can be retrieved to generate predictive models for each

company and type of workplace, as a strategy to better understand and control risk factors in each sector.

Flexible schedules, in which employees alternate teleworking and working at a CG location when necessary, are very important. If an employee feels unwell, they must notify their direct manager and should not present to their work location. In worksite dining rooms, menus should be based on nutritional recommendations following the EAT-LANCET Commission on healthy diets and sustainable food production. Every meal is to be prepared according to the planetary health plate, characterized by at least 50% vegetables (fruits and vegetables) and the remainder comprising whole grains, plant-source protein, animal-source protein, dairy foods, and unsaturated plant oils [114].

Workplaces are implementing programs to promote wellbeing and healthy lifestyles among employees and their household members. In this way, the CG seeks to empower its employees through health promotion initiatives conducted by trained multidisciplinary health professionals in topics including nutrition, NCDs prevention, physical activity, vaccination, mental health awareness, and wellbeing.

As part of its response to COVID-19 as well as other novel pathogens, the CG plans to create emergency response teams and permanent communication via DH among HR departments across all CG businesses. Frequent intervention assessments will be carried out to gauge adherence to protocols and determine where improvements are needed.

6. Conclusions

This chapter describes the CG COVID-19 mitigation strategy within a corporate group in Mexico. Priorities for the CG during this outbreak have been to protect employees' health and wellbeing by implementing protocols and strategies based on scientific evidence. Consequently, occupational safety and health have taken on greater relevance in all kinds of workplaces.

First, our experience shows that Digital Health can be used to quickly identify people with any infection risk, during early stages. CG employees are empowered through advice and counseling using IT tools such as a mobile phone app or website. The MONITOR strategy has proven to be an effective intervention. The use of DH has been instrumental in outbreak control and maintaining workplace activities. Second, we have learned that the use of a Digital Health ecosystem is effective in detecting and controlling COVID-19 outbreaks in work settings.

This experience can be useful for other organizations in the process of implementing and operating digital health based strategies to cope with outbreaks of viral disease.

Acknowledgements

We wish to acknowledge the work of the different HR departments of CG in the implementation and follow-up of the Carso COVID Protocol. The strategy and results included in this chapter were only possible because of their dedication, and their hard work.

On the other hand, we acknowledge the help provided by Alejandra Cantoral, ScD., Larissa Betanzos, ScM, and Adriana Granich, MD, for the data compilation of digital health solutions around the world. We also acknowledge Analisa Avila, of Edanz Evidence Generation, for editorial support.

Conflict of interest

All authors declare no conflicts of interest.

Notes/thanks/other declarations

None

Abbreviations and acronyms

AI	artificial intelligence
CDC	Centers for Disease Control and Prevention
CG	Carso Group
CSF	Carlos Slim Foundation
DH	digital health
HR	human resources
MDHE	MONITOR digital health ecosystem
MERS-CoV	Middle East respiratory syndrome coronavirus
MIDO	Integrated Measurement for Early Detection
NCDs	non-communicable diseases
NGO	non-governmental organization
PAHO	Pan American Health Organization
RT-PCR	reverse transcription polymerase chain reaction
SARS-CoV	severe acute respiratory syndrome coronavirus
SARS-CoV-2	severe acute respiratory syndrome coronavirus-2
SSA	Ministry of Health
WHO	World Health Organization

Appendix 1. The Carso COVID Protocol

To support the Carso Group (CG) COVID-19 response plan, the Carlos Slim Foundation prepared and designed the Carso COVID Protocol, called the “Recommendations and guidelines for the prevention and management of COVID-19 in an organization”. The Protocol has two components, launched at two time points during the course of the pandemic:

- Prevention and containment of COVID-19, launched on March 13, 2020 (**Supplementary Table 1**)
- Safe return to work, launched on May 22, 2020 (**Supplementary Table 2**).

This Protocol is based on scientific evidence regarding infectious diseases and the most important available evidence regarding COVID-19 to date. Most recommendations are based on WHO and CDC guidelines and are continuously updated as new evidence becomes available.

The Protocol was designed with consideration for the needs of the different CG workplaces. Nonetheless, each company within the CG has adapted the recommendations to the operational needs of each workplace. For example, most employees in workplace settings that were not considered essential switched to teleworking whereas employees performing activities classified as essential implemented different schemes, such as staggered working schedules. It is noteworthy that the Protocol was implemented at all CG worksites.

Section	Description	Main actions/recommendations
Continuity of Operations Group	In each company, this refers to a team comprising employees with decision-making capacity. This group designs, coordinates, and establishes the organization's continuous operations policies and guidelines.	<ul style="list-style-type: none">• Oversee adequate implementation of the COVID-19 protocol.• Communicate general preventive measures.• Ensure the implementation of proper cleaning and disinfection policies.• Define and implement work-at-home policies and provide guidance to staff regarding their implementation to maintain operations.• Monitor employees' health status and implement quarantine and isolation policies according to guidelines.• Monitor the evolution of employees with COVID-19 infection in isolation.• Update COVID-19 prevention and care policies according to the latest evidence and government regulations.
Communication strategies	Identifying the point of contact in each workplace and department to communicate new policies and guidelines.	<ul style="list-style-type: none">• Communication of Protocol policies through available channels: billboards, intranet, email, social media, mobile phone text messaging, etc.• Implementation of a "hotline" available to employees 24/7, to address any questions or request support.
General containment measures	This refers to general containment measures for employees.	<p>Measures are classified according to risk:</p> <ul style="list-style-type: none">• General (employees, suppliers & visitors).• Asymptomatic employees.• Employees with any symptoms of respiratory infection.• Employees diagnosed with COVID-19 (suspected or confirmed) and/or in contact with a confirmed COVID-19 case.
General preventive measures	This describes hygiene and physical distancing measures that must be implemented in each workplace. The supplies needed to implement these policies are also listed. Recommendations for working from home are given.	<ul style="list-style-type: none">• Placement of posters and communication materials.• Availability of face masks at workplaces, as well as bins for their disposal.• Equipment for cleaning staff.• Use of 0.1% chlorine solution or 70% ethanol for disinfection of surfaces.• Handwashing and use of alcohol-based hand sanitizer.• Suspension of air conditioner use and proper ventilation measures.• Physical distancing.• Staggered work schedules in confined or crowded workspaces.• Working from home.• Recommendations for vulnerable populations• Timely notification of symptoms.• Establishment of a COVID-19 team in each workplace.

Section	Description	Main actions/recommendations
Employee dining rooms	Describes sanitary measures that dining room staff must implement during the preparation of meals and cleaning of the dining room.	<ul style="list-style-type: none">• Measures at the dining room entrance and restriction of access for employees who do not comply with policies.• Use of personal protective equipment among dining room staff.• Safe use of trays, glasses, and cups.• Elimination of self-service areas, such as salad bars or shared condiments.• Isolation of dining room staff with COVID-19 infection or symptoms.
Cleaning company staff	Describes policies and guidelines that all cleaning staff must comply with.	<ul style="list-style-type: none">• Policies for work attendance.• Use of uniforms and restrictions regarding jewelry and beards.• Use of personal protective equipment.• Use of 0.1% chlorine solution or 70% ethanol to disinfect surfaces.• Suspension of air conditioner use and proper ventilation measures.• Adequate disposal of garbage.
Travel, business meetings and events	Describes general policies for travel, meetings, and events. This section emphasizes the importance of transitioning to tele- or video conferences.	<ul style="list-style-type: none">• Cancellation or restriction of national and international travel.• Isolation policies after returning from essential travel.• Suspension of conferences, events, or summits, regardless of their nature.• Restriction of visitors and suppliers in the workplace.• Promotion of tele- and video conferences.• Restrictions regarding face-to-face work meetings.
Customer service workplaces	This section describes the general policies for workplaces that provide customer service, such as retail and post-sales services and banking.	<ul style="list-style-type: none">• Use of face masks and personal protective equipment.• Cleaning of workspaces, and use of 0.1% chlorine solution or 70% ethanol for disinfection.• Identification and management of suspected cases of COVID-19 infection.
Call centers		<ul style="list-style-type: none">• Alternating work shifts to facilitate physical distancing.• Identification and management of suspected cases of COVID-19 infection.• Use of 0.1% chlorine solution or 70% ethanol to disinfect surfaces.

Table S1.
Supplementary Table 1. Prevention and containment of COVID-19 (summary).

Section	Main actions/recommendations
Preparation and adaptation of workspaces	<ul style="list-style-type: none">• Reinforcement of basic preventive measures.• Adaptation of workspaces:<ul style="list-style-type: none">◦ Screens and partitions between workstations.◦ Signs outlining requirements and recommendations posted in areas with high visibility.◦ Strategically located alcohol-based hand sanitizer dispensers that are constantly stocked.• Sanitization and disinfection of workspaces.
Measures to reduce physical interaction	<ul style="list-style-type: none">• Staggered work shifts and working from home.• Implementation of flexible work schedules.• Restrictions in common areas, e.g., dining rooms, hallways, and reception desks.• Protocols for interaction with suppliers and customers.• Restriction of meetings and promotion of tele- and video conferences.
Measures to reduce risk of infection	<ul style="list-style-type: none">• Organization of teams to supervise the correct application of basic preventive measures.• Point-of-entry screening in each workplace.• Identification and management of suspected COVID-19 cases during working hours.
Employee training and awareness campaigns	<ul style="list-style-type: none">• Permanent social media campaigns to raise awareness.• Development and adaptation of content and materials: the CSF developed a web portal with curated information about COVID-19. As of October 31, the CSF has produced more than 150 informational materials including infographics, videos, and audio recordings to support CG companies in raising awareness about COVID-19.• Two online courses for COVID-19 teams and employees

Table S2.
Supplementary Table 2. Safe return to work (summary).

IntechOpen

Author details

Miguel Betancourt-Cravioto¹, Jorge Falcón-Lezama¹, Fernando Rojas-Estrella¹,
Rodrigo Saucedo-Martínez¹ and Roberto Tapia-Conyer^{1,2*}

1 Carlos Slim Foundation, Mexico City, Mexico

2 National Autonomous University of Mexico, Mexico City, Mexico

*Address all correspondence to: tapiaconyer@yahoo.com.mx

IntechOpen

© 2020 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. 

References

- [1] Naming the coronavirus disease (COVID-19) and the virus that causes it, [https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-\(covid-2019\)-and-the-virus-that-causes-it](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it) (accessed 12 October 2020).
- [2] Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020; 395: 497-506.
- [3] Timeline of WHO's response to COVID-19, <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline/> (accessed 12 October 2020).
- [4] Song Z, Xu Y, Bao L, et al. From SARS to MERS, thrusting coronaviruses into the spotlight. *Viruses*; 11. Epub ahead of print 1 January 2019. DOI: 10.3390/v11010059.
- [5] WHO. *Public Health Surveillance for COVID-19: Interim guidance*. 2020. Epub ahead of print 2020. DOI: 10.1007/978-1-59745-326-4_13.
- [6] WHO. Preguntas y respuestas sobre la enfermedad por coronavirus (COVID-19), <https://www.who.int/es/emergencies/diseases/novel-coronavirus-2019/advice-for-public/q-a-coronaviruses> (2020, accessed 18 October 2020).
- [7] Lauer SA, Grantz KH, Bi Q, et al. The incubation period of coronavirus disease 2019 (CoVID-19) from publicly reported confirmed cases: Estimation and application. *Ann Intern Med* 2020; 172: 577-582.
- [8] Symptoms of Coronavirus | CDC, <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html> (accessed 12 October 2020).
- [9] Adhikari SP, Meng S, Wu YJ, et al. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: A scoping review. *Infectious Diseases of Poverty*; 9. Epub ahead of print 17 March 2020. DOI: 10.1186/s40249-020-00646-x.
- [10] World Health Organization. Laboratory testing for coronavirus disease 2019 (COVID-19) in suspected human cases. 2020; 1-7.
- [11] Sachs JD, Abdool Karim S, Akinin L, et al. Lancet COVID-19 Commission Statement on the occasion of the 75th session of the UN General Assembly. *The Lancet* 2020; 396: 1102.
- [12] Wilder-Smith A, Freedman DO. Isolation, quarantine, social distancing and community containment: Pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak. *J Travel Med*; 27. Epub ahead of print 1 March 2020. DOI: 10.1093/jtm/taaa020.
- [13] WHO. *Novel Coronavirus (2019-nCoV): Strategic Preparedness and Response Plan*. Geneva, Switzerland, 2020.
- [14] WHO. *COVID-19 Strategy Update*. Geneva, Switzerland, 2020.
- [15] DOF - Diario Oficial de la Federación. ACUERDO por el que se establecen las medidas preventivas que se deberán implementar para la mitigación y control de los riesgos para la salud que implica la enfermedad por el virus SARS-CoV2 (COVID-19)., https://www.dof.gob.mx/nota_detalle.php?codigo=5590339&fecha=24/03/2020 (2020, accessed 12 October 2020).
- [16] Wu C, Chen X, Cai Y, et al. Risk Factors Associated With Acute

Respiratory Distress Syndrome and Death in Patients With Coronavirus Disease 2019 Pneumonia in Wuhan, China. *JAMA Intern Med* 2020; 180: 934.

[17] Williamson EJ, Walker AJ, Bhaskaran K, et al. Factors associated with COVID-19-related death using OpenSAFELY. *Nature* 2020; 584: 430-436.

[18] Phoswa WN, Khaliq OP. Is pregnancy a risk factor of COVID-19? *European Journal of Obstetrics and Gynecology and Reproductive Biology* 2020; 252: 605-609.

[19] Historia - Grupo Carso, <https://www.carso.com.mx/historia/> (2020, accessed 12 October 2020).

[20] Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomedica* 2020; 91: 157-160.

[21] WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020, <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020> (accessed 12 October 2020).

[22] Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV), [https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-\(2019-ncov\)](https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)) (accessed 12 October 2020).

[23] Suárez V, Suarez Quezada M, Oros Ruiz S, et al. Epidemiology of COVID-19 in Mexico: from the 27th of February to the 30th of April 2020. *Rev Clínica Española*. Epub ahead of print May 2020. DOI: 10.1016/j.rce.2020.05.007.

[24] Fundación Carlos Slim. About us., <https://fundacioncarlosslim.org/english/quienes-somos/> (2020, accessed 12 October 2020).

[25] Tapia-Conyer R, Gallardo-Rincón H, Saucedo-Martinez R. CASALUD: An innovative health-care system to control and prevent non-communicable diseases in Mexico. *Perspectives in Public Health* 2015; 135: 180-190.

[26] Alwashmi MF. The use of digital health in the detection and management of COVID-19. *Int J Environ Res Public Health*; 17. Epub ahead of print 2 April 2020. DOI: 10.3390/ijerph17082906.

[27] Bempong NE, De Castañeda RR, Schütte S, et al. Precision Global Health - The case of Ebola: A scoping review. *J Glob Health*; 9. Epub ahead of print 2019. DOI: 10.7189/jogh.09.010404.

[28] Roberto Tapia-Conyer RS-M. "La Salud Digital: Eje de la transformación del sistema de salud de México" en Raúl Contreras Bustamantes y Pedro José Peñaloza (coord.) *¡Sí hay salidas!* Purrua. Mexico, 2018.

[29] Eysenbach G. SARS and population health technology. *Journal of Medical Internet Research* 2003; 5: 1-8.

[30] Lajous M, Danon L, López-Ridaura R, et al. Mobile messaging as surveillance tool during pandemic (H1N1) 2009, Mexico. *Emerging Infectious Diseases* 2010; 16: 1488-1489.

[31] Keesara S, Jonas A, Schulman K. Covid-19 and health care's digital revolution. *New England Journal of Medicine* 2020; 382: e82.

[32] Hollander JE, Carr BG. Virtually perfect? Telemedicine for covid-19. *New England Journal of Medicine* 2020; 382: 1679-1681.

[33] Scott BK, Miller GT, Fonda SJ, et al. Advanced Digital Health Technologies

for COVID-19 and Future Emergencies. *Telemed e-Health* 2020; 26: 1226-1233.

[34] Caetano R, Silva AB, Guedes ACCM, et al. Challenges and opportunities for telehealth during the COVID-19 pandemic: Ideas on spaces and initiatives in the Brazilian context. *Cad Saude Publica*; 36. Epub ahead of print 2020. DOI: 10.1590/0102-311X00088920.

[35] WHO/PAHO. *The potential of frequently used information technologies during the pandemic. Department of Evidencie and Intelligence for Action in Health*. 2020.

[36] Digital Health Network of Networks: building the Global Digital Health Community, [https://www.who.int/news-room/events/detail/2020/09/24/default-calendar/\(unga-side-event\)-digital-health-network-of-networks-building-the-global-digital-health-community](https://www.who.int/news-room/events/detail/2020/09/24/default-calendar/(unga-side-event)-digital-health-network-of-networks-building-the-global-digital-health-community) (accessed 18 October 2020).

[37] Ohannessian R, Duong TA, Odone A. Global Telemedicine Implementation and Integration Within Health Systems to Fight the COVID-19 Pandemic: A Call to Action. *JMIR Public Heal Surveill* 2020; 6: e18810.

[38] WHO launches a chatbot on Facebook Messenger to combat COVID-19 misinformation, <https://www.who.int/news-room/feature-stories/detail/who-launches-a-chatbot-powered-facebook-messenger-to-combat-covid-19-misinformation> (accessed 3 November 2020).

[39] Coronavirus disease (COVID-19), <https://www.who.int/emergencies/diseases/novel-coronavirus-2019> (accessed 3 November 2020).

[40] Brote de enfermedad por el Coronavirus (COVID-19) - OPS/OMS | Organización Panamericana de la Salud, <https://www.paho.org/es/temas/coronavirus/>

brote-enfermedad-por-coronavirus-covid-19 (accessed 3 November 2020).

[41] ASSE - Call Center ASSE y Facultad de Medicina, <https://www.asse.com.uy/contenido/Call-Center-ASSE-y-Facultad-de-Medicina-12285> (accessed 3 November 2020).

[42] Línea gratuita 154, <https://www.mspbs.gov.py/linea-gratuita-154.html> (accessed 3 November 2020).

[43] Telcel da acceso gratuito a app Covid-19 MX | Telcel Empresas, <https://www.telcel.com/empresas/tendencias/notas/telcel-da-acceso-gratuito-app-covid19> (accessed 3 November 2020).

[44] Coronavirus – gob.mx, <https://coronavirus.gob.mx/> (accessed 3 November 2020).

[45] Secretaría de Salud | Gobierno | gob.mx, <https://www.gob.mx/salud/> (accessed 3 November 2020).

[46] COVID-19 IMSS, <http://imss.gob.mx/covid-19> (accessed 3 November 2020).

[47] (No Title), <http://www.health.gov.tt/sitepages/default.aspx?id=299> (accessed 3 November 2020).

[48] Covid-19: el Gobierno trabajó con Facebook en la implementación de un chatbot y una serie de iniciativas para brindar a la comunidad información segura | Argentina.gob.ar, <https://www.argentina.gob.ar/noticias/covid-19-el-gobierno-trabajo-con-facebook-en-la-implementacion-de-un-chatbot-y-una-serie-de> (accessed 3 November 2020).

[49] Ministry Of Health and Wellness, <https://jamcovid19.moh.gov.jm/how-to-protect.html> (accessed 3 November 2020).

[50] Ministerio de Sanidad, Consumo y Bienestar Social - Profesionales

- Información para la ciudadanía -
 Coronavirus, <https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov/ciudadania.htm>
 (accessed 3 November 2020).

[51] ForceManager participa en la creación de Asistencia COVID-19, <https://www.forcemanager.com/es//blog/app-asistencia-covid19/> (accessed 3 November 2020).

[52] Coronavirus disease (COVID-19): Symptoms and treatment - Canada.ca, <https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/symptoms.html> (accessed 3 November 2020).

[53] Preguntas Frecuentes acerca del Covid-19, <https://coronaviruscolombia.gov.co/Covid19/preguntas-frecuentes.html> (accessed 3 November 2020).

[54] Bolivia Segura, sitio oficial del Gobierno de Bolivia sobre el COVID-19, <https://www.boliviasegura.gob.bo/> (accessed 3 November 2020).

[55] WHO Coronavirus Disease (COVID-19) Dashboard | WHO Coronavirus Disease (COVID-19) Dashboard, <https://covid19.who.int/> (accessed 3 November 2020).

[56] FAO Big Data tool on Covid-19 impact on food value chains | FAO DataLab, <http://www.fao.org/datalab/website/covid19> (accessed 3 November 2020).

[57] Google. COVID-19 Situation Dashboard, <https://datastudio.google.com/u/0/reporting/e48b8c46-502c-41ae-8ffa-e8b43a43adca/page/LVWXB?ref=producthunt> (accessed 3 November 2020).

[58] COVID-19 | HumanitarianResponse, <https://www.humanitarianresponse.info/es/operations/simulation-klanndestan/covid-19> (accessed 3 November 2020).

[59] Novel Coronavirus (COVID-19), <https://www.healthmap.org/covid-19/> (accessed 3 November 2020).

[60] COVID-19 Map - Johns Hopkins Coronavirus Resource Center, <https://coronavirus.jhu.edu/map.html> (accessed 3 November 2020).

[61] See the latest data in your region - Johns Hopkins Coronavirus Resource Center, <https://coronavirus.jhu.edu/region> (accessed 3 November 2020).

[62] Ministerio de Sanidad, Consumo y Bienestar Social - Profesionales - Situación actual Coronavirus, <https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov/situacionActual.htm?q=service/> (accessed 3 November 2020).

[63] Covid-19 Casos e Óbitos, https://susanalitico.saude.gov.br/extensions/covid-19_html/covid-19_html.html (accessed 3 November 2020).

[64] COVID-19 UNAM-Mexico, <https://covid19.ciga.unam.mx/> (accessed 3 November 2020).

[65] COVID-19 Tablero México - CONACYT - CentroGeo - GeoInt - DataLab, <https://datos.covid-19.conacyt.mx/> (accessed 3 November 2020).

[66] Ministry Of Health and Wellness, <https://jamcovid19.moh.gov.jm/> (accessed 3 November 2020).

[67] Mapa de calor Coronapp, <https://coronaviruscolombia.gov.co/Covid19/estadisticas-covid-19/mapa-coronapp.html#dashboardAncor> (accessed 3 November 2020).

[68] Coronavirus - OPS/OMS | Organización Panamericana de la Salud, <https://www.paho.org/es/temas/coronavirus> (accessed 3 November 2020).

[69] Coronavirus Disease 2019 (COVID-19) | CDC, <https://www.cdc.gov/>

coronavirus/2019-nCoV/index.html (accessed 3 November 2020).

[70] Telehealth: Delivering Care Safely During COVID-19 | HHS.gov, <https://www.hhs.gov/coronavirus/telehealth/index.html> (accessed 3 November 2020).

[71] Coronavirus disease (COVID-19) outbreak updates, symptoms, prevention, travel, preparation - Canada.ca, <https://www.canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19.html> (accessed 3 November 2020).

[72] COVID-19 self-assessment, <https://landing.google.com/screener/covid19> (accessed 3 November 2020).

[73] Coronavirus (COVID-19) Self-Checker, <https://www.hopkinsmedicine.org/coronavirus/covid-19-self-checker.html> (accessed 3 November 2020).

[74] Coronavirus Self-Checker | CDC, <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/coronavirus-self-checker.html> (accessed 3 November 2020).

[75] Ministry Of Health and Wellness, <https://jamcovid19.moh.gov.jm/contact-us.html> (accessed 3 November 2020).

[76] COVID-19 (Coronavirus) self-assessment tool - Mayo Clinic, <https://www.mayoclinic.org/covid-19-self-assessment-tool> (accessed 3 November 2020).

[77] Canada Covid-19 self-check, <https://ca.thrive.health/covid19/en> (accessed 3 November 2020).

[78] Autodiagnostico COVID-19, <https://coronaviruscolombia.gov.co/Covid19/auto-diagnostico.html> (accessed 3 November 2020).

[79] En casa | Telesalud VA, <https://telehealth.va.gov/type/home> (accessed 3 November 2020).

[80] Teléfonos y contactos útiles sobre coronavirus | Argentina.gob.ar, <https://www.argentina.gob.ar/coronavirus/telefonos> (accessed 3 November 2020).

[81] Ministerio de Salud Pública, <https://www.gub.uy/ministerio-salud-publica/coronavirus> (accessed 3 November 2020).

[82] Emprende IMSS estrategia de Orientación Médica Telefónica para atender dudas sobre el virus COVID-19 | Sitio Web 'Acercando el IMSS al Ciudadano', <http://www.imss.gob.mx/prensa/archivo/202003/162> (accessed 3 November 2020).

[83] Call & Chat Center | MediTIC, <http://meditic.facmed.unam.mx/index.php/contactcenter/> (accessed 3 November 2020).

[84] Monitora Covid-19: como usar o app para monitorar coronavírus | Saúde e fitness | TechTudo, <https://www.techtudo.com.br/dicas-e-tutoriais/2020/05/monitora-covid-19-como-usar-o-app-para-monitorar-coronavirus.ghml> (accessed 3 November 2020).

[85] Información sobre la Aplicación Coronavirus UY | Ministerio de Salud Pública, <https://www.gub.uy/ministerio-salud-publica/politicas-y-gestion/informacion-sobre-aplicacion-coronavirus> (accessed 3 November 2020).

[86] Contact tracing apps: A new world for data privacy. <https://www.nortonrosefulbright.com/en-br/knowledge/publications>.

[87] In Coronavirus Fight, China Gives Citizens a Color Code, With Red Flags - The New York Times, <https://www.nytimes.com/2020/03/01/business/china-coronavirus-surveillance.html> (accessed 3 November 2020).

[88] COVIDSafe app | Australian Government Department of Health, <https://www.health.gov.au/resources/>

apps-and-tools/covidsafe-app (accessed 3 November 2020).

[89] South Korea is watching quarantined citizens with a smartphone app | MIT Technology Review, <https://www.technologyreview.com/2020/03/06/905459/coronavirus-south-korea-smartphone-app-quarantine/> (accessed 3 November 2020).

[90] Coronavirus: India to trace covid-19 patients through app-based Bluetooth handshake - Technology News, <https://www.indiatoday.in/technology/news/story/coronavirus-india-to-trace-covid-19-patients-through-app-based-bluetooth-handshake-1662617-2020-04-02> (accessed 3 November 2020).

[91] Covid-19: Germany launches smartwatch app to monitor coronavirus spread | The Star, <https://www.thestar.com.my/tech/tech-news/2020/04/07/covid-19-germany-launches-smartwatch-app-to-monitor-coronavirus-spread> (accessed 3 November 2020).

[92] COVID-19 Thematic Website - Together, We Fight the Virus - "StayHomeSafe" Mobile App User Guide, <https://www.coronavirus.gov.hk/eng/stay-home-safe.html> (accessed 3 November 2020).

[93] Coronapp, <https://coronaviruscolombia.gov.co/Covid19/aislamiento-saludable/coronapp.html> (accessed 3 November 2020).

[94] COVID-19: Consulta médica gratuita en línea por el Coronavirus en Guatemala, <https://www.guatemala.com/noticias/sociedad/covid-19-consulta-medica-gratuita-en-linea-coronavirus-guatemala.html> (accessed 3 November 2020).

[95] EsSalud habilita nueva línea gratuita exclusiva 107 para información y prevención del coronavirus - Essalud, [http://noticias.essalud.gob.](http://noticias.essalud.gob.pe/?inno-noticia=essalud-habilita-nueva-linea-gratuita-exclusiva-107-para-informacion-y-prevencion-del-coronavirus)

[pe/?inno-noticia=essalud-habilita-nueva-linea-gratuita-exclusiva-107-para-informacion-y-prevencion-del-coronavirus](http://noticias.essalud.gob.pe/?inno-noticia=essalud-habilita-nueva-linea-gratuita-exclusiva-107-para-informacion-y-prevencion-del-coronavirus) (accessed 3 November 2020).

[96] Aplicación digital permitirá darle seguimiento a los pacientes con nuevo coronavirus - La Nación, <https://www.nacion.com/ciencia/salud/aplicacion-digital-permitira-darle-seguimiento-a-EVA2RT2KINGENHXILKURY5QOSU/story/> (accessed 3 November 2020).

[97] COVID19 - Necesitas ayuda | Tecmilenio, <https://tecmilenio.mx/es/covid19/necesitas-ayuda> (accessed 3 November 2020).

[98] WHO | Virtual Health Library (VHL), <https://www.who.int/chp/knowledge/vhl/en/> (accessed 3 November 2020).

[99] COVID-19 resources | Cochrane Library, <https://www.cochranelibrary.com/covid-19> (accessed 3 November 2020).

[100] LitCovid - NCBI - NLM - NIH, <https://www.ncbi.nlm.nih.gov/research/coronavirus/> (accessed 3 November 2020).

[101] Post COVID-19: OAS Portal for Consultations, Forums and Repository > Repository, <https://www.oas.org/ext/en/main/covid-19/Repository> (accessed 3 November 2020).

[102] Novel Coronavirus Information Center, <https://www.elsevier.com/connect/coronavirus-information-center> (accessed 3 November 2020).

[103] Cursos | OpenWHO, <https://openwho.org/courses?q=COVID> (accessed 3 November 2020).

[104] Courses and materials relating to COVID-19 | Virtual Campus for Public Health (VCPH/PAHO), <https://www.campusvirtualsp.org/en/covid-19> (accessed 3 November 2020).

- [105] Capacitación – Coronavirus, <https://coronavirus.gob.mx/capacitacion/> (accessed 3 November 2020).
- [106] Cursos Gratuitos Durante el Brote de COVID-19 | Coursera, https://www.coursera.org/promo/cursos-gratis-covid-19?ranMID=40328&ranEAID=8WD*rW8tVwE&ranSiteID=8WD.rW8tVwE-Z5kP3JonyF._wGr6W_byYg&siteID=8WD.rW8tVwE-Z5kP3JonyF._wGr6W_byYg&utm_content=10&utm_medium=partners&utm_source=linkshare&utm_campaign=8WD*rW8tVwE (accessed 3 November 2020).
- [107] CDC Learning Connection | CDC, <https://www.cdc.gov/learning/index.html> (accessed 3 November 2020).
- [108] Información Internacional y Nacional sobre nuevo Coronavirus (COVID-2019) | Secretaría de Salud | Gobierno | gob.mx, <https://www.gob.mx/salud/documentos/informacion-internacional-y-nacional-sobre-nuevo-coronavirus-2019-ncov> (accessed 12 October 2020).
- [109] 077. Se confirma en México caso importado de coronavirus COVID- 19 | Secretaría de Salud | Gobierno | gob.mx, <https://www.gob.mx/salud/prensa/077-se-confirma-en-mexico-caso-importado-de-coronavirus-covid-19> (accessed 12 October 2020).
- [110] Cargo Mojca and Viljoen Kim. CASALUD : A suite of digital health services for the prevention and management of NCDs. Delivered in partnership with the Mexico Ministry of Health and Carlos Slim Foundation. 2019.
- [111] Tapia-conyer R, Saucedo-martinez R, Mujica-rosales R, et al. Enablers and inhibitors of the implementation of the Casalud Model , a Mexican innovative healthcare model for non-communicable disease prevention and control. *Heal Res Policy Syst* 2016; 1-12.
- [112] Tapia-conyer R, Saucedo-martínez R, Mújica-rosales R, et al. Policy Brief A Policy Analysis on the Proactive Prevention of Chronic Disease : Learnings from the Initial Implementation of Integrated Measurement for Early Detection (MIDO). 2017; 6: 339-344.
- [113] Bello-Chavolla OY, Bahena-López JP, Antonio-Villa NE, et al. Predicting Mortality Due to SARS-CoV-2: A Mechanistic Score Relating Obesity and Diabetes to COVID-19 Outcomes in Mexico. *J Clin Endocrinol Metab*; 105. Epub ahead of print 1 August 2020. DOI: 10.1210/clinem/dgaa346.
- [114] Willett W, Rockström J, Loken B, et al. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet* 2019; 393: 447-492.