Public health surveillance programs, systems, and strategies to monitor the indirect population health impact attributable to the COVID-19 pandemic and the associated public health response measures.

A Rapid Scoping Review

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Executive summary

NOTE: A list of all abbreviations and key definitions are available in Appendix 1.

Objectives: To identify what is known about public health surveillance programs, systems, indicators, and strategies for monitoring the indirect population health impact attributable to the COVID-19 pandemic and associated public health response measures for governments globally.

Design: Rapid scoping review

Method: A search was conducted in MEDLINE/PubMed, EMBASE, BIREME-LILACS, WHO-PAHO IRIS and other institutional repositories from 2020 and forward. Study selection was performed by single-reviewer titles/abstracts and full text screening. Data extraction was performed with a single abstraction approach. Results are presented following the framework proposed by the World Health Organization in "Strengthening population health surveillance: a tool for selecting indicators to signal and monitor the wider effects of the COVID-19 pandemic".

Results: 23 reports and 59 studies were found. Among the documents, six documents were related to surveillance systems and ten addressed frameworks. Important measures for monitoring the population health impact attributable to either the COVID-19 pandemic or the associated public health response include measuring the capacity and quality of health services through indicator areas such as supply of, and demand for, essential medicines, PPE, other critical medical equipment (ventilators, dialysis materials), and diagnostic tests. Affected routine health care, staff shortages, supply shortages and partial or complete closure of some health facilities should be measured as they represent indirect effects of the COVID-19 outbreak. Containment measures had impacted other sectors of wellbeing, with some of the most significant negative consequences observed in employment and income loss, unpaid labor, education, food security, and personal safety, affecting mostly women. Risk factors and wider determinants of health such as income, education, transport behavior, and access to essential services are indicators of the indirect effects of containment measures. Other direct and indirect impacts of the pandemic affect mental health, well-being, quality of life, sleep patterns, morbidity and mortality.

Conclusion: Evidence was not available to support all of the indicator areas stated by the WHO document individually. Most of the mechanisms were found, however, there was no explanation for some indicators included in the following pathways: fear of getting infected or spreading infection, impaired healthcare for non-COVID-19 conditions and direct effects of containment measures, and for some health outcomes. Most of the information was concentrated on the pathways related to access, indirect effects by risk factors, wider determinants of health and health outcomes. New areas of indicators were identified and fitted into the pathways established.

Introduction

On March 11, 2020, the World Health Organization (WHO) announced that COVID-19, a predominantly respiratory illness caused by a novel coronavirus, was a pandemic (1). Since then, there has been a substantial impact on human health and the economy globally (2).

Beyond the morbidity and mortality directly associated with COVID-19 (i.e., among individuals infected with SARS-CoV-2), the pandemic has also indirectly impacted society more broadly. These indirect effects are a result of the public health measures implemented worldwide to contain the spread of COVID-19, such as stay-at-home orders, business closures, and travel restrictions; as well as indirect impact on health care services, such as closures, staffing shortages, and reduced quality of care. These indirect effects impact the general population, not just those who have become ill with COVID-19. For the purposes of this report, healthy people who have not been infected with the SARS-CoV-2 virus, are defined as the "general population", including several vulnerable groups such as women, children, older people, prisoners, migrants, and people experiencing homelessness. The WHO recommends monitoring these populations closely because they are more likely to be negatively impacted by the COVID-19 pandemic, including the indirect effects (3).

Although some indicators have been identified to monitor the indirect effects of the pandemic, a systematic review of the published evidence will aid to identify possible systems, surveillance techniques or tools that could expand and complement existing methodologies.

Therefore, this report aims to answer the following research question: What is known about public health surveillance programs, systems and strategies for monitoring the indirect population health impact attributable to the COVID-19 pandemic and the associated public health response measures for governments globally? The following sub-questions were also considered:

- Are there other published **frameworks for integrating indicators across multiple domains** that are different from the one described by WHO in "Strengthening population health surveillance: a tool for selecting indicators to signal and monitor the wider effects of the COVID-19 pandemic"?
- Are there other **surveillance indicators** that are different from the ones considered by WHO in "Strengthening population health surveillance: a tool for selecting indicators to signal and monitor the wider effects of the COVID-19 pandemic"?

Mapping this information will strengthen the concepts previously provided in the WHO framework report.

Methods

This rapid scoping review was conducted according to the World Health Organization guide for rapid reviews, the JBI 2020 guidance on scoping reviews (4), and reported according to the PRISMA-ScR statement (5).

Table 1. Eligibility criteria

Population/Problem	**General population**
Concepts of interest	• Published frameworks, public health surveillance programs, systems and strategies that contain and integrate indicators to monitor the health effects that are indirectly attributable to the COVID-19 pandemic. • Published frameworks, public health surveillance programs, systems and strategies that contain and integrate indicators to monitor the health effects that are directly or indirectly attributable to the associated public health response to the pandemic. • Indicators to monitor the health effects that are directly attributable to the COVID-19 pandemic, contained in frameworks, public health surveillance programs, systems and strategies. • Indicators to monitor the health effects that are directly or indirectly attributable to the associated public health response to the pandemic, contained in frameworks, public health surveillance programs, systems and strategies.
Outcome	• Health effects that are directly attributable to the COVID-19 pandemic (e.g., psychological effects) • Health effects that are directly or indirectly attributable to the associated public health response to the pandemic (e.g., lockdown, healthcare impact, changes in risk factors, SES indicators, socioeconomic aspects).
Setting	CSAR is leading PHAC efforts to identify indicators for health impacts, to ultimately develop an indicator framework for reporting on the wider impacts of COVID-19. To inform this work, CSAR has requested an evidence review of what existing surveillance systems/programs could be utilized to inform key indicators – and to provide data with which to assess the wider effects of the pandemic (for example, info on discrimination, changes in health care service utilization, unemployment etc.)

Literature Search

We searched evidence syntheses, including systematic reviews, scoping reviews, and rapid syntheses (from now on 'systematic reviews'), guidelines, primary studies and organizational reports. An experienced librarian developed and tested the search strategies through an iterative process in consultation with the review team. Each database was searched using an individualized search

strategy; to review the complete strategies, see **Appendix 2**. The databases consulted were MEDLINE/PubMed, EMBASE, BIREME-LILACS, WHO-PAHO IRIS and other institutional repositories (OECD Library, CEPAL, UN Library, World Bank Library, National Academies of Sciences, Engineering, and Medicine). Searches were conducted from 2020 forward.

Study Selection

Study selection was performed by single-reviewer titles/abstracts screening and single-reviewer full text screening (PV, LM). The online platform 'Covidence' (Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia. Available at www.covidence.org) was used for titles/abstracts and full-text screening steps. Training was provided to all reviewers at the beginning of the review and during the review for consistency purposes.

Data Extraction

The data extraction from the evidence was carried out in a Google Form developed. The form was tested independently on three articles by two researchers (PVS, LM) and iteratively improved after discussion.

● For each evidence synthesis included, we documented the following information: title, author, focus, publishing year, date of the last literature search, country, population, concepts, outcomes, and key findings.

● For primary studies, we documented the following information: title, authors, publishing date, type of design, focus, population, concepts, outcomes, and key findings.

● For official policy/government documents and documents that provide recommendations: title, country, authors/organization, publishing date, focus, target population, concepts, and key findings.

After checking that the Google Form was exhaustive, training of reviewers was performed. We used a single abstraction approach (PVS, LM).

Data Synthesis

Data was synthesized narratively and descriptively. The main results of the studies included upon full-text screening are summarized in tables (text) following the framework proposed by the WHO in "Strengthening population health surveillance: a tool for selecting indicators to signal and monitor the wider effects of the COVID-19 pandemic" (3), after discussion by the research team.

The document mentioned above describes the following as pathways (bold) and the areas of indicators that are included in each of them.

Fear of Getting infected or spreading infection: psychological distress, health literacy, discrimination, poisoning incidents, antibiotics prescription and consumption patterns, emergence and spread of drug-resistant pathogens; **2. Impaired health care for non-COVID-19 conditions: access:**

unmet health care needs, waiting times, coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions), patient-Reported Experience Measures (PREMs), human resources for health/workload, COVID-19 infections and quarantines among health care staff, stress/well-being among health care staff, telemedicine consults, supply of and demand for (essential) medicines, supply of and demand for PPE, supply of and demand for other critical medical equipment (ventilators, dialysis materials); **3. Impaired health care for non-COVID-19 conditions: quality:** health care quality in various settings (for example, primary care, hospital care, acute care), patient safety /adverse effects, the average length of stay in hospital for (specific) non-COVID-19 conditions, patient-Reported Experience Measures (PREMs), adherence to medical guidelines, timeliness of quality control measures; **4. Impaired health care for non-COVID-19 conditions: financial protection:** public spending on health (by function, provision, illness), public spending on social services, Out-of-pocket payments, catastrophic and impoverishing health spending, unmet needs; **5. Direct effects of containment measures:** Household size, Loneliness, Work-life balance, Time spent on unpaid domestic and care work, Time spent outside / time for leisure activities, Psychological distress, Home working conditions, Interpersonal violence (intimate partner violence, child maltreatment, elderly abuse), (Unmet) need for informal care, Social support, Adherence to containment measures such as hygiene and physical distancing measures; **6. Indirect effects of containment measures through risk factors:** Tobacco use, Alcohol use, Physical activity, Overweight/obesity, Hypertension, High cholesterol, Diet, and Illicit drug use, **7. Indirect effects of containment measures through wider determinants of health:** Income / (at risk of) poverty, Public spending on essential services, Unemployment, Workers on flexible contracts / informal workers, Education, Childhood development, Air quality, Transport behavior; **8.Health outcomes:** General health and well-being: Self-perceived (mental) health, Quality of life, Well-being, Sleep, Patient-Reported Outcome Measures (PROMs); Morbidity: Occurrence of chronic diseases, Occurrence of mental disorders, Occurrence of (vaccine-preventable) infectious diseases, Occurrence of non-fatal injuries; Mortality: All-cause mortality, Excess mortality, Mortality from chronic diseases, Mortality from infectious diseases other than COVID-19, Fatal injuries (including suicide), Maternal mortality, Neonatal mortality, Under-five mortality, and Avoidable mortality.

Results presentation

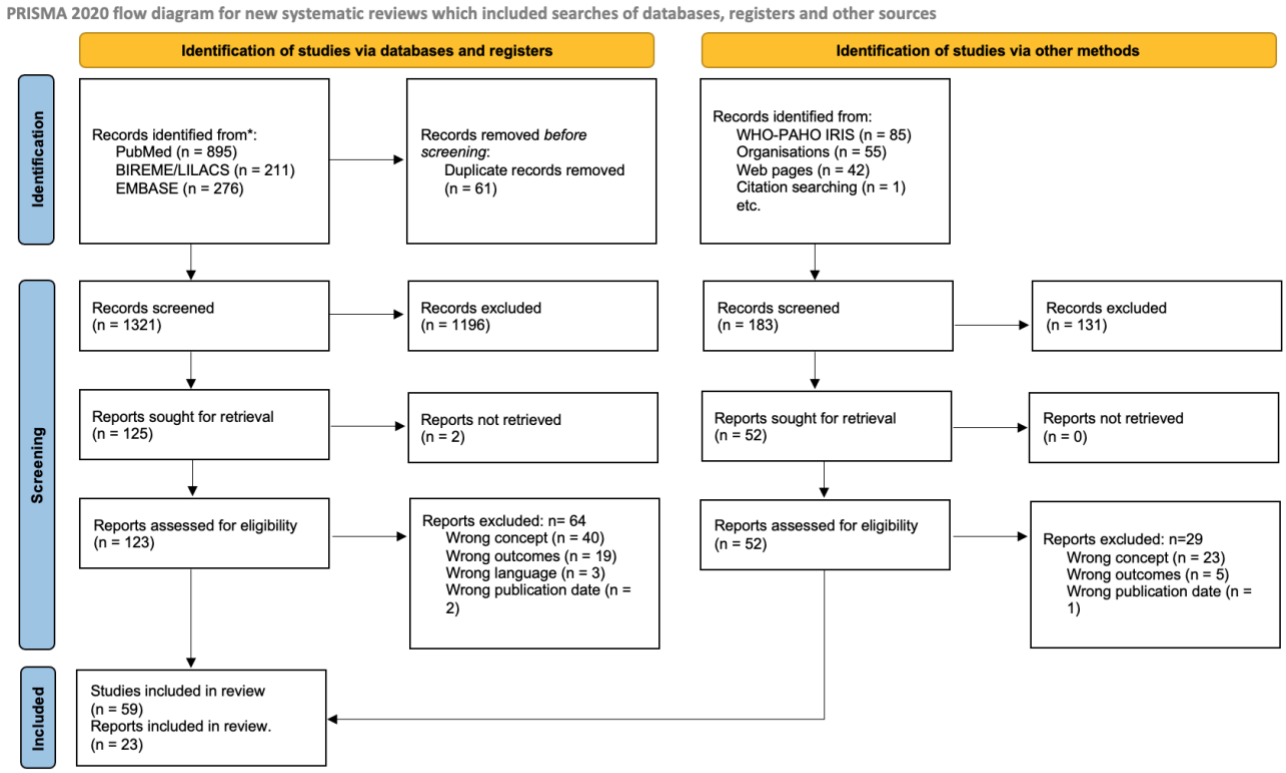
We present the results in two sections. First, we present a summary of the Key Findings of the literature, and second, we present tables that summarize the mechanisms and indicators founded based on the Conceptual framework of the main pathways for the wider effects of the COVID-19 pandemic presented in the WHO framework (3).

Results

Selection process

The search identified 1,382 potential references. After titles and abstracts screening, 123 articles were assessed for eligibility in full text, 64 records were excluded during this process, and the reasons for their exclusion are presented in the PRISMA diagram (**Figure 1**). Subsequently, we included 59 articles and 23 reports that were identified via other methods.

Figure 1. Modified PRISMA flow diagram.



From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: http://www.prisma-statement.org/

Key findings

The most important findings from the studies are presented in **Table 2** and **Table 3**, separated by the pathways proposed in the World Health Organization document “Strengthening population health surveillance: a tool for selecting indicators to signal and monitor the wider effects of the COVID-19 pandemic” (3).

The search found 15 systematic reviews (6–20), one scoping review (21), two guidelines (22,23), eight non-systematic reviews (24–31), 38 primary studies (32–69) and 18 organization reports (70–87). **Appendix 3** presents in detail the evidence retrieved from all the included studies, along with the citations and link to the articles.

From the main findings we retrieve information related to indicators, area of indicators and underlying mechanisms.

Underlying mechanisms

No underlying mechanisms were found for the following areas: health literacy, discrimination, poisoning incidents, timeliness of quality control measures, home working conditions, (unmet) need for informal care, general health and well-being (well-being), morbidity(occurrence of non-fatal injuries), and mortality(all-cause mortality, neonatal mortality and under-five mortality). **Table 2** presents the mechanisms by which each indicator area is affected.

Areas of indicators

The graphical representation of the main pathways and indicator areas found in this review is presented in **Figure 2**. Each color represents a pathway, and its indicator areas are weighted according to the amount of information supporting it.

For the pathway, “Fear of getting infected or spreading infection” the “Psychological distress” indicator area was the most frequent.

The impaired healthcare for non-COVID-19 conditions pathway is divided into three main categories: Access, quality and financial protection. The “Access” pathway was mostly represented by the “Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions)” area, followed by “Human resources for health/workload”, and the less represented indicator areas were “Prescription patterns/trends” and “Waiting times”. For the financial protection category, the “Public spending on health (by function, provision, illness)”; and for the quality domain, the “Health care quality in various settings (for example, primary care, hospital care, acute care)” were the indicator areas mostly found.

Regarding the “Direct effects of containment measures” pathway, the indicator area, “Psychological distress” was identified as the main category, whereas “Physical activity” and “Unemployment” represented the majority for “Indirect effects of containment measures through risk factors” and “Indirect effects of containment measures through wider determinants of health” respectively. The occurrence of chronic diseases and self-perceived (mental) health were the most represented indicator areas for the “health outcomes” category.

Table 3 presents the indicator areas, with the indicators metadata and composition, the recommended disaggregation, information sources and frequency of measuring (when reported). For the pathway “fear of getting infected or spreading infections”, no indicators were found for the following areas: poisoning incidents, health literacy and discrimination.

For the “impaired health care for non-COVID-19 conditions - access” pathway, we identified new areas for indicators not identified within the WHO document such as the supply of and demand for surgery, supply of and demand for diagnostic tests, and supply of and demand for other medical equipment. No information was found for the indicator area “COVID-19 infections and quarantines among health care staff”.

Regarding the pathway “impaired health care for non-COVID-19 conditions - financial protection”, funding and allocation of resources, personal spending and purchasing and payment systems were identified as new areas of indicators. No information was found for unmet needs and catastrophic and impoverishing health spending areas. For the impaired health care for non-COVID-19 conditions - quality pathway, no information was found for timeliness of quality control measures.

According to the literature, for the “direct effects of containment measures” pathway, no information was found related to the following areas; home working conditions, unmet need for informal care, and household size.

New areas were found for the “Indirect effects of containment measures through risk factors” and “Indirect effects of containment measures through wider determinants of health” pathways, namely other substances use, and access to financial institutions/government financial support.

In this review, information for the following “health outcomes” was not found; neonatal mortality, and under-five mortality.

Surveillance programs, systems and strategies

Six documents that address surveillance systems were found, **table 4** presents the detailed description. The included surveillance systems monitored different indicators of interest, including health outcomes (30); impact of COVID-19 on healthcare utilization using a range of syndromic indicators (36); major behavioral and intermediate chronic disease risk factors (39); COVID-19 pandemic impact on health access and outcomes for sexual or gender minority (SGM) individuals (65); risk of major depressive disorders and anxiety during the COVID-19 pandemic (66); and sentinel and non-sentinel epidemiological and virological surveillance for influenza, SARS-CoV-2, and potentially other respiratory viruses (76).

Published frameworks.

Ten documents that present or use different frameworks were found. From those, seven integrated different indicator areas (**Figure 3**). Those documents included three studies that reported their findings according to the existing frameworks: the Global Monitoring Framework for non-communicable diseases (25), the WHO Health Systems Framework (28), and the socioecological framework (27). One document that presented a new framework: Monitoring and evaluation framework for COVID-19 response activities in the EU/EEA and the UK (70), a five-step framework proposed to support decision-making (88), a proposed framework aimed to assess the performance and progress of the country and

regional responses against the country's national plans/responses, and the WHO COVID-19 Strategic Preparedness and Response Plan (84), and one document that provides technical specifications for each indicator included in the menu of indicators proposed for primary health care (PHC) measurement framework and indicators (83).

The remaining three documents include a study that developed a cost-effectiveness framework to evaluate societal costs and quality adjusted life years (QALYs) lost due to six health-related indirect effects of COVID-19 in California (35), an article that describes how following the National Academies of Sciences, Engineering, and Medicine proposal of a uniform national framework for data collection recommendations could help improve the quality and timeliness of public health surveillance data during pandemics (42), and a study that develops a Culturally Responsive Trauma-Informed Public Health Emergency Framework for Aboriginal and Torres Strait Islander Communities in Australia (67).

The main characteristics of the frameworks are presented in **Table 5**.

Figure 2. Treemap representing the pathways and indicator areas weighted according to the amount of information supporting them. Each color represents a pathway and its indicator areas.

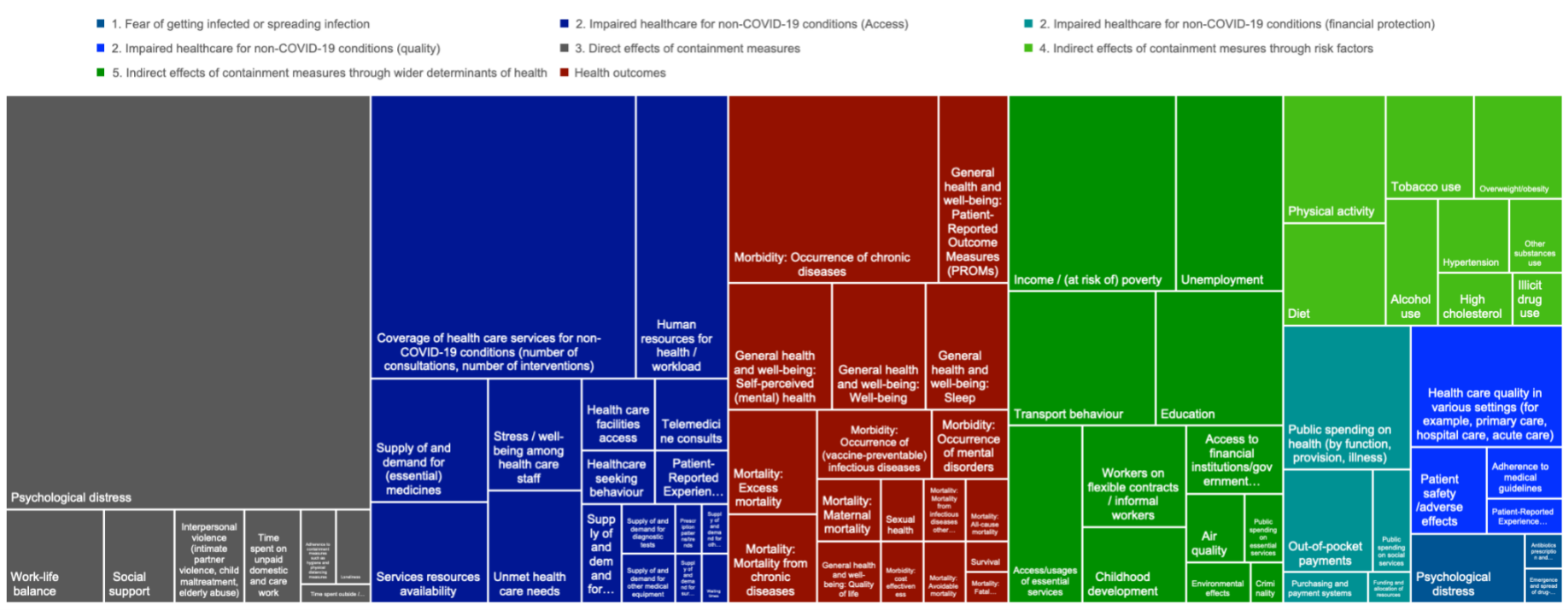
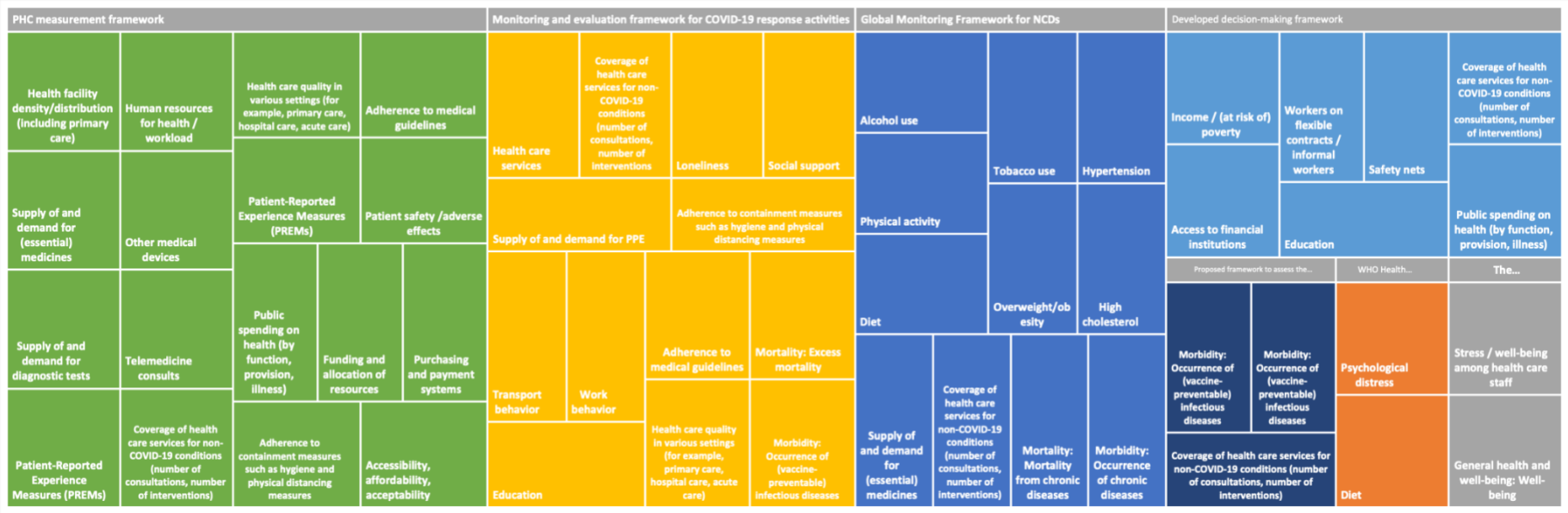


Figure 3. Integrated indicator areas across published frameworks



Conclusions

- Most of the underlying mechanisms were found, however, for the areas of health literacy, discrimination, poisoning incidents, timeliness of quality control measures, home working conditions, (unmet) need for informal care, general health and well-being, occurrence of non-fatal injuries, all-cause mortality, neonatal mortality and under-five mortality, no information was identified within the literature.
- For the “fear of getting infected or spreading infections” pathway, indicators such as health literacy, discrimination, and poisoning incidents were not found in the literature.
- The new areas detected for the “impaired health care for non-COVID-19 conditions - access” were the supply of and demand for surgery, supply of and demand for diagnostic tests, and supply of and demand for other medical equipment. No information was found for “COVID-19 infections and quarantines among health care staff”.
- Regarding the pathway “impaired health care for non-COVID-19 conditions - financial protection”, Funding and allocation of resources, personal spending and purchasing and payment systems were identified as new areas of indicators. No information was found for unmet needs and catastrophic and impoverishing health spending.
- For the “impaired health care for non-COVID-19 conditions – quality” pathway, no information was found for timeliness of quality control measures.
- For the “direct effects of containment measures”, no information was related to the following areas; home working conditions, unmet need for informal care, and for household size.
- Two new areas were found for the “Indirect effects of containment measures through risk factors” and “Indirect effects of containment measures through wider determinants of health”, such as other substances use and access to financial institutions/government financial support, respectively.
- In this review, information for the following “health outcomes” was not found: neonatal mortality, under-five mortality.
- It was found in the evidence that the COVID-19 outbreak has directly affected the population through concerns regarding COVID-19 contraction, the uncertainty over employment and financial hardships, fear of the unknown, and social isolation as a result of pandemic measures. Those findings were classified in the literature in the fear of getting infected or spreading infection’s pathway.
- The Indirect effects of the COVID-19 outbreak related to the “impaired access to health care for non-COVID-19 conditions” were due to several healthcare programs disruptions (whether their preventive or curative health services routines), staff shortage due to the reassignment of healthcare workers, stock-out of vaccines and other supplies, the need to postpone health programs, and partial or complete closure of some health facilities.
- Perceived barriers to access, such as geographical, financial, and sociocultural barriers, also negatively impact the use of health services, especially for marginalized and vulnerable populations.

- There is evidence that the SARS-CoV-2-related mortality in the general population, high risk of virus infection, and workload affect access to healthcare by the consequences posted on healthcare workers.
- Telemedicine could improve access and continuity of care by reducing geographic, physical or financial barriers, but the pivot of services to virtual care may not be equitable due to multiple barriers associated with the level of need and sociodemographic factors.
- Indicators measuring the supply of and demand for (essential) medicines, PPE, and other critical medical equipment (ventilators, dialysis materials), are necessary to follow the waning capacity and the quality of health services.
- The quality of healthcare services can be compromised as an indirect effect of the pandemic by service readiness, the ability of facilities to provide adequate supplies and staffing, timely delivering of services, increase in health complications, prescribing practices, resources utilization, lack of linkage with PHC service providers for continuity of care and partial or complete closure of some health facilities.
- The amount of government spending on health reflects the level of prioritization by the government as well as the sustainability of financing. Health spending and health outcomes are also shaped by other social spending, particularly on education and social protection. Low levels of public investment in health correlates with high levels of compensatory out-of-pocket spending, and increased risk of poverty.
- The COVID-19 pandemic and the containment measures impacted other areas of wellbeing, with some of the most significant negative consequences seen in employment and income loss, unpaid labor, education, food security, and personal safety, affecting mostly women. Economic/financial instability, loss of employment, social isolation and stay-home orders, disrupt family routines, increase demands of caregiving and reduce social support and recreational downtime, impacting mental health outcomes.
- Containment measures, reductions in awareness and educational public health campaigns also impact people's behavior, leading to increased risk factors (alcohol use, tobacco use, physical activity reduction, and diet quality among others). Also, containment measures impact other wider determinants of health as income, education, transport behavior, and access to essential services.
- Despite the importance of early childhood education, countries' mitigation measures and concern for learning losses prioritize other educational levels and not pre-primary, potentially harming childhood development.
- The pandemic's wide-reaching impacts underscored the need for timely surveillance of physical, economic, and social conditions, to enable early detection of vulnerable groups and prompt action to mitigate health inequities.
- The pandemic's wide-reaching impacts also underscored the need for timely surveillance of physical, economic, and social conditions, also known broadly as social determinants of health (SDOH), to enable early detection of vulnerable groups and prompt action to mitigate health inequities.
- While the origins of SARS-CoV-2 have not been determined definitively, the pandemic has nevertheless drawn attention to the impact of environmental degradation and the possible

effects of changes in land use on the spillover of disease from animals to humans. Other environmental effects were identified, due to some interventions mandating or recommending the closure of public transport or a reduced capacity of passenger transport or transport behavior.

- The decrease in physical activity, income and reductions, changes in other infectious disease rates, the increase in health risk factors as changes in the quantity and quality of food and overall diet, use of tobacco, alcohol and other drugs; and the disruptions in health care including screening, treatment, self-care and surveillance among others, had negatively impacted mental health, well-being, quality of life, sleep patterns, morbidity and mortality.
- The frameworks identified were mainly focused on non-communicable diseases and COVID-19. The main pathways were Impaired healthcare for non-COVID-19 conditions (Access), direct effects of containment measures, indirect effects of containment measures through risk factors and also health outcomes assessment.
- Some of the surveillance systems were focused on behavioral tendencies and mental disorders as the pandemic consequence. Others identified, tracked and monitored COVID-19 trends among the general population.

Table 2. Mechanisms underlying the main pathways of the wider effects of the COVID-19 pandemic and related indicator areas.

2.1 Direct effects of COVID-19 outbreak.

Main pathway	Underlying Mechanism	Indicator area
Fear of getting infected or spreading infection	Concerns regarding themselves or loved ones contracting COVID19, uncertainty over employment and financial hardships, fear of the unknown, social isolation as a result of pandemic measures (lockdowns, physical distancing, etc.), and worries associated with following and/or others not abiding by guidelines increase psychological distress (44,52)	Psychological distress
	Variation in antibiotics prescription is likely to be explained, on the supply side, by differences in the guidelines and incentives that govern primary care prescribers and uptake of e-prescribing solutions and, on the demand side, by differences in attitudes and expectations regarding optimal treatment of infectious illness (79). This is an important outcome measure of quality and safety of care. The over-, under- or misuse of antibiotics can cause negative health consequences at both individual and population levels (e.g., antibiotic resistance) (83).	Antibiotics prescription and consumption patterns
	Hampered non-COVID-19 health services such as TB surveillance resulting in a drop in diagnosis of new cases of active TB which could potentially result in a surge in number of patients with TB once the lockdown is lifted; Worsening of the increase in TB transmission due to the social, economic and biomedical consequences of the pandemic; TB patients may develop multidrug resistance and superinfection by COVID-19 (21).	Emergence and spread of drug-resistant pathogens

2.2 Indirect effects of COVID-19 outbreak.

Main pathways	Underlying Mechanism	Indicator area
Impaired health care for non- COVID-19 conditions: access	Control measures including lockdown, social distancing among others, had affected routine health care programs with disruption of routine preventive and curative health services among others. Fears of contracting the disease in health facilities, staff shortage due to reassignment of health care workers to support the COVID-19 outbreak response, stock-out of vaccines and other supplies, the need to postpone health programs and partial or complete closure of some health facilities derives in unmet health care needs (40). Although COVID-19 adversely affects people's lives in many respects, it disproportionately impacts certain groups and populations (32).	Unmet health care needs
	Staff shortage due to reassignment of health care workers to support the COVID-19 outbreak response, and partial	Waiting times

	or complete closure of some health facilities (40). High hospital admission/ discharge rates can also signal a failure of PHC service delivery that has necessitated hospital admissions. This measures a health system's performance in terms of providing timely access to essential health services to individuals in need (83).	
	The pandemic and social and movement measures implemented thus far have had heterogeneous effects on national health systems, both directly in terms of cases and deaths and indirectly by disrupting essential health services (82). Movement restrictions have caused disruptions to the screening, treatment, self-care and surveillance of patients (25) and lockdown, economic hardship and the psychological impact of the pandemic all had a detrimental effect on people with chronic diseases (55). The use of primary care services can indicate high use in periods of epidemic exacerbation or underuse due to stay-at-home recommendations or fear of patients to use primary care services. A non-responsive system may lead to delays in diagnosis and treatment of other treatable diseases (70). Utilization of care can be a predictor of access to primary care (83). Also implementation of COVID-19-related public health measures, such as physical distancing, travel restrictions and emphasis on hygiene, is likely to have contributed to the lower-than-expected notification numbers (36,37).	Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions)
	Perceived barriers to access can negatively impact the use of health services, especially for marginalized and vulnerable populations. A perceived barrier during one visit can impact on future use of services. Addressing barriers to access and use of health services is critical for ensuring equitable delivery and use of health services (83).	Patient-Reported Experience Measures (PREMs)
	Presence of medical staff is a critical component for health service delivery and quality. Low levels of staff availability may preclude people from accessing the care that they require (83). Overwhelmed health system capacity and vulnerability of health personnel to COVID-19 infections (23,72) results in decreased human resources for health. It has been estimated, in the World Health Report 2006, that countries with fewer human resources for health generally fail to achieve adequate coverage rates for selected PHC interventions as prioritized by the Millennium Development Goals framework. Presence of medical staff is a critical component for health service delivery and quality (83).	Human resources for health / workload COVID-19 infections and quarantines among health care staff
	SARS-CoV-2-related mortalities in the general population, high risk of virus infection and workload contributes to an increased likelihood of depression or other mental disorder (69).	Stress / well-being among health care staff
	Geographic access, physical or financial barriers, being part of stigmatized groups are barriers to access to health care services. Receiving health care remotely can mitigate some of these barriers. Advances in ICT can improve access to health (83). In compliance with public health measures, many services have pivoted to virtual care. While this shift has been crucial in providing swift services and ensuring continuity of healthcare by reducing the deleterious effects of pandemic-related restrictions (i.e., isolation), it may not be equitable due to multiple barriers associated with level of need and sociodemographic factors (44).	Telemedicine consults

	Affordable access to medicines is essential to achieving effective universal health coverage, access includes whether medicines hold marketing authorization (i.e. have regulatory approval), whether they are affordable to individuals and the health system, and whether they are available and physically accessible (33,83). Factors that can adversely affect access include high prices and large out of pocket costs; launch strategies by companies; delay in or denial of coverage or reimbursement; and importantly, individual health system characteristics (33). As the COVID-19 pandemic has caused major disruptions in all aspects of life, it also can impact difficult to access pharmacological treatment (21).	Supply of and demand for (essential) medicines
	Respiratory protection equipment is vital IPC material for in COVID-19. Early in the pandemic there was insufficient stock for all healthcare facilities, in Europe and globally (70).	Supply of and demand for PPE
	During periods of COVID-19 surge, the waning capacity of hospitals, intensive care units (ICUs), and equipment (e.g., ventilators) becomes a critical signal of potential increases in case of fatalities (31).	Supply of and demand for other critical medical equipment (ventilators, dialysis materials)
	New identified indicator areas	
	Access to essential diagnostics is a central component of quality health services (83). Some tests decreased after the pandemic (81).	Supply of and demand for diagnostic tests
	Due to restrictions in access to general practitioners and number of routine referrals because of periods of lockdown and increased pressure on hospitals (64).	Supply of and demand for surgery
Impaired health care for non- COVID-19 conditions: quality	Long-term care facilities have been heavily affected by COVID-19 with a high proportion of facilities across some countries and residents in these affected settings causing high morbidity and mortality in this vulnerable group. Data on the proportion of affected long-term care facilities would provide a better understanding of the situation in the country and across countries. (70) Health care quality can be measured through service readiness, the ability of facilities to provide adequate supplies and staffing, clinical outcomes that reflect the provision of appropriate care in hospitals, the process of travel/transport to the hospital in a timely manner, the inability of the primary care system to manage patients and avoid complications, avoidable hospital admissions, prescribing practices to assess safety, resource utilization rate that may reflect poor confidence in services, concerns over affordability of hospital services or services congestion (83). A lack of linkage with PHC service providers for continuity of care for discharged patients can impact quality of primary care. Health worker shortages may result in increased caseloads per provider, potentially compromising service quality. Conversely, low caseloads can also contribute to decreased	Health care quality in various settings (for example, primary care, hospital care, acute care)

	quality of care (e.g., through decreased provider motivation, increased absenteeism, and fewer opportunities to practice skills) or serve as a sign of poor availability of care or services (83).	
	This is an important outcome measure of quality and safety of care. The over-, under- or misuse of antibiotics can cause negative health consequences at both individual and population levels (e.g., antibiotic resistance) (83).	Patient safety /adverse effects
	When occupancy rates are high, interventions to increase patient turnover - reducing length of stay and avoiding inappropriate admissions - have an impact on caseload and requires adaptation of staffing norms per bed (83)	Average length of stay in hospital for (specific) non-COVID-19 conditions
	Patient-reported experiences provide critical insight into the quality of care received. They broadly reflect perceptions of health care from the patient perspective, described across three categories: patient experience, patient satisfaction and health system responsiveness (83).	Patient-Reported Experience Measures (PREMs)
	Adherence to clinical guidelines improves patient outcomes (83).	Adherence to medical guidelines
Impaired health care for non-COVID-19 conditions: financial protection	The amount of government spending on health devoted to PHC reflects the level of prioritization of PHC by the government as well as the sustainability of financing for PHC (83). The COVID19 pandemic forced a shift in government spending. A wide range of reasons may contribute to these, such as distribution channels, availability of generic medicines, access to prescribed medicines, prevalence of self-medication and relative prices (87).	Public spending on health (by function, provision, illness)
	Government spending on health does not exist in a vacuum; health spending and health outcomes are also shaped by other social spending, particularly on education and social protection. The COVID19 pandemic forced a shift in government spending (87).	Public spending on social services
	Low levels of public investment in health correlates with high levels of compensatory out-of-pocket spending, and heightened risk of slipping into poverty or suffering financial catastrophe during a pandemic (88). Informality, inequality, poverty, and lack of political representation, result in a disproportionate impact of the pandemic on the most vulnerable (72). A health system that relies heavily on OOPS has a higher financial burden for households, particularly poor ones (87).	Out-of-pocket payments
	Low levels of public investment in health correlates with high levels of compensatory out-of-pocket spending, and heightened risk of slipping into poverty or suffering financial catastrophe during a pandemic (86).	Catastrophic and impoverishing health spending

	The COVID-19 pandemic has impacted other sectors of well-being, with some of the most significant negative consequences seen in employment and income loss, unpaid labor, education, food security, and personal safety. The economic downturn has affected women more severely than men (38)**.**	Unmet needs
	New identified indicator areas	
	The distribution of sources for expenditure on health reflects the mix of resources available to support a country's health system, indicating the government's overall contribution to funding health care relative to other sources of funding from domestic private and external sources (83).	Funding and allocation of resources
	Not reported	Personal spending
	The way in which providers are paid is one of the most powerful ways to influence the performance of providers, from several perspectives, including the quality and efficiency of services provided (83).	Purchasing and payment systems

2.3 Direct effects of containment measures

Main pathways	Underlying Mechanism	Indicator area
Direct effects of containment measures	Poverty, quarantine and mandatory lockdown, socioeconomic level predisposes to living in overcrowded conditions. The degree of household overcrowding is a factor that increases the probability that coronavirus will be transmitted and spread (81).	Household size
	Measures in vulnerable individuals living in the community and those resident in facilities such as long-term care facilities, psychiatric institutions, homeless shelters or prisons can include visitor restrictions (70).	Loneliness
	The prevalence of insomnia, anxiety, depression and obesity increased with increasing phone screen time among university students (8).	Work-life balance
	COVID-19 pandemic has caused impacts on other sectors of wellbeing with negative consequences seen in unpaid labor, education, food security, and personal safety. The economic downturn has affected women more severely than men (38). Pervasive economic/financial instability; loss of employment; social isolation and stay-home orders; concern over own health and health of family members; family stress (i.e., disruption of family routines, loss of respite, interpersonal conflict); increased demands of caregiving including responsibilities to dependents; loss of pre pandemic educational and childcare supports; and loss of recreational downtime; impact mental health outcomes among caregivers of youth during (44)**.**	Time spent on unpaid domestic and care work

	Pervasive economic/financial instability; loss of employment; social isolation and stay-home orders; concern over own health and health of family members; family stress (i.e., disruption of family routines, loss of respite, interpersonal conflict); increased demands of caregiving including responsibilities to dependents; loss of pre pandemic educational and childcare supports; and loss of recreational downtime; impact mental health outcomes among caregivers of youth during (44)**.**	Time spent outside / time for leisure activities
	Confinement measures adopted by governments induced a large immediate drop-in economic activity and influenced mental health (11,75). Also lockdown across the country and strict isolation and social distancing measures, delay in prevailing educational system, sudden closure of classes, are expected to influence the mental health of the students of several schools, colleges and universities across the country (53).	Psychological distress
	COVID-19 pandemic impacts on other sectors of wellbeing with some of the most significant negative consequences seen in employment and income loss, unpaid labor, education, food security, and personal safety. The economic downturn has affected women more severely than men (38). Financial strain, indebtedness and the inability to provide materially for one's family may increase stress and household conflict, undermine personal autonomy and induce feelings of shame and guilt (6)**.**	Interpersonal violence (intimate partner violence, child maltreatment, elderly abuse)
	People being part of socially vulnerable populations may find it difficult to adhere to the public health measures required during the COVID-19 pandemic (70).	Social support
	People being part of socially vulnerable populations may find it difficult to adhere to the public health measures required during the COVID-19 pandemic (70). Mobile apps to support contact tracing could help complement manual contact tracing and it is important to understand population coverage as it is related to effectiveness (70).	Adherence to containment measures such as hygiene and physical distancing measures

2.4 Indirect effects of containment measures

Main pathways	Underlying Mechanism	Indicator area
Indirect effects of containment measures	COVID-19 pandemic (and the implemented public health measures) impact people's behavior, their health status and well-being (43).The indirect effects of containment measures may include changes in the use of tobacco, alcohol and other drugs (39).	Tobacco use

through risk factors	COVID-19 pandemic (and the implemented public health measures) impact people's behavior, their health status and well-being (43).The indirect effects of containment measures may include changes in the use of tobacco, alcohol and other drugs (39).	Alcohol use
	COVID-19 pandemic (and the implemented public health measures) impact people's behavior, their health status and well-being (43). The indirect effects may include reductions in awareness and educational public health campaigns for noncommunicable diseases and reduced physical activity (39).	Physical activity
	Lockdown, economic hardship and the psychological impact of the pandemic all had a detrimental effect on people with liver disease, including poorer metabolic control (55).	Overweight/obesity
	Lockdown, economic hardship and the psychological impact of the pandemic all had a detrimental effect on people with liver disease, including poorer metabolic control (55).	Hypertension
	Lockdown, economic hardship and the psychological impact of the pandemic all had a detrimental effect on people with liver disease, including poorer metabolic control (55).	High cholesterol
	COVID-19 pandemic has caused major disruptions in all aspects of life, with some of the most significant impacts in employment and income loss, unpaid labor, education, food security, and personal safety (38). The indirect effects of containment measures may include changes in the quantity and quality of food and overall diet; use of tobacco, alcohol and other drugs; changes in other infectious disease rates. Such changes in the behavioral and intermediate risk factors related to noncommunicable diseases could significantly increase or decrease their prevalence in the population (39).	Diet
	COVID-19 pandemic (and the implemented public health measures) impact people's behavior, their health status and well-being (43).The indirect effects of containment measures may include changes in the use of tobacco, alcohol and other drugs (39).	Illicit drug use
	New identified indicator areas	
	The indirect health effects of the COVID-19 pandemic may include use of tobacco, alcohol and other drugs (39).	Other substances use
Indirect effects of containment measures through wider determinants of health	Confinement measures adopted by governments induced a large immediate drop in economic activity (75).The World Bank's latest publication on the impact of COVID-19 on global poverty and inequality shows a reversal of the gains in global poverty with job losses and deprivation induced by the pandemic (88). As the COVID-19 pandemic has caused major disruptions in all aspects of life, its impacts on other sectors of wellbeing are expected to be profound and widespread, with some of the most significant negative consequences seen in employment and income loss, unpaid labor, education, food security, and personal safety. The economic downturn has affected	Income / (at risk of) poverty

	women more severely than men, partly reversing progress towards gender equality that had been made in many countries. (38)	
	Tax measures to address the COVID-19 crisis and the consequent economic slowdown are taking a toll on tax revenues. Fiscal policy is playing an essential role in mitigating the negative economic and social effects of the pandemic and will continue to be pivotal for the recovery. (75).	Public spending on essential services
	As the COVID-19 pandemic has caused major disruptions in all aspects of life, its impacts on other sectors of wellbeing are expected to be profound and widespread, with some of the most significant negative consequences seen in employment and income loss, unpaid labor, education, food security, and personal safety (43). In a number of countries, the pandemic has impacted the school-to-work transition of youth negatively (73).	Unemployment
	Self-employed people and workers in the informal sector, who tend to have lower wages (or none in family businesses), are also reported to be severely hit by social and movement measures (88).	Workers on flexible contracts / informal workers
	Preventing contact among children is a known prevention measure in influenza outbreaks and pandemics (70). During closure of face-to-face schooling, many children miss regular education, which could result in loss of more than half a year of effective basic learning in a child schooling globally (88). COVID-19 pandemic has caused major disruptions in all aspects of life, with some of the most significant impacts in employment and income loss, unpaid labor, education, food security, and personal safety (38).	Education
	Despite the importance of early childhood education, countries' mitigation measures and concern for learning losses prioritize other educational levels and not pre-primary (89).	Childhood development
	The pandemic's wide-reaching impacts underscored the need for timely surveillance of physical, economic, and social conditions, to enable early detection of vulnerable groups and prompt action to mitigate health inequities (24).	Air quality
	Interventions mandating or recommending the closure of public transport or a reduced capacity of passenger transport (70).	Transport behavior
	New identified indicator areas	
	Social and movement measures in the context of COVID-19 require detailed understanding of the current health and socio-economic situation and of the feasibility, acceptability and financial resources required for those measures and the economic response. Direct support to individuals and households to sustain their income and living conditions includes wage subsidies, unemployment benefits, cash transfers and/or in-kind donations. Indirect measures include financial support to households to pay utility bills, loans or mortgages and deferral or	Access to financial institutions/government financial support

	subsidization of other costs (e.g., rent, utility bills, interest payments) (88).	
	The pandemic's wide-reaching impacts also underscored the need for timely surveillance of physical, economic, and social conditions, also known broadly as social determinants of health (SDOH), to enable early detection of vulnerable groups and prompt action to mitigate health inequities (23). While the origins of SARS-CoV-2 have not been determined definitively, the pandemic has nevertheless drawn attention to the impact of environmental degradation and the possible effects of changes in land use on the spillover of disease from animals to humans (78).	Other environmental effects

2.5 Health outcomes

Underlying Mechanism	Indicator area
COVID-19 has both mental/emotional and social implications for pregnant and postpartum women who have been physically separated from families, relatives, and society all around the world (14). Financial strain, indebtedness and the inability to provide materially for one's family may increase stress and household conflict, undermine personal autonomy and induce feelings of shame and guilt (6).	General health and well-being: Self-perceived (mental) health
Quality of life was not largely affected in adolescents following COVID-19, but there might be greater impairment in young children and in those with more severe forms of the disease (12).The decrease in physical activity, the cessation of the intervention of the recovery and the social distance imposed by the lockdown, has had a negative impact on the physical and mental health, quality of life, daily activities, as well as on the behavioral attitudes of the diet (17).	General health and well-being: Quality of life
The COVID-19 pandemic affected sleep patterns positively for some individuals, but negatively for others (43). Misinformation on social media that leads to public panic also contributes (58).	General health and well-being: Sleep
Loneliness and isolation due to the lack of physical and social contact with other family members and friends may negatively impact health and wellbeing (45).	General health and well-being: Patient-Reported Outcome Measures (PROMs)
Movement restrictions have caused disruptions to the screening, treatment, self-care and surveillance of NCD patients (25). The indirect effects may include denied or delayed disease prevention and medical procedures for acute and chronic conditions; reductions in awareness and educational public health campaigns for noncommunicable diseases; reduced physical activity; losses of jobs and income and reductions in overall living status; disruption of social networks; increases in self-harm and anxieties over contracting the disease; changes in the quantity and quality of food and overall diet; use of tobacco, alcohol and other drugs; changes in other infectious disease rates. Such changes in the behavioral and intermediate risk factors related to noncommunicable diseases could significantly increase or decrease their prevalence in the population (39). Lockdown, economic hardship and the psychological impact of the pandemic all had a detrimental effect on people's chronic	Morbidity: Occurrence of chronic diseases

diseases (68) Also, high morbidity and mortality will occur if there is insufficient capacity to hospitalize severe cases (90).	
People who were unemployed or experiencing financial difficulties reported higher rates of anxiety and depression than the general population during the COVID-19 crisis (79).	Morbidity: Occurrence of mental disorders
COVID-19 has impacted the maintenance of vaccination programs due to the system's inability to maintain essential health programs (70). Fears of contracting the disease in health facilities, staff shortage due to reassignment of health care workers to support the COVID-19 outbreak response, stock-out of vaccines and other supplies, and the need to postpone health programs and partial or complete closure of some health facilities contributes (40).	Morbidity: Occurrence of (vaccine-preventable) infectious diseases
Changes may be related to the COVID-19 pandemic's effects on health systems (23).	Mortality: Excess mortality
People living with NCDs are at higher risk of more severe infection and mortality due to COVID19, and the movement restrictions have already caused disruptions to the screening, treatment, self-care and surveillance of NCD patients (25). Mortality has been shown to increase in people with chronic disease due to the impact of the COVID-19 pandemic on the diagnosis and management programs (55).	Mortality: Mortality from chronic diseases
Not reported	Mortality: Mortality from infectious diseases other than COVID-19
Not reported	Mortality: Fatal injuries (including suicide)
Restrictions on reproductive health services during the pandemic (81).	Mortality: Maternal mortality
Indicators of avoidable mortality offer a general "starting point" to assess the effectiveness of public health and health care systems in reducing deaths from various diseases and injuries (79).	Mortality: Avoidable mortality
New identified indicator areas	
The COVID-19 pandemic led to important indirect health and social harms in addition to deaths and morbidity due to SARS-CoV-2 infection. These indirect impacts, such as increased depression and substance abuse, can have persistent effects over the life course. Estimated health and cost outcomes of such conditions and mitigation strategies may guide public health responses (35,46)	Morbidity: cost-effectiveness
The pandemic may affect fertility through many different mechanisms through three main channels: (i) changes in "demand for children"; (ii) changes in reproductive capacity or the "supply of children"; and (iii) changes in intermediate variables, particularly sexual activity, marriage rates, access to contraception and abortion (89).	Sexual/reproductive health
Due to restriction in access to general practitioners and number of routine referrals because of periods of lockdown and increased	Survival

pressure on hospitals (64).	

Table 3. List of core indicators

3.1 Direct effects of COVID-19 Outbreak

Pathway	Indicator	Metadata/Calculation[1]	Relevant disaggregation	Data source type[2]	Frequency
Psychological distress	Anxiety of self or others contracting COVID (44)	Level of concern over self-and/or someone close developing COVID-19 was assessed on two original items via five-point unipolar Likert scales (1=extremely worried, 5=not worried at all). Individuals registered with AskingCanadians, whose profile matched a priori quotas, web survey		Online survey	
	COVID-19-Related Fear (52)			Online survey ● Fear of COVID-19 Scale: This 7-item scale is used to measure fears related to the ongoing COVID-19 pandemic. Participants are asked to rate the extent to which they have been bothered by each item during the pandemic on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Total score ranged from 7 to 35.	
	Somatic Symptoms (52)			Online survey	

[1] Metadata/calculations, this domain includes where the information can be found or how the indicator can be calculated, if available.

[2] Source: This domain includes the tool, scale or mechanism used to capture the data

				• The Somatic Symptom Scale-8[3]	
	Anxiety (52)			Online survey • The Generalized Anxiety Disorder-7[4]	
	Depression(52)			Online survey • The Centre for Epidemiologic Studies Depression Scale[5]	
	Fear of infection (81)				
Antibiotics prescription and consumption patterns	Safe primary care attention (77)	Antibiotics prescribed (defined daily dose per 1000 people)		Online survey	
Emergence and spread of drug-resistant pathogens.	TB multidrug resistance and superinfection (21)	TB multidrug resistance and superinfection			

3.2 Indirect effects of COVID-19 Outbreak

3.2.1 Access

Pathway	Indicator	Metadata/Calculation[6]	Relevant disaggregation	Data source type[7]	Frequency
Unmet health care needs	Percentages of households whose members could not receive medical attention (89)				

[3] Assess the participants for stomach problems, fatigue, back pain, headache, sleeping troubles, dizziness, shortness of breath, and pain in arms, legs, and joints. The SSS-8 is an 8-item self-report questionnaire, rated on a five-point Likert scale, ranging from 0 (not at all) to 4 (very much).

[4] GAD-7 is a 7- item measure, rated on a four-point Likert scale, ranging from 0 (not at all) to 3 (nearly every day).

[5] The CES-D is a 20-item measure, rated on a four-point Likert scale, with responses ranging from 0 (rarely or none of the time) to 3 (most or all of the time). The scale measures six facets of depression: depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance.

[6] Metadata/calculations, this domain includes where the information can be found or how the indicator can be calculated, if available.

[7] Source: This domain includes the tool, scale or mechanism used to capture the data

	Distance to the closest health care facility (32)	Distance (miles/hour) to the closest health care facility			
	Service coverage (79)	Population reporting unmet need for medical care (% population)			
	Proportion of HF FP with Knowledge of AFP Case Definition (79)	Proportion of HF FP with Knowledge of AFP Case Definition		Data stored on the server of countries implementing the integrated supportive supervision and Monthly routine administrative immunization data[8].	Annual but depending on the country context visits are conducted Weekly, Bi-Weekly, Monthly and Quarterly.
	Proportion of HF FP with Knowledge of Measles Case Definition (79)			Data stored on the server of countries implementing the integrated supportive supervision and Monthly routine administrative immunization data.	Annual but depending on the country context visits are conducted Weekly, Bi-Weekly, Monthly and Quarterly.
	Unreported Suspected Measles Cases (79)			Data stored on the server of countries implementing the integrated supportive supervision and Monthly routine administrative immunization data.	Annual but depending on the country context visits are conducted Weekly, Bi-Weekly, Monthly and Quarterly.
	Unreported Suspected AFP Cases (79)			Data stored on the server of countries implementing the integrated supportive supervision and Monthly routine administrative immunization data.	Annual but depending on the country context visits

[8] The ISS data is collected using a standard checklist, which was designed to collect information on vaccine preventable disease (VPD) surveillance and routine immunization process indicators.

					are conducted Weekly, Bi-Weekly, Monthly and Quarterly.
	People with a disability (20)	% people with a disability			
Waiting times	Change in time spent in consultation (63)	Increase (>50%, 25–50%, 10–25%, 0–10%), decrease (>50%, 25–50%, 10–25%, 0–10%)		Based on a survey	
Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions)	Access to palliative care (25)			Palliative Care Services, MOH	
	HPV vaccination (25)	Family Health Development Division, MOH		Data collection through an electronic monitoring mechanism (MOH school health teams)	Annual
	Hep. B vaccination (25)	Family Health Development Division, MOH		Data collection through an electronic monitoring mechanism (MOH school health teams)	Annual
	Cervical cancer screening (25)	Family Health Development Division, MOH		Data collection through an electronic monitoring mechanism (MOH school health teams)	Annual
	Number of registered visits to primary care (70)	**Numerator:** Number of registered visits to primary care **Denominator:** Total population **Calculation:** Number of registered visits to primary care x 100 000 / total population **Monitoring level:** Subnational National		Health insurance providers, health registries, electronic prescription systems, electronic general practice databases, representative surveys in primary care services if needed	Monthly
	Measles incidence and proportion of all cases among unvaccinated children whose first dose of MMR was due during the COVID-19 pandemic (70)	**Numerator:** Number of measles cases among children who were at the age eligible for the first dose of MMR (between 9-18 months, depending on the country) during the COVID-19 pandemic		National Level: national measles surveillance system EU level: ECDC TESSy	Quarterly, Annual adjustment of data

		Denominator: Number of children born 9-18 months (depending on the country) prior to the COVID-19 pandemic. The 2019 birth cohort could be used to approximate this if granular denominator information is unavailable. **Direction of change:** Lower = better **Monitoring level:** National EU level			
	Diphtheria-tetanus-pertussis (DTP)-3 vaccination coverage in children under 12 months of age (70)	**Numerator:** Number of children under the age of 12 months who received the third dose of DTP vaccine during the month **Denominator:** Estimated population under the age of 12 months in the areas from which the numerator is provided (* the number of months in the numerator/12) **Direction of change:** Higher = better **Monitoring level:** National		National vaccination coverage data	Quarterly
	Disruption to HIV primary care service (21)				
	Drop in diagnosis of new cases of active TB (21)				
	Percentage of change in number of people living with HIV in target area who received ART (84)	**Numerator:** Number of people living with HIV in target area who received ART last month **Denominator:** Number of people living with HIV in target area who received ART during the same month in 2019			

	Access to skilled birth attendants (72)	Percentage of population			
	Immunization rate (measles/ MCV1) (percentages) (72)				
	Number of beds in facility (80)		Type of facility		
	Number of beds for hospitalization (80)		Type of facility		
	Number of inpatient bed-days (80)	Number of inpatient bed-days, last three months	Type of facility		
	Lack of appointments (81)				
	Sexual and reproductive health and family planning counseling (81)				
	Reproductive health services - contraceptives methods (81)				
	Proportion of hospital beds occupied (82)				
	Number of intensive care beds (82)	Number of intensive care beds per 10 000 population			
	Number of hospital beds with access to an oxygen supply (82)				
	Access to emergency surgery (83)	**Numerator:** Total count of population that can access, within 2 hours, a facility that can perform emergency cesarean section, laparotomy and open fracture fixation **Denominator:** Total population	Urban/rural Subnational	Routine facility information system – facility database/master facility list, geospatial modeling; facility survey	
	Outpatient visits (primary	**Numerator:** Total number of	Age groups, Gender,	Population-based survey; can also be	

	care) (83)	visits **Denominator:** Per person in a given year	Subnational	collected through RHIS if the RHIS includes all facilities in the country (public and private)	
	Emergency unit visits (83)	**Numerator:** Number of patients who seek care at the emergency department **Denominator:** Per 1000 population	Age groups, Gender, Subnational	RHIS – if the RHIS included all facilities offering emergency unit services in the country (public and private) Could also be collected through population-based survey	
	Hospital discharges (83)	**Numerator:** Number of patients who are admitted or leave a hospital after staying at least one night **Denominator:** Per 1000 population	Age groups, Gender, Subnational	RHIS - if the RHIS included all facilities offering inpatient services in the country (public and private) Population based survey	
	Waiting time to elective surgery (for tracers) (83)	**Numerator:** Average number of days that patients have been waiting for elective procedure (i.e., non-urgent) surgeries – cataract, coronary angioplasty, hip replacement, knee replacement, skin biopsies **Denominator:** Not applicable	Gender, Type of procedure Facility type (as relevant to context): first-level hospitals, second-level hospitals Managing authority: public, private Urban/rural	RHIS (Waiting time management systems)	
	Bed density (by facility type, ward, managing authority) (83)	**Numerator:** Total number of hospitals beds (excluding labor and delivery beds) **Denominator:** Total population	Facility type (as relevant to context): first-level hospitals, second-level hospitals, long-term care, etc. Managing authority: public, private Subnational Urban/rural	RHIS, facility census, other routine information data sources	
	Cesarean section rate (83)	**Numerator:** Number of live births delivered by cesarean section in a given time period	Facility type (as relevant to context): first-level hospitals,	Routine health information system (RHIS) but can also be collected through a population-based survey or through a	

		Denominator: Total number of live births in the same time period X 100	second-level hospitals, etc. Managing authority: public, private Subnational Urban/rural Age Education (in population-based surveys)	record review during a facility survey.	
	Perioperative mortality rate (83)	**Numerator:** Number of deaths among patients having one or more procedures in an operating theater during the relevant admission **Denominator:** Total number of surgical procedures in an operating theater	Emergency versus elective surgery Tracer condition Facility type (as relevant to context): first-level hospitals, second-level hospitals, specialty hospitals, etc.	Recommended to be collected through RHIS but can also be collected through a special study	
	Coverage of timely emergency resuscitation at first-level hospitals (83)	**Numerator:** Number of patients [at first-level hospitals] admitted or transferred with shock who receive any oxygen or intravenous volume (fluids or blood) in the emergency unit prior to admission or transfer **Denominator:** All patients [at first-level hospitals] admitted/transferred with shock from any cause	Facility type (as relevant to context): first-level hospitals, second-level hospitals, specialty hospitals, etc. Managing authority: public, private Subnational	RHIS or through special study	
	Clinical diagnosis of mumps reported per 100,000 population (36)	**Numerator:** Clinical diagnosis of mumps reported per 100,000 population **Total:** Number of consultations at GP PHE national syndromic surveillance systems			Daily
	Any disruption in health care (38)	University of Maryland Social Data Science Center Global	Age groups, Gender, Place of residence /	Survey	

		COVID-19 Trends and Impact Survey (UMD Global CTIS); COVID-19 Health Services Disruption Survey 2020, COVID-19 Health Services Disruption Survey 2021; Survey on Gender Equality at Home; COVID-19 Rapid Gender Assessment Survey	living situation		
	Disruption in reproductive health (38)	COVID-19 Rapid Gender Assessment Survey	Age groups, Place of residence / living situation		
	Disruption in preventative care (38)	University of Maryland Social Data Science Center Global COVID-19 Trends and Impact Survey (UMD Global CTIS)	Age groups, Gender, Place of residence / living situation		
	Supportive Supervision (ISS) Visits (40)				
	% HF with RED Plan Available (40)	% HF with RED Plan Available		Data stored on the server of countries implementing the integrated supportive supervision and Monthly routine administrative immunization data[9].	Annual but depending on the country context visits are conducted Weekly, Bi-Weekly, Monthly and Quarterly.

[9] The ISS data is collected using a standard checklist, which was designed to collect information on vaccine preventable disease (VPD) surveillance and routine immunization process indicators.

	% Fixed Sessions Conducted (40)	% Fixed Sessions Conducted		Data stored on the server of countries implementing the integrated supportive supervision and Monthly routine administrative immunization data[1].	Annual but depending on the country context visits are conducted Weekly, Bi-Weekly, Monthly and Quarterly.
	% Outreach Sessions Conducted (40)	% Outreach Sessions Conducted		Data stored on the server of countries implementing the integrated supportive supervision and Monthly routine administrative immunization data[1].	Annual but depending on the country context visits are conducted Weekly, Bi-Weekly, Monthly and Quarterly.
	% HF with Updated Monitoring Chart (40)	% HF with Updated Monitoring Chart		Data stored on the server of countries implementing the integrated supportive supervision and Monthly routine administrative immunization data[1].	Annual but depending on the country context visits are conducted Weekly, Bi-Weekly, Monthly and Quarterly.
	Medical treatment received (last 14 days) (43)			Survey	
	Non-use of medical treatment (last 14 days) (43)			Survey	
	Service utilization and access checklists (44)	1. Services receiving/accessed 2. Services desired/seeking 3. Barriers to access			

	Youth MHA needs (reported by caregiver) (mental health and addictions): Emotional, behavioral and substance use concerns (44)				
	MHA service access for youth with greatest need (reported by caregiver) : Service types accessed. Need for service and waitlist status (44)				
	Delayed outcomes (55)	Type of delayed outcomes, n (% to all outcomes) Retrospective data from four university hospitals in Barcelona (three) and Girona (one), Catalonia, Spain	Delayed HCC diagnosis, n (%) Delayed varices treatment, n (%)		
	Change in referral pattern compared with pre-pandemic patterns (63)				
	Availability concerns (63)	Scale of change like Significant increase, Slight increase, No change, Slight decrease, Significant decrease			
	Fall in overall rate of consultations (21)				
	Postponed doctor's visit (21)				
	Access to healthcare, especially high complexity care (20)				
	Number of OPD attendance (84)				Monthly
	Number of cesarean sections performed in the				

	country (84)				
	Percentage of change in consultations (84)	**Numerator:** Number of consultations last month **Denominator:** Number of consultations same month in YEAR			Monthly
	Percentage of change in ODP attendance (84)	**Numerator:** Number of OPD attendance during the last month **Denominator:** Number of OPD attendance during the same month in YEAR			Monthly
	All-cause hospitalization rate trends (85)				
	Proportion of occupied hospital beds (85)				
	Number of trained ICU staff (85)	Number of trained ICU staff per 10 000 population			
Patient-Reported Experience Measures (PREMs)	Perceived barriers to access (geographical, financial, sociocultural) (83)		Age groups, Gender, Wealth quintile Education Urban/rural Subnational	Population-based survey	
	Satisfaction with services (44)	Satisfaction with services/supports received was assessed with a seven-point Likert scale (1=extremely satisfied, 7=extremely dissatisfied).			
	Barriers to access (44)				
Human resources for health / workload	Health care worker absenteeism (23)				
	Doctors per 100,000 people (72)	Doctors per 100,000 people			

	Nurses and midwives per 100,000 people (72)	Nurses and midwives per 100,000 people			
	Coordination of preventive, primary care and other outpatient services (74)				
	Doctors (79)	number of practicing physicians (per 1 000 people)			
	Nurses (79)	number of practicing nurses (per 1 000 people)			
	Medical staff cadre (80)	Medical staff cadre			
	Lack of availability of medical staff (81)				
	Health worker density per 10 000 population and distribution (83)	**Numerator:** Number of health workers by occupation **Denominator:** Total population as estimated by the UN Statistics Division. In case of other methodology used, WHO recalculates densities according to the UN Statistics population data in order to harmonize the densities and ensure comparability. NHWA	Age groups, Gender, Activity level, Occupation, Health facility, location, GINI index		
	Provider availability (absence rate) (83)	**Numerator:** Number of health professionals that are not off duty who are absent from the facility on an unannounced visit **Denominator:** Ten randomly sampled workers who are supposed to be on duty at the facility on the day of the assessment. The only health workers that are removed from the denominator are those on shift work (i.e., not	Facility type (as relevant to context): including primary care facilities (e.g., GP practices, health centers, community health posts), first-level hospitals, second-level hospitals, specialty hospitals, long-term care facilities, continuing care	Facility survey	

		present because it is not their shift) or those doing fieldwork (mainly community and public health professionals).	facilities, etc.) Managing authority: public, private Subnational Urban/rural		
	Doctors (per 10,000 population) (34)	Global Health Observatory, WHO (who.int/data/gho).			
	Nurse and midwives (per 10,000 population) (34)	Global Health Observatory, WHO (who.int/data/gho).			
	Skilled health professional density (per 10,000 population) (34)	Global Health Observatory, WHO (who.int/data/gho).			
	Health system to treat the sick and protect health workers (34)	Global Health Security Index: Bringing Collective Action and Accountability (ghsindex.org/wp-content/uploads/2020/04/2019-Global-Health-Security-Index.pdf)			
	Proportion of health care workers (32)		Age groups		
	Proportion of single vs multiple household earners (32)				
	Proportion of frontline workers (32)				
	Primary care clinicians other than physicians, No. per 10000 population (20)				
	Number of physicians per 10000 population (20)				
	Staff shortages and staff-related sickness (21)				
Stress / well-being	Burnout (27)				

among health care staff	Secondary traumatic stress (STS) (27)				
	Depression and degree of depression severity (69)		Age groups, Gender, Socioeconomic status (income, education, occupation), Place of residence / living situation, People with a chronic condition or disability, severity, marital status, medical specialty	• PHQ-9[10]	
	Anxiety (69)		Age groups, Gender, Socioeconomic status (income, education, occupation), Place of residence / living situation, People with a chronic condition or disability, Medical specialty	• GAD-7[11]	
	Mental health status of healthcare workers (54)		Gender	• The General Health Questionnaire (GHQ-12) Higher scores on the GHQ-12 indicate more mental health problems.	
	Psychological distress (54)	Frequency of experiencing COVID-19-related stressors among participants n % Options: Never/rarely, Sometimes, Often/always		Survey	

[10] PHQ it is composed of nine items, Each item was selected, with four-point-scale based answers ranging from 0 (not at all) to 3 (nearly every day). The total score of the PHQ-9 scale after self-reported response ranges from 0 to 27, and more severe depression symptoms are shown by a higher score. absence of depression (0–4), mild depression (5–9), moderate depression (10–14), and severe depression (15–27).

[11] GAD-7 All the items were rated on a four-point scale scoring from 0 (not at all) to 3 (nearly every day). The total score ranges from 0 to 21, and symptom severity was interpreted as follows: absence of anxiety (0–4), mild anxiety (5–9), moderate anxiety (10–14), and severe anxiety (15–21).

	Fear of being infected (54)	Frequencies of psychological distress indicators of participants n %		• General Health Questionnaire-12[12]	
	Areas to treat (63)	Scale of change in Significant increase, Slight increase, No change, Slight decrease, Significant decrease			
Telemedicine consults	Percentage of people that have had at least one virtual health consultation in the past 12 months (83)		Age groups, Gender, Socioeconomic status (income, education, occupation), Subnational, Urban/rural	Population-based survey	Annual
	Impact of telemedicine on healthcare delivery (21)				
	Fall in face-to-face consultation rates (21)				
	Digital mental health clinics (13)				
Supply of and demand for (essential) medicines	Essential technologies and medicines (25)				
	Antibiotics availability (80)		Type of facility		
	Rehydration (80)		Type of facility		
	Percentage of health facilities that have a core set of relevant essential		Facility type (as relevant to context): including primary care	Facility survey	

[12] Options: Yes, no
General Health Questionnaire-12
Have you been able to enjoy day-to-day activities? /Have you been feeling reasonably happy? /Have you been feeling unhappy and depressed? /Have you felt constantly under strain? /Have you lost much sleep due to worry? /Have you been able to face up to problems? /Have you felt you couldn't overcome your difficulties? /Have you been losing confidence? /Have you felt capable of making decisions? /Have you been able to concentrate on what you are doing? /Have you been feeling worthless? /Have you felt playing a useful part in things?

	medicines available and affordable on a sustainable basis (SDG indicator) (70)		facilities (e.g., GP practices, health centers, community health posts), first-level hospitals, second-level hospitals, specialty hospitals, long-term care facilities, continuing care facilities, etc. Managing authority: public, private, Subnational Urban/rural		
	Availability Proportion of covered medicines by limitations or restrictions applied to coverage decisions (33)	Survey		Relevant authority (internal) database, private data provider, provided by company, provided by expert through survey	
	Availability Time-to-access, e.g., median time to positive coverage decision from date of marketing authorization (early access coverage excluded) (33)	Survey		Regulatory database e.g., EMA (centralized for EU)	
	Affordability System affordability (33)	Survey		Relevant authority (internal) database or website, provided by expert, private data provider, national statistics	Monthly, Annual
	Accessibility Consumption or sales in the general population (33)	Survey		Private data provider, provided by expert through survey, national statistics	
	Acceptability Proportion of medicines by consistency between covered indication and national guidelines or treatment protocols (33)	Survey		Relevant authority (internal) database or guidelines, provided by expert through survey.	

	Disruption in medication access (38)	University of Maryland Social Data Science Center Global COVID-19 Trends and Impact Survey (UMD Global CTIS); COVID-19 Health Services Disruption Survey 2020; COVID-19 Health Services Disruption Survey 2021; Measuring COVID-19 Impacts, Mitigation and Awareness Survey (FINMRK)	Age groups, Gender, Place of residence / living situation		
	Difficult to access pharmacological treatment (21)				
Supply of and demand for PPE	Number of facilities without sufficient access to respiratory protection equipment, i.e., FFP2/3 respirator stock (70)		Type of facility (Acute care hospital; Long-term care facility), Type of respiratory protection (Medical face masks; FFP2/3 respirators)	Hospitals, regional/national authorities	Weekly
	Coordination of preventive, primary care and other outpatient services (74)				
	Personal protective equipment (PPE) availability (80)		Type of facility		
Supply of and demand for other critical medical equipment (ventilators, dialysis materials)	Available ventilators (31)				Daily
Supply of and demand for diagnostic tests	Percentage of health facilities with availability of essential IVDs (83)	Percentage of health facilities with availability of essential IVDs		Facility survey	
	Human immunodeficiency virus (HIV) testing (81)				

Supply of and demand for other medical equipment	Disruption in health products access (38)	University of Maryland Social Data Science Center Global COVID-19 Trends and Impact Survey (UMD Global CTIS); COVID-19 Health Services Disruption Survey 2021; Survey on Gender Equality at Home; COVID-19 Rapid Gender Assessment Survey	Age groups, Gender, Place of residence / living situation		
	Basic equipment availability (80)		Type of facility		
Supply of and demand for surgery	Type of treatment offered (64)		Lockdown period, year		
Services resources availability	Available adult hospital beds (50)	Measures capacity to care for patients with COVID-19, other conditions requiring hospitalization, & those with injuries or emergent conditions; indicates the current number of physical, staffed adult hospital beds. # available adult hospital beds % of total capacity (# available beds/tot. # of adult beds) % change from prior week			Daily
	Available adult ICU beds(50)	Measures the capacity to care adequately for the sickest COVID-19 patients & others in need of intensive care; indicates the current number of physical, staffed adult intensive care beds, excluding surge, PICU, & NICU beds. # available adult ICU beds % of total capacity (# available			Daily

		beds/tot. # of adult ICU beds) % change from prior week			
	Proportion of primary care practices that are closed because of COVID-19 (e.g., insufficient access to personal protective equipment) (70)	**Numerator:** Number of general practices/clinics closed for at least a week due to COVID-19 **Denominator:** Total number of primary care practices/clinics **Calculation:** [Numerator/denominator] x 100 **Direction of change:** Less=better **Monitoring level:** Subnational National Level depends on the administrative level which has coordination of primary care as competence.		Repeated survey in primary care	Monthly
	Occupancy rate of total Intensive Care Unit (ICU) beds (overall and for COVID-19 patients) (70)	**Numerator:** Number of occupied ICU beds (number of patients currently in the ICU) **Denominator:** Total number of operational ICU beds, including ICU beds that were deployed for surge capacity **Calculation:** (Number of occupied ICU beds at a specific time point in the week (e.g., at 00:01 AM on Wednesday) x 100)/total number of ICU beds) OR (Number of occupied ICU bed days during the last 7 days x 100 /(total number of ICU beds x 7) **Direction of change:** Lower = better **Monitoring level:** Subnational		Hospitals	Weekly to EU level, recommended daily at national and subnational level.

		National EU level			
	Hospital beds per 100,000 people (80)				
	Hospitalization capacity (80)		Type of facility		
	Emergency transport availability (80)		Type of facility		
	Percentage of health facilities with availability of priority medical equipment and other medical devices (83)	**Numerator:** Total number of facilities with the equipment, supply or commodity **For diagnostic technologies:** Total count of medical devices available in the country (by type) **Denominator:** Total number of facilities surveyed	Type of equipment, supply, commodity Facility type (as relevant to context): including primary care facilities (e.g., GP practices, health centers, community health posts), first-level hospitals, long-term care facilities, continuing care facilities, etc.) Managing authority: public, private Subnational Urban/rural	Facility survey	
	Hospital beds (per 1,000 population) (34)	Global Health Observatory, WHO (who.int/data/gho).			
Health care facilities access	Health facility density/distribution (including primary care) (83)	**Numerator:** Number of facilities in public and private sectors **Denominator:** Total population		Routine facility information system – facility database/master facility list, geospatial modeling	

	Accessibility, affordability, acceptability (83)	Percentage of population living within 5 km (or 1 hour) of a comprehensive primary care provider and 2 hours of an emergency care unit/provider **Numerator:** Number of people who live within 5km of a primary care facility/provider **Denominator:** Total population count	Urban/rural Subnational	Routine facility information system – facility database/master facility list, geospatial modeling	
	Health care utilization: Diagnosis of all fractures (36)	Total assigned a diagnosis: Number of attendees at ED assigned a diagnosis (% of total) Fractures: Diagnosis of all fractures Total: Number of attendances at ED	Gender	PHE national syndromic surveillance systems Emergency Department (ED)	Submitting data on a daily consecutive basis
	Health care utilization: Clinical diagnosis of Herpes zoster/shingles reported per 100,000 population (36)	Clinical diagnosis of Herpes zoster/shingles reported per 100,000 population. Total: Number of consultations at GP In Hours		PHE national syndromic surveillance systems General practitioner In Hours (GPIH)	

Health care seeking behavior	Chest pain/myocardial infarction (36)	Chest pain/myocardial infarction: includes chest pain and acute myocardial infarction as a percentage of total contacts with a 'Read code.' Total: Numbers of 'contacts' (either by telephone or in person) Total with a Read code: Number of contacts that have a 'Read code' (% of total contacts) . Read codes are a coded thesaurus of clinical terms which record findings and procedures in NHS settings. PHE national syndromic surveillance systems			
	Chest pain (36)	Chest pain: Calls where a person is described as experiencing chest pain or chest discomfort. Total: Number of syndromic calls to 999 for ambulance service Myocardial ischemia PHE national syndromic surveillance systems		Ambulance calls	
	Myocardial ischemia: Clinical diagnosis of myocardial ischemia (36)	Total: Number of attendances at ED Total assigned a diagnosis: Number of attendees at ED assigned a diagnosis (% of total) PHE national syndromic surveillance systems		Emergency Department (ED)	submitting data on a daily consecutive basis

3.2.2 Financial protection

Pathway	Indicator	Metadata/Calculation[13]	Relevant disaggregation	Data source type[14]	Frequency
Public spending on health	Public spending on health (corresponds to general government current expenditure on health) (71)	Public spending on health as a percentage of total public expenditure World Health Organization (WHO), "Global Health Expenditure Database"		WHO works collaboratively with Member States, using available information such as health accounts data, government expenditure records and official statistics.	Annual
	Domestic general government health expenditure per capita, purchasing power parity (current international dollars) (72)				
	Financial protection (79)	expenditure covered by compulsory prepayment schemes (% total expenditure)			
	Health spending (79)	Total health spending (per capita, USD using purchasing power parities)			

[13] Metadata/calculations, this domain includes where the information can be found or how the indicator can be calculated, if available.

[14] Source: This domain includes the tool, scale or mechanism used to capture the data

	Current expenditure on health (total and PHC-specific) as a percentage of GDP (83)	**Numerator:** Sum of all current expenditure on health (12-month period). **Denominator:** GDP National health account (NHA) Existing data collection tool: OECD and World Health Organization. Guidelines for the implementation of the SHA 2011 framework for accounting health care financing. OECD; 2014 (https://www.who.int/health-topics/health-accounts#tab=tab_1, accessed 18 August 2021)		Total (and PHC-specific) current expenditure on health as a percentage of GDP[15]	
	Per capita total health expenditure (and PHC-specific) (83)	**Numerator:** Total health expenditure and Total current PHC expenditure (in U.S. dollars) **Denominator:** Population count NHA Existing data collection tool OECD and World Health Organization. Guidelines for the implementation of the SHA 2011 framework for accounting health care financing. OECD	PHC-specific expenditure Source of funding (e.g., GGHE-D, private, external)	Per capita health expenditure (total and PHC-specific)[4]	
	Government PHC spending as percentage of	Numerator Government expenditure on PHC		NHA	

[15] Notes on calculation of PHC expenditure based on SHA2011 methodology include:
• General outpatient curative care (HC.1.3.1) - such as visits to a general practitioner or nurse
• Dental outpatient curative care (HC.1.3.2) - such as visits for regular control and other oral treatment
• Curative outpatient care not elsewhere classified. (HC.1.3.nec), excluding specialized outpatient care.
• Home-based curative care (HC.1.4), such as home visits by a general practitioner or nurse
• Outpatient (HC.3.3) and home-based (HC.3.4) long-term health care
• Preventive care (HC.6), such as immunization, health check-ups, health education, disease detection, monitoring and emergency response programmes
• Part of medical goods provided outside health care services (80% of HC.5)
• Part of health system administration and governance costs (80% of HC.7)
The medical goods category under the HC classification includes medicines purchased outside the inpatient and outpatient setting (in pharmacies and markets) or paid for separately from the consultation fee. The PHC component of medical goods includes only those for general outpatient use and self-prescribed medicine. It does not include medical goods for specialized outpatient and inpatient services. Following these criteria and assuming most spending recorded for medical goods is for PHC, 80% of medical goods spending was attributed to PHC spending under this global definition.

	government health expenditure (83)	**Denominator:** General government expenditure on health NHA			
	Current health expenditure (% GDP). (34)	Current health expenditure (% GDP). WHO Global Health Expenditure database			
	Government expenditure on health (34)	Government expenditure on health (% of total government expenditure) WHO Global Health Expenditure database			
	Government spending on health as a share of GDP (87)	Government spending on health in the period (% of GDP per capita, in the period (US$)) International Monetary Fund's (IMF) Government Finance Statistics database or the World Bank's World Development Indicators database		Government social spending includes three main components: health, education and social protection[16].	Annual
	Average income elasticity of growth (the ratio of growth in spending to growth in income) (87)	Compound annual growth in government spending on health (%) compared to Compound annual growth in gross domestic product (%) International Monetary Fund's (IMF) Government Finance Statistics database or the World Bank's World Development Indicators database		Government social spending includes three main components: health, education and social protection[5].	Annual

[16] Government spending on health refers to domestic general government health expenditure, which is government spending from domestic financing sources. Data are from the WHO Global Health Expenditure Database. Government spending on education encompasses all levels of education combined, from early childhood to tertiary, including expenditure funded by transfers from external sources to government. Government spending on social protection consists of cash and in-kind benefits provided to targeted individuals and households, including people with sickness and disability, survivors of a deceased person, households with dependent children and other socially excluded groups. It also includes transfers and services provided on a collective basis, including old-age pension schemes, unemployment insurance and housing. The data are from the IMF's Government Finance Statistics database.

	Government and donor spending on PHC, by type of service (87)	Government and donor spending on primary health care (PHC) as a share of gross domestic product (GDP)(%)[17]. The global measure of PHC spending in the Global Health Expenditure Database			Annual
	Pharmaceutical spending as a share of total health spending (%) (87)	Pharmaceutical spending as a share of total health spending (%)		Retail pharmaceuticals, a subcategory of medical goods, includes prescription medicines and self-medication, which is often referred to as over-the-counter products[18].	Annual
	Per capita spending on over-the-counter medicines (US$) compared to Per capita spending on prescribed medicines (US$) (87)	Per capita spending on over-the-counter medicines (US$) compared to Per capita spending on prescribed medicines (US$)		Retail pharmaceuticals, a subcategory of medical goods, includes prescription medicines and self-medication, which is often referred to as over-the-counter products[7].	Annual
Public spending on social services	Government spending on education as a share of GDP (87)	Government spending on education in the period (% of GDP per capita, in the period (US$)) Data are from the International Monetary Fund's (IMF) Government Finance Statistics database or the World Bank's World Development Indicators database			Annual
	Government spending on social protection as a share of GDP (87)	Government spending on social protection in the period (% of GDP per capita, in the period (US$))			Annual

[17] The following spending categories from the classification of health care function are considered part of PHC spending for the global measure: • Unspecialized outpatient care (including general and dental outpatient curative care, home-based curative care, outpatient and home-based long-term health care, and unclassified outpatient care). • Preventive care • 80% of spending on medical goods purchased as a result of consultation and self-treatment. • 80% of spending on health system governance and administration.

[18] The subcategory excludes non-durable medical goods (such as hypodermic syringes, hot-water bottles, ice bags and the like), therapeutic appliances (glasses, hearing aids and the like), vaccines (which are included under preventive care under the System of National Accounts 2011), and pharmaceuticals consumed in hospitals and other health care settings. Spending on pharmaceuticals includes wholesale and retail margins and value-added tax. In most countries, total spending on pharmaceuticals refers to net spending—that is, adjusted for rebates from manufacturers, wholesalers or pharmacies.

		Data are from the International Monetary Fund's (IMF) Government Finance Statistics database or the World Bank's World Development Indicators database			
	Average income elasticity of growth (the ratio of growth in spending to growth in income) (87)	Compound annual growth in government spending on education, (%) compared to Compound annual growth in gross domestic product (%) Data are from the International Monetary Fund's (IMF) Government Finance Statistics database or the World Bank's World Development Indicators database			Annual
Out-of-pocket payments	Out-of-pocket health expenditures per capita, purchasing power parity (current international dollars) (72)				
	Out of pocket payments (79,81)				
	Lack of money (81)				
	Affordability Patient affordability: Out-of-pocket (OOP) cost of treatment relative to wage (patient level) (33)	Cost of per person treatment for a defined time period (monthly, annually) – based on patient OOP contribution. Average population wage		Survey Relevant authority (internal) database or website, provided by expert through survey, national statistics	Monthly, Annual
	Out-of-pocket expenditure (34)	% of total health expenditure		WHO Global Health Expenditure database	
	OOPS[19] (87)	(% of total health spending)		household surveys national accounts	Annual

[19] OOPS is usually estimated by multiplying the share of OOPS in total household consumption (from household surveys) by total final private consumption (from national accounts). This method is based on the fact that in a given country, OOPS is strongly correlated with private consumption.

		Annual growth in out-of-pocket spending per capita (%)			
Funding and allocation of resources	Sources of expenditure on health including out-of-pocket (and PHC-specific) (83)	**Numerator:** Total expenditure on health from each relevant source (government schemes, compulsory contributory health care financing, voluntary health care payment schemes, household out-of-pocket, rest of world financing schemes, other) **Denominator:** Total expenditure on health NHA	PHC-specific expenditure Source: out of pocket, domestic government, external	NHA	
Personal spending	ACCRA Cost of Living Index (23)	Fruit and vegetable price index and fast-food price index - based on the food prices available			Annual
Purchasing and payment systems	Purchasing and provider payment methods[20] are in place (including in primary care) (83)			Qualitative assessment based on interview with key informant and/or desk review of country documents	
	Purchasing and payment systems[21] (83)			Qualitative assessment based on interview with key informant and/or desk review of country documents.	
Access to financial institutions/government financial support	Households that could not access a financial institution when necessary (88)		Households that could not access a financial institution when necessary because of movement restrictions		
	Safety nets (88)	• Households that had received any form of			

[20] Appropriate provider payment methods are in place as measured against the following criteria: • Payment of providers is driven by information on the health needs of the population they serve • Provider payments harmonized within and across purchasers to ensure coherent incentives for providers • Purchasing arrangements promote quality of care • Provider payment methods and complementary administrative mechanisms address potential over- or underprovision of services • Information on providers' activities captured by purchasers adequate to guide purchasing decisions • Providers have financial autonomy and are held accountable

[21] Health financing (or access to HBP or insurance scheme) follows WHO-recommended guidelines, including following criteria: • Population entitlements and conditions of access defined explicitly and in easy-to-understand terms • User charges are designed to ensure financial obligations are clear and have functioning protection mechanisms for patients • Defined benefits aligned with available revenues, available health services, and purchasing mechanisms.

		assistance since the start of the pandemic. • Respondents who stopped working or received less labor income who received government assistance after losing a job or receiving less labor income			

3.2.3 Quality

Pathway	Indicator	Metadata/Calculation[22]	Relevant disaggregation	Data source type[23]	Frequency
Health care quality in various settings (for example, primary care, hospital care, acute care)	Proportion of affected long-term care facilities reporting weekly surveillance data (70)		Type of facility		Weekly, Monthly
	Consultation rate (76)				Weekly
	Safe long-term care (79)		Gender		
	Percentage of facilities meeting minimum standards to deliver tracer services (83)		Facility type (as relevant to context): including primary care facilities (e.g., GP practices, health centers, community health posts), first-level hospitals, second-level hospitals, specialty hospitals, long-term	Facility survey	

[22] Metadata/calculations, this domain includes where the information can be found or how the indicator can be calculated, if available.

[23] Source: This domain includes the tool, scale or mechanism used to capture the data

			care facilities, continuing care facilities, etc.) Managing authority: public, private Subnational Urban/rural		
	30-day hospital case fatality rate (for acute myocardial infarction or stroke) (83)		Cause, Facility type (as relevant to context): first-level hospitals, second-level hospitals, specialty hospitals, long-term care facilities, continuing care facilities, etc.) Managing authority: public, private Subnational Urban/rural Gender Age	Recommended to be collected through routine health information system (RHIS) but can also be collected through a record review during a facility survey	
	Avoidable complications (Lower limb amputation in diabetes) (83)		Age groups, Gender, Subnational	Recommended to be collected through RHIS but can also be collected through a record review during a facility survey	
	Hospital readmission rates for tracer conditions (83)		Age groups, Gender, Tracer condition Facility type (as relevant to context): first-level hospitals, second-level hospitals, specialty hospitals Managing authority (public/private) Subnational Urban/rural	Recommended to be collected through RHIS but can also be collected through a record review during a facility survey	
	Admissions for ambulatory care sensitive conditions (asthma, chronic obstructive pulmonary disease, diabetes, congestive heart failure, hypertension) (83)	**Numerator:** All non-maternal/non-neonatal hospital admissions with a principal diagnosis of asthma, or chronic obstructive pulmonary diseases, congestive heart failure, hypertension, or diabetes in a specified year. **Denominator:** Population count and total number of inpatient admissions	Age groups, Gender, Tracer condition Sub-national	RHIS (inpatient)	

	Overall volume of antibiotics for systemic use prescribed (83)		Subnational	Prescription database	
	Proportion of people 65 years and over prescribed antipsychotics in the reference year (83)		Subnational	Prescription database	
	Provider caseload (including primary care) (83)			Facility survey - Record review	
	Bed occupancy (83)		Facility type (as relevant to context): first-level hospitals, second-level hospitals, specialty hospitals Managing authority (public/private) Subnational Urban/rural	RHIS	
	Cancer stage at diagnosis (by cancer) (83)		Gender, Cancer type	Cancer registry	
	MHA service access for youth with greatest need (reported by caregiver) : Support type preferences (44)				
Patient safety/adverse effects	Institutional mortality rates all causes (83)		Cause -of- death Age (minimum 0-4 and 5+ years) Facility type (as relevant to context): first-level hospitals, second-level hospitals, specialty hospitals, etc.	RHIS, death surveillance and response systems	
	Postoperative sepsis (83)		Facility type (as relevant to context): first-level hospitals, second-level hospitals, specialty hospitals, etc. Managing authority: public, private	Recommended to be collected through RHIS but can also be collected through a special study	

			Subnational		
	Postoperative pulmonary embolism (83)		Facility type (as relevant to context): first-level hospitals, second-level hospitals, specialty hospitals, etc. Managing authority: public, private Subnational	Recommended to be collected through RHIS but can also be collected through a special study	
	Hospital-acquired infections (83)		Tracer condition Facility type (as relevant to context): first-level hospitals, second-level hospitals, specialty hospitals, etc. Managing authority: public, private	RHIS	
	Percentage of outbreak alerts investigated within 48 hours (50)				
Patient-Reported Experience Measures (PREMs)	Index of patient-reported experiences (including in primary care facilities) (83)		Age groups, Gender, When collected through population-based survey and facility surveys: Age Gender Subnational Urban/rural For exit interview during facility surveys only: Facility type (as relevant to context): including primary care facilities (e.g., GP practices, health centers, community health posts), first-level hospitals, second-level hospitals, specialty hospitals, long-term care facilities, continuing care facilities, etc.)		

	MHA care needs and preferences : Support types and mode preferences (44)				
Adherence to medical guidelines	Percentage of healthcare facilities with a policy for face mask wearing by all healthcare workers providing care to all patients (70)				
	Respiratory illness treatment guidelines (80)				
	Adherence to clinical standards/ guidelines for primary care tracer services (family planning, antenatal care, sick childcare, hypertension, diabetes) based on observed visits (percentage of tracer services adhering to standards) (83)				

3.3 Direct effects of containment measures

Pathway	Indicator	Metadata/Calculation[24]	Relevant disaggregation	Data source type[25]	Frequency
Loneliness	Interventions in place for risk groups and vulnerable population (70)	Ministry of health and national public health agency recommendations; recommendations by bodies representing facilities for	Risk group/population		Weekly or every two weeks depending on epidemic levels

[24] Metadata/calculations, this domain includes where the information can be found or how the indicator can be calculated, if available.

[25] Source: This domain includes the tool, scale or mechanism used to capture the data

		vulnerable populations			
	Loneliness (21)		Gender, Other: profession , geographical location		
Work conditions	Interventions in place regarding the closing of workplaces (70)	Method of measurement: Fully/partially/not implemented. Monitoring level: National EU level		Ministry of health and national public health agency recommendations; recommendations by different industry bodies or private companies regarding workplace closures	Weekly or every two weeks depending on epidemic levels.
Work-life balance	Work/job related concerns (49)				
	Social deprivation index (32)				
	Well-being (13)		Age groups, Gender, Socioeconomic status (income, education, occupation), Pregnancy		
	Prevalence of insomnia (7)		Age groups, Gender, Socioeconomic status (income, education, occupation), Pregnancy		
	Prevalence of anxiety (7)		Age groups, Gender, Socioeconomic status (income, education, occupation), Pregnancy		
	Prevalence of obesity (7)		Age groups, Gender, Socioeconomic status (income, education, occupation), Pregnancy		
	Prevalence of depression (7)				
Time spent on unpaid domestic and care work	Increase in chores (38)	COVID-19 Rapid Gender Assessment Survey; Survey on Gender Equality at Home	Age groups, Gender, Place of residence / living situation		

	Increase in care for others (38)	COVID-19 Rapid Gender Assessment Survey; Survey on Gender Equality at Home	Age groups, Gender, Place of residence / living situation		
	Caregiver strain (44)				
	Caregiving responsibilities: Impact on own well-being (38)				
Time spent outside / time for leisure activities	Well-being (13)				
Psychological distress	Major depressive disorders (28)				
	Anxiety disorders (28)				
	social anxiety (75)				
	Depression (11,12,17,21,41,59)		Age groups, Gender, Professional status employed/unemployed, Region and State of COVID prevalence, People with a chronic condition or disability	• Patient Health Questionnaire [PHQ-9][26] • Taiwanese Depression • Self-rating Depression Scale • Center for Epidemiological Studies-Depression	
	Depression screening (66)				
	Anxiety (7,12,16,17,41,56,59,61,75)		Age groups, Gender, Professional status employed/unemployed,	self-report • Generalized anxiety disorder [GAD-7][27]	

[26] Nine item self-report measure to monitor the presence and severity of depression symptoms. Items include statements such as “Feeling down, depressed or helpless” and “Little pleasure or interest in doing things" rated for intensity of occurrence over the last two weeks from 0 to 3 respectively for the following options: not at all, several days, more than half the days, or nearly every day. A cutoff value of≥5 was used as indication of mild to moderate depression and a value of>20 indicated severe depression.

[27] Seven item self-report Items include statements such as “Feeling anxious, nervous or on edge” rated for intensity of occurrence over the last two weeks from 0 to 3 respectively for the following options: not at all, several days, over half the days, or nearly every day. A cutoff value of≥5 was used as indication of mild to moderate anxiety and a value of>15 indicated severe anxiety.

			State of COVID prevalence, region Socioeconomic status (income, education, occupation) People with a chronic condition or disability	• Self-rating Anxiety Scale (SAS)	
	Anxiety level among students of different college and universities during lock down (53)		Age groups, Gender	Online questionnaire	
	Liebowitz social anxiety scale (47)				
	State-trait anxiety inventory (STAI) (47)				
	Sleep Quality (16,41)		Age groups, Gender, Professional status employed/unemployed	• Pittsburgh Sleep Quality Index [PSQI] [28]	
	Insomnia (7,11)		Socioeconomic status (income, education, occupation), Specialty	• Insomnia Severity Index (ISI) • The Pittsburgh Sleep Quality Index (PSQI) • Sleep Condition Indicator (SCI)	
	Gratitude (41)		Age groups, Gender, Professional status employed/unemployed	• Gratitude Questionnaire [GQ-6][29]	
	PTSD (7,11,12,41,59)		Age groups, Gender, Professional status employed/unemployed,	• Impact of Event Scale [IES-	

[28] 18 items on a four-point Likert scale and is designed to measure sleep disturbances and sleep habits over a one-month period. It includes questions about time of bed, the number of hours of sleep per night, wake up time, and the time it takes to fall asleep. It also includes statements such as “during the past month how often have you had trouble sleeping because you have bad dreams” and “how would you rate your overall quality of sleep”. Each statement is scored between 0 [not during the past month] and 3 [three or more times a week]. Statements are broken down into seven components and converted to a point score. Higher scores indicate poorer sleep hygiene and scores>5 point to poor sleep quality. Validity and reliability have been previously reported.

[29] Gratitude Questionnaire [GQ-6] is a six-item self-report measure designed to quantify individual variances in the proneness to experience gratitude in daily life. Items are rated on a seven-point Likert-type scale, where 1 = strongly disagree and 7 = strongly agree and include statements like “I have so much in life to be thankful for” and “When I look at the world, I don’t see much to be grateful for”. Total score ranges between 6 and 42, with higher scores indicating higher gratitude.

			Region and State COVID prevalence Socioeconomic status (income, education, occupation), Specialty	22][30] Impact of Events Scale-6 • Impact of Event Scale–Revised (IES-R) • PTSD Checklist-Civilian version • PTSD Reaction Index • Primary Care PTSD screen (PC-PTSD)	
	General life satisfaction: Good to very good (43)	General life satisfaction (0-10) SHP Swiss Household Panel		Survey	
	Current quality of life: Good to very good (43)	SHS Swiss Health Survey		Survey	
	Quality of life compared to before COVID-19 emergency: Worsened (43)			Survey	
	General health status: Good to very good (43)	SHS Swiss Health Survey		Survey	
	Feelings of loneliness: Often or very often (43)	SHS Swiss Health Survey		Survey	
	Fears of losing employment	**Numerator:** Fears of losing employment/ **Denominator:** Employed population SHS Swiss Health Survey		Survey	
	Health and Well-being (59)		Age groups, Gender		
	Anxiety and depression levels (16,59,60)		Age groups, Gender, Socioeconomic status (income, education, occupation), Province, marital status	• Chinese version of the Hospital Anxiety and Depression Scale • Hospital Anxiety and Depression Scale • Anxiety Inventory (BAI) and Beck Depression online survey	

[30] 22-item scale used to evaluate the degree of distress one experiences in response to a given trauma. Items include statements such as “any reminder brought back feelings about it”, “I had trouble concentrating” and “I tried not to talk about it”. Items are rated for distressing levels over the last seven days on a scale from 0 [not at all] to 4 [extremely]. A cutoff value of>24 was used as indication of clinical worry and a value of>33 indicated likely PTSD diagnosis.

				of Beck Inventory (BDI)	
	Perceived Stress (7,16,41,49,59)		Age groups, Gender, Professional status employed/unemployed, Socioeconomic status (income, education, occupation)	• Perceived Stress Scale [PSS] • 10-item Perceived Stress Scale (PSS-10) • Stress Scale 21 Items	
	Stress (21,59,63)	• Scale of change, Significant increase, Slight increase, No change, Slight decrease, Significant decrease	Gender Region and state COVID prevalence		
	Acute stress disorder (11)	Study-specific questionnaire adapted from DSM-IV (11)			
	Stress levels (56)			questionnaire	
	Mental health (11)	Chinese Health Questionnaire			
	Anxiety and depression (7,11)		Socioeconomic status (income, education, occupation), Specialty	• Patient Health Questionnaire-4 • Hospital Anxiety and Depression Scale (HADS) • Goldberg depression and anxiety scale (GADS)	
	Psychological distress (11) (7,13,16)		Socioeconomic status (income, education, occupation), Specialty	• Patient Health Questionnaire-4 • Patient Health Questionnaire-9 (PHQ-9) • Kessler 10 Psychological Distress questionnaire • The 2-item Patient Health Questionnaire (PHQ-2) • Patient Health Questionnaire-8 (PHQ- 8)	
	Psychological disorders (11)			• General Health Questionnaire-30	

	Depression, anxiety and stress (11)			• Depression, Anxiety and Stress Scale-21	
	Stigma, depression, anxiety and stress (11)			• Study-specific questionnaire adapted from HIV Stigma Scale and Depression • Anxiety and Stress Scale	
	Novelty seeking (11)			• Langer Mindfulness Scale novelty seeking subscale	
	Anger (11)			• State-Trait Anger Expression Inventory-2	
	Emotional exhaustion (7)			• Maslach Burnout Inventory-General Survey	
	Mental health service utilization (7)			• Audit	
	Depression, psychological need satisfaction, and loneliness (7)			• Center for Epidemiological Studies Depression • Need Satisfaction Scale • Revised Loneliness Scale	
	Fear and intolerance of uncertainty (16)				
	Acute stress reaction (ASR) (16)			• Impact of Event Scale-Revised (IES-R)	
	Depression, Anxiety and Stress (7,11,16)		Socioeconomic status (income, education, occupation), Specialty	• Depression, Anxiety and Stress Scale (DASS-21)	
	Effort Reward Imbalance (ERI)(7)		Socioeconomic status (income, education, occupation), Specialty		
	Emotion regulation (17)		Age groups, Gender, People with a chronic condition or disability		
	Stress perception (17)		Age groups, Gender, People with a chronic condition or disability		

	Difficulty concentrating (12)		Gender, Time		
Interpersonal violence (intimate partner violence, child maltreatment, elderly abuse)	Domestic violence (75)				
	Femicide (89)				
	Perception of gender-based violence increase (38)	COVID-19 Health Services Disruption Survey 2021; COVID-19 Rapid Gender Assessment Survey	Age groups, Gender, Place of residence / living situation		
	Feeling unsafe at home (38)	Survey on Gender Equality at Home; COVID-19 Rapid Gender Assessment Survey	Age groups, Gender, Place of residence / living situation		
	Intrafamilial violence (21)				
Social support	Mechanisms in place to provide practical and logistical support[31] to people living in socially vulnerable settings (70)			National and regional health authorities	Monthly
	Social supports: Positive Perceptions Scale (44)			• Social supports: Positive Perceptions Scale	
	Support System (52)			Online survey • The Multidimensional Scale of Perceived Social Support[32]	
	Satisfaction with social supports (44)				
Adherence to containment measures such as hygiene and	Availability of mobile app(s) to complement manual contact tracing and proportion of		Age groups	App controller (likely public health authority)	Quarterly

[31] Provision of support should ideally be focused on at least the following groups: people with mental or physical disabilities, people with mental health problems, people with learning disabilities, homeless people, people living in abusive household settings, ethnic minorities, people from the LGBTI community, people in prisons, and undocumented migrants.

[32] Measure the support system from three sources: family, friends, and significant others. This is a 12-items measure, rated on a seven-point Likert scale from 1 (very strongly disagree) to 7 (very strongly agree).

physical distancing measures	population that has downloaded them (70)				
	Percentage of facilities with availability of basic WASH amenities (potable water, toilet, sink, waste management, cleaning) (83)	**Numerator:** Number of health facilities that meet basic WASH standards **Denominator:** Total number of facilities examined	Facility type: hospital, non-hospital Managing authority: government, non-government Urban/rural	Facility survey	

3.4. Indirect effects of containment measures through risk factors

Pathway	Indicator	Metadata/Calculation[33]	Relevant disaggregation	Data source type[34]	Frequency
Tobacco use	Tobacco use (adolescents) (25)	NHMS by IPH, MOH			Every 4 years
	Cigarette Smoking (39)	Prevalence in percentage of cigarette smoking in weighted sample. Cigarette Smoking - Never - Yes, daily. - Yes, occasionally. Secondary data from The Sharik Health Indicators Surveillance System (SHISS)		Phone interviews	Quarterly
	Smoking status (65)	- Current Smoker - Smokes everyday - Smokes some days. - Former smoker - Never smoked			
	Smoking (13,20,79)	Proportion of smokers %			

[33] Metadata/calculations, this domain includes where the information can be found or how the indicator can be calculated, if available.

[34] Source: This domain includes the tool, scale or mechanism used to capture the data

		Daily smokers (% population aged 15+)			
Alcohol use	Alcohol per capita consumption (13,25,79)	Liters consumed per capita (population aged 15+)		based on sales data	
	Prevalence of heavy episodic drinking (24)	National Health and Morbidity Survey (NHMS) by Institute for Public Health (IPH), MOH			Every 4 years
Physical activity	Physical inactivity (adolescents) (25)	Physical inactivity (adolescents) NHMS by IPH, MOH			Every 4 years
	Physical inactivity (adults) (25)	NHMS by IPH, MOH		Physical inactivity (adults) uses the short IPAQ questionnaire	Every 4 years
	Inability to exercise or be active (61)	Percentage of patients reporting symptom (%)			
	Physical Activity (39)	Prevalence in percentage of Physical activity in the weighted sample[35] categorical outcome Secondary data from The Sharik Health Indicators Surveillance System (SHISS)			Quarterly
	No moderate physical activity during the last 7 days (43)	%		Survey	
	Never left home during the last 7 days (43)	%		Survey	
	Physical Activity Behavior (59)	Changes in physical activity were calculated as the difference between the participants' reported number of days of physical activity			

[35] An acceptable level of physical activity (ALPA) (at least 150 min of MIPA per week and/or at least 75 min of VIPA per week) and a low level of physical activity (LLPA) (less than 150 min of MIPA and/or less than 75 min of VIPA).

		currently and prior to the COVID-19 pandemic.			
	Physical activity prevalence (59)	Physical activity prevalence			
	Physical activity (17)		People with a chronic condition or disability, gender, age group, region	• international Physical Activity Questionnaire Short Form (IPAQ-SF)	
	Type of physical activity (17)	Activity of Daily Living, moderate PA, walking, outdoor activity, PA vigorous, PA 16 Hrs. per week	People with a chronic condition or disability, gender, age group, region		
Overweight/obesity	Overweight and obesity (adolescents) (25)	NHMS by IPH, MOH			Every 4 years
	Overweight and obesity (adults) (25)	NHMS by IPH, MOH			Every 4 years
	Overweight/obese (79)	population with BMI>=25 kg/m2 (% population aged 15+)			
	Obesity (20,33)	Prevalence in percentage of obesity in the weighted sample[36] Secondary data from The Sharik Health Indicators Surveillance System (SHISS)		Phone interviews	Quarterly
	Weight gain (55)	Significant weight gain[37], n (%) Retrospective data from four university hospitals in Barcelona (three) and Girona (one), Catalonia, Spain			
Hypertension	Raised blood pressure (25)	NHMS by IPH, MOH			Every 4 years

[36] Center for Disease Control and Prevention's (CDC) BMI category status, which specifies a BMI of 30 or above as obese.

[37] Weight gain: any measured weight gain compared to one year earlier (under the assumption that people with NAFLD are supposed to lose weight or maintain it); Significant body weight gain: >5%

	Hypertension (39) (20)	Prevalence in percentage of Hypertension in the weighted sample Diagnosed on-treatment. Secondary data from The Sharik Health Indicators Surveillance System (SHISS)		Phone interviews	Quarterly
	Poor control of systemic hypertension (55)	Poor control of systemic hypertension[38] Retrospective data from four university hospitals in Barcelona (three) and Girona (one), Catalonia, Spain			
High cholesterol	Raised total cholesterol (25)	Raised total cholesterol. NHMS by IPH, MOH			Every 4 years
	Hypercholesterolemia (39)	Prevalence in percentage of Hypercholesterolemia in the weighted sample Diagnosed on-treatment. Secondary data from The Sharik Health Indicators Surveillance System (SHISS)		Phone interviews	Quarterly
	Poor control of dyslipidemia (55)	Poor control of dyslipidemia[39], n (%) Retrospective data from four university hospitals in Barcelona (three) and Girona (one), Catalonia, Spain			
Diet	Salt intake (25)	IPH, MOH			
	Saturated fat intake (25)				

[38] Poor control of systemic hypertension: new diagnosis of high blood pressure and/or routine measurements of systolic arterial pressure >140 mmHg or diastolic arterial pressure >90 mmHg and/or episodes of hypertensive crisis-emergencies, and/or new drug added.

[39] Poor control of dyslipidemia: new diagnosis of dyslipidemia (either due to hypercholesterolemia, hypertriglyceridemia or both) and/or total cholesterol >240 mg/dl and/or total triglycerides >200 mg/dl, and/or new drug added.

	Fruit and vegetable intake (25)	NHMS by IPH, MOH			Every 4 years
	online food shopping (28)	Percentage			
	Vitamin D deficiency/insufficiency (28)				
	Fruit and Vegetable Intake (39)	Prevalence in percentage of Fruit and Vegetable Intake[40] in the weighted sample Secondary data from The Sharik Health Indicators Surveillance System (SHISS)		Phone interviews	Quarterly
	Eating behavior (17)		People with a chronic condition or disability, gender, age group, region	• Short Diet Behaviors Questionnaire for Lockdowns (SDBQL)	
	Distance to the nearest food market(32)				
Illicit drug use	Drug use (24)				
	Substance misuse (21)				
Other substances use	Waterpipe Smoking (39)	Prevalence in percentage of waterpipe smoking in the weighted sample. Never Yes, daily. Yes, occasionally. Secondary data from The Sharik Health Indicators Surveillance System (SHISS)		Phone interviews	Quarterly
	E-Cigarette Smoking (39)	Prevalence in percentage of E-cigarette smoking in the weighted		Phone interviews	Quarterly

[40] If a participant's daily food intake included at least one portion of fruit and one portion of vegetables, they were categorized as having an acceptable level of fruit and vegetable intake (AFVI). If not, they were categorized as having a low level of fruit and vegetable intake (LFVI)

		sample E-Cigarette Smoking Never Yes, daily. Yes, occasionally. Secondary data from The Sharik Health Indicators Surveillance System (SHISS)			
	Substance use (44)			• ASSIST and self-perceived use (Alcohol, Smoking, and Substance Involvement Screening Test)This scale classifies participants into low-risk, moderate-risk and high-risk categories for substance use and dependence	

3.5 Indirect effects of containment measures through wider determinants of health

Pathway	Indicator	Metadata/Calculation[41]	Relevant disaggregation	Data source type[42]	Frequency
Income / (at risk of) poverty	Personal bankruptcy (24)	Safegraph	Age groups, Socioeconomic status (income, education, occupation)		Weekly
	Proportion of people living below the poverty threshold (24)	Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC)	Region		
	Neighborhood deprivation index (24)	Six variables were selected to compute the NDI score (% unemployment, % female-headed households, % households on public assistance, % households with a car,	Region		Annual

[41] Metadata/calculations, this domain includes where the information can be found or how the indicator can be calculated, if available.

[42] Source: This domain includes the tool, scale or mechanism used to capture the data

		% the population below the federal poverty line, and % non-Hispanic blacks) after being standardized and weighted by their factor loading coefficients			
	Economic activity (75)				
	employment growth rates (91)		Gender		
	employment level (91)				
	Employment recovery (91)		Gender		
	household income (78)				
	Poverty and extreme poverty (81)				
	average hourly labor income (81)				
	Households that experience a decrease in total income (%) (88)	Households that experience a decrease in total income (%)		High-frequency mobile phone surveys, such as those supported by the World Bank and partners before the pandemic to monitor household welfare[43].	
	Households with farm income as the source of livelihood in the past 12 months that had decreased farm income (%) (88)	Households with farm income as the source of livelihood in the past 12 months that had decreased farm income (%)		High-frequency mobile phone surveys, such as those supported by the World Bank and partners before the pandemic to monitor household welfare[23].	
	Households with non-farm business income as the source of livelihood in the past 12 months that had decreased income from	Households with non-farm business income as the source of livelihood in the past 12 months that had decreased income from non-farm family business (%)		High-frequency mobile phone surveys, such as those supported by the World Bank and partners before the pandemic to monitor household welfare[23].	

[43] With a flexible design, countries' national statistical offices can adapt the data collection tool to their evolving needs, priorities and insights from emerging data. (low- and middle-income countries)

	non-farm family business (88)				
	Households that receive remittances that had decreased remittance (88)	Households that receive remittances that had decreased remittance (%)			
	Households that reduced consumption of goods (essential and non-essential) (88)	Households that reduced consumption of goods (essential and non-essential)			
	Households that sold assets to pay for basic living expenses (88)	Households that sold assets to pay for basic living expenses			
	Households that used emergency savings to cover basic living expenses (88)	Households that used emergency savings to cover basic living expenses			
	Income loss (38)	Proportion of individuals currently working who had loss of income since the COVID-19 pandemic. COVID-19 Rapid Gender Assessment Survey; COVID-19 Behavior Tracker 2020 (YouGov); Research for Effective Covid-19 Response Panel Survey 2020; COVID-19 Health Services Disruption Survey 2020	Age groups, Gender, Place of residence / living situation		
	Income (65)	<15,000 15,000 to <25,000 25,000 to <35,000 35,000 to <50,000 50,000+			
	Proportion of people under the federal poverty line (32)		Age groups		
	% Living below poverty line (20)				

	Gini income inequality index (20)				
	% family receiving public assistance (20)				
	% households which heads worked in informal sector (20)				
Public spending on essential services	Debt-to-tax ratio (gross public debt) (75)				
	ACCRA Cost of Living Index (24)			• Fruit and vegetable price index and fast-food price index - based on the food prices available	Annual
Unemployment	Unemployment (24)	US Bureau of Labor Statistics, local area unemployment statistics	Geographically		Monthly, Annual
	Employment in working-age people (24)	CPS ASEC	Region		
	tourism and international travel (75)				
	Unemployment rate (62,91) (81)	Percentage	Age groups, Gender		
	Employment loss (38)	Proportion of individuals who worked before the pandemic and who are not currently working. University of Maryland Social Data Science Center Global COVID-19 Trends and Impact Survey (UMD Global CTIS); COVID-19 Health Services Disruption Survey 2020; COVID-19 Health Services Disruption Survey 2021; COVID-19 Behavior Tracker 2020 (YouGov); COVID-19 High Frequency Phone Survey; Survey on Gender Equality at Home	Age groups, Gender, Place of residence / living situation		

	Not working to care for others (38)	Proportion of individuals that left their job after the COVID-19 pandemic to care for someone out of those not currently working. University of Maryland Social Data Science Center Global COVID-19 Trends and Impact Survey (UMD Global CTIS); COVID-19 Health Services Disruption Survey 2020; COVID-19 Health Services Disruption Survey 2021	Age groups, Gender, Place of residence / living situation		
	Unemployed due to Corona-Crisis (43)	**Numerator**: Unemployed due to Corona-Crisis **Denominator**: Employed population % SHS Swiss Health Survey		Survey	
	Already unemployed before Corona-Crisis (43)	**Numerator**: Already unemployed before Corona-Crisis **Denominator:** Employed population % SHS Swiss Health Survey		Survey	
	Home office during the last 7 days (43)	**Numerator**: Home office during the last 7 days **Denominator:** Employed population %		Survey	
	Home office before Corona-Crisis (43)	**Numerator**: Home office before Corona-Crisis **Denominator**: Employed population%		Survey	
	Work impairment (43)				
	Proportion of unemployment (32)		Age groups		
Workers on flexible contracts / informal workers	informal employment (75)				
	Own-account workers (91)		Gender, Domestic work, wage employment, own-		

			account work		
	Employment status (65)	Employed for wages. Self-employed Out of work for 1 yr.+ Out of work for <1 yr. Homemaker Student Retired Unable to work			
	informal settlements (78)	Ministry of Housing and Urban Affairs' 2019 national survey			
	Respondents who are currently employed and aged > 18 years who have changed jobs since the start of the pandemic (88)				
	Respondents > 18 years who are self-employed (88)				
	Respondents in wage employment who did not work as usual who received partial or no payment when not working as usual (88)				
	Households unable to perform normal farming activities (crop, livestock, fishing) (88)				
Education	Proportion of high school completers enrolled in college the October immediately after completing high school (24)	CPS	Region		
	Interventions in place regarding closing of schools including day care,	**Method of measurement:** Fully/partially/not implemented. **Monitoring level:**	Age groups, School levels: day care, primary school,	Ministry of health and national public health agency recommendations; recommendations by	Weekly or every two weeks

	primary school, secondary school and higher education.(70)	National EU level	secondary school, higher education	administrative/industry body representing educational institutions	depending on epidemic levels
	youth not in employment, education or training (NEET) (73)				
	knowledge and skills (75)				
	Remote education access via the Internet, television or radio (81)				
	Households with school-age children who attended school before the pandemic who have engaged in any learning or educational activity since school closure (88)				
	Households with school-age children who attended school before the pandemic who have used mobile learning apps since school closure (88)				
	Education School dropout (38)	Proportion of learners (individuals previously enrolled in any level of school) no longer in school, not because of graduation or school break, among all learners in school before the COVID-19 pandemic. COVID-19 Health Services Disruption Survey 2021	Age groups, Gender, Place of residence / living situation	Survey	
	Adequate remote learning (38)	Proportion of learners (individuals currently enrolled in any level of school) with good internet access among all learners learning remotely during the COVID-19 pandemic	Age groups, Gender, Place of residence / living situation	Survey	

		COVID-19 Health Services Disruption Survey 2021			
	% of people aged 6 to 14 who do not attend school (20)	% of people aged 6 to 14 who do not attend school			
	School abstentionism (19)				
	School closing (86)	0 – No measures 1 – Recommend/require adapting in-person teaching (such as physical distancing, hand hygiene, masks, staggered classes and separate arrival) 2 – Recommend suspension of in-person teaching (by, for example, transitioning to online/distance learning) 3 – Require suspension of in-person teaching on some levels or categories (just in high schools, for instance) 4 – Require suspension of in-person teaching at all levels			
Childhood development	Proportion of children living with at least 1 parent who works full time (24)	Proportion of children living with at least 1 parent who works full time. CPS ASEC	Region		
	rate of orphanhood (81)				
	Single parent household (20)				
	% Female-headed households with children (20)				
	% of women aged 10 to 17 who had children (20)				

	% Households with children aging Under 18 years old (20)				
Air quality	Air quality index (32)				
	Air quality (24)		Region		Annual
	Ambient air pollution (79)	Deaths due to ambient particulate matter, especially PM 2.5 (per 100 000 people)			
Other environmental effect	Air pollution, blue space, water quality, and coastlines(24)	Moderate-resolution imaging spectroradiometer			Ongoing basis
	Plastic waste (92)				
Transport behavior	Interventions in place regarding the restriction on the use of public transport (70)	**Method of measurement:** Fully/partially/not implemented. **Monitoring level:** National EU level		Ministry of health and national public health agency recommendations; recommendations by industry body responsible for public transportation network	Weekly or every two weeks depending on epidemic levels
	Public transport mobility (81)	Reduction in mobility			
	Limited or no transportation (81)				
	Proportion of people relying on public transportation (32)		Age groups		
	Proportion of people relying on carpooling (32)		Age groups		
	Proportion of people without access to a vehicle (32)		Age groups		
	% Households using public transport (20)				
	% Working population access to public				

	transportation (20)				
	Transportation burden index (32)				
	National movement restrictions or recommendations (70)	**Method of measurement:** Binary (yes/no) **Monitoring level:** Subnational EU level	Level of enforcement (mandatory or voluntary)	Government, Ministry of Health and national public health agency recommendations	Weekly or every two weeks depending on epidemic levels
Access/usages of essential services	Percentage of homes with access to at least basic water infrastructure (89)				
	Percentage of homes with access to at least basic sanitation facilities (89)				
	Digital technologies usage (75)	adoption of digital technologies			
	Digital technologies usage (75)	Lack of high-speed broadband Internet			
	housing vulnerability (89)	housing vulnerability	Race and ethnicity		
	Communication facilities (80)	Functioning fixed or mobile phone, Functioning internet connection			
	Connectivity (20) (32)	% Population access to internet			
	Connectivity (20) (32)	% Population having cell phone or telephone			

3.6 Health outcomes

Pathway	Indicator	Metadata/Calculation[44]	Relevant	Data source type[45]	Frequenc

[44] Metadata/calculations, this domain includes where the information can be found or how the indicator can be calculated, if available.

[45] Source: This domain includes the tool, scale or mechanism used to capture the data

			disaggregation		**y**
General health and well-being: Self-perceived (mental) health	Perceived stress			• 4-item version of the Perceived Stress Scale[46].	Survey
	Depression and anxiety symptoms		Socioeconomic status (income, education, occupation), People with a chronic condition or disability, Monthly income (<500 JOD), Employment status (unemployed), Chronic disease (diabetes)	• Kessler Psychological Distress Scale (K10)[47]	Questionnaire self-administered questionnaire
	Anxiety symptoms over the past 2 weeks	Items n(%)		• Generalized Anxiety Disorder scale (GAD-7)[48] to evaluate the frequency of anxiety symptoms over the past 2 weeks.	Web-based questionnaire
	Depressive symptoms over the past week			• Center for Epidemiologic Studies Depression Scale (shortened version) (CESD-10)[49] to assess whether participants had depressive	Web-based questionnaire

[46] Items were rated from 0 (never) to 4 (very often). Two positively stated items (items 2 & 3) were reverse-coded, and scores were summed across all scale items. Higher values represent higher perceived stress.

[47] This was a 10-item questionnaire intended to yield a global measure of distress based on questions about anxiety and depressive symptoms that a person has experienced during the COVID-19 outbreak. The scale used five-value response options for each question –all of the time, most of the time, some of the time, a little of the time, and none of the time– that were scored from five through to one. The Kessler scale was tailored to study aims by adding 6 questions related to the COVID-19 and the local situation in Jordan. Therefore, the maximum score was therefore 80, indicating a severe mental problem, and the minimum score was 16, indicating well mental health. From 16 to 32 was considered well mental status, from 32 to 48 was considered mild mental status, from 48 to 64 was considered moderate mental status, and from 64 to 80 was considered severe mental status.

[48] Answer options for the 7 items of the measure were on a four-point Likert scale ranging from 0-3 points 'not at all', 'several days', 'over half the days', 'nearly every day' to a score ranging from '0-21'; increasing score indicates increasing functional impairment as a result of anxiety over the last 2 weeks.
Feeling nervous, anxious, or on edge /Not being able to stop or control worrying /Worrying too much about different things /Trouble relaxing /Being so restless that it's hard to sit still /Becoming easily annoyed or irritable /Feeling afraid as if something awful might happen.

[49] Answer options for the 10 items of the measure were on a four-point Likert scale ranging from 0-3 points 'rarely or none of the time', 'some or little of the time', 'occasionally or a moderate amount of time', 'most or all of the time' with a score ranging from 0-30; increasing score indicates greater depressive symptoms during the past week.
Items n(%) I was bothered by things that usually don't bother me /I had trouble keeping my mind on what I was doing /I felt depressed /I felt that everything I did was an effort /I felt hopeful about future /I felt fearful /My sleep was restless /I was happy /I felt lonely /I could not "get going."

				symptoms over the past week.	
	Perceived Stress Scale (PSS-10) (16)			• Perceived Stress Scale (PSS-10)	
	Scales (CPSS) under a self-Chinese Perceived Stress design questionnaire (16)				questionnaire
	Anxiety, Depression, Stress, Insomnia, Social dysfunction in pregnant women (14)			• BDI-I: Beck Depression Inventory—I. • CES-D: Center for Epidemiological Studies—depression. • DASS-21: Depression, Anxiety, and Stress scales. • EPDS: Edinburgh Postnatal Depression Scale. • GAD-7: Generalized Anxiety Disorder 7-items. • HADS: Hospital Anxiety and Depression Scale. • PHQ-9:Patient Health Questionnaire. • PSS: Perceived Stress Scale. • SAS: Self-Rating Anxiety Scale. • SDS: Self-Rating Depression Scale.	
	Mental health outcomes (6)			• Duke-UNC FSSQ, • Functional Social Support Questionnaire; • EQ-5D, EuroQol-5 Dimension; • GHQ-12, General Health Questionnaire; • HADS, Hospital Anxiety and Depression Scale; • HSCL, Hopkins Symptoms Checklist;	

				• MYCaW, Measure Yourself Concerns and Well-being; • PSS-10, Perceived Stress Scale; • SF-12, 12-item Short Form Survey; • SF-36, 36-item Short Form Survey; • SSS, Stress Symptom Scale; • STAI-S, State-Trait Anxiety Inventory-state short form; • SWEMWBS, Shortened Warwick-Edinburgh Mental Well-Being Scale; • UM-CIDI, Composite International Diagnostic Interview, University of Michigan short version	
	Depression and anxiety (17)		People with a chronic condition or disability, gender, age group, region	• Short Mood and Feelings Questionnaire (SMFQ), where a high score means worsening psychic symptoms	
General health and well-being: Quality of life	Quality of life (children)			• PedQL scale (0–100) • EQ- 5D-Y	
	Quality of life (adults)		Age groups, Gender, People with a chronic condition or disability	• Quality of Life (QOL) • Quality of Life short version (SF-8) • EQ-5D-5L	
General health and well-being: Well-being	Well-being (17,30)		Gender, Place of residence / living situation, Race and ethnicity, Age , People with a chronic condition or disability group	• The CDC Behavioral Risk Factor Surveillance System (BRFSS)	
	Life satisfaction (17)		Gender, Place of residence / living situation, Race and ethnicity, Age , People	• The Short Life Satisfaction Questionnaire for Lockdowns (SLSQL)	

			with a chronic condition or disability group		
	Physical and mental health(30)	US Census Household Pulse Survey	Place of residence / living situation, Ethnicity	Survey	Weekly, Biweekly
	University of California, Los Angeles Loneliness Scale (51)		Age groups, Gender, Socioeconomic status (income, education, occupation), Place of residence / living situation, Marital status and employment		
	International Physical Activity Questionnaire (51)	Low, moderate high activity level	Age groups, Gender, Socioeconomic status (income, education, occupation), Place of residence / living situation, Marital status and employment.		
	PROMIS anxiety (51)		Age groups, Gender, Socioeconomic status (income, education, occupation), Place of residence / living situation, Marital status and employment		
	Mental health and well-being (17)			• Short Warwick–Edinburgh Mental • Score between 7–35, and the superior shows considerable mental wellbeing	
	Resilience (67)				
	Meditation prevalence (59)	Meditation prevalence			
General health and well-being: Sleep	Sleep quality (8,17,45,58)		People with a chronic condition or disability,	Survey Web-based questionnaire	

			gender, age group, region Socioeconomic status (income, education, occupation)	• Pittsburgh Sleep Quality Index (PSQI)[50] • The validated Shortened Pittsburgh Sleep Quality index (short PSQI)[51] to assess the quality of sleep over the past month.	
	Sleep (17)		Age groups, Gender, People with a chronic condition or disability	• New-onset/worsening of sleep (NOWS), • REM Sleep Behavior Disorder (REMBD), • Epworth Sleepiness Scale (ESS), • Sleep Disordered Breathing (SDB)	
	Sleeping alterations (61)	Percentage of patients reporting symptom (%)			
	Sleep health (8)		Age groups, Gender, Socioeconomic status (income, education, occupation), Underlying diseases		
General health and well-being: Patient-Reported Outcome Measures (PROMs)	Patient Health Questionnaire-8 (51)			• Patient Health Questionnaire-8	
	COVID-19 Fears Questionnaire(51)			• COVID-19 Fears Questionnaire	
	Self-rated health (79)	Population in poor health (% population aged 15+)			
	Self-Report Habit Index (59)			• The Self-Report Habit Index (SRHI) includes 12 items reflecting on three proposed	

[50] The PSQI consists of seven components (with subscales ranged 0–3), each reflecting an important aspect of sleep: subjective sleep quality, sleep onset latency, sleep duration, sleep efficiency, presence of sleep disturbances, use of medication, and presence of daytime disturbances, indicating daytime alertness. The sum of these seven component scores yields one global score, with scores ranging from 0 to 21; higher scores reflect poorer sleep quality.

[51] Answer options for the 9 items of the measure were on a four-point Likert scale ranging from 0-3 points 'not during the past month', 'less than once a week', 'once or twice a week', 'three or more times a week' with a score ranging from 0-27; increasing score indicates poorer quality of sleep in the last month. Items n(%)

				characteristics of habit (i.e., automaticity, frequency, and relevance to self-identity).	
	Multidimensional State Boredom Scale (51)			• Multidimensional State Boredom Scale	
Morbidity: Occurrence of chronic diseases	Chronic disease morbidity (25)	Cancer incidence National cancer registries	Type of cancer	National cancer registries	
	Chronic disease morbidity (79)	Diabetes prevalence (% adults, age standardized)			
	Non communicable diseases (39)	Prevalence in percentage of the disease in the weighted sample Diagnosed on-treatment: • Diabetes • Heart Disease • Stroke • Cancer • Chronic Respiratory • Disease • Genetic Diseases		Phone interviews	Quarterly
	TB services (55)	• No. of people served in the swabbing area. • No of people who consented to screening. • No. of people screened with any respiratory signs or symptoms (cough, fever, dyspnea), regardless of duration. • No of people screened by chest X-ray with computer-aided detection. • No. of people with presumptive TB • Presence of any respiratory sign or symptom • By chest-X-ray with computer-aided detection • No. of people who submitted		Data from facilities	

		sputum specimen for TB testing. • No. of people tested by Xpert MTB/RIF • No. of people with bacteriologically confirmed TB. • No. of people who consented to Xpert MTB/RIF testing. • No. of people who submitted a sputum specimen for TB testing. • No. of people tested by Xpert MTB/RIF • No. of people with bacteriologically confirmed TB			
	First liver-related event (people with NAFLD-related cirrhosis) (68)	Development of clinical events during the period, particularly a first liver-related event (LRE)[52] amongst persons without prior decompensations. n (%)	Type of first LRE, n (% to all LRE) Ascites, Hepatic encephalopathy, Upper gastrointestinal bleeding, HCC	Medical records	
	Cardiovascular events (people with NAFLD-related cirrhosis) (68)	Cardiovascular events: acute coronary syndrome, acute stroke, others (e.g., acute peripheral arterial syndrome). CV events, n (%)	Type of CV event, n (% to all CV) Cerebrovascular Ischemic heart disease	Medical records	
	Worsening of metabolic status (people with NAFLD-related cirrhosis) (68)	Overall worsening of metabolic status[53], n (%)		Medical records	

[52] A first LRE was defined as the development of a clinical decompensation (ascites, hepatic encephalopathy, or upper gastrointestinal bleeding secondary to portal hypertension) or HCC. First liver event: first episode of ascites of any grade (stage 1 to 3), any grade of hepatic encephalopathy (HE) according to the West-Haven classification (stage 1 to 4), portal hypertension related bleeding, or hepatocellular carcinoma in people with compensated cirrhosis.
Liver events: portal hypertension-related bleeding, any grade of HE, or ascites, spontaneous bacterial peritonitis (in people with refractory ascites), hepatocellular carcinoma, and liver transplant.

[53] Worsening of metabolic status: Presence of at least one of the previous variables (significant weight gain and/or poor control of diabetes mellitus/arterial hypertension/dyslipidemia).

	Metabolic syndrome (28)	Proportion of subjects with metabolic syndrome			
	Percentage of persons with disabilities (81)	Percentage of persons with disabilities	Age groups, Gender, area of residency		
	Cardiopulmonary conditions (20)	% CHF % COPD			
	Poor control of diabetes (people with NAFLD-related cirrhosis) (68)	Poor control of diabetes n (%): new diagnosis of T2D and/or fasting glucose >140 and/or Hb1Ac >8%, and/or introduction of new drug to treat T2D. Retrospective data from four university hospitals in Barcelona (three) and Girona (one), Catalonia, Spain			
	Metabolic conditions (20)	% Diabetes			
Morbidity: Occurrence of mental disorders	Dementia (79)	Prevalence of dementia (age-specific prevalence rates).	Gender		
	Antipsychotic prescribing rates (79)	Antipsychotic prescribing rates, using Anatomical Therapeutic Classification (ATC) codes. **Numerator:** all patients on the medications register with a prescription for a drug within ATC subgroup N05A. **Denominator:** total number of people on the register.			
	Mental health (15)			• PSS • HADS • ICD-9 • VAMS • Health Illness Scale • Self Esteem Scale • Spielberger scale • Functional independence	

				measure, • BDI • STAI • POMS • SARS questionnaire • Taiwanese Depression Questionnaire • Self- Perceived Health Questionnaire • Neighborhood Relationship Questionnaire • Charlson comorbidity score • Mini International Neuropsychiatric Interview • Depression Scale • health care satisfaction • MBI-GS • STAXI • Schaufeli scale • SPOS • Psychological Disorder (>/=7 GHQ) • PTSD-RI • PCL-C • Abbreviated Mental Test Score • Barthel Index • GDS • PDMS • Kessler 10 • SRQ-20 • IES-R • EQ-5D-VAS U	
	Mental health (44)			• DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure (Diagnostic Statistical Manual-5 • The presence of mental health concerns was assessed by the American Psychiatric	

				Association's Diagnostic Statistical Manual-5 Self-Rated Level 1 Cross-Cutting Symptom Measure, Adult version.	
	Mental disorders (26)				
Morbidity: Occurrence of (vaccine-preventable) infectious diseases	Measles incidence and proportion of all cases among unvaccinated children whose first dose of MMR was due during the COVID-19 pandemic (70)	Measles incidence and proportion of all cases among unvaccinated children whose first dose of MMR was due during the COVID-19 pandemic			Quarterly
	Diphtheria-tetanus-pertussis (DTP)-3 vaccination coverage in children under 12 months of age (70)	Diphtheria-tetanus- pertussis (DTP)-3 vaccination coverage in children under 12 months of age			Quarterly
	Immunization coverage (50)	• Yellow fever immunization coverage • Full immunization coverage			
	Number of surviving infants receiving third dose of DPT containing vaccine (84)	Number of surviving infants receiving third dose of DPT containing vaccine			Monthly
	Percentage of change in surviving infants receiving first dose of measles containing vaccine (MCV1) (84)	**Numerator:** Number of surviving infants receiving third dose of measles containing vaccine during the last month **Denominator:** Number of surviving infants receiving third dose of measles containing vaccine the same period in 2019			Monthly
Mortality: Excess mortality	All-cause excess mortality (23,70,76)	**Numerator:** Observed number of deaths during a specific period, adjusted for reporting delay **Direction of change:** Lower = better **Monitoring level:**	Age groups, Age (0-14, 15-44, 45-64, 65-74, 75-84, 85+ years)	Mortality monitoring systems Civil registration and vital statistics. Formal death certifications	Weekly

		Subnational National EU level			
	Excess mortality (42,79,81)	Expected deaths are calculated based on mortality data from a previous period. Excess deaths are calculated as the difference between the deaths and the expected deaths.	Race	Mortality monitoring systems	Weekly
Mortality: Avoidable mortality	Avoidable mortality (79)	Preventable and treatable deaths (per 100 000 people, age standardized)			
	Perioperative mortality rate (83)	**Numerator:** Number of deaths among patients having one or more procedures in an operating theater during the relevant admission **Denominator:** Total number of surgical procedures in an operating theater Recommended to be collected through RHIS but can also be collected through a special study	Emergency versus elective surgery Tracer condition Facility type (as relevant to context): first-level hospitals, second-level hospitals, specialty hospitals, etc.		
Mortality: Mortality from chronic diseases	Premature mortality due to NCDs (25)			National Vital Statistics	Annual
	Alcohol-related morbidity and mortality (25)				
	Effective secondary care (79)	30-day mortality following AMI (per 100 admissions, age-sex standardized)			
	Mortality due to notifiable communicable diseases (34,48,50,55)	Cause of death, n (% to all death) • Liver-related • CV • Extrahepatic cancer • Cardiovascular deaths (per 100,000)	Region	Medical records	
Mortality: Mortality from infectious	Smallpox mortality (10)				

diseases other than COVID-19					
Mortality: Fatal injuries (including suicide)	Mortality: Fatal injuries (including suicide) (34)	Injuries			
Mortality: Maternal mortality	Maternal mortality (34,50,81)				
Morbidity: cost effectiveness	disability-adjusted life years by non-communicable diseases (81)	disability-adjusted life years by non-communicable diseases			
	Years of life lost (YLL) (46)	YLL per person YLL for an isolation 3-month period YLL per person across the entire population[54]	Suicidality, Divorces (spouses), Divorces (affected minors), Family violence (affected minors), Depression, Alcohol use disorder, Diminished social contacts		
Sexual/reproductive health (89)	Fertility	• Total fertility rate • Monthly births			

[54] 1. Estimation of baseline risk of outcome i (BRi) based on the literature. 2. Estimation of YLL per incident of outcome i (YLLi) from the literature. 3. Estimation of increased risk factor during the pandemic for outcome i (PRi), where possible based on literature. 4. Estimation of the increased incident cases relating to the pandemic outcome i (PICi). PICi = (PRi – 1) BRi 0.25, where PRi is the estimate of the increased risk of outcome relating to the pandemic and D is the duration of the social mitigation measures, which is fixed 0.25 years (3 months). 5. Estimation of YLL for incidence due to the pandemic (PYYLi). PYLLi = PICi YLLi. 6. Calculation of summary statistics.
PICs is the sum of all PICi; PYLLs is the sum of all PYLLi. Average YLL per impacted person: PICs/PYLLs. Percentage of persons impacted: PICs/100 population of Switzerland (8.57 million). Average PYLL per person of the general population: PYLLs/ population of Switzerland (8.57 million).

Table 4. Surveillance programs, systems and strategies

Document	Program, system or strategy used	Aim	Key characteristics and findings	Pathway/Indicator areas
Adequacy of Existing Surveillance Systems to Monitor Racism, Social Stigma and COVID Inequities: A Detailed Assessment and Recommendations (30)	Different surveillance systems that monitor outcomes as T = test (viral or antibody), C = cases (i.e., diagnoses), H = hospitalizations, V = ventilators used, D = deaths; O = Other/do not know. Race/ethnicity categories.	Detailed assessment of diverse surveillance systems and databases to identify characteristics, constraints and best practices.	Found and evaluated a group of COVID surveillance systems (n = 3), other public health systems (4) and systems tracking racism and/or social stigma (n = 3). Overall, the most important contribution of COVID-19 surveillance systems is their real-time (e.g., daily) or near-real-time (e.g., weekly) reporting; however, they are severely constrained by the lack of complete data on race/ethnicity. The included surveillance systems are: • 1point3acres • Olivia • JHU COVID-19 dashboard • COVID-19 surveillance system • COVID Tracking Project • LA County Dept. of Public Health • COVID Behind Bars project • CDC COVID Data Tracker • NC DHHS COVID-19 Response • Census COVID Data • Google COVID-19 Public Forecaster • National Vital Statistics Program	Health outcomes • General health and well-being: Well-being
Describing the indirect impact of COVID-19 on healthcare utilization using syndromic surveillance system (36) .	Nationally Notifiable Diseases Surveillance System (NNDSS)	Data from the syndromic surveillance systems monitored by Public Health England were used to describe the number of contacts with NHS 111, general practitioner (GP) In Hours (GPIH) and Out-of-Hours (GPOOH), Ambulance and	This study describes the indirect impact of COVID-19 on healthcare utilization using a range of syndromic indicators including eye conditions, mumps, fractures, herpes zoster and cardiac conditions.	2. Impaired healthcare for non-COVID-19 conditions (Access) • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) 3. Direct effects of containment measures • Health care utilization • Healthcare seeking behavior.

		Emergency Department (ED) services over comparable periods before and during the pandemic.		
Exploring the Impact of COVID-19 Response on Population Health in Saudi Arabia: Results from the "Sharik" Health Indicators Surveillance System during 2020 (39)	The Sharik Health Indicators Surveillance System (SHISS)	To explore the prevalence of some behavioral health risk factors, intermediate risk factors, and chronic diseases at different timepoints during 2020 using the data available from a currently used surveillance system in Saudi Arabia.	The SHISS collects demographic data, as well as data on the major behavioral and intermediate chronic disease risk factors and the major chronic diseases, including diabetes, heart disease, stroke, cancer, and chronic respiratory diseases. Is a multi-wave, nationwide, survey-based population health surveillance program that was initiated in early 2020 by the Sharik Association for Health Research.	4. Indirect effects of containment measures through risk factors ● Diet ● Physical activity ● Overweight/obesity ● Hypertension ● Tobacco use ● High cholesterol ● Waterpipe Smoking ● E-Cigarette Smoking Health outcomes ● Morbidity: Occurrence of chronic diseases
Disparities in chronic physical health conditions in sexual and gender minority people using the United States Behavioral Risk Factor Surveillance System (65)	United States Behavioral Risk Factor Surveillance System	This study addresses the possible interaction of the COVID-19 pandemic on health access and outcomes for Sexual or gender minority (SGM) individuals.	The Centers for Disease Control and Prevention (CDC) 2014–2020 Behavioral Risk Factor Surveillance System (BRFSS) includes data for adults who identified as gay, lesbian, bisexual, other, and/or transgender and adults who identified as cisgender and straight. In this study authors focused on the top chronic health conditions in the United States (U.S.) that are assessed in the BRFSS survey results: hypertension, heart attack, angina and/or coronary heart disease, stroke, asthma (past and current). Data comes from cross-sectional telephone surveys conducted by state health departments using instruments provided by the CDC.	4. Indirect effects of containment measures through risk factors ● Tobacco use 5. Indirect effects of containment measures through wider determinants of health ● Income / (at risk of) poverty ● Employment status
A Mental Health Surveillance System for the General Population During the COVID-19 Pandemic: Protocol for a Multiwave Cross-sectional Survey	Surveillance system	To identify, track, and monitor trends in the population in Saudi Arabia at risk of major depressive disorders and anxiety during the COVID-19 pandemic. Also mentions established health surveillance	This study used the QPlatform data collection system. All questions had to be answered for the questionnaire to be successfully submitted to the database. The interview takes approximately 8 minutes to complete. Data collection included general demographic variables, such as age, gender, region, educational level, and marital status. It also included variables related to COVID-19, such as employment category (e.g., health care professional, security, etc.), concerns	3. Direct effects of containment measures ● Psychological distress

Study (66)		surveys: -Centers for Disease Control and Prevention's (CDC) -National Health Interview Survey (NHIS) -National Health and Nutrition Examination Survey (NHANES) -Behavioral Risk Factor Surveillance System (BRFSS)	and worries about COVID-19, and COVID-19 incidence in family, friends, etc. In addition, other health-related risk factors, such as a history of noncommunicable diseases, obesity, physical activity, and smoking, were collected. The main mental health screening tool used was the Patient Health Questionnaire-9 (PHQ-9). Anxiety was measured using the Generalized Anxiety Disorder-7 (GAD-7). After the first draft of the survey was finalized, a linguistic validation was conducted via a focus group of 8 participants, who were asked to discuss and answer the survey as a group. According to the results of the focus group and feedback from the researchers and interviewers, the questionnaire was further edited, and a final version was produced. Following this, a pilot stage study with a small sample size will be conducted via phone interview to assess internal consistency and test the surveillance system operation plan.	
Operational considerations for respiratory virus surveillance in Europe (76)	Sentinel and non-sentinel surveillance	This document outlines operational considerations to support the continuity of national surveillance systems and public health laboratories for epidemiological and virological surveillance for influenza, SARS-CoV-2, and potentially other respiratory viruses (such as RSV or new viruses of public health concern) in the 2022/2023 winter season and beyond	Sentinel surveillance systems ● Sentinel primary care surveillance: Sentinel surveillance of influenza in primary care is conducted by representative national networks of primary care practitioners. It relies on the use of syndromic case definitions for influenza-like illness (ILI) and/or acute respiratory infection (ARI). Moving Epidemic Method (MEM) thresholds have been established to compare weekly ARI and/or ILI consultation rates across countries together with respective viral data to assess the start and end as well as the intensity of respiratory virus activity in the outpatient population. ● Severe acute respiratory infection (SARI) surveillance: hospital surveillance approach, based on laboratory-confirmed hospitalized and/or ICU-admitted influenza cases.or sentinel SARI surveillance with laboratory testing. ● Virological testing Non-sentinel data sources	2. Impaired healthcare for non-COVID-19 conditions (quality) ● Health care quality in various settings (for example, primary care, hospital care, acute care) Health outcomes ● Mortality: Excess mortality 5. Indirect effects of containment measures through wider determinants of health ● Other environmental effects

			• Data from primary and secondary care laboratory confirmations • Registry-based surveillance: Registry-based systems collect information about individual persons. Some countries have central systems based on personal identifiers (personal numbers) that enable the identification of when a person has been tested, tested positive, vaccinated and/or hospitalized. The registries can also include international classification of diseases (ICD) codes for diagnosis of respiratory disease. • Aggregate data on hospital and ICU admissions and occupancy • Long-term care facility surveillance • Virological sequencing and characterization: A carefully selected sample of influenza virus and SARS-CoV-2 positive specimens from non-sentinel and registry-based systems and a subset shared for further virus characterization and antiviral/therapy resistance testing at National Influenza Centres (NIC), SARS-CoV-2 reference laboratories, and/or WHO reference laboratories.	

Table 5. Published frameworks.

Document	Framework used	Aim	Key characteristics and findings	Pathway/Indicator areas
Non-communicable Disease Surveillance in Malaysia: An Overview of Existing Systems and Priorities Going Forward (25)	Global Monitoring Framework for NCDs	Policy and program documents relating to NCD surveillance in Malaysia from 2010 to 2020 were identified and analyzed. The findings of this review are presented	The National Strategic Plan for Non-Communicable Diseases (NSP-NCD) had incorporated the WHO NCD global monitoring targets. It is based on the three major themes of the WHO Global Monitoring Framework for the 25 indicators: monitoring of outcomes; monitoring of exposure/risk factors; and health system capacity/response. There are areas that require strengthening. The country must also look	2. Impaired healthcare for non-COVID-19 conditions (Access) • Supply of and demand for (essential) medicines • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) 4. Indirect effects of containment measures through

		according to the three major themes of the Global Monitoring Framework: monitoring of exposure/risk factor, monitoring of outcomes and health system capacity/response.	beyond these set of indicators in view of the increasing burden and impact of the COVID-19 pandemic. This includes incorporating mental health indicators and leveraging on alternate sources of data relating to behaviors.	risk factors ● Alcohol use ● Physical activity ● Diet ● Tobacco use ● Hypertension ● Overweight/obesity ● High cholesterol Health outcomes ● Mortality: Mortality from chronic diseases ● Morbidity: Occurrence of chronic diseases
How to cope with emerging viral diseases: lessons from South Korea's strategy for COVID-19, and collateral damage to cardiometabolic health (28)	WHO Health Systems Framework	Describe how the South Korean government approached the COVID-19 pandemic by transforming the healthcare system according to the WHO Health Systems Framework. Also focus on how private sectors and the central government actively cooperated to manage the COVID-19 pandemic.	Not reported	3. Direct effects of containment measures ● Psychological distress 4. Indirect effects of containment measures through risk factors ● Diet
We must practice what we preach: a framework to promote well-being and sustainable performance in the public health workforce in the United States (27)	The socioecological framework	The purpose of this Viewpoint is to examine contributors to stress and burnout and highlight existing efforts to address these issues in the US	Presents a framework for a multilevel systemic approach to promote well-being and sustainable performance among those who serve to protect population health. The socioecological framework, used widely in health promotion, recognizes the influence of factors that shape health behavior and outcomes at four levels: individual, relationship (interpersonal), community, and societal. ● Individual Public health professionals need to be aware of risk factors that can worsen wellbeing and recognize and respond to early signs of secondary traumatic stress (STS) and burnout.	2. Impaired healthcare for non-COVID-19 conditions (Access) ● Stress / well-being among health care staff Health outcomes ● General health and well-being: Well-being

			• Interpersonal: It is important to understand the impact of interlocking systems of oppression on those who belong to multiple marginalized subgroups (such as race, gender, class, citizenship status) shapes the unique stressors in one's life and an individual's response thereto. • Community: We should take into consideration the role that environment (home, schools, workplaces, neighborhoods) can play in shaping norms and access to resources for engaging in wellness practices, including safe environments for exercise. Organizations can address primary, secondary, and tertiary prevention of secondary traumatic stress and burnout. • Society: Societal factors include policy and laws at the local, state, and national level, as well as policies issued to govern a profession (e.g., medicine). Secondary prevention activities include early and regular screening for indicators of stress and burnout, using tools such as the professional quality of life scale (PROQOL 5) and Maslach Burnout Inventory.	
Monitoring and evaluation framework for COVID-19 response activities in the EU/EEA and the UK (70)	Monitoring and evaluation framework for COVID-19 response activities	Provide a set of standardized indicators to guide subnational, national and EU level response to COVID-19 in the EU/EEA and the UK.	The framework presents indicators for a variety of key pillars of COVID-19 preparedness, prevention and control activities and provides guidance to countries on how to collect and analyze data for the suggested indicators. Pillar 1: Country-level coordination, planning, and monitoring Pillar 2: Risk communication and community engagement Pillar 3: Surveillance, rapid response teams and case investigation Pillar 4: Vaccine monitoring (policy, coverage, safety, effectiveness and acceptance) Pillar 5: Testing policy and practice (WHO pillar 'national laboratories')	2. Impaired healthcare for non-COVID-19 conditions (quality) • Adherence to medical guidelines • Health care quality in various settings (for example, primary care, hospital care, acute care) 2. Impaired healthcare for non-COVID-19 conditions (Access) • Health care services • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) • Supply of and demand for PPE 3. Direct effects of containment measures • Loneliness

			Pillar 6: Infection prevention and control Pillar 7: Case management Pillar 8: Maintaining essential health services and systems	• Social support • Adherence to containment measures such as hygiene and physical distancing measures 5. Indirect effects of containment measures through wider determinants of health • Transport behavior • Work behavior • Education Health outcomes • Mortality: Excess mortality • Morbidity: Occurrence of (vaccine-preventable) infectious diseases
Sustaining lives and livelihoods: a decision framework for calibrating social and movement measures during the COVID-19 pandemic (88)	Developed decision-making framework	A five-step framework is proposed to support decision-making.	It starts from the health dimension, with assessment of the epidemiological situation, health system capacity and potential social and movement measures and is then extended to other dimensions of importance to a given society that may be affected by these measures, such as economic and equity dimensions.	2. Impaired healthcare for non-COVID-19 conditions (Access) • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) 2. Impaired healthcare for non-COVID-19 conditions (financial protection) • Public spending on health (by function, provision, illness) 5. Indirect effects of containment measures through wider determinants of health • Income / (at risk of) poverty • Access to financial institutions • Workers on flexible contracts / informal workers • Safety nets • Education
Primary health care measurement framework and indicators: monitoring health systems through a primary health care lens (83)	PHC measurement framework	This document provides technical specifications for each indicator included in the menu of indicators proposed for primary health care (PHC) measurement framework and indicators.	Presents PHC performance measurement framework and indicators. Many of the indicators (particularly those that assess outcomes and impact) draw from globally agreed standards, including the Global indicator framework for the Sustainable Development Goals and the WHO Thirteenth General Programme of Work 2019–2023 (GPW 13) Impact Framework. Other indicators are more novel and have been included to address critical areas of PHC measurement.	2. Impaired healthcare for non-COVID-19 conditions (financial protection) • Public spending on health (by function, provision, illness) • Funding and allocation of resources • Purchasing and payment systems 2. Impaired healthcare for non-COVID-19 conditions (Access) • Health facility density/distribution (including primary care)

				• Human resources for health / workload • Supply of and demand for (essential) medicines • Other medical devices • Supply of and demand for diagnostic tests • Telemedicine consults • Patient-Reported Experience Measures (PREMs) • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) 2. Impaired healthcare for non-COVID-19 conditions (quality) • Health care quality in various settings (for example, primary care, hospital care, acute care) • Patient-Reported Experience Measures (PREMs) • Adherence to medical guidelines • Patient safety /adverse effects 3. Direct effects of containment measures • Adherence to containment measures such as hygiene and physical distancing measures • Accessibility, affordability, acceptability
Indirect COVID-19 health effects and potential mitigating interventions: Cost-effectiveness framework (35)	Cost-effectiveness framework	Developing a cost-effectiveness framework to evaluate societal costs and quality adjusted life years (QALYs) lost due to six health-related indirect effects of COVID-19 in California. Short- and long-term outcomes were evaluated for the adult population.	Developed a health and cost simulation tool employing a generic structure to portray the health and cost effects of COVID-19 pandemic-associated increases in prevalence of individual conditions. The model, called “Broad & Rapid Analysis of COVID-19 Indirect Effects” (BRACE), uses a cost-effectiveness framework that can portray short- and long-term health and cost effects and the impacts of mitigating interventions on health and societal costs for any condition exacerbated by the pandemic. Health outcomes include deaths and quality-adjusted life years (QALYs). Costs include both direct medical and non-medical costs. The model specifies the coverage of mitigating interventions.	• Quality-Adjusted Life Years (QALYs) Lost

A National Framework to Improve Mortality, Morbidity, and Disparities Data for COVID-19 and Other Large-Scale Disasters (42)	National framework for data collection	A new report from the National Academies of Sciences, Engineering, and Medicine proposes a uniform national framework for data collection to more accurately quantify disaster related deaths, injuries, and illnesses. This article describes how following the report's recommendations could help improve the quality and timeliness of public health surveillance data during pandemics, with special attention to addressing gaps in the data necessary to understand pandemic-related health disparities	NASEM recommends that the Department of Health and Human Services adopt and support the use of a uniform framework for assessing pandemic-related mortality and morbidity by state, local, tribal, and territorial entities; public health agencies; and death investigation and registration systems.	Health outcomes ● Mortality: Excess mortality
A Culturally Responsive Trauma-Informed Public Health Emergency Framework for Aboriginal and Torres Strait Islander Communities in Australia, Developed during COVID-19 (67)	Developed culturally responsive trauma-informed public health emergency response framework	To develop a culturally responsive trauma-informed public health emergency response framework for Aboriginal and Torres Strait Islander people	The framework included: an overarching philosophy (cultural humility, safety and responsiveness); key enablers (local leadership and Eldership); supporting strategies (provision of basic needs and resources, well-functioning social systems, human rights, dignity, choice, justice and ethics, mutuality and collective responsibility, and strengthening of existing systems); interdependent core concepts (safety, transparency, and empowerment, holistic support, connectedness and collaboration, and compassion, protection and caring); and central goals (a sense of security, resilience, wellbeing, self- and collective-efficacy,	Health outcomes ● General health and well-being: Well-being

			hope, trust, resilience, and healing from grief and loss).	
Modelling the health impacts of disruptions to essential health services during COVID-19 Module 1: Understanding modelling approaches for sexual, reproductive, maternal, newborn, child and adolescent health, and nutrition (84)	Proposed framework	The Framework aims to assess the performance and progress of the country and regional responses against the country's national plans/responses, and the WHO COVID-19 Strategic Preparedness and Response Plan.	To address the continued need to use models for country planning and policy development, a new tool – the benefit–risk model for maintaining essential reproductive, maternal, newborn, child and adolescent health services in the COVID-19 pandemic – is under development by WHO to help countries to prioritize and implement strategies to maintain essential services. This model combines the LiST models and the benefit–risk assessment models of the London School of Hygiene & Tropical Medicine. LiST is used to estimate the lives saved at different levels of service provision. The combination of these two models allows the trade-offs (between the risk of lives lost to COVID-19 and lives saved by mother and child health interventions) to be estimated when trying to maintain immunization coverage and other health services provided at health facilities. Most models of the effects of COVID-19 on maternal, newborn, child and adolescent health rely on Spectrum and LiST. Key assumptions in LiST – such as distributions in the cause of death in individual countries, the affected fraction (proportion of the population affected by a given disease or ailment) and the effectiveness of the interventions – are very important.	2. Impaired healthcare for non-COVID-19 conditions (Access) ● Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Health outcomes ● Morbidity: Occurrence of (vaccine-preventable) infectious diseases ● Morbidity: Occurrence of (vaccine-preventable) infectious diseases

Land Acknowledgement(s)

SPOR Evidence Alliance operates from the St. Michael's Hospital, Unity Health Toronto which is located on the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island.

COVID-END is housed within McMaster University which is located on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the "Dish With One Spoon" wampum, an agreement to peaceably share and care for the resources around the Great Lakes**.**

We are grateful to have the opportunity to work on these lands.

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Appendix 1. Abbreviations and definitions

Abbreviations

AFP	Acute flaccid paralysis
ASR	Acute stress reaction
BAI	Beck Anxiety Inventory
BDI	Beck Depression online survey of Beck Inventory
BRFSS	The CDC Behavioral Risk Factor Surveillance System
CEPAL	Comisión Económica para América Latina y el Caribe*
COVID-19	Coronavirus disease
CSAR	Centre for Surveillance and Applied Research
CV	Cardiovascular
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders
DTP	Diphtheria-tetanus-pertussis
ECDC	European Centre for Disease Prevention and Control
ERI	Effort Reward Imbalance
EU	European Union
FINMRK	Mitigation and Awareness Survey
GAD-7	Generalized Anxiety Disorder
GADS	Goldberg depression and anxiety scale
GP	General Practitioner
GDP	Gross Domestic Product
GQ-6	Gratitude Questionnaire
HADS	Hospital Anxiety and Depression Scale
HCC	hepatocellular carcinoma

HE	Hepatic encephalopathy
HIV	Human immunodeficiency virus
HPV	Human Papillomavirus
ICT	Information communication technologies
ICU	Intensive care units
IES	Impact of Event Scale
IES-R	Impact of Event Scale–Revised
IMF	International Monetary Fund
IPAQ-SF	International Physical Activity Questionnaire Short Form
ISI	Insomnia Severity Index
IVD	In vitro diagnostics
MCV1	Measles containing vaccine
MHA	Mental health and/or addiction
MMR	Measles, mumps and rubella
NAFLD	Non-alcoholic fatty liver disease
NCDs	Non-communicable diseases
NHWA	National Health Workforce Accounts
OECD	Organization for Economic Co-operation and Development
OOPS	Out-of-pocket spending
OPD	Out-patient department
PAHO	Pan American Health Organization
PC	Primary care
PH	Public Health
PHAC	Public Health Agency of Canada
PHC	Primary health-care

PHE	Public Health Emergency
PPE	Personal protective equipment
PREMs	Patient-Reported Experience Measures
PROMs	Patient-Reported Outcome Measures
PSQI	Pittsburgh Sleep Quality Index
PSQI	The Pittsburgh Sleep Quality Index
PSS	Perceived Stress Scale
PTSD	Post-traumatic stress disorder
QOL	Quality of life
RHIS	Routine health information systems
SAS	Self-rating Anxiety Scale
SCI	Sleep Condition Indicator
SDG	Sustainable Development Goals
SDoH	Social Determinants of Health
SHISS	Indicators Surveillance System
SLSQL	The Short Life Satisfaction Questionnaire for Lockdowns
STAI	State-trait anxiety inventory
TESSy	The European Surveillance System
UMD Global CTIS	University of Maryland Social Data Science Center Global COVID-19 Trends and Impact Survey
UN	United Nations
USD	United States Dollar
VPD	Vaccine preventable diseases
WASH	Water sanitation and hygiene
WB	World Bank
WHO	World Health Organization

*Spanish abbreviation

Key Definitions

FFP2/3: It is a type of face mask with Protection class FFP2. Are made for working environments in which deleterious and mutagenic particles can be found in the breathing air.

Generalized anxiety disorder (GAD-7): Seven item self-report Items include statements such as "Feeling anxious, nervous or on edge" rated for intensity of occurrence over the last two weeks from 0 to 3 respectively for the following options: not at all, several days, over half the days, or nearly every day. A cutoff value of≥5 was used as indication of mild to moderate anxiety and a value of>15 indicated severe anxiety.

Gratitude Questionnaire (GQ-6): Gratitude Questionnaire [GQ-6] is a six-item self-report measure designed to quantify individual variances in the proneness to experience gratitude in daily life. Items are rated on a seven-point Likert-type scale, where 1 = strongly disagree and 7 = strongly agree.

Impact of Event Scale (IES-22): 22-item scale used to evaluate the degree of distress one experiences in response to a given trauma. Items include statements such as "any reminder brought back feelings about it", "I had trouble concentrating" and "I tried not to talk about it". Items are rated for distressing levels over the last seven days on a scale from 0 [not at all] to 4 [extremely]. A cutoff value of>24 was used as indication of clinical worry and a value of>33 indicated likely PTSD diagnosis.

Indicator: A construct of public health surveillance that defines a measure of health.

IRIS: It refers to the Pan American Health Organization database.

Out-of-pocket: Expenses for medical care that aren't reimbursed by insurance.

Patient Health Questionnaire (PHQ-9): Nine item self-report measure to monitor the presence and severity of depression symptoms. Items include statements such as "Feeling down, depressed or helpless" and "Little pleasure or interest in doing things" rated for intensity of occurrence over the last two weeks from 0 to 3 respectively for the following options: not at all, several days, more than half the days, or nearly every day. A cutoff value of≥5 was used as indication of mild to moderate depression and a value of>20 indicated severe depression.

Pittsburgh Sleep Quality Index (PSQI): 18 items on a four-point Likert scale, and is designed to measure sleep disturbances and sleep habits over a one-month period. It includes questions about time of bed, the number of hours of sleep per night, wake up time, and the time it takes to fall asleep. It also includes statements such as "during the past month how often have you had trouble sleeping because you have bad dreams" and "how would you rate your overall quality of sleep". Each statement is scored between 0 [not during the past month] and 3 [three or more times a week]. Statements are broken down into seven components and converted to a point score. Higher scores indicate poorer sleep hygiene and scores>5 point to poor sleep quality. Validity and reliability have been previously reported.

Appendix 2. Search strategies

Databases and registries

Medline/PubMed	Hits	DATE
(("Severe Acute Respiratory Distress Syndrome"[Title/Abstract] OR "SARS"[Title/Abstract] OR "MERS"[Title/Abstract] OR "sars cov"[Title/Abstract] OR "SARS-CoV-2"[Title/Abstract] OR "SARSCOV-2"[Title/Abstract] OR "SARSCOV2"[Title/Abstract] OR "COVID-19"[Title/Abstract] OR "COVID19"[Title/Abstract] OR "COVID"[Title/Abstract] OR "coronavirus disease"[Title/Abstract] OR "novel coronavirus"[Title/Abstract] OR "novel 2019 coronavirus"[Title/Abstract] OR "nCoV"[Title/Abstract] OR "2019nCoV"[Title/Abstract] OR "19nCoV"[Title/Abstract] OR "severe acute respiratory syndrome coronavirus 2"[Supplementary Concept] OR "COVID-19"[Supplementary Concept] OR "COVID-19"[MeSH Terms] OR "SARS-CoV-2"[MeSH Terms]) AND ("effect*"[Title] OR "sequel*"[Title] OR "consequenc*"[Title]) AND ("public health surveillance"[MeSH Major Topic] OR "population surveillance"[MeSH Major Topic] OR (("public health"[Title/Abstract] OR "population health"[Title/Abstract]) AND ("surveillance"[Title] OR "framework*"[Title] OR "prepar*"[Title] OR "pathway*"[Title] OR "follow*"[Title] OR "indicat*"[Title] OR "monitor*"[Title] OR "strateg*"[Title] OR "impact*"[Title] OR "system*"[Title]))) OR (("SARS-CoV-2"[Title/Abstract] OR "SARSCOV-2"[Title/Abstract] OR "SARSCOV2"[Title/Abstract] OR "COVID-19"[Title/Abstract] OR "COVID19"[Title/Abstract] OR "COVID"[Title/Abstract] OR "coronavirus disease"[Title/Abstract] OR "novel coronavirus"[Title/Abstract] OR "novel 2019 coronavirus"[Title/Abstract] OR "nCoV"[Title/Abstract] OR "2019nCoV"[Title/Abstract] OR "19nCoV"[Title/Abstract] OR "severe acute respiratory syndrome coronavirus 2"[Supplementary Concept] OR "COVID-19"[Supplementary Concept] OR "COVID-19"[MeSH Terms] OR "SARS-CoV-2"[MeSH Terms]) AND ("public health surveillance"[MeSH Major Topic] OR "population surveillance"[MeSH Major Topic] OR (("public health"[Title/Abstract] OR "population health"[Title/Abstract]) AND ("surveillance"[Title] OR "pathway*"[Title] OR "follow*"[Title]))) AND ("framework*"[Title] OR "indicat*"[Title] OR "monitor*"[Title] OR "strateg*"[Title] OR "system*"[Title])) OR (("Severe Acute Respiratory Distress Syndrome"[Title/Abstract] OR "SARS"[Title/Abstract] OR "MERS"[Title/Abstract] OR "sars cov"[Title/Abstract] OR "SARS-CoV-2"[Title/Abstract] OR "SARSCOV-2"[Title/Abstract] OR "SARSCOV2"[Title/Abstract] OR "COVID-19"[Title/Abstract] OR "COVID19"[Title/Abstract] OR "COVID"[Title/Abstract] OR "coronavirus disease"[Title/Abstract] OR "novel coronavirus"[Title/Abstract] OR "novel 2019 coronavirus"[Title/Abstract] OR "nCoV"[Title/Abstract] OR "2019nCoV"[Title/Abstract] OR "19nCoV"[Title/Abstract] OR "severe acute respiratory syndrome coronavirus 2"[Supplementary Concept] OR "COVID-19"[Supplementary Concept] OR "COVID-19"[MeSH Terms] OR "SARS-CoV-2"[MeSH Terms]) AND ("effect*"[Title] OR "sequel*"[Title] OR "consequence*"[Title]) AND ("surveillance"[Title] OR "framework*"[Title] OR "indicat*"[Title] OR "monitor*"[Title] OR "strateg*"[Title]) AND ("review"[Publication Type] OR "systematic review"[Filter] OR "review"[Title])) OR (("SARS-CoV-2"[Title/Abstract] OR "SARSCOV-2"[Title/Abstract] OR "SARSCOV2"[Title/Abstract] OR "COVID-19"[Title/Abstract] OR "COVID19"[Title/Abstract] OR "COVID"[Title/Abstract] OR "coronavirus disease"[Title/Abstract] OR "novel coronavirus"[Title/Abstract] OR "novel 2019 coronavirus"[Title/Abstract] OR "nCoV"[Title/Abstract] OR "2019nCoV"[Title/Abstract] OR "19nCoV"[Title/Abstract] OR "severe acute respiratory syndrome coronavirus 2"[Supplementary Concept] OR "COVID-19"[Supplementary Concept] OR "COVID-19"[MeSH Terms] OR "SARS-CoV-2"[MeSH Terms]) AND ("public health surveillance"[MeSH Major Topic] OR "population surveillance"[MeSH Major Topic] OR (("public health"[Title/Abstract] OR "population health"[Title/Abstract]) AND ("framework*"[Title] OR "surveillance"[Title] OR "indicat*"[Title] OR "strateg*"[Title]))) AND ("review"[Publication Type] OR "systematic review"[Filter] OR "review"[Title])) OR (("COVID-19"[MeSH Terms] OR "COVID-19"[Title]) AND "prepared*"[Title] AND ("review"[Publication Type] OR "systematic review"[Filter] OR "review"[Title]))	895	24 FEB 2023

BVSalud – BIREME/LILACS	Hits	Date
("COVID-19") AND ("public health surveillance") AND (db:("LILACS" OR "BDENF" OR "SES-SP" OR "BDNPAR" OR "INDEXPSI" OR "CUMED" OR "MINSAPERU"))	175	*25 FEB 2023*
("COVID-19") AND (preparedness) AND (db:("LILACS" OR "BDENF" OR "BRISA" OR "MINSAPERU" OR "BBO" OR "BINACIS" OR "CUMED" OR "SES-SP" OR "colecionaSUS"))	36	*25 FEB 2023*
EMBASE	**Hits**	**Date**
#1 'covid-19'/exp AND ('public health surveillance'/exp OR 'public health surveillance' OR 'public surveillance') #1 AND [embase]/lim NOT ([embase]/lim AND [medline]/lim) AND ('article'/it OR 'review'/it)	55	*25 FEB 2023*
#1 ('covid-19'/exp OR 'covid-19') AND 'preparedness' #1 AND [embase]/lim NOT ([embase]/lim AND [medline]/lim) AND (2022:py OR 2023:py) AND ('article'/it OR 'review'/it)	221	*25 FEB 2023*
COMBINED	276	
WHO-PAHO IRIS	**Hits**	**Date**
"covid-19" AND "public health surveillance" (filter subject: "WHO guidelines", "public health", "population surveillance", "public policy", "policy brief", "health planning", "health services", "health systems", "health equity", "community participation", "delivery of health care", "emergency preparedness and response", "environment and public health", "epidemics",	86	*26 FEB 2023*
OTHER INSTITUTIONAL REPOSITORIES	**Hits**	**Date**
OECD Library, CEPAL, UN Library, World Bank Library, National Academies of Sciences, Engineering, and Medicine. COVID-19 AND (preparedness OR framework OR surveillance)	55	*26 FEB 2023*

Relevant organizations websites searched.

CDC. Center for Diseases Control

- Science Brief: Indicators for Monitoring COVID-19 Community Levels and Making Public Health Recommendations. Aug. 12, 2022 https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/indicators-monitoring-community-levels.html
- Indicators for Monitoring COVID-19 Community Levels and COVID-19 and Implementing COVID-19 Prevention Strategies https://www.cdc.gov/coronavirus/2019-ncov/downloads/science/Scientific-Rationale-summary-COVID-19-Community-Levels.pdf
- Pandemic COVID-19 Incident Response (RSP). https://www.cdc.gov/orr/readiness/phep/00_docs/CDC_PHEP-ORR-Guidance_Pandemic-COVID-19-Incident-Response-RSP_508c.pdf
- CDC Strategy for Global Response to COVID-19 (2020-2023) https://www.cdc.gov/coronavirus/2019-ncov/global-covid-19/pdfs/CDCGlobalCOVIDStrategy_2020-2023.pdf?v=3
- U.S. COVID-19 Global Response and Recovery Framework. Sep 2022 https://www.whitehouse.gov/wp-content/uploads/2022/09/U.S.-COVID-19-GLOBAL-RESPONSE-RECOVERY-FRAMEWORK-_clean_9-14_7pm.pdf
- The U.S. COVID-19 Global Response and Recovery Framework. July 1, 2021 https://www.whitehouse.gov/wp-content/uploads/2021/07/U.S.-COVID-19-Global-Response-and-Recovery-Framework.pdf
- Population Connectivity Across Borders (POPCAB) Toolkit; COVID-19 Preparedness and Response (Print-Only) https://www.cdc.gov/immigrantrefugeehealth/pdf/POP-CAB-Tool_English-p.pdf

ECDC. European Center for Diseases Control

- Guidelines in response to the worsening of the epidemiological situation - Addendum to the Aviation Health Safety Protocol.11 Jan 2023
https://www.ecdc.europa.eu/sites/default/files/documents/GUIDELINES%20in%20response%20to%20the%20worsening%20of%20the%20epidemiological%20situation-website_NEWFINAL.pdf
https://www.ecdc.europa.eu/sites/default/files/documents/Joint-EASA-ECDC-Aviation-Health-Safety-Protocol_issue%204.pdf

- ECDC expert consultation on the implementation and evaluation of non-pharmaceutical interventions. 14 Dec 2022 https://www.ecdc.europa.eu/sites/default/files/documents/ECDC%20Expert%20Consultation%20on%20the%20Implementation%20and%20Evaluation%20of%20NPIs.pdf
- Long-term qualitative scenarios and considerations of their implications for preparedness and response to the COVID-19 pandemic in the EU/EEA. 29 Aug 2022 https://www.ecdc.europa.eu/sites/default/files/documents/covid-19-post-acute-phase-pandemic-scenarios-august-2022.pdf
- The EU experience in the first phase of COVID-19: implications for measuring preparedness. 26 Sep 2022 https://www.ecdc.europa.eu/sites/default/files/documents/covid-19-the-EU-experience_1.pdf
- Survey on the implementation of integrated surveillance of respiratory viruses with pandemic potential. 17 Jun 2022 https://www.ecdc.europa.eu/sites/default/files/documents/Integrated_respiratory_surveillance_survey_results-2022.pdf
- Conducting in-action and after-action reviews of the public health response to COVID-19. 4 Jun 2020 https://www.ecdc.europa.eu/sites/default/files/documents/In-Action-and-After-Action-Reviews-of-the-public-health-response-to-COVID-19.pdf
- Considerations for infection prevention and control practices in relation to respiratory viral infections in healthcare settings. 9 Feb 2023 https://www.ecdc.europa.eu/sites/default/files/documents/Infection-prevention-and-control-in-healthcare-settings-COVID-19_6th_update_9_Feb_2021.pdf
- COVID-19 Aviation Health Safety Protocol: Operational guidelines for the management of air passengers and aviation personnel in relation to the COVID-19 pandemic. 11 May 2022 https://www.ecdc.europa.eu/sites/default/files/documents/Joint-EASA-ECDC-Aviation-Health-Safety-Protocol_issue%204.pdf
- Monitoring and evaluation framework for COVID-19 response activities in the EU/EEA and the UK. 17 Jun 2020 https://www.ecdc.europa.eu/sites/default/files/documents/covid-19-framework-monitor-responses.pdf
- Operational considerations for respiratory virus surveillance in Europe. 18 Jul 2022 https://www.ecdc.europa.eu/sites/default/files/documents/Operational-considerations-respiratory-virus-surveillance-euro-2022.pdf
- Technical guidance for antigenic SARS-CoV-2 monitoring.7 Jun 2022 https://www.ecdc.europa.eu/sites/default/files/documents/Antigenic-SARS-CoV-2-monitoring-Joint-ECDC-WHO-report-June-2022.pdf

Africa Center for Diseases Control

- Africa CDC Support Program to Combat COVID-19 and Future Public Health Risks https://africacdc.org/download/africa-cdc-support-program-to-combat-covid-19-and-future-public-health-risks/
- Enhanced COVID-19 Surveillance at the Community Level in Africa https://africacdc.org/download/enhanced-covid-19-surveillance-at-the-community-level-in-africa/?ind=1639923431171&filename=Enhanced_Covid_Surveillance_En.pdf&wpdmdl=10771&refresh=63fb4cb4b3fce1677413556
- Guidance for Establishing a National Laboratory Quality Framework https://africacdc.org/download/guidance-for-establishing-a-national-laboratory-quality-framework/?ind=1635862448090&filename=Guidance-for-Establishing-a-National-Laboratory-Quality-Framework.pdf&wpdmdl=10175&refresh=63fb5863dbd7a1677416547
- Statement of guidance and recommendations to African Union Member States on the epidemic modelling of the COVID-19 pandemic https://africacdc.org/download/statement-of-guidance-and-recommendations-to-african-union-member-states-on-the-epidemic-modelling-of-the-covid-19-pandemic/?ind=1625596975329&filename=Statement%20on%20modeling%20COVID19%20in%20Africa%20JULY%205.pdf&wpdmdl=9062&refresh=63fb880b6429f1677428747
- Adapted Africa Joint Continental Strategy for COVID-19 Pandemic https://africacdc.org/download/adapted-africa-joint-continental-strategy-for-covid-19-pandemic/?ind=1623868952789&filename=AfricaCDC_JointContinentalStrategyCOVID-19_16Jun21.pdf&wpdmdl=8851&refresh=63fb4dc6495221677413830

PreventionWeb.

- Putting pandemics behind us: Investing in one health to reduce risks of emerging infectious diseases. The World Bank. 2022 https://www.preventionweb.net/publication/putting-pandemics-behind-us-investing-one-health-reduce-risks-emerging-infectious
- When disasters and pandemic collide: what does it mean to ASEAN, now and into the future? https://www.preventionweb.net/publication/when-disasters-and-pandemic-collide-what-does-it-mean-asean-now-and-future
- A global deal for our pandemic age. The Group of Twenty. 2021 https://www.preventionweb.net/publication/global-deal-our-pandemic-age
- COVID-19: Make it the last pandemic https://www.preventionweb.net/publication/covid-19-make-it-last-pandemic
- Disasters in COVID-19: Implications for nexus governance. 2021. S. Rajaratnam School of International Studies Nanyang Technological University. https://www.preventionweb.net/publication/disasters-covid-19-implications-nexus-governance
- Building resilience during COVID-19: lessons learned from Disaster Risk Reduction programming. Stakeholder Engagement Mechanism. 2021. https://www.preventionweb.net/publication/building-resilience-during-covid-19-lessons-learned-disaster-risk-reduction-programming
- Public-private solutions to pandemic risk. International Association for the Study of Insurance Economics. 2021 https://www.preventionweb.net/publication/public-private-solutions-pandemic-risk
- Being prepared for unprecedented times: national mobilisation conceptualisations and their implications. Griffith University.2021 https://www.preventionweb.net/publication/being-prepared-unprecedented-times-national-mobilisation-conceptualisations-and-their
- Frontline: preparing healthcare systems for shocks from disasters to pandemics. The World Bank 2021 https://www.preventionweb.net/publication/frontline-preparing-healthcare-systems-shocks-disasters-pandemics

FDA. Food and Drug Administration

- FDA's Work to Combat the COVID-19 Pandemic. https://www.fda.gov/media/160998/download
- 2022 National Biodefense Strategy and Implementation Plan for Countering Biological Threats, Enhancing Pandemic Preparedness, and Achieving Global Health Security. https://www.whitehouse.gov/wp-content/uploads/2022/10/National-Biodefense-Strategy-and-Implementation-Plan-Final.pdf

GPMB. Global Preparedness Monitoring Board.

- Global Preparedness Monitoring Board Outlines Three Tests of Global Health Reforms. 22 February 2023 https://www.gpmb.org/docs/librariesprovider17/default-document-library/gpmb-manifesto-2023.pdf?sfvrsn=f8ac828b_11

NHS. England Coronavirus

- Delivery plan for tackling the COVID-19 backlog of elective care https://www.england.nhs.uk/coronavirus/delivering-plan-for-tackling-the-covid-19-backlog-of-elective-care/

IPFMA. International Federation of Pharmaceutical Manufacturers and Associations

- Pharma recommends five priorities for future pandemic preparedness and response. 13 feb 2023 https://ifpma.org/news/pharma-five-priorities-ppr/
- Berlin Declaration: Biopharmaceutical Industry Vision for Equitable Access in Pandemics. 19 jul 2022 https://ifpma.org/wp-content/uploads/2023/01/i2023_IFPMA_Berlin-Declaration_Biopharmaceutical-industry-vision-for-equitable-access-in-pandemics-1.pdf
- Principles for a fit-for-purpose global health architecture. 25 oct 2022 https://ifpma.org/wp-content/uploads/2023/02/25-October-2022_Principles-for-a-fit-for-purpose-global-health-architecture_IFPMA.pdf
- Applying Lessons Learned from COVID-19 to Create a Healthier, Safer, More Equitable World. 22 May 2022. https://ifpma.org/wp-content/uploads/2023/01/i2023_IFPMA_COVID-19_Pandemic_Lessons_Learned_May_2022.pdf

IECS Argentina.

- Modelo Integral de Preparación y Respuesta de los Sistemas de Salud de Latinoamérica y el Caribe para estimar el impacto de la expansión de COVID-19. https://www.iecs.org.ar/modelocovid/

Global Health Impact. Pandemic Preparedness

- Pandemic preparedness and response: Beyond the WHO's Access to COVID-19 Tools Accelerator. April 2021 https://www.brookings.edu/wp-content/uploads/2021/04/Pandemic-preparedness-and-response_final.pdf

Appendix 3. Included studies.

Systematic Reviews					
Article	**Country**	**Population**	**Year of literature search**	**Scope**	**Main findings**
Tran et al., 2022 (9)	Global and national levels	Global population	2021	This study aimed to summarize measurement profiles of existing risk assessment toolkits to inform COVID-19 control at global and national levels.	Direct effects of disasters ● Preparedness and responses to infectious disease epidemics and pandemics
Henssler et al., 2022 (15)	Global	Persons in quarantine or isolation that had a quantitative assessment of psychological outcome parameters.	2020	Systematic literature review and meta-analysis assessing the psychological effects in both quarantined and isolated persons compared to non-quarantined and non-isolated persons.	Direct effects of containment measures ● Mental health
Jiang et al., 2022 (13)	Australia		2021	Summarize the impact of restrictive lockdown measures on the general mental health of people living in Victoria, Australia during 2020 and to identify the groups with an increased risk of adverse mental health outcomes	Impaired healthcare for non-COVID-19 conditions (Access) ● Telemedicine consults Direct effects of containment measures ● Psychological distress ● Time spent outside / time for leisure activities. ● Work-life balance Indirect effects of containment measures through risk factors ● Alcohol use ● Tobacco use Indirect effects of containment measures through wider

					determinants of health • Unemployment
Franco et al., 2022 (19)	Global		2022	Describe the findings of studies assessing key outcomes related to wellbeing and recovery in children and adolescents using the evidence derived from an evidence map	Health outcomes • General health and well-being: Quality of life
Muehlschlegel et al., 2021 (11)	Global	Human populations during different infectious outbreaks (SARS, COVID-19, MERS, Ebola, or H1N1)	2021	Aims to analyze the biopsychosocial consequences after lockdown measures	Direct effects of containment measures • Psychological distress
Shankar et al., 2021 (16)	Global		2021	The review seeks to answer three important questions. The first is to identify the stressors mentioned in published studies during the pandemic till January 15th, 2021. The second objective is to see which subgroups of students may be at greater risk of mental health problems. Recommendations by the authors of the manuscripts included in the review to reduce stress levels and support health science students will also be mentioned (third objective).	Direct effects of containment measures • Psychological distress Health outcomes • General health and well-being: Self-perceived (mental) health
Tong et al., 2023 (7)	Global		2021	(1) What is the overall estimated prevalence of insomnia, stress, anxiety, and depression among frontline HCWs during the COVID-19 pandemic? (2) What are the differences of mental health problems among frontline	Direct effects of containment measures • Psychological distress

				HCWs in different periods and regions during COVID-19?	
Demissie et al., 2021 (14)	Global	Pregnant and/or lactating women	2020	Examine the effects of coronavirus disease 2019 pandemic on the prevalence of anxiety, depression, stress, insomnia, and social dysfunction among pregnant and/or lactating women and to measure the global pooled prevalence of mental health effects among these populations in the era of coronavirus disease 2019 pandemic.	Health outcomes • General health and well-being: Self-perceived (mental) health
McGrath et al., 2021 (6)	High-income countries	Working-age adults (18–64 years) living in high-income, OECD countries experiencing periods of personal or household financial uncertainty relating to employment (e.g., recent or imminent unemployment, precarious employment), personal debt and legal issues, housing security (e.g., mortgage or rent stress,	2019	Examined the effectiveness of community interventions for protecting and promoting the mental health of working-age adults in high-income countries during periods of financial insecurity.	Health outcomes • General health and well-being: Self-perceived (mental) health

		threatened eviction) or food insecurity.			
Al-Ajlouni et al., 2022 (8)	Middle Eastern and North African countries		2022	Systematic review of the literature on the impact of the COVID-19 pandemic on sleep health among Middle Eastern and North African (MENA) populations, understudied geographic regions including with regards to sleep health	Direct effects of containment measures • Sleeping alterations • Work-life balance
Bacanoiu et al., 2022 (17)	Global	patients with neurodegenerative diseases and associated comorbidities, such as Myasthenia and Vascular dementia	2021	The aim of the paper is to carry out a literature analyses regarding how the lockdown and physical activity influence motor and cognitive function, based on evaluation of the impact of decreasing physical activity, and the affected emotional status of healthy adults and patients with neurodegenerative diseases and associated comorbidities, such as Myasthenia and Vascular dementia, in conditions imposed by COVID- 19.	Direct effects of containment measures • Psychological distress • Social support Indirect effects of containment measures through risk factors • Diet • Physical activity Health outcomes • General health and well-being: Self-perceived (mental) health • General health and well-being: Sleep • General health and well-being: Well-being • General health and well-being: Quality of life
Larkin et al., 2022 (10)	United States		2022	Compare results for COVID-19 vaccines with those of prior vaccines	Health outcomes • Mortality: Mortality from infectious diseases other than COVID-19
Fallah-Aliabadi et al., 2022 (20)	United States		2022	Identify and categorize social vulnerability indicators in the COVID-19 pandemic.	Direct effects of containment measures • Connectivity Impaired healthcare for non-COVID-19 conditions (Access) • Unmet health care needs • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of

					interventions) • Human resources for health / workload Indirect effects of containment measures through risk factors • Overweight/obesity • Tobacco use • Hypertension • Metabolic conditions • Cardiopulmonary conditions Indirect effects of containment measures through wider determinants of health • Childhood development • Education • Income / (at risk of) poverty • Unemployment • Transport behavior
Ma et al., 2022 (12)	Global	COVID-19 survivors	2022	Assess the long-term effects of COVID-19 at 6 months and above to provide a more comprehensive and scientific basis for the care and rehabilitation of COVID-19 survivors, the surveillance of these patients, and setting public health policy for healthcare facilities.	Direct effects of containment measures • Psychological distress Health outcomes • General health and well-being: Sleep
Rodríguez-Fernández et al., 2021 (18)	China, Spain, Germany, United Kingdom , Saudi Arabia , Brazil , India, South Korea, Pakistan , Jordan, Italy	General adult population	2021	The main objective of this study was to identify the best available scientific evidence on the impact that home confinement and social distancing, derived from the SARS-CoV-2 pandemic, have had on the mental health of the general population in terms of depression, stress and anxiety	Direct effects of containment measures • Psychological distress

	, Vietnam, Turkey , Bangladesh and the US				
Scoping reviews					
Article	**Country**	**Population**	**Year of literature search**	**Scope**	**Main findings**
Lim et al., 2021 (21)	Global	To inform future practice and research by examining the COVID-19 pandemic's impacts on primary care at both service and patient levels, as well as strategies employed to mitigate these impacts.	2020	To inform future practice and research by examining the COVID-19 pandemic's impacts on primary care at both service and patient levels, as well as strategies employed to mitigate these impacts.	Direct effects of containment measures • Psychological distress • Loneliness • Interpersonal violence (intimate partner violence, child maltreatment, elderly abuse) Impaired healthcare for non-COVID-19 conditions (Access) • Telemedicine consults • Supply of and demand for (essential) medicines • Staff shortage • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Indirect effects of containment measures through risk factors • Illicit drug use Health outcomes • Morbidity: Occurrence of chronic diseases • Morbidity: antimicrobial resistance
Guidelines					
Organization, year	**Audience**	**Population**		**Scope**	**Main findings**

WHO, 2022 (23)	Member States	Global		Updates the guidance published on 14 February 2022, provides guidance to World Health Organization (WHO) Member States on the continued implementation and strengthening of surveillance for COVID19 disease and the SARS-CoV-2 virus that causes it and reporting requirements for WHO	Impaired healthcare for non-COVID-19 conditions (Access) ● Human resources for health / workload Health outcomes ● Mortality: Excess mortality
WHO, 2022 (22)	Decision makers	Global		This operational guidance aims to guide decision making on when and how to implement and strengthen Early Warning Alert and Response (EWAR) in preparation for and response to emergencies	Health outcomes ● Early warning
Non systematic reviews					
Article	**Country**	**Population**	**Year of literature search**	**Scope**	**Main findings**
Harawa et al., 2022 (31)	United States	COVID-19 surveillance systems to monitor racial/ethnic and other disparities in the pandemic		Discuss the importance of each indicator for quantifying health inequities and highlight challenges and data gaps in existing systems that may hamper the achievement of these goals.	Impaired healthcare for non-COVID-19 conditions (Access) ● Supply of and demand for other critical medical equipment (ventilators, dialysis materials) ● Other resources
Ford et al., 2021 (30)	United States	US residents		Authors conducted a detailed assessment of diverse surveillance systems and databases to identify characteristics, constraints and best practices	Health outcomes ● General health and well-being: Well-being

Bhattacharjee et al., 2020 (26)	United States	General population		In this article, the authors critically examine the onset of the pandemic in the United States of America focusing on its effect on the mental health of American people. The authors discuss various strategies to overcome the mental health challenges associated with both the outbreak and response.	Direct effects of containment measures • Mental illness
Chandran et al., 2021 (25)	Malaysia	Non-Communicable Disease surveillance tools, activities and performance in Malaysia	2020	Policy and program documents relating to NCD surveillance in Malaysia from 2010 to 2020 were identified and analyzed. The findings of this review are presented according to the three major themes of the Global Monitoring Framework: monitoring of exposure/risk factor, monitoring of outcomes and health system capacity/response.	Impaired healthcare for non-COVID-19 conditions (Access) • Supply of and demand for (essential) medicines • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Indirect effects of containment measures through risk factors • Alcohol use • Tobacco use • Alcohol use • Physical activity • Overweight/obesity • Hypertension • High cholesterol • Diet • Illicit drug use Health outcomes • Mortality: Mortality from chronic diseases
Lim et al., 2022 (28)	South Korea	South Korea		Describe how the South Korean government approached the COVID-19 pandemic by transforming the healthcare system according to the WHO Health Systems Framework. Also focus on how private sectors and the central government actively cooperated to manage the COVID- 19 pandemic.	Direct effects of containment measures • Psychological distress Indirect effects of containment measures through risk factors • Diet • Metabolic syndrome
Ahmad et al., 2021 (29)	United States	United States		This report describes the processes that NCHS took to produce timely mortality data in response to the COVID-19 pandemic	Health outcomes • Mortality: All-cause mortality • Mortality: Excess mortality

Thorpe et al., 2022 (24)	United States	United States	2020	Summarize data sources with potential to produce timely and spatially granular measures of physical, economic, and social conditions relevant to public health surveillance, and we briefly describe emerging analytic methods to improve small-area estimation	Impaired healthcare for non-COVID-19 conditions (Access) ● Healthcare services usages Impaired healthcare for non-COVID-19 conditions (financial protection) ● Personal spending Indirect effects of containment measures through risk factors ● Alcohol use ● Illicit drug use Indirect effects of containment measures through wider determinants of health ● Environmental variables ● Unemployment Income / (at risk of) poverty ● Childhood development ● Education ● Air quality
Jackson Preston et al., 2022 (27)	United States	Health care workers		The purpose of this Viewpoint is to examine contributors to stress and burnout and highlight existing efforts to address these issues in the US	Impaired healthcare for non-COVID-19 conditions (Access) ● Stress / well-being among health care staff Health outcomes ● General health and well-being: Well-being
Primary Studies					
Article	**Country**	**Population**	**Design**	**Scope**	**Main findings**
OECD, 2023 (33)	OECD and EU countries	OECD and non-OECD EU country Experts who provided information to the OECD survey from 21 EU member countries responded.	Descriptive	The OECD undertook a pilot study in EU Member States that aimed to determine the utility and feasibility of routine, cross-national monitoring of access to medicines across multiple dimensions. The work included a desk review to define the dimensions of access and associated indicators, followed by an OECD survey to explore the feasibility of collecting and analyzing the relevant data for a convenience sample of 15 recently authorized	Impaired healthcare for non-COVID-19 conditions (Access) ● Supply of and demand for (essential) medicines Impaired healthcare for non-COVID-19 conditions (financial protection) ● Out-of-pocket payments

				product/indication pairs. Using the convenience sample of 15 novel medicine and treatment indication pairs (i.e., products/indications) representing different medicine archetypes and therapeutic areas, retrospective data from 21 countries were collected via an OECD survey covering different aspects of access relative to the lifecycle of each sample medicine. Several indicators were generated reflecting the dimensions of availability, affordability, accessibility, and acceptability	
Osewe, 2021 (34)	Republic of Korea, Thailand, and Viet Nam	ROK, Thailand, and Viet Nam.	Case studies	Share experiences in addressing COVID-19 across three distinct countries: the ROK, Thailand, and Viet Nam. Also presents indicators used by the author to reflect Thailand Context and Health System context	Impaired healthcare for non-COVID-19 conditions (Access) ● Human resources for health / workload ● Other resources Impaired healthcare for non-COVID-19 conditions (financial protection) ● Public spending on health (by function, provision, illness) ● Out-of-pocket payments Health outcomes ● Mortality: Maternal mortality ● Mortality: Mortality from chronic diseases ● Mortality: Fatal injuries (including suicide)
Maya et al., 2022 (35)	United States	Adult population	Developing of a cost-effectiveness framework	Development of a cost-effectiveness framework to evaluate societal costs and quality adjusted life years (QALYs) lost due to six health-related indirect effects of COVID-19 in California. Short- and long-term outcomes were evaluated for the adult population	Quality-Adjusted Life Years (QALYs) Lost ● Societal costs and quality adjusted life years (QALYs) lost
Ferraro et al., 2021 (36)	England	England population	Descriptive	This study describes the indirect impact of COVID-19 on healthcare utilization using a range of syndromic indicators including eye conditions, mumps, fractures, herpes zoster	Impaired healthcare for non-COVID-19 conditions (Access)

				and cardiac conditions. Data from the syndromic surveillance systems monitored by Public Health England were used to describe the number of contacts with NHS 111, general practitioner (GP) In Hours (GPIH) and Out-of-Hours (GPOOH), Ambulance and Emergency Department (ED) services over comparable periods before and during the pandemic.	• Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Direct effects of containment measures • Health care utilization • Healthcare seeking behavior.
Bright et al., 2020 (37)	Australia	Australia population	Descriptive	Analyzed Nationally Notifiable Diseases Surveillance System (NNDSS) data to determine the effect of COVID-19 public health measures on other nationally notifiable diseases in Australia.	Impaired healthcare for non-COVID-19 conditions (Access) • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions)
Flor et al., 2022 (38)	Global	General COVID-19 population	Cohort	Explore gender disparities in major health-related and non-health-related indicators at the regional and global level. Review and synthesize publicly-available datasets that describe the impact of the social and economic fallout of the COVID-19 pandemic on gender equality in health and other core domains of wellbeing worldwide.	Impaired healthcare for non-COVID-19 conditions (Access) • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) • Supply of and demand for (essential) medicines • Supply of and demand for other medical equipment Direct effects of containment measures • Time spent on unpaid domestic and care work. • Interpersonal violence (intimate partner violence, child maltreatment, elderly abuse) Indirect effects of containment measures through wider determinants of health • Unemployment • Income / (at risk of) poverty • Education
Brakefield et al., 2021 (32)	United States	General population	Design and Development Study	This study sought to redefine the Healthy People 2030's SDoH taxonomy to accommodate the COVID-19 pandemic and provide a blueprint and implement a prototype for the Urban Population Health Observatory (UPHO), a web-based platform that integrates	Impaired healthcare for non-COVID-19 conditions (Access) • Unmet health care needs • Human resources for health / workload • Access Direct effects of containment measures • Connectivity

				classified group-level SDoH indicators to individual- and aggregate-level population health data. SDoH: Social Determinants of Health. Modified Healthy People 2030's SDoH taxonomy include and classify SDoH indicators reported previously into the following six domains: (1) SDoH that affect access to resources; (2) SDoH that increase disease exposure, susceptibility, and severity; (3) SDoH that affect adherence to local laws and health policies; (4) SDoH that are community characteristics; (5) SDoH that help increase awareness, knowledge dissemination, and health education; and (6) SDoH specific to neighborhood and built environment that can impact COVID-19–associated comorbidities	• Work-life balance Indirect effects of containment measures through risk factors • Tobacco use • Diet Indirect effects of containment measures through wider determinants of health • Transport behavior • Income / (at risk of) poverty • Unemployment • Criminality • Air quality
BinDhim et al., 2021 (39)	Saudi Arabia	Arabic-speaking Saudi residents who were ≥18 years old of the 13 administrative region	Descriptive	To explore the prevalence of some behavioral health risk factors, intermediate risk factors, and chronic diseases at different timepoints during 2020 using the data available from a currently used surveillance system in Saudi Arabia.	Indirect effects of containment measures through risk factors • Physical activity • Diet • Overweight/obesity • Hypertension • Tobacco use • High cholesterol • Waterpipe Smoking • E-Cigarette Smoking Health outcomes • Morbidity: Occurrence of chronic diseases
Bello et al., 2021 (40)	East and Southern African countries	General population from 19 countries in the East and	Cross sectional	The authors reviewed the integrated supportive supervision (ISS) data and the routine administrative coverage from 19 countries in the East and Southern Africa (ESA) for the period January to August 2019 to analyze the trends in the number of visits,	Impaired healthcare for non-COVID-19 conditions (Access) • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) • Unmet health care needs

		Southern Africa (ESA)		vaccine-preventable diseases (VPD), and routine immunization (RI) indicators, and compare with the period January to August 2020 during the months of the COVID-19 pandemic	
El Khoury-Malhame et al., 2023 (41)	Lebanon	348 Lebanese adults	Cross sectional	Investigates the psychological impact of the viral spread and austere lockdown and focuses mostly on potential protective factors in a politically and economically unstable society. Participants filled questionnaires of perceived stress (PSS), depression (PHQ-9), anxiety (GAD-7), PTSD (IES-22), as well as sleep (PSQi) and gratitude (GQ-6) immediately after 3 months of strict quarantine	Direct effects of containment measures ● Psychological distress
Stoto et al., 2021 (42)	Global	General	Descriptive	A new report from the National Academies of Sciences, Engineering, and Medicine proposes a uniform national framework for data collection to more accurately quantify disaster related deaths, injuries, and illnesses. This article describes how following the report's recommendations could help improve the quality and timeliness of public health surveillance data during pandemics, with special attention to addressing gaps in the data necessary to understand pandemic-related health disparities.	Health outcomes ● Mortality: Excess mortality
Moser et al., 2020 (43)	Switzerland	Random sample of a large cohort of the resident population in Switzerland	Cohort	Provide almost real-time evidence about relevant social and health behavior indicators, to inform the public and health authorities about the impact of the COVID-19 pandemic on relevant social and public health domains.	Impaired healthcare for non-COVID-19 conditions (Access) ● Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Direct effects of containment measures ● Psychological distress

		with online access aged 18 years or older			Indirect effects of containment measures through risk factors ● Physical activity Indirect effects of containment measures through wider determinants of health ● Unemployment
Markoulakis et al., 2022 (44)	Canada	Ontario adults 18 years or older	Cross sectional	This protocol describes the Mental health and Addictions Service and Care Study that will use a repeated cross-sectional design to examine the effects, impacts, and needs of Ontario adults during the COVID-19 pandemic.	Fear of getting infected or spreading infection ● Psychological distress Impaired healthcare for non-COVID-19 conditions (Access) ● Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) ● Satisfaction with services Impaired healthcare for non-COVID-19 conditions (quality) ● Patient-Reported Experience Measures (PREMs) ● Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) ● Health care quality in various settings (for example, primary care, hospital care, acute care) Direct effects of containment measures ● Social support ● Time spent on unpaid domestic and care work. Indirect effects of the pandemic ● Mental health concerns Indirect effects of containment measures through risk factors ● Substance use
Tracy et al., 2021 (45)	United States	Participants 60 years of age or older, either a former night shift worker or a former day worker,	Cohort	This study examined associations between perceived stress and sleep health, mental health, physical health, and overall perceived health outcomes among older adults	Health outcomes ● General health and well-being: Sleep ● General health and well-being: Self-perceived (mental) health ● General health and well-being: Patient-Reported Outcome Measures (PROMs)

		had not worked in a full-time position in the last 12 months, and were currently working a maximum of <10 h/week at part time work.			
Moser et al.,2020 (46)	Switzerland	Switzerland population	Modeling study	The strict social mitigation strategies carry a significant risk for mental health, which can lead to increased short-term and long-term mortality and is currently not included in modeling the impact of the pandemic. Authors used years of life lost (YLL) as the main outcome measure, applied to Switzerland as an example.	YLL • YLL
Czorniej et al., 2022 (47)	Poland	Students from Poland starting working with coronavirus patients during the pandemic.	Cross sectional	The study aimed to analyze the occurrence of level anxiety in students who start work at the time of the COVID-19 pandemic, with relation to the socio-demographic factors and health status, vaccination, coronavirus infection, assistance of a psychologist or psychiatrist in the past, and using tranquilizers.	Direct effects of containment measures • Psychological distress
Kim et al., 2022 (48)	Global	COVID-19 Database	Cross sectional	This study conducted a panel data analysis using time-series cross-sectional data to address 2 main objectives: (1) to estimate comparable CFRs adjusted for country-level	Health outcomes • Mortality: Mortality from chronic diseases

				multiple covariates, and (2) to examine potential factors that cause variation in the CFR among countries after adjustment for multiple covariates	
Fairozekhan et al., 2021 (49)	India, Malaysia, Gulf Cooperation Council (Kingdom of Saudi Arabia, Qatar, Oman, United Arab Emirates, and Kuwait)	Healthcare Professionals	Cross sectional	The objectives of the study were to identify factors that influence behavior, safety measures at work, pandemic preparedness, responsibility for dependents, influences of personal life in discharging their duties at the workplace and further to correlate the above objective between dental and medical health care workforce	Direct effects of containment measures ● Psychological distress ● Work-life balance
Khan et al., 2020	Ethiopia, Nigeria and Pakistan	Ethiopia, Nigeria and Pakistan	Cross sectional	1. Access relevant existing data within an appropriate time frame; 2. Analyze, interpret and present data in a policy-relevant manner; 3. Initiate Action through established mechanisms of communication	Impaired healthcare for non-COVID-19 conditions (quality) ● Patient safety /adverse effects Health outcomes ● Mortality: Occurrence of notifiable communicable diseases ● Morbidity: Occurrence of (vaccine-preventable) infectious diseases ● Mortality: Maternal mortality
Thombs et al., 2021 (51)		Self-reported systemic sclerosis diagnosis (not confirmed by a physician), were at least	Parallel RCT	Evaluate the effect of the Scleroderma Patient- centered Intervention Network COVID-19 Home-isolation Activities Together (SPIN-CHAT) Program on anxiety symptoms and other mental health outcomes among people vulnerable during COVID-19 owing to a pre-existing medical condition	Health outcomes ● General health and well-being: Patient-Reported Outcome Measures (PROMs)

		18 years old, and were fluent in English or French.			
Suhail et al., 2021 (52)	India	163 volunteers from India between 16 years and 45 years	Cross sectional	The study examined the moderating effects of support system in the association between COVID-19 related fear and mental health outcomes – somatic symptoms, generalized anxiety disorder (GAD), and depression	Fear of getting infected or spreading infection • Psychological distress
Biswas et al., 2021 (53)	India	College and university students from India	Cross sectional	Assessed the psychological pressure on college and university students in India through cluster sampling by evaluating the teaching learning pattern during the COVID-19 lockdown phase along with other activities and precautions occurred during lockdown; the anxiety level was evaluated using GAD-7 and HAM-A.	Direct effects of containment measures • Psychological distress
Ünal et al., 2022 (54)	Turkey	Healthcare professionals working in health facilities of the Ministry of Health of Turkey	Cross sectional	Aimed to determine the stressors experienced by healthcare workers during the initial phase of the COVID-19 pandemic in Turkey	Direct effects of the pandemic • Psychological distress Health outcomes • General health and well-being: Self-perceived (mental) health
Rivera-Esteban et al., 2022 (55)	Catalonia, Spain	People with a diagnosis of cirrhosis due to NAFLD	Cohort	Authors aimed to evaluate the impact of the first year of the pandemic on the outcomes of people with NAFLD cirrhosis.	Indirect effects of containment measures through risk factors • Overweight/obesity • Diabetes • Hypertension • High cholesterol

		before March 2019 under follow-up at liver clinics of the participating hospitals.			Health outcomes ● Morbidity: Occurrence of chronic diseases ● Mortality: Mortality from chronic diseases
Al-Amer et al., 2022 (56)	Jordan	Individuals attending a vaccination center in the eastern part of the Jordanian capital (Amman) who agreed to take part in the study.	Cross sectional	Investigate anxiety and stress symptoms among 250 Jordanians who received their first vaccine dose.	Impaired healthcare for non-COVID-19 conditions (Access) ● Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Direct effects of containment measures ● Psychological distress
Suleiman et al., 2021 (57)	Jordan	Jordanian participants in all 12 governorates of Jordan	Cross sectional	To assess the potential psychiatric disorders induced by the current pandemic and evaluate the relevant risk factors.	Health outcomes ● General health and well-being: Self-perceived (mental) health
Nour et al., 2022 (58)	Saudi Arabia	Undergraduate students studying at different medical and health-related colleges at Saudi	Cross sectional	Investigate the impact of social media infodemics on mental health status among health colleges' students, as future healthcare workers, at Saudi universities during the COVID-19 pandemic	Health outcomes ● General health and well-being: Sleep ● General health and well-being: Self-perceived (mental) health

		governmental universities who were regular social media users (guided by time spent on social media per day).			
Green et al., 2021 (59)	United States	Adult paying subscribers to Calm, a mindfulness meditation	Cross sectional	To (1) examine the regional differences in mental health and COVID-19–related worry, attention to news, and stress, in light of the state-level prevalence of COVID-19 cases; (2) estimate the associations between mental health and COVID-19–related worry, attention to news, and stress and health behavior engagement (i.e., physical activity, mindfulness meditation); and (3) explore the mediating effect of health behavior engagement on the associations between mental health and COVID-19–related worry, attention to news, and stress.	Direct effects of containment measures ● Psychological distress Indirect effects of containment measures through risk factors ● Physical activity Health outcomes ● Self-report health General health and well-being: Well-being
Wang et al., 2023 (60)	China	Nurses	Cross sectional	to clarify the current status of disaster preparedness in nurses who have experienced the COVID-19 pandemic and to identify the influencing factors of nursing disaster preparation.	Direct effects of containment measures ● Psychological distress
Lambert et al., 2022 (61)	United States	Participants were recruited from	Cross sectional	To determine the frequency, timing, and duration of post-acute sequelae of SARS-CoV-2 infection (PASC) and their impact on health and function	Direct effects of containment measures ● Sleeping alterations ● Psychological distress Indirect effects of containment measures through risk factors

		Survivor Corps, a Facebook community of more than 176,000 COVID-19 survivors, and other online survivor communities			• Physical impairment Indirect effects of containment measures through wider determinants of health • Unemployment
Marzouk et al., 2022 (62)	Egypt		Modeling study	A thorough examination of the pandemic's influence on four SDGs in Egypt is presented in a system dynamic model. The addressed goals are related to no poverty (SDG 1), zero hunger (SDG 2), decent work and economic growth (SDG 8), and climate action (SDG 13). The model is simulated over 35 years extending from 2015 to 2050. Furthermore, a web-based interactive learning environment is developed to analyze the interdependencies among public health activities and study the impacts of possible intervention countermeasures or prevention policies.	Indirect effects of containment measures through wider determinants of health • Unemployment
Doan et al., 2021 (69)	Vietnam	Healthcare workforce who worked at the National Hospital of Tropical Diseases	Cross sectional	To assess the magnitude of, and factors associated with, depression and anxiety among Vietnamese frontline hospital healthcare workers in the fourth wave of COVID-19	Health outcomes • General health and well-being: Self-perceived (mental) health

Howkins et al., 2022 (63)	Germany, Canada, USA, Switzerland, Austria, Israel and Argentina	Clinicians working with people with IDD	Cross sectional	Examine the experiences of mental health clinicians working with people with IDD during the COVID-19 pandemic in high-income countries	Impaired healthcare for non-COVID-19 conditions (Access) ● Waiting times ● Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) ● Prescription patterns ● Stress / well-being among health care staff
Pinnamaneni et al., 2022 (65)	United States	Individuals in the U.S.	Cross sectional	This study addresses the possible interaction of the COVID-19 pandemic on health access and outcomes for SGM individuals	Employment status ● Employment status Indirect effects of containment measures through risk factors ● Tobacco use Indirect effects of containment measures through wider determinants of health ● Income / (at risk of) poverty
Aparicio et al., 2022 (64)	France	All adults aged 65 or over hospitalized in one of the 30 participating hospitals	Cohort	To evaluate the number of newly treated digestive system cancers in older patients as a function of age group, sex, primary tumor site, disease stage, and comorbidities. The study's secondary objective was to assess the effect of lockdown on the type of treatment and the 3-month mortality rate.	Impaired healthcare for non-COVID-19 conditions (Access) ● Supply of and demand for surgery Health outcomes ● Survival
BinDhim et al., 2020 (66)	Arabia Saudi	Arabic-speaking adults, aged ≥18 years, from Saudi Arabia	Cross sectional	To identify, track, and monitor trends in the population in Saudi Arabia at risk of major depressive disorders and anxiety during the COVID-19 pandemic.	Direct effects of containment measures ● Psychological distress
Graham et al., 2022 (67)	Australia	Aboriginal and Torres Strait Islander	Qualitative	Develop a culturally responsive trauma-informed public health emergency response framework for Aboriginal and Torres Strait Islander peoples	Health outcomes ● General health and well-being: Well-being

Who, 2022 (68)	Global	Audience: national TB programs, partners, funders, civil society organizations, as well as the private sector engaged in TB response at country level	Case studies	This report summarizes the findings from both calls for case studies in order to disseminate best practices that have been successful in overcoming disruptions to TB service.	Health outcomes • Morbidity: Occurrence of chronic diseases
Organization reports					
Organization, year	**Target audience**	**Country**	**Scope**	**Main findings**	
ECDC, 2020 (70)	The target audience is public health authorities in EU/EEA countries and the UK involved in planning response activities to the COVID-19 pandemic.	European Union (EU), European Economic Area (EEA) countries and the United Kingdom (UK)	Provide a set of standardized indicators to guide subnational, national and EU level response to COVID-19 in the EU/EEA and the UK. The framework presents indicators for a variety of key pillars of COVID-19 preparedness, prevention and control activities and provides guidance to countries on how to collect and analyze data for the suggested indicators. Pillars: Pillar 1: Country-level coordination, planning, and monitoring Pillar 2: Risk communication and community engagement Pillar 3: Surveillance, rapid response teams and case investigation Pillar 4: Vaccine monitoring (policy, coverage, safety, effectiveness and acceptance)	Impaired healthcare for non-COVID-19 conditions (quality) • Adherence to medical guidelines • Health care quality in various settings (for example, primary care, hospital care, acute care) Impaired healthcare for non-COVID-19 conditions (Access) • Supply of and demand for PPE • Health care services • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Direct effects of containment measures • Loneliness • Social support • Adherence to containment measures such as hygiene and physical distancing measures	

			Pillar 5: Testing policy and practice (WHO pillar 'national laboratories') Pillar 6: Infection prevention and control Pillar 7: Case management Pillar 8: Maintaining essential health services and systems	Indirect effects of containment measures through wider determinants of health ● Transport behavior ● Movement restrictions ● Education ● Work behavior Health outcomes ● Mortality: Excess mortality ● Morbidity: Occurrence of (vaccine-preventable) infectious diseases
ECLAC and PAHO, 2021 (71)	Latin America and Caribbean countries	Latin America and Caribbean countries	This report highlights the need to strengthen coordination, regional integration and international cooperation mechanisms. It also underscores the need for a transformation of health systems based on primary health care, with universal health as the guiding principle. It calls for the strengthening of health authorities' institutional capacities, forging a resilient health system that is capable of responding to current and future challenges. The report presents indicators used to show the evolution of the pandemic and its implications for health, society and the economy.	Impaired healthcare for non-COVID-19 conditions (financial protection) ● Public spending on health (by function, provision, illness)
ECLAC and UNDRR, 2021 (72)	The insular Caribbean.	The insular Caribbean.	To provide an overview of how the Caribbean is addressing the pandemic, notably in terms of its economies and disaster risk reduction governance mechanisms. Presents results from selected indicators of the Global Health Security Index that measures national capacities to prevent, detect, and respond to public health emergencies	Impaired healthcare for non-COVID-19 conditions (Access) ● Human resources for health / workload ● Other resources ● Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Impaired healthcare for non-COVID-19 conditions (financial protection) ● Public spending on health (by function, provision, illness) ● Out-of-pocket payments Indirect effects of containment measures through wider determinants of health ● Essential services

OECD, 2022 (73)	OECD countries	OECD countries	Provides evidence on the impact of the pandemic on immigrant integration in terms of health, labor market outcomes and training, as OECD countries start to recover from the crisis.	Indirect effects of containment measures through wider determinants of health ● Education
ECDC, 2022 (74)		Europe	To capitalize on this experience to identify specific challenges that were encountered, as well as successful responses to them	Impaired healthcare for non-COVID-19 conditions (Access) ● Supply of and demand for PPE ● Human resources for health / workload
OECD, 2020 (75)		Latin America	Updates indicators and the main socio-economic consequences of the COVID-19 crisis in Latin America and the Caribbean (LAC) and presents the main policy priorities to be achieved, taking into account the most recent evolution of the crisis	Direct effects of containment measures ● Interpersonal violence (intimate partner violence, child maltreatment, elderly abuse) ● Psychological distress Indirect effects of containment measures through wider determinants of health ● Income / (at risk of) poverty ● Unemployment ● Digital technologies usage ● Education ● Workers on flexible contracts / informal workers ● Public spending on essential services
ECDC, 2022 (76)	Europe	Europe	This document outlines operational considerations to support the continuity of national surveillance systems and public health laboratories for epidemiological and virological surveillance for influenza, SARS-CoV-2, and potentially other respiratory viruses (such as RSV or new viruses of public health concern) in the 2022/2023 winter season and beyond	Impaired healthcare for non-COVID-19 conditions (quality) ● Health care quality in various settings (for example, primary care, hospital care, acute care) Health outcomes ● Mortality: Excess mortality Environmental indicators ● Wastewater
ECLAC and ILO, 2022 (77)		Latin America and the Caribbean	The first section of this report describes, the pace of job creation is expected to slow in 2022, although progress with vaccinations, fewer movement restrictions and reopening of schools are expected to drive a recovery in participation, especially among women. However, the combined effect of higher labor force participation rates and slow job creation could drive the unemployment rate up over the year.	Indirect effects of containment measures through wider determinants of health ● Income / (at risk of) poverty ● Unemployment ● Workers on flexible contracts / informal workers

			The second section of the report outlines how the health crisis caused by COVID-19 has severely affected wage trends in the region.	
ECLAC, 2022 (78)		Latin America and the Caribbean	This Special Report is the thirteenth in a series prepared by the Economic Commission for Latin America and the Caribbean (ECLAC) on the evolution and impacts of the COVID-19 pandemic in Latin America and the Caribbean.	Indirect effects of containment measures through wider determinants of health ● Income / (at risk of) poverty ● Workers on flexible contracts / informal workers ● Environmental effects
OECD, 2021 (79)	Global population	Global	Health at a Glance compares key indicators for population health and health system performance across OECD member countries and key emerging economies.	Fear of getting infected or spreading infection ● Antibiotics prescription and consumption patterns Impaired healthcare for non-COVID-19 conditions (quality) ● Health care quality in various settings (for example, primary care, hospital care, acute care) Impaired healthcare for non-COVID-19 conditions (Access) ● Human resources for health / workload ● Unmet health care needs Impaired healthcare for non-COVID-19 conditions (financial protection) ● Out-of-pocket payments ● Public spending on health (by function, provision, illness) Indirect effects of containment measures through risk factors ● Tobacco use ● Alcohol use ● Overweight/obesity Direct effects of containment measures ● Psychological distress Indirect effects of containment measures through wider determinants of health ● Air quality Health outcomes ● Mortality: All-cause mortality ● Morbidity: Occurrence of chronic diseases ● Self-perceived general health ● Mortality: Mortality from chronic diseases ● Mortality: Excess mortality

				• Morbidity: Occurrence of mental disorders
Sharma et al., 2020 (80)		Kenya, Sierra, Leone Tanzania	Draws from the World Bank's Service Delivery Indicator surveys to highlight key aspects of health service preparedness in Kenya, Sierra Leone, and Tanzania	Impaired healthcare for non-COVID-19 conditions (Access) • Services availability • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) • Human resources for health / workload • Medical transportation • Supply of and demand for PPE • Supply of demand for basic equipment • Supply of and demand for (essential) medicines Impaired healthcare for non-COVID-19 conditions (quality) • Adherence to medical guidelines Direct effects of containment measures • Connectivity
ECLAC, 2022 (81)	Latin America and the Caribbean	Latin America and the Caribbean	This document, prepared at the request of the Regional Conference on Population and Development in Latin America and the Caribbean, analyzes the socio demographic impacts of the pandemic and makes recommendations for recovery and reconstruction from the perspective of the Montevideo Consensus on Population and Development.	Fear of getting infected or spreading infection • Psychological distress Direct effects of containment measures • Interpersonal violence (intimate partner violence, child maltreatment, elderly abuse) Impaired healthcare for non-COVID-19 conditions (Access) • Lack of resources • Human resources for health / workload • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Impaired healthcare for non-COVID-19 conditions (financial protection) • Out-of-pocket payments Indirect effects of containment measures through wider determinants of health • Income / (at risk of) poverty • Education • Transport behavior • Childhood development • Unemployment

				• Housing vulnerability Health outcomes • Mortality: Excess mortality • Morbidity: Occurrence of infectious diseases other than COVID-19 • Mortality: Maternal mortality • Fertility • Morbidity: Occurrence of non-fatal injuries
WHO and OECD, 2020 (82)	Decision makers. The scale of implementation may be general (national) or targeted (subnational, groups of people).	Global	A five-step framework is proposed to support decision-making. It starts from the health dimension, with assessment of the epidemiological situation, health system capacity and potential social and movement measures and is then extended to other dimensions of importance to a given society that may be affected by these measures, such as economic and equity dimensions.	Impaired healthcare for non-COVID-19 conditions (Access) • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Indirect effects of containment measures through wider determinants of health • Income / (at risk of) poverty • Access to financial institutions • Workers on flexible contracts / informal workers • Safety nets • Education
WHO and UNICEF, 2022 (83)	Global	Global	This document provides technical specifications for each indicator included in the menu of indicators proposed for primary health care (PHC) measurement framework and indicators.	Impaired healthcare for non-COVID-19 conditions (financial protection) • Public spending on health (by function, provision, illness) • Purchasing and payment systems Impaired healthcare for non-COVID-19 conditions (Access) • Health facility density/distribution (including primary care) • Human resources for health / workload • Supply of and demand for (essential) medicines • Other medical devices • Supply of and demand for diagnostic tests • Accessibility, affordability, acceptability • Patient-Reported Experience Measures (PREMs) • Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions)

				Impaired healthcare for non-COVID-19 conditions (quality) ● Patient-Reported Experience Measures (PREMs) ● Health care quality in various settings (for example, primary care, hospital care, acute care) ● Patient safety /adverse effects Direct effects of containment measures ● Adherence to containment measures such as hygiene and physical distancing measures
WHO, 2020 (84)		Africa	The Framework aims to assess the performance and progress of the country and regional responses against the country's national plans/responses, and the WHO COVID-19 Strategic Preparedness and Response Plan.	Impaired healthcare for non-COVID-19 conditions (Access) ● Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Health outcomes ● Morbidity: Occurrence of (vaccine-preventable) infectious diseases
WHO, 2021 (85)		Global	Provides guidance to help Member States assess the situation at national and sub-national levels, as well as key recommendations about the implementation of PHSMs.	Impaired healthcare for non-COVID-19 conditions (Access) ● Coverage of health care services for non-COVID-19 conditions (number of consultations, number of interventions) Health outcomes ● Morbidity: other infectious disease
WHO, 2020 (86)		Global	The PHSM Severity Index provides a systematic approach to track and assess measures taken by governments over the course of the COVID-19 epidemic in each country.	Indirect effects of containment measures through wider determinants of health ● Education
WHO, 2022 (87)	Governments around the world	Global	"This report examines health spending alongside other government social spending (namely, on education and social protection). Collectively, these social spending components play a key role in supporting the well-being of the population by helping meet people's basic day-to-day needs, developing and preserving	Impaired healthcare for non-COVID-19 conditions (financial protection) ● Public spending on health (by function, provision, illness) ● Public spending on social services ● Out-of-pocket payments

			human capital and providing basic security in the face of unexpected shocks. This broader view helps contextualize government spending on health and how it changes in response to shifting demographics, underlying macro-fiscal conditions and economic and other crises that suddenly alter demand for government spending."	