Health System Capacity

Measures to Support System-Level Monitoring in Canada

Canadian Institute for Health Information
Institut canadien d'information sur la santé

Production of this document is made possible by financial contributions from Health Canada and provincial and territorial governments. The views expressed herein do not necessarily represent the views of Health Canada or any provincial or territorial government.

Unless otherwise indicated, this product uses data provided by Canada's provinces and territories.

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ISBN 978-1-77479-116-5 (PDF)

How to cite this document:
Canadian Institute for Health Information. *Health System Capacity: Measures to Support System-Level Monitoring in Canada*. Ottawa, ON: CIHI; 2022.

Cette publication est aussi disponible en français sous le titre *Capacité des systèmes de santé : mesures de suivi à l'échelle des systèmes au Canada*.
ISBN 978-1-77479-117-2 (PDF)

Table of contents

Executive summary

The COVID-19 pandemic put health care systems under sudden and immense pressure, testing the systems' abilities to absorb and adapt to unprecedented surges in critical care demand.

From a data perspective, there was no playbook to guide system-level monitoring and decision-making when the pandemic began. Federal, provincial and territorial response teams rushed to compile data from disparate sources to monitor resource capacity and utilization. There was little time to discuss how health system capacity was being monitored in other jurisdictions or how key data concepts were defined or collected.

Timely and relevant data is required for decision-making and mobilizing responses. During the COVID-19 pandemic, processes to collect new data were established to provide daily updates on key measures such as hospital and intensive care unit (ICU) capacity. These manual processes were informative but labour-intensive and placed an additional burden upon governments and health systems at a time when resources were already stretched.

This Canadian Institute for Health Information (CIHI) report presents a series of system-level measures for monitoring health system capacity. These measures were informed by jurisdictional experience during the first waves of the COVID-19 pandemic, supplemented by published literature on emergency planning and the advice of experts. These measures can support COVID-19 monitoring, but they also provide a blueprint for monitoring future epidemics/pandemics. Jurisdictions are not expected to adopt the entire framework; rather, they are invited to choose measures that supplement their monitoring and public reporting activities.

Some of the measures are aspirational, meaning that system-level data is not currently available. These measures reflect some of the data gaps that have come to light and key questions that could not be answered during the COVID-19 pandemic. These measures can guide future data collection and reporting in preparation for the next outbreak or prolonged surge event.

Monitoring health system capacity

The COVID-19 pandemic put health care systems under sudden and immense pressure, testing the systems' abilities to absorb and adapt to unprecedented surges in critical care demand. Even with public health measures and vaccines, the transmissibility of COVID-19 variants threatened to overwhelm hospitals and health care systems.

Responding to increased demand for critical care services — particularly over a prolonged period — requires planning and coordination at both the facility and system levels. Success requires an understanding of what resources are available and how those resources can and will be used.

This Canadian Institute for Health Information (CIHI) report presents a series of measures that support system-level monitoring of resource capacity and utilization. These measures can contribute to continuing efforts to monitor the COVID-19 pandemic, but they also provide a blueprint for data collection in and monitoring of future outbreaks.

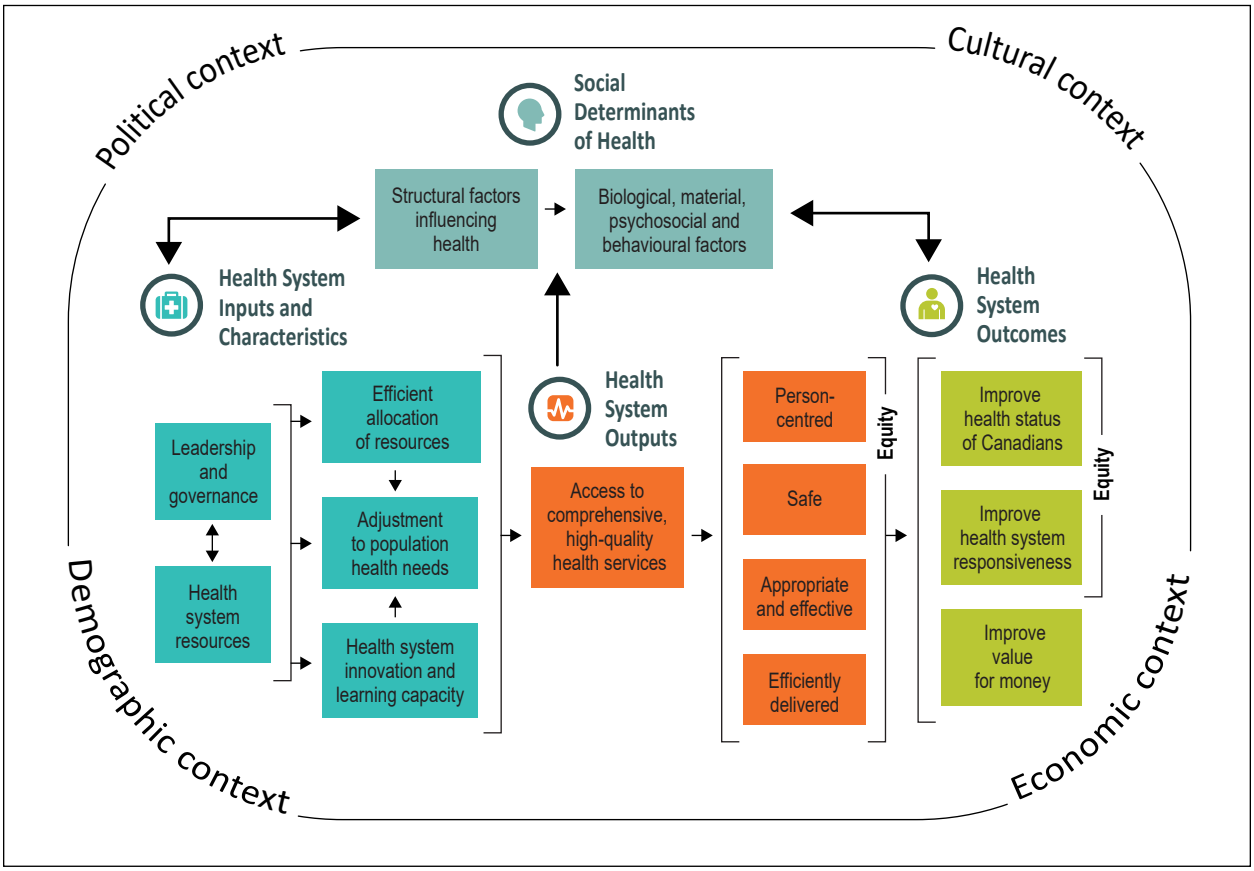
Approach and scope

This set of system-level measures reflects the experiences and information needs of federal, provincial and territorial decision-makers through the first waves of the COVID-19 pandemic. These measures also reflect recommendations from published literature on emergency planning and input from experts as to what information is most valuable for planning and decision-making.

The measures align with CIHI's Health System Performance (HSP) Measurement Framework, a structure "that enables health system managers and policy-makers to assess health system performance and to compare their results with those of their peers, as well as to learn from each other and from the best available evidence."[1]

As shown in Figure 1 below, the HSP Measurement Framework is divided into 4 quadrants. Measures for monitoring health system capacity fit into the Health system resources dimension of the Health System Inputs and Characteristics quadrant. In this dimension, financial, human, physical, technical and informational resources are mobilized and used by the health system to produce the goods and services required for the system to achieve its ends. These categories align with how the measures are structured in this report.

Figure 1 CIHI's Health System Performance Measurement Framework



Source
Canadian Institute for Health Information. *A Performance Measurement Framework for the Canadian Health System*. 2013.

The measures presented in this report support federal, provincial and territorial planning and decision-making during prolonged surges in health care demand. Specifically, these measures

- Support system-level planning and monitoring, not facility-level emergency response. Facility-level plans are beyond the scope of this work, although data is collected and synthesized from facilities in support of system-level responses.
- Are focused on the initial crisis-response phase of a prolonged surge event. System impact measures such as the number of cancelled or postponed surgeries or delayed cancer screenings are critical to understanding the longer-term effects of the surge event but are beyond the scope of this report.

- Exclude short-term surge events, such as most natural disasters or accidents. These measures help to monitor system-wide events in which entire health systems must absorb and adapt to a surge of critically ill patients over a prolonged period.
- Supplement current federal, provincial and territorial monitoring and public reporting activities. Jurisdictions are invited to choose which measures best meet their needs but are not expected to adopt or publicly report on the entire framework.

A working definition is included for each of the foundational measures presented in this report. However, during the engagement process to identify and refine these measures, it was clear that additional effort is needed to align and standardize definitions for many current concepts. While that work is beyond the scope of this report, CIHI will continue to work collaboratively with federal, provincial and territorial ministries, academics and researchers, clinicians and patients to establish and implement pan-Canadian definitions to guide data collection and reporting.

Many of these measures build upon data that currently exists, but some are identified as aspirational measures. They can guide future data collection and infrastructure to help health care systems better prepare for the next prolonged crisis.

Definition of health system capacity

Health care systems are periodically confronted by crisis events that cause disruption. The ability to prepare for, adapt to and learn from unexpected shocks is referred to as system resiliency. It is resiliency that enables a system to deliver increasing critical care with minimal impact on other essential care and services.

Health system capacity can be defined as the adequate number of supplies and equipment (stuff), space and structure in which to treat patients (space), trained personnel (staff) and policies and procedures (systems) to meet the health care needs of the population.[2]

Monitoring health system capacity at a system level during a prolonged surge event requires data and information from both health system delivery and public health. Public health surveillance data can help to predict increased health care demand and service utilization. This report proposes measures from both system delivery and from public health.

Current data challenges

In consultations held between June and October 2021, federal, provincial and territorial ministry representatives described some of the data challenges experienced during the first few waves of the COVID-19 pandemic.

From a data perspective, most provinces and territories were not fully able to monitor health system capacity when the COVID-19 pandemic began. Provincial and territorial response teams rushed to compile data from disparate sources to monitor resource capacity and utilization. There was little time to explore how health system capacity was monitored in other jurisdictions or how key concepts were defined or collected.

Traditional administrative data sources, while comprehensive, were unable to provide the evidence base needed for real-time decision-making. Processes to collect new data provided more timely data, but the process was manual and labour-intensive, with the onus on front-line staff to document and submit even more data at a time when resources were already stretched.

The urgency to compile new and existing information exposed differences in how concepts are defined and tracked across jurisdictions. Not all facility-level information is comparable with other sources, limiting the system-level view of resource capacity and utilization.

There was no set of measures or standardized definitions to follow. This report responds to that need by recommending a series of measures that support system-level monitoring of health care capacity and utilization.

System-level measures

Structure

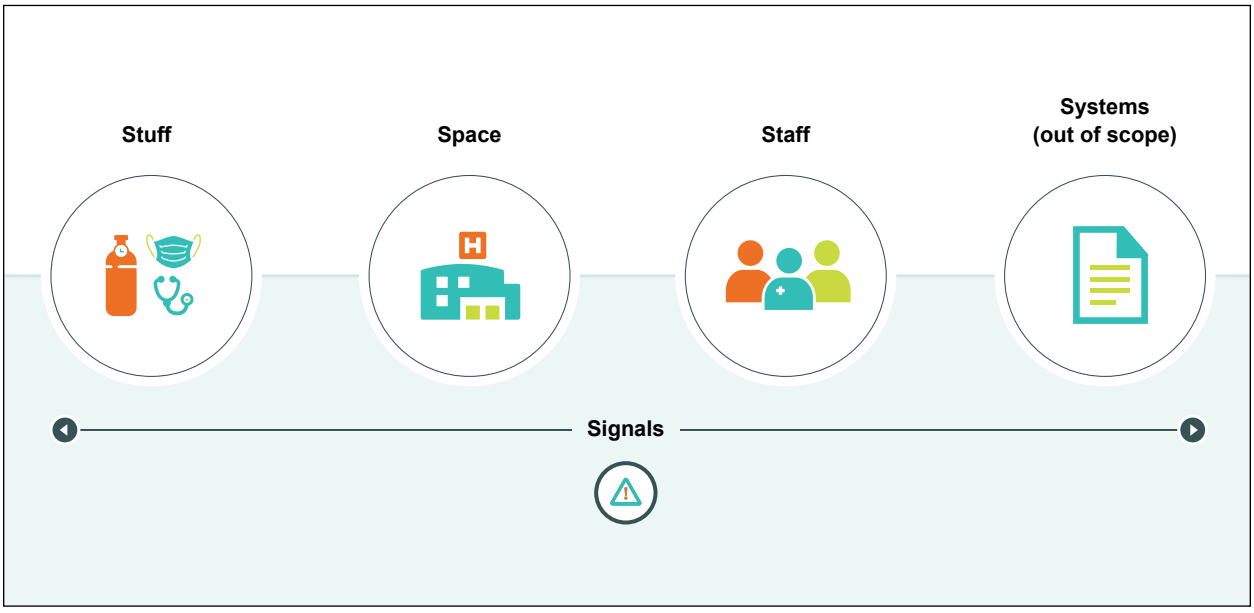
The measures presented in this report are categorized into domains as illustrated in Figure 2 below. These domains are consistent with published literature on surge capacity and emergency planning:[3]

- **Stuff:** Supplies and equipment;
- **Space:** Space and structure in which to treat patients;
- **Staff:** Trained personnel; and
- **Systems:** Policies and procedures.

Of note, the Systems domain refers to facility-level policies and procedures to guide emergency response and clinical management. This domain was deemed out of scope for this report, as these recommendations focus on measures at a system level.

A supplemental domain is added in this report — **Signals:** Early warning signals. Signals are typically populated by public health data and were increasingly used by provinces and territories through subsequent waves of the COVID-19 pandemic to predict increasing demand for hospital and intensive care unit (ICU) resources.

Figure 2 Structure of system-level measures



Measures

This report outlines 31 foundational measures across the domains. Informed by consultation, published literature and expert input, these measures provide a basis for effective system-level monitoring of health system capacity.

The 31 foundational measures are supplemented by 21 aspirational measures — future opportunities — for which, in most cases, comparable system-level data is not yet available. These measures reflect information gaps identified by system planners and others planning crisis responses.

There are also 30 early warning signals that reflect information that proved valuable to rapid analysis and response during the pandemic.

Appendix A provides detailed information for each of the 31 foundational measures presented in this report, including definitions and proposed data sources.

Stuff domain

The COVID-19 pandemic highlighted challenges with national and global health care supply chains. Supply chain and logistics infrastructure is a strategic asset in health systems. The sourcing and distribution of products is critical to ensuring that health care teams have access to the products necessary to deliver safe and effective patient care.[4]

The fragility of health supply chains limits the ability of providers to deliver patient care effectively and safely and to protect the health workforce from transmission of COVID-19.[4] This occurred when demand for oxygen tanks temporarily exceeded supply; the root cause may not have been the actual supply of medical oxygen but rather the ability of companies to deliver oxygen to hospitals.[5]

Table 1a Foundational measures for the Stuff domain

Category	Measure	Stratifiers	Data source
Personal Protective Equipment (PPE)	Number and consumption rate of N95 respirators	Sector; region	Provincial/territorial data
	Number and consumption rate of gowns	Sector; region	Provincial/territorial data
	Number and consumption rate of face shields	Sector; region	Provincial/territorial data
	Number and consumption rate of surgical masks	Sector; region	Provincial/territorial data
	Number and consumption rate of gloves	Sector; region	Provincial/territorial data
	Number and consumption rate of protective goggles	Sector; region	Provincial/territorial data
Lab Supplies	Number of testing kits available	Sector; region	Provincial/territorial data
Medical Devices and Equipment	Number of ventilators	ICU/non-ICU; region; ventilator type	CIHI health spending data
	Number of oxygen delivery devices	Region	Provincial/territorial data

Table 1b Aspirational measures for the Stuff domain

Category	Measure	Anticipated time frame to data availability
Critical Medications	Supply of critical medications approved by Health Canada (e.g., remdesivir, bamlanivimab, casirivimab, imdevimab, sotrovimab)	3 to 5 years
Medical Devices and Equipment	Devices and equipment with potential supply challenges (e.g., manual pulmonary resuscitators, pulse oximeters, infusion pumps)	3 to 5 years

Space domain

From March 2020 to June 2021, there was an average increase of approximately 3,000 inpatient admissions per month for respiratory conditions, compared with the pre-pandemic period (January to December 2019).[6] This increase was not evenly distributed. Each successive wave of COVID-19 saw higher volumes of respiratory conditions and put added pressure on ICU beds. Also, thousands of surgical procedures and diagnostic imaging services were cancelled, which compromised timely access to care and tested the resilience of the hospital sector.[6]

Managing space in health care facilities is a challenge during an outbreak or pandemic. Not all available beds and equipment are clinically appropriate (e.g., pediatric equipment is not suitable for adults), some spaces are inefficient in terms of space utilization and others fail to meet new standards for distancing. Resilient health care organizations repurpose available resources and use unconventional care spaces. Emergency management plans can include the creation of external temporary clinics as new structures specifically designed to accommodate a sudden influx of patients.[3]

Canada's health care workers pivoted to provide safe and effective care virtually. In February 2020, for the provinces where data was available, 48% of physicians had provided at least one virtual care service; by September, this had increased to 83%.[7]

Table 2a Foundational measures for the Space domain

Category	Measure	Stratifiers	Data source
Acute Care Capacity	Number of inpatient beds (excluding ICU)	COVID-19 status; region	CIHI health spending data; provincial/territorial data
	Number of COVID-19–capable beds	Region; ICU/non-ICU	Provincial/territorial data
	Number of ICU beds	Region	CIHI health spending data; provincial/territorial data
Acute Care Utilization	Percentage of ICU beds occupied	COVID-19 status; region	CIHI health spending data
	Percentage of inpatient beds occupied (excluding ICU)	COVID-19 status; region	CIHI health spending data
	Number of patients attending inpatient rehabilitation programs	COVID-19 status; region	CIHI rehabilitation and health spending data

Category	Measure	Stratifiers	Data source
Community Care	Number of long-term care beds (LTC homes in Canada that offer 24-hour nursing care and have publicly funded and/or subsidized beds)	Region	CIHI long-term care data
	Number of home care contact (screening) assessments completed	Location (community, hospital)	CIHI home care data
	Number of full home care assessments completed	Location (community, hospital)	CIHI home care data
	Number of services provided virtually	Region; COVID-19 status; patient age; patient sex; physician type (family medicine, medical specialist, surgical specialist)	CIHI physician data

Table 2b Aspirational measures for Space domain

Category	Measure	Anticipated time frame to data availability
Acute Care	Number of surge beds created through repurposing space (including creation of field hospitals)	3 to 5 years
Primary Health Care	Number and type of services provided in primary health care (including virtual services)	5+ years
	Number and type of services provided by mobile health units	5+ years
Residential Care	Percentage of occupancy in publicly funded long-term care facilities	5+ years
	Number of beds in residential facilities that do not provide 24-hour nursing care or receive public funding (e.g., assisted living, supportive housing, retirement homes)	5+ years
Isolation	Number of people isolating in government-approved quarantine facilities	3 to 5 years

Staff domain

Staff refers to health care workers and administrative staff essential to the functioning of a health care facility. The items identified in the previous domains are highly dependent on staffing, as it is health care workers who operate the equipment and deliver patient care.

Front-line health care workers face elevated risks when treating patients in a respiratory outbreak, including direct exposure to infection, physical and mental distress, fatigue and burnout. A survey administered in November/December 2020 found that one-third (33%) of respondents working in health care settings reported fair to poor mental health.[8] In addition, over three-quarters (77%) of respondents working in direct contact with COVID-19 patients reported worsening mental health, compared with before the pandemic.[8]

Sustained staff shortages contribute to increased burden for the health workforce and limit ability to manage surge capacity. Given this, ongoing monitoring and evaluation of staff measures is necessary to inform and respond to changing staff levels from surges in caseloads.

Table 3a Foundational measures for the Staff domain

Category	Measure	Stratifiers	Data source
Health Workforce Supply	Number of nurses (nurse practitioners/registered nurses/ licensed practical nurses/ registered psychiatric nurses) per 100,000 population	Place of work/setting (hospital, long-term care, community health, other); region; employment status (full time, part time, casual, unknown)	CIHI health workforce data
	Number of physicians per 100,000 population	Physician type and specialty; region	CIHI health workforce data
	Number of respiratory therapists per 100,000 population	Region	CIHI health workforce data
	Number of pharmacists per 100,000 population	Region	CIHI health workforce data
	Number of medical laboratory technologists, medical radiation technologists, psychologists, social workers and paramedics per 100,000 population	Region	CIHI health workforce data

Category	Measure	Stratifiers	Data source
Health Workforce Utilization	Full-time equivalent for medical staff, registered nurses, licensed practical nurses, other professional staff and assistants	ICU/non-ICU; long-term care; community care	CIHI health spending data
Staff-to-Patient Ratio	Nurse-to-patient ratios (registered nurses/licensed practical nurses)	ICU/non-ICU; long-term care; community care	CIHI health spending data
	Other staff–to-patient ratios (e.g., personal support workers, health care aides)	ICU/non-ICU; long-term care; community care	CIHI health spending data
Health and Well-Being of the Health Workforce	Number of health care workers testing positive for infection (e.g., COVID-19)	Region	CIHI health workforce data
	Number of deaths in health care workers due to infection (e.g., COVID-19)	Region	CIHI health workforce data
	Number of overtime hours worked by staff	Organizational unit; trends over time (pre-pandemic total overtime hours versus current total overtime hours)	CIHI health spending data
	Number of hours reported as sick leave	Organizational unit; trends over time (pre-pandemic total sick leave hours versus current total sick leave hours)	CIHI health spending data

Table 3b Aspirational measures for the Staff domain

Category	Measure	Anticipated time frame to data availability
Health Workforce Supply	Name and address of current employer(s)	3 to 5 years
	Number of personal support workers per 100,000 population	3 to 5 years
Health Workforce Utilization in Acute Care Settings	Employment status of full-time equivalents (full time, part time, casual)	3 to 5 years
	Number of redeployed staff	3 to 5 years
	Number of staff operating under an expanded scope of practice	5+ years
	Staff mix	5+ years
	Vacancy rates for health workforce positions	3 to 5 years

Category	Measure	Anticipated time frame to data availability
Health Workforce Utilization Outside of Acute Care Settings	Number of full-time equivalents employed	5+ years
	Nurse-to-patient ratios (registered nurses/licensed practical nurses)	5+ years
	Vacancy rates for health workforce positions	3 to 5 years
Temporary Licensure	Temporary licences granted to non-practising providers, students, providers from other jurisdictions and/or recent retirees/non-practising providers	3 to 5 years
	Temporary licences granted to internationally trained health professionals	5+ years
Health and Well-Being of the Health Workforce	Vaccination rates of the health workforce	3 to 5 years

Signals domain

Signals consist of early warnings that precede the emergence of a crisis event, providing information for timely interventions to contain outbreaks. Most often, these are measures that predict increases in health care demand by using public health data to track case rates and positivity in a timely manner.

Table 4 Foundational measures for the Signals domain

Category	Measure
Cases and Transmission	Number of active cases, daily new cases, cumulative cases (stratified by demographics, region, variant of concern)
	Reproduction rate (R_t) (stratified by variant of concern)
	5-day positivity rate (stratified by demographics, region, variant of concern)
	Wastewater analysis (i.e., amount of virus present per litre of wastewater prior to treatment)
	Number of active cases by vaccination status (unvaccinated, cases not yet protected, partially vaccinated, fully vaccinated)
	Number of deaths and daily new fatalities from outbreak
	Number of patients recovered from outbreak

Category	Measure
Health System Capacity	Hours of sick leave for health care workers
	Number of patients ventilated in acute care (stratified by COVID-19 status, vaccination status)
	ICU occupancy rates and daily new ICU patients (stratified by COVID-19 status, vaccination status)
	Number of current (active and total) hospitalizations (stratified by COVID-19 status, vaccination status, ICU/non-ICU)
	Number of daily new acute care hospitalizations (stratified by COVID-19 status, vaccination status)
	Number of emergency department visits (stratified by time period, COVID-19 status, vaccination status, age)
	Number of virtual primary care visits (stratified by time period, COVID-19 status)
Case and Contact Tracing Statistics	Number of close contacts who were exposed in the hospital, or were exposed in the community but are now admitted to hospital
	Number of newly identified high-risk exposure contacts that are successfully reached within 24 and 48 hours
	Expected number of contacts per case
Emergency Resource Planning	Number of 911 calls related to outbreak symptoms (e.g., respiratory distress)
	Number of paramedic visits to patients with severe outbreak symptoms
Active Outbreaks (by Region)	Number of outbreaks in care or living environments
	Number of outbreaks in health care institutions
	Number of outbreaks in educational or childcare establishments
	Number of outbreaks in essential work environments
	Number of outbreaks resulting from public activities and events
Laboratory Statistics	Number of collection sites
	Laboratory testing volume (daily)
	Test turnaround times
Vaccination Statistics	Total number of vaccines administered
	Percentage of population vaccinated (at least one dose, fully vaccinated, booster[s] given)
	Vaccination status (stratified by age, sex)

Moving forward

This report presents a series of system-level measures for monitoring health system capacity during a prolonged surge event. These measures were largely informed by the early waves of the COVID-19 pandemic and, as a result, can supplement current data collection and public reporting efforts as the pandemic continues.

In the short term, efforts should focus on improving consistency in how key concepts are defined and collected. Terms such as “ICU bed” and “COVID hospitalizations” are widely reported, but differences in the inclusion/exclusion criteria hinder comparability and, more importantly, can cast doubt on the accuracy or veracity of the information.

Greater consistency in key concepts and definitions can establish a better foundation for new investments in data infrastructure and data collection. Many of the aspirational measures identified in this report reflect long-standing data gaps that, if filled, could inform a wide range of policy and planning decisions. Alignment in definitions and reporting at the pan-Canadian level can support this work.

In the longer term, this report could be supplemented with a series of measures that monitor system impact during a pandemic. Whereas current measures focus on the initial period of crisis response, new measures could monitor the impact of cancelled surgeries, decreased cancer screenings or increased demand for mental health services during a prolonged surge event.

Lastly, these measures — and the experience of responding to the COVID-19 pandemic — could help to guide system-level surge capacity requirements for supplies and equipment. The fragility of supply chains was emphasized during the pandemic; these measures could support emergency preparedness efforts to better prepare for the next prolonged crisis.

Appendices

Appendix A: Supplementary information on foundational measures

Table A1 Number and consumption rate of N95 respirators

Attribute	Details
Identifying information	
Domain	Stuff
Category	Personal Protective Equipment (PPE)
Measure	Number and consumption rate of N95 respirators
Background and interpretation	
Rationale	The health care industry continues to struggle with shortages of N95 respirators — the PPE most often used to control exposures to infectious pathogens transmitted via the airborne route. N95 respirators are intended to be used once and then properly disposed of and replaced with a new one.[9] An average consumption rate can guide jurisdictions in supporting health care facilities with planning and optimizing the use of respiratory protection in response to a sudden increase in patient volume that would severely challenge or exceed the present capacity of a facility. The consumption rate of PPE is forecasted using a spreadsheet-based model. To use the calculator, enter the number of full boxes of N95 respirators and the total number of patients at defined facilities. Most respirators have a limited shelf life, after which they should normally be thrown out. The length of time a respirator is stored beyond its shelf life or recommended conditions of storage may affect its performance. However, in times of increased demand and decreased supply, health care providers may consider using expired respirators. An expired respirator can still be effective at protecting health care providers if it can be fit-tested. Health care providers should inspect the respirator and perform a seal check.
Interpretation	This information can be used to estimate how long the remaining supply of N95 respirators will last based on the average consumption rate. The calculation can help facilities make more accurate order projections based on future needs. A higher consumption rate will require urgent processing of order requests.
Other information	
Description	The total number of N95 respirators and the average consumption rate, also referred to as a “burn rate” for N95 respirators
Recommended data source	Provincial/territorial data
Potential stratifiers	Sector; region

Table A2 Number and consumption rate of gowns

Attribute	Details
Identifying information	
Domain	Stuff
Category	Personal Protective Equipment (PPE)
Measure	Number and consumption rate of gowns
Background and interpretation	
Rationale	Medical gowns are used in a variety of health care settings, such as emergency departments, ICUs and clinics. An appropriate type of gown is selected within the context of the setting and the needs of health care professionals and patients. There are 2 main types of medical gowns: isolation gowns and surgical gowns. They are both Class I medical devices. It is important to note that the product names of gowns are not standardized. These products may also be called procedural gowns, operating room gowns or non-surgical gowns.[10] An average consumption rate can guide jurisdictions in supporting health care facilities with planning and optimizing the use of gowns in response to a sudden increase in patient volume that would severely challenge or exceed the present capacity of a facility. The consumption rate of PPE is forecasted using a spreadsheet-based model. To use the calculator, enter the number of full boxes of gowns and the total number of patients at defined facilities.
Interpretation	This information can be used to estimate how long the remaining supply of gowns will last based on the average consumption rate. The calculation can help facilities make more accurate order projections based on future needs. A higher consumption rate will require urgent processing order requests.
Other information	
Description	The total number of medical gowns and the average consumption rate, also referred to as a “burn rate” for medical gowns
Recommended data source	Provincial/territorial data
Potential stratifiers	Sector; region

Table A3 Number and consumption rate of face shields

Attribute	Details
Identifying information	
Domain	Stuff
Category	Personal Protective Equipment (PPE)
Measure	Number and consumption rate of face shields
Background and interpretation	
Rationale	In Canada, face shields are Class I medical devices. A face shield has a transparent window or visor that shields the face and associated mucous membranes (eyes, nose and mouth). It protects the wearer against exposure from splashes and sprays of body fluids. Face shields are made of shatterproof plastic, fit over the face and are held in place by head straps or caps. They may be made of polycarbonate, propionate, acetate, polyvinyl chloride or polyethylene terephthalate.[10] An average consumption rate can guide jurisdictions in supporting health care facilities with planning and optimizing the use of face shields in response to a sudden increase in patient volume that would severely challenge or exceed the present capacity of a facility. The consumption rate of PPE is forecasted using a spreadsheet-based model. To use the calculator, enter the number of full boxes of face shields and the total number of patients at defined facilities.
Interpretation	This information can be used to estimate how long the remaining supply of face shields will last based on the average consumption rate. The calculation can help facilities make more accurate order projections based on future needs. A higher consumption rate will require urgent processing of order requests.
Other information	
Description	The total number of face shields and the average consumption rate, also referred to as a “burn rate” for face shields
Recommended data source	Provincial/territorial data
Potential stratifiers	Sector; region

Table A4 Number and consumption rate of surgical masks

Attribute	Details
Identifying information	
Domain	Stuff
Category	Personal Protective Equipment (PPE)
Measure	Number and consumption rate of surgical masks
Background and interpretation	
Rationale	Surgical masks are worn by operating room personnel during surgical procedures to prevent the spread of pathogens to the external environment.[10] An average consumption rate can guide jurisdictions in supporting health care facilities with planning and optimizing the use of surgical masks in response to a sudden increase in patient volume that would severely challenge or exceed the present capacity of a facility. The consumption rate of PPE is forecasted using a spreadsheet-based model. To use the calculator, enter the number of full boxes of surgical masks and the total number of patients at defined facilities. Medical masks can be used beyond their shelf life provided they have been kept in accordance with their labelled storage conditions and have not been used. Users should check that the straps are intact and there are no visible signs of damage.
Interpretation	This information can be used to estimate how long the remaining supply of surgical masks will last based on the average consumption rate. The calculation can help facilities make more accurate order projections based on future needs. A higher consumption rate will require urgent processing of order requests.
Other information	
Description	The total number of surgical masks and the average consumption rate, also referred to as a “burn rate” for surgical masks
Recommended data source	Provincial/territorial data
Potential stratifiers	Sector; region

Table A5 Number and consumption rate of gloves

Attribute	Details
Identifying information	
Domain	Stuff
Category	Personal Protective Equipment (PPE)
Measure	Number and consumption rate of gloves
Background and interpretation	
Rationale	Disposable medical gloves are used in a variety of health care settings, such as emergency departments, ICUs and medical clinics. Medical gloves can include examination gloves (non-sterile or sterile), surgical gloves and chemotherapy gloves. An appropriate type of glove is selected within the context of the setting and the needs of health care professionals and patients.[10] An average consumption rate can guide jurisdictions in supporting health care facilities with planning and optimizing the use of gloves in response to a sudden increase in patient volume that would severely challenge or exceed the present capacity of a facility. The consumption rate of PPE is forecasted using a spreadsheet-based model. To use the calculator, enter the number of full boxes of gloves and the total number of patients at defined facilities.
Interpretation	This information can be used to estimate how long the remaining supply of gloves will last based on the average consumption rate. The calculation can help facilities make more accurate order projections based on future needs. A higher consumption rate will require urgent processing of order requests.
Other information	
Description	The total number of gloves and the average consumption rate, also referred to as a “burn rate” for gloves
Recommended data source	Provincial/territorial data
Potential stratifiers	Sector; region

Table A6 Number and consumption rate of protective goggles

Attribute	Details
Identifying information	
Domain	Stuff
Category	Personal Protective Equipment (PPE)
Measure	Number and consumption rate of protective goggles
Background and interpretation	
Rationale	Eye wear will protect the user if the eye and surrounding soft tissues are fully covered by the protection device.[10] An average consumption rate can guide jurisdictions in supporting health care facilities with planning and optimizing the use of goggles in response to a sudden increase in patient volume that would severely challenge or exceed the present capacity of a facility. The consumption rate of PPE is forecasted using a spreadsheet-based model. To use the calculator, enter the number of full boxes of goggles and the total number of patients at defined facilities.
Interpretation	This information can be used to estimate how long the remaining supply of goggles will last based on the average consumption rate. The calculation can help facilities make more accurate order projections based on future needs. A higher consumption rate will require urgent processing of order requests.
Other information	
Description	The total number of protective goggles and the average consumption rate, also referred to as a “burn rate” for protective goggles
Recommended data source	Provincial/territorial data
Potential stratifiers	Sector; region

Table A7 Number of testing kits available

Attribute	Details
Identifying information	
Domain	Stuff
Category	Lab Supplies
Measure	Number of testing kits available
Background and interpretation	
Rationale	There have been persistent concerns about shortages of testing kits and associated supplies. Timely high-quality COVID-19 testing is now a critical component of Canada's pandemic response in addition to other infection prevention measures. Testing is the only way to confirm whether a health care worker has COVID-19, and the rate of infection (percentage of tests that are positive for COVID-19) shows whether the virus is spreading to other staff and/or patients. This information supports public health officials in making recommendations to reduce further spread in health care settings.[11] Monitoring the number of testing kits available for immediate use can guide jurisdictions in supporting health care facilities with planning and optimizing the use of testing kits.
Interpretation	This information can be used to track the supply and availability of testing kits. It can also support jurisdictions in making more accurate order projections based on future needs. A lower number of testing kits will require urgent processing of order requests.
Other information	
Description	The total number of testing kits available for immediate use
Recommended data source	Provincial/territorial data
Potential stratifiers	Sector; region

Table A8 Number of ventilators

Attribute	Details
Identifying information	
Domain	Stuff
Category	Medical Devices and Equipment
Measure	Number of ventilators
Background and interpretation	
Rationale	Canada's health care system must be prepared for the possibility of a significant influx of ICU patients during a crisis event. ICUs and ventilators are vital resources for the treatment of severely ill patients. Significant shortages of ventilators can be expected across Canada regardless of the duration of the pandemic if widespread vaccination is not implemented. Shortfalls arise largely due to the extended length of time that patients must remain on ventilation. Canada is expediting the importation and domestic production of medical devices used to diagnose, treat or prevent COVID-19. On March 18, 2020, the Minister of Health approved an interim order to speed up the review of these medical devices, including ventilators.
Interpretation	This information can be used to track the supply and availability of ventilators. It can further support jurisdictions in making more accurate order projections to address future needs. A lower number of ventilators will require urgent processing of order requests and/or the need to transfer patients to nearby jurisdictions.
Other information	
Description	The total number of ventilators available for immediate use
Recommended data source	CIHI health spending data
Potential stratifiers	ICU/non-ICU; region; ventilator type

Table A9 Number of oxygen delivery devices

Attribute	Details
Identifying information	
Domain	Stuff
Category	Medical Devices and Equipment
Measure	Number of oxygen delivery devices
Background and interpretation	
Rationale	Oxygen delivery devices and accessories (e.g., AirLife High Flow FiO2 Nebulizer) are currently reported as a medical device shortage through Interim Order No. 2 Respecting Drugs, Medical Devices and Foods for a Special Dietary Purpose in Relation to COVID-19. The sudden rise in patient volume since the onset of the pandemic has increased the demand for such vital devices and accessories. Under the new interim order, manufacturers and importers must report shortages of specified critical medical devices (including their components, accessories or parts) to Health Canada.[12]
Interpretation	This information can be used to track the supply and availability of oxygen. It can further support jurisdictions in making more accurate order projections to address future needs. A lower number of oxygen delivery services will require urgent processing of order requests and/or the need to transfer patients to nearby jurisdictions.
Other information	
Description	The total number of oxygen delivery devices available for immediate use
Recommended data source	Provincial/territorial data
Potential stratifiers	Region

Table A10 Number of inpatient beds (excluding ICU)

Attribute	Details
Identifying information	
Domain	Space
Category	Acute Care Capacity
Measure	Number of inpatient beds (excluding ICU)
Background and interpretation	
Rationale	COVID-19 mortality rates are likely affected by multiple factors, including hospital resources such as the number of inpatient beds available. Throughout the COVID-19 pandemic, there has been uncertainty as to whether hospitals have an adequate number of beds available to manage the influx of patients. The monitoring of inpatients beds allows jurisdictions to reassess the number of beds at regular intervals and maximize the quality of care during resurgences and future disasters.
Interpretation	Non-ICU bed capacity is determined by each province and territory based on the number of hospitalizations, regional income and other resources.
Other information	
Description	The number of adult medical/surgical beds staffed and in operation outside of ICUs, including • Surge capacity when beds are staffed and in operation • Adult medical/surgical acute care beds • Adult medical/surgical step-down units
Recommended data source	CIHI health spending data
Potential stratifiers	COVID-19 status; region

Table A11 Number of COVID-19–capable beds

Attribute	Details
Identifying information	
Domain	Space
Category	Acute Care Capacity
Measure	Number of COVID-19–capable beds
Background and interpretation	
Rationale	Through an approved COVID-19 system capacity plan, a portion of inpatient beds can be readily available should they be needed during a crisis event. Readily available means that the bed can become vacant and/or ready to accept a COVID-19 admission within 24 to 48 hours. The strategies included in the plan either allocate existing beds (ensuring they are readily available) or create new traditional or non-traditional space not previously included in the COVID-19 bed base.
Interpretation	COVID-19 bed capacity is determined by each province and territory based on the total number of active and recovered COVID-19 cases as well as overall hospitalizations.
Other information	
Description	The portion of acute care inpatient beds outlined that could accommodate a COVID-19 patient, excluding • ICU (included in the ICU Capacity Plan) • Critical care unit/neonatal ICU and other special care beds • Operating rooms • Labour and delivery, ante- and postpartum • Ambulatory assessment and transition beds • Emergency department
Recommended data source	Provincial/territorial data
Potential stratifiers	Region; ICU/non-ICU

Table A12 Number of ICU beds

Attribute	Details
Identifying information	
Domain	Space
Category	Acute Care Capacity
Measure	Number of ICU beds
Background and interpretation	
Rationale	ICUs provide life-supporting treatments to critically ill patients. ICU resources are limited and costly in Canadian hospitals. Clinicians must consider the possible benefits of admission to ICU, and hospital administrators must coordinate the provision of procedures and surgeries requiring critical care with existing capacity. During periods of increased demand for ICU resources, such as during infectious outbreaks or pandemics, it can be difficult to match available resources to clinical demands.[13] The use of ICUs is increasing faster than overall hospital admissions. The large number of patients with COVID-19–related critical illness requiring ICU care has placed considerable strain on the critical care system. Jurisdictions must closely monitor their critical care systems to accommodate the surge of COVID-19 patients to date, focusing on critical capacity as it relates to physical space.[14]
Interpretation	It is not entirely clear what the relationship is between the number of ICU beds and hospitalization rates under normal circumstances. The variation among the provinces and territories, coupled with a lack of information on ICU overuse and underuse, makes it difficult to determine the ideal number of ICU beds for each jurisdiction.[13] However, an increase in demand for ICU beds during the COVID-19 pandemic has been observed. ICU bed capacity is determined by each province and territory based on the regional income and other resources.
Other information	
Description	The number of adult medical/surgical ICU beds staffed and in operation; includes ICU surge capacity when beds are staffed and in operation
Recommended data source	CIHI health spending data
Potential stratifiers	Region

Table A13 Percentage of ICU beds occupied

Attribute	Details
Identifying information	
Domain	Space
Category	Acute Care Utilization
Measure	Percentage of ICU beds occupied
Background and interpretation	
Rationale	Tracking the proportion of ICU beds occupied is important for monitoring capacity in order to provide adequate critical care to patients with life-threatening conditions. ICU beds are defined as adult beds with critical care equipment (i.e., ventilator) that are adequately staffed and in operation for use. A rise suggests an increased burden on the health care system. Monitoring this data allows for timely resource planning and decision-making to expand capacity during a crisis event.
Interpretation	A lower percentage is desirable.
Other information	
Description	The percentage of beds occupied in ICU in each jurisdiction
Recommended data source	CIHI health spending data
Potential stratifiers	COVID-19 status; region

Table A14 Percentage of inpatient beds occupied (excluding ICU)

Attribute	Details
identifying information	
Domain	Space
Category	Acute Care Utilization
Measure	Percentage of inpatient beds occupied (excluding ICU)
Background and interpretation	
Rationale	Tracking the proportion of inpatient beds occupied is important to ensure that there is capacity to care for new patients. Inpatient beds are defined as adult medical/surgical beds staffed and in operation outside of ICUs. A rise suggests an increased burden on the health care system. Monitoring this data allows for timely resource planning and decision-making to expand capacity during a crisis event.
Interpretation	A lower percentage is desirable.
Other information	
Description	The percentage of inpatient beds occupied in each jurisdiction
Recommended data source	CIHI health spending data
Potential stratifiers	COVID-19 status; region

Table A15 Number of patients attending inpatient rehabilitation programs

Attribute	Details
Identifying information	
Domain	Space
Category	Acute Care Utilization
Measure	Number of patients attending inpatient rehabilitation programs
Background and interpretation	
Rationale	Tracking the number of patients attending inpatient rehabilitation programs is important to ensure that there is capacity to care for new patients. A rise suggests an increased burden on the health care system. Monitoring this data allows for timely resource planning and decision-making to expand capacity during a crisis event.
Interpretation	A lower number is desirable.
Other information	
Description	Number of patients attending inpatient rehabilitation programs
Recommended data source	CIHI rehabilitation and health spending data
Potential stratifiers	COVID-19 status; region

Table A16 Number of long-term care beds (LTC homes in Canada that offer 24-hour nursing care and have publicly funded and/or subsidized beds)

Attribute	Details
Identifying information	
Domain	Space
Category	Community Care
Measure	Number of long-term care beds (LTC homes in Canada that offer 24-hour nursing care and have publicly funded and/or subsidized beds)
Background and interpretation	
Rationale	Long-term care (LTC) homes — also called nursing homes, continuing care facilities and residential care homes — provide a wide range of health and personal care services for Canadians with medical or physical needs who require access to 24-hour nursing care, personal care and other therapeutic and support services.[15] Canada's seniors (people age 65 and older) are more vulnerable to the effects of COVID-19. Residents of LTC facilities and those receiving home care are therefore at higher risk than the rest of Canada's population; hence, many COVID-19 deaths in Canada have occurred in LTC and retirement homes.
Interpretation	LTC bed capacity is determined by each province and territory based on long-term care utilization rates by age group, aggregate health care needs and regional income.
Other information	
Description	The number of beds in an LTC home that are licensed or approved to be occupied by 1 resident, or the right, in accordance with the applicable legislation, to provide such a bed
Recommended data source	CIHI LTC data
Potential stratifiers	Region

Table A17 Number of home care contact (screening) assessments completed

Attribute	Details
Identifying information	
Domain	Space
Category	Community Care
Measure	Number of home care contact (screening) assessments completed
Background and interpretation	
Rationale	Home care providers complete screening assessments for new clients to determine their care needs. Most assessments (90%) are completed in community settings, such as the client's home. Assessments completed in hospitals inform discharge-planning decisions, particularly for long-term care facilities.[16] In the first few months of the COVID-19 pandemic, home care providers temporarily changed assessment methods to avoid close contact with clients. At the same time, some home care clients placed their services on hold to limit contact with people outside their household. In April 2020, the number of screening assessments declined 25% compared with the previous month, regardless of where the assessment was completed.[16]
Interpretation	Monitoring the number of home care contact (screening) assessments completed allows jurisdictions to re-evaluate the demand for home care services at regular intervals and identify resources to support the timely completion of assessments during a crisis event.
Other information	
Description	The number of home care contact (screening) assessments completed by a home care provider
Recommended data source	CIHI home care data
Potential stratifiers	Location (community, hospital)

Table A18 Number of full home care assessments completed

Attribute	Details
Identifying information	
Domain	Space
Category	Community Care
Measure	Number of full home care assessments completed
Background and interpretation	
Rationale	Home care providers complete full assessments for new and existing clients to determine or update their care needs. Most assessments (90%) are completed in community settings, such as the client's home. Assessments completed in hospitals inform discharge-planning decisions, particularly for long-term care facilities.[16] In the first few months of the COVID-19 pandemic, home care providers temporarily changed assessment methods to avoid close contact with clients. At the same time, some home care clients placed their services on hold to limit contact with people outside their household. The number of full assessments completed in April 2020 declined substantially (44%), compared with the previous month. By June 2020, screening assessments had nearly rebounded to March 2020 levels, but full assessments had not.[16]
Interpretation	Monitoring the number of full home care assessments completed allows jurisdictions to re-evaluate the demand for home care services at regular intervals and identify resources to support the timely completion of assessments during a crisis event.
Other information	
Description	The number of full home care assessments completed by a home care provider
Recommended data source	CIHI home care data
Potential stratifiers	Location (community, hospital)

Table A19 Number of services provided virtually

Attribute	Details
Identifying information	
Domain	Space
Category	Community Care
Measure	Number of services provided virtually
Background and interpretation	
Rationale	The COVID-19 pandemic shifted how Canadian health care workers and patients interact with each other, including how they engage with health care systems. As cases surged across the country, Canada's health care workers had to pivot in order to provide safe and effective care.[7] In February 2020, for the jurisdictions where data was available, 48% of physicians had provided at least one virtual care service; by September, this had increased to 83%. An even bigger change occurred in Canadians accessing virtual care services: for those same jurisdictions, the proportion of people receiving at least one virtual care service jumped from 6% to 56%. Proportions varied among the jurisdictions.[7]
Interpretation	Monitoring the number of services provided virtually allows jurisdictions to re-evaluate the demand for virtual care as an option for both patients and health care workers at regular intervals and identify resources to support the services provided virtually.
Other information	
Description	The number of services that are provided virtually by physicians in order to interact with patients remotely using electronic information and telecommunication technologies
Recommended data source	CIHI physician data
Potential stratifiers	Region; COVID-19 status; patient age; patient sex; physician type (family medicine, medical specialist, surgical specialist)

Table A20 Number of nurses (nurse practitioners/registered nurses/ licensed practical nurses/registered psychiatric nurses) per 100,000 population

Attribute	Details
Identifying information	
Domain	Staff
Category	Health Workforce Supply
Measure	Number of nurses (nurse practitioners/registered nurses/licensed practical nurses/ registered psychiatric nurses) per 100,000 population
Background and interpretation	
Rationale	Nurses play an important role in supporting the response to a crisis event (e.g., response testing and contact tracing, providing direct care to the vulnerable in acute and long-term care, supporting vaccine rollout initiatives). Nursing care can significantly influence national mortality and morbidity outcomes in a pandemic.[17] During the COVID-19 pandemic in 2020, the nursing profession saw the largest number of individuals returning to practice.[8] Despite this increase, health care worker infections and exposure to the virus contributed to shortages.
Interpretation	Higher rates are desirable
Other information	
Description	Number of active nurses (NPs/RNs/RPNs/LPNs) in the jurisdiction per 100,000 population Calculation: Number of nurses ÷ Number of people in jurisdiction × 100,000
Recommended data source	CIHI health workforce data
Potential stratifiers	Place of work/setting (hospital, long-term care, community health, other); region; employment status (full time, part time, casual, unknown)

Table A21 Number of physicians per 100,000 population

Attribute	Details
Identifying information	
Domain	Staff
Category	Health Workforce Supply
Measure	Number of physicians per 100,000 population
Background and interpretation	
Rationale	Physicians play an essential role in providing care and improving the health of the population. During a crisis event, rapidly expanding an existing acute care physician workforce is critical for effective pandemic response planning, ensuring that Canadians can access health services when and where they need them.
Interpretation	Higher rates are desirable
Other information	
Description	Number of active physicians in the jurisdiction per 100,000 population Calculation: Number of physicians ÷ Number of people in jurisdiction × 100,000
Recommended data source	CIHI health workforce data
Potential stratifiers	Physician type and specialty; region

Table A22 Number of respiratory therapists per 100,000 population

Attribute	Details
Identifying information	
Domain	Staff
Category	Health Workforce Supply
Measure	Number of respiratory therapists per 100,000 population
Background and interpretation	
Rationale	Respiratory therapists are health professionals who provide direct patient care by evaluating, treating and maintaining cardiopulmonary function. They work in diverse clinical settings and are considered experts in managing patients with respiratory distress. During the COVID-19 pandemic, respiratory therapists in acute care settings have been at the forefront of critical care and managing ventilated and critically ill COVID patients.
Interpretation	Higher rates are desirable
Other information	
Description	Number of active respiratory therapists in the jurisdiction per 100,000 population Calculation: Number of respiratory therapists ÷ Number of people in jurisdiction × 100,000
Recommended data source	CIHI health workforce data
Potential stratifiers	Region

Table A23 Number of pharmacists per 100,000 population

Attribute	Details
Identifying information	
Domain	Staff
Category	Health Workforce Supply
Measure	Number of pharmacists per 100,000 population
Background and interpretation	
Rationale	Pharmacists are considered medication management experts of a health care team. During a crisis event, they may be involved in multiple activities, including safely maintaining patient access to essential medications, chronic disease management, mobilizing vaccinations, point-of-care screening and testing services, and infectious disease mitigation in the community.
Interpretation	Higher rates are desirable.
Other information	
Description	Number of active pharmacists in the jurisdiction per 100,000 population Calculation: Number of pharmacists ÷ Number of people in jurisdiction × 100,000
Recommended data source	CIHI health workforce data
Potential stratifiers	Region

Table A24 Number of medical laboratory technologists, medical radiation technologists, psychologists, social workers and paramedics per 100,000 population

Attribute	Details
Identifying information	
Domain	Staff
Category	Health Workforce Supply
Measure	Number of medical laboratory technologists, medical radiation technologists, psychologists, social workers and paramedics per 100,000 population
Background and interpretation	
Rationale	Other health care professionals, including medical laboratory technologists, medical radiation technologists, psychologists, social workers and paramedics, are key in providing essential, often direct, patient care during a crisis event.
Interpretation	Higher rates are desirable.
Other information	
Description	Number of active medical laboratory technologists, medical radiation technologists, psychologists, social workers and paramedics in the jurisdiction per 100,000 population Calculation: Number of other health care professionals ÷ Number of people in jurisdiction × 100,000
Recommended data source	CIHI health workforce data
Potential stratifiers	Region

Table A25 Full-time equivalent for medical staff, registered nurses, licensed practical nurses, other professional staff and assistants

Attribute	Details
Identifying information	
Domain	Staff
Category	Health Workforce Utilization
Measure	Full-time equivalent for medical staff, registered nurses, licensed practical nurses, other professional staff and assistants
Background and interpretation	
Rationale	Tracking full-time equivalents (FTEs) is useful in project and resource management and to support staffing decisions. During a crisis event, FTE can be used to track time and costs of the health workforce.
Interpretation	A value less than 1 suggests that the number of earned hours is less than what is expected, while a value greater than 1 suggests that actual work effort is more than what is expected during a specific period of time.
Other information	
Description	FTE is a unit of measure that evaluates the total earned hours during a certain time period divided by the normal earned hours during that period. Calculation: Total earned hours in a time period ÷ Normal earned hours for same time period
Recommended data source	CIHI health spending data
Potential stratifiers	ICU/non-ICU; long-term care; community care

Table A26 Nurse-to-patient ratios (registered nurses/licensed practical nurses)

Attribute	Details
Identifying information	
Domain	Staff
Category	Staff-to-Patient Ratio
Measure	Nurse-to-patient ratios (registered nurses/licensed practical nurses)
Background and interpretation	
Rationale	An optimal nurse-to-patient ratio is associated with more favourable patient outcomes, including lower mortality, fewer complications, higher patient satisfaction, shorter stays and fewer readmissions, as well as better nurse outcomes such as less burnout.[18] During a crisis event, health system managers can use data on nurse-to-patient ratio to monitor and compare resource utilization in each jurisdiction.
Interpretation	A low nurse-to-patient ratio implies that each nurse is caring for more patients than what is typical.
Other information	
Description	Reflects the balance between the quantity of nurses in the jurisdiction and the number of patients receiving care Calculation: Total number of nurses ÷ Total number of patients
Recommended data source	CIHI health spending data
Potential stratifiers	ICU/non-ICU; LTC; community care

Table A27 Other staff-to-patient ratios (personal support workers, support workers/health care aides)

Attribute	Details
Identifying information	
Domain	Staff
Category	Staff-to-Patient Ratio
Measure	Other staff-to-patient ratios (personal support workers, support workers/health care aides)
Background and interpretation	
Rationale	An optimal staff-to-patient ratio is associated with more favourable patient outcomes overall. During a crisis event, health system managers can use data on staff-to-patient ratio to monitor and compare resource utilization in each jurisdiction.
Interpretation	A low staff-to-patient ratio implies that each staff member is caring for more patients than what is typical.
Other information	
Description	Staff-to-patient ratio Calculation: Total number of other staff ÷ Total number of patients
Recommended data source	CIHI health spending data
Potential stratifiers	ICU/non-ICU; LTC; community care

Table A28 Number of health care workers testing positive for infection (e.g., COVID-19)

Attribute	Details
Identifying information	
Domain	Staff
Category	Health and Well-Being of the Health Workforce
Measure	Number of health care workers testing positive for infection (e.g., COVID-19)
Background and interpretation	
Rationale	Individuals working in health care settings are on the front line and are at risk of exposure to infection. Given the critical role of the health workforce in response efforts, it is important to monitor this measure in order to maintain optimal level of care and to respond to potential surges in need. This measure also addresses the extent to which jurisdictions are effective in preventing the development of infection in the health workforce. Monitoring this will help improve health workforce safety and ensure the use of appropriate infection control measures. Between January 2020 and 2021, health care workers accounted for approximately 66,000 COVID-19 infections.[19]
Interpretation	A lower value is desirable.
Other information	
Description	The number of health care workers testing positive for infection
Recommended data source	CIHI health workforce data
Potential stratifiers	Region

Table A29 Number of deaths in health care workers due to infection (e.g., COVID-19)

Attribute	Details
Identifying information	
Domain	Staff
Category	Health and Well-Being of the Health Workforce
Measure	Number of deaths in health care workers due to infection (e.g., COVID-19)
Background and interpretation	
Rationale	Individuals working in health care settings are on the front line and are at risk of mortality due to exposure to infection. Monitoring deaths is important as it reflects the underlying effectiveness of infection control/prevention measures for the health workforce. Between January 2020 and 2021, there were 24 COVID-19–related deaths in health care workers.[19]
Interpretation	A lower value is desirable.
Other information	
Description	The number of health care worker deaths associated with infection
Recommended data source	CIHI health workforce data
Potential stratifiers	Region

Table A30 Number of overtime hours worked by staff

Attribute	Details
Identifying information	
Domain	Staff
Category	Health and Well-Being of the Health Workforce
Measure	Number of overtime hours worked by staff
Background and interpretation	
Rationale	Increased demand due to a crisis event will most often increase the need for overtime hours worked due to any shortages in the health workforce. Compiling data on overtime hours is important because excess workload has been linked to decreased wellbeing and has implications for the longterm health of staff and for health service delivery.[20, 21] An increase in overtime hours may suggest a poor level of health and well-being of the health workforce and the need for additional resources.
Interpretation	A lower value is desirable.
Other information	
Description	The number of worked overtime hours among the health care workforce
Recommended data source	CIHI health spending data
Potential stratifiers	Organizational unit; trends over time (pre-pandemic total overtime hours versus current total overtime hours)

Table A31 Number of hours reported as sick leave

Attribute	Details
Identifying information	
Domain	Staff
Category	Health and Well-Being of the Health Workforce
Measure	Number of hours reported as sick leave
Background and interpretation	
Rationale	Members of the health workforce are at an elevated risk of contracting infections due to the nature of their work in providing direct care to patients. The number of sick leave hours reported can indicate a need for increased infection control measures and additional resources to maintain levels of care.
Interpretation	A lower value is desirable.
Other information	
Description	Number of sick time hours reported among the health care workforce
Recommended data source	CIHI health spending data
Potential stratifiers	Organizational unit; trends over time (pre-pandemic total hours reported as sick leave versus current total hours reported as sick leave)

Appendix B: Text alternative for figure

Text alternative for Figure 1

CIHI's Health System Performance Management Framework consists of 4 quadrants: Health System Outcomes, Social Determinants of Health, Health System Outputs, and Health System Inputs and Characteristics. These quadrants are linked together to form a dynamic framework in an expected causal chain. Here is an overview of the quadrants:

The first quadrant, Health System Outcomes, consists of 3 dimensions: Improve health status of Canadians, Improve health responsiveness and Improve value for money. The first 2 of these dimensions encompass equity to reflect the overarching goal of equitable distribution. Quadrant 3, Health System Outputs, has 1 dimension (Access to comprehensive high-quality health services) with 4 quality attributes of the health services delivered (attributes are Person-centred, Safe, Appropriate and effective, and Efficiently delivered), and these impact the 3 dimensions in Quadrant 1. Quadrant 1 and Quadrant 2 (Social Determinants of Health) influence each other.

The second quadrant, Social Determinants of Health, consists of 2 dimensions: Structural factors influencing health, and Biological, material, psychosocial and behavioural factors. The first dimension influences the second dimension. Quadrants 1 and 2 influence each other. Quadrant 4 (Health System Inputs and Characteristics) and Quadrant 2 also influence each other. Quadrant 2 is also influenced by Quadrant 3 (Health System Outputs).

The third quadrant, Health System Outputs, consists of 1 dimension, Access to comprehensive high-quality health services, and 4 quality attributes: Person-centred, Safe, Appropriate and effective, and Efficiently delivered. These quality attribute dimensions also encompass equity. Access to comprehensive high-quality health services is influenced jointly by the dimensions in the fourth quadrant: Efficient allocation of resources, Adjustment to population health needs, and Health system innovation and learning capacity. Quadrant 3 influences Quadrant 2.

The fourth quadrant, Health System Inputs and Characteristics, consists of 5 dimensions: Leadership and governance, Health system resources, Efficient allocation of resources, Adjustment to population health needs, and Health system innovation and learning capacity. This quadrant comprises 2 foundational dimensions that influence the capacity of the system to improve: Leadership and governance, and Health system resources. These foundational dimensions influence one another as well as the other inputs and characteristic dimensions in this quadrant. The dimensions Efficient allocation of resources, Adjustment to population health needs, and Health system innovation and learning capacity influence each other. Quadrants 4 and 2 influence each other.

4 contextual elements — Cultural context, Economic context, Demographic context and Political context — surround the quadrants in the framework.

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