McMaster University | Health Forum

Rapid Evidence Profile

Processes and mechanisms for enabling evidence-informed decision-making in pandemic planning and response

13 December 2024

[MHF product code: REP 85]

Context

- Lessons learned from the COVID-19 pandemic consistently point to the critical role of science and evidence in supporting pandemic responses.
- Recommendations emerging from the Chief Science Advisor's Expert Panel on COVID-19 included the need to improve science advisory mechanisms in Canada as well as to strengthen the research and developing prioritization and coordination for preparedness and during crisis responses.(1)
- In efforts to inform updates to pandemic preparedness plans, we undertook a rapid evidence profile that examines both evidence documents and pandemic preparedness plans from a wide range of countries to determine what is known about the integration of processes and mechanisms for enabling evidence-informed decision-making within these strategic documents.
- The intention of this document is to provide a broad overview of the evidence and approaches noted in the pandemic preparedness plans (and related documents) from other countries and from international and multinational organizations.
- The text below highlights specific examples of processes and mechanisms for enabling evidence-informed decision-making but should not be comprehensive in the same way as a systematic review.

Box 1: Evidence and other types of information

+ Global evidence drawn upon

Evidence syntheses selected based on relevance, quality, and recency of search

+ Forms of domestic evidence used (🍁 = Canadian)

Qualitative insights

+ Other types of information used

Jurisdictional scan (13 countries: AU, CA, FR, DE, IT, HK, JP, NE, NO, NZ, SW, US, UK and five international/multinational organizations: ACDC; EUCDC; PAHO, WHO-Euro; WHO)

*** Additional notable features**

Prepared in three-business days using an 'all hands-on deck' approach

Questions

1) What evidence is available about processes and mechanisms for enabling evidence-informed decision-making in pandemic planning and response?

High-level summary of key findings

- We identified 16 highly relevant evidence documents including five evidence syntheses and 11 single studies.
- The majority of findings from evidence documents relate directly to activities that support the integration of evidence into pandemic planning and response, specifically examining examples of evidence-support mechanisms and assessments of methods to streamline ethics and regulatory approvals.
- We identified 47 pandemic preparedness plans and related documents across 13 jurisdictions (Australia, Canada, France, Germany, Italy, Hong Kong, Japan, Netherlands, Norway, New Zealand, Switzerland, United Kingdom, and

the United States) and five international/multinational organizations (African Centre for Disease Control, European Centre for Disease Control, Pan-American Health Organization, World Health Organization's Regional Office for Europe, and the World Health Organization) that were published from 2005 to 2024.
- Among these documents, we included some reports that spoke to lessons learned and evaluations from Auditor Generals, government departments, and commissions about the COVID-19 pandemic and influenza.
- In terms of the activities described in the pandemic preparedness plans, the findings largely focused on processes and mechanisms to access timely, demand-driven evidence support (e.g., rapidly mobilizing existing domestic and global forms of evidence to answer questions from decision-makers and support learning and improvement platforms) and new flows of research evidence.
- National-level plans tended to include greater details regarding governance and financial arrangements while international and multinational plans described research priorities and opportunities for collaboration.
- Though there were frequent mentions across all plans about the importance of evidence-informed decision making, many details were missing with regards to understanding who is responsible for providing what forms of evidence and how it is used to make decisions.

Framework to organize what we looked for

- Level of pandemic preparedness plan
  - National
  - International
  - Multinational
- Components of evidence support infrastructure (i.e., the structures, mechanisms and process that enable the use of evidence in decision-making) for pandemic planning and preparedness

Box 2: Approach and supporting materials

At the beginning of each rapid evidence profile and throughout its development, we engage a subject matter expert and at least one citizen partner, who help us to scope the question and ensure relevant context is taken into account in the summary of the evidence.

We identified evidence documents addressing the question by searching Health Systems Evidence and PubMed. All searches were conducted on 29 November 2024. The full search strategies used are included in Appendix 1. In contrast to synthesis methods that provide an in-depth understanding of the evidence, this profile focuses on providing an overview and key insights from relevant documents.

We searched for evidence syntheses, protocols for evidence syntheses and single studies.

We appraised the methodological quality of evidence syntheses that were deemed to be highly relevant using the first version of the AMSTAR tool. AMSTAR rates overall quality on a scale of 0 to 11, where 11/11 represents a review of the highest quality, medium-quality evidence syntheses are those with scores between four and seven, and low-quality evidence syntheses are those with scores less than four. The AMSTAR tool was developed to assess reviews focused on clinical interventions, so not all criteria apply to evidence syntheses pertaining to delivery, financial or governance arrangements within health systems or implementation strategies.

In addition, we conducted a jurisdictional scan focused on identifying pandemic preparedness plans from 13 countries and five multi-national organizations. Additional details regarding the search strategy for these documents is included in Appendix 1.

A separate appendix document includes:
1) Methodological details (Appendix 1)
2) Details about each identified synthesis (Appendix 2)
3) Details about each identified single study (Appendix 3)
4) Details from the jurisdictional scan (Appendix 4)
5) Documents that were excluded in the final stages of review (Appendix 5)

This rapid evidence profile was prepared in the equivalent of three days of a 'full-court press' by all involved staff.

- Connections to advisory and decision-making processes and/or learning and improvement platforms
- Governance of pandemic preparedness plan
  - Membership of governance body includes interdisciplinary perspectives, subject-matter expertise, evidence-methods expertise and lived experience (including those from equity-deserving populations)
  - Secretariat support with documented capacity for evidence coordination (i.e., oversight and management of the interface between the demand and supply of evidence) and support, including identifying evidence needs for a policy question
  - Mechanisms to enable domestic and global data and evidence sharing
  - Mechanisms to enable collaboration with other levels of government and governance, domestically and globally (as appropriate)
  - Knowledge-management system to enable evidence support
  - Explicit plan for how evidence supports will pivot/ramp up alongside a pandemic
- Funding for research and evidence support
  - Core (non-emergency) funding for research and evidence support
  - Time-limited and/or flexible funding arrangements with a plan for how it pivots/ramps up alongside a pandemic
- Activities described within the pandemic preparedness plan that support the integration of evidence
  - Priority setting processes for new research or the focus for evidence-support processes
  - Processes, standards and reporting for determining who is requested/commissioned to provide evidence support and/or produce new flows of evidence
  - Capacity building to enable the use of evidence in decision-making processes
  - Implementing and aligning enablers to support the use of evidence in decision-making
  - Standards or requirements for transparency in how evidence is used to inform recommendations and decisions
  - Establish processes and mechanisms to access **timely, demand-driven evidence support (i.e., using existing flows of evidence)** to inform pandemic preparedness planning and response, based on one or more of the eight different forms of evidence that can be used to inform decision-making (data analytics, modelling, evaluation, behavioural/implementation research, qualitative insights, evidence syntheses, technology assessment/cost-effectiveness analysis, guidance and other types of information and knowing, including Indigenous ways of knowing)
  - Mechanisms for streamlined approval, regulatory and ethics processes
  - Processes and mechanisms to access **flows of new research evidence** needed to inform planning and policy in public health (e.g., for one or more of the forms of evidence listed above)
- Outcomes
  - Use of evidence in decision-making
    - Changes in intentions to use evidence (as a proxy for actual use)
    - Instrumental use (i.e., direct connection between evidence and decisions or plans put in place)
    - Conceptual use (i.e., informing ways of thinking over time)
    - Political use (i.e., use of evidence to justify decisions or plans already made)
  - Public trust
  - Health outcomes
  - Research costs

What we found

We identified 17 evidence documents, of which we determined 16 to be highly relevant. These include five evidence syntheses and 11 single studies. In addition, our jurisdictional scan identified 47 national pandemic preparedness plans from 13 countries and from five international/multinational organizations.

Coverage by and gaps in existing evidence syntheses and domestic evidence

In both the evidence documents and the review of pandemic preparedness and related plans, we found a lack of detailed descriptions of how mechanisms and processes for supporting evidence-informed decision-making are built into pandemic preparedness plans. While preparedness plans frequently acknowledge the importance of evidence-informed decision-making, they rarely detail the mechanisms and processes for implementing it or specify evidence sources for it.

The evidence documents we examined primarily focus on support mechanisms and evidence flows that emerged during the COVID-19 pandemic. These examples offer valuable insights for developing more robust structures and processes for future pandemic preparedness.

Within our organizing framework, we found that certain areas received more attention than others. National plans typically emphasized governance structures, while international and multinational plans focused on mechanisms for data and evidence sharing, particularly regarding global surveillance systems. International plans also extensively discussed research priorities, though they often failed to specify how these priorities were determined or who would be responsible for addressing them.

Many forms of evidence were notably absent from the included evidence documents and preparedness plans that were identified in the jurisdictional scans. Specifically, surveillance data received considerable attention while attention to evidence syntheses was scant and other types of evidence were largely overlooked. This limited coverage of evidence types, combined with vague descriptions of processes and mechanisms, made it difficult to identify concrete outcomes—though some were documented in reviews and audits of national pandemic preparedness plans.

A final gap that should be noted is the lack of Indigenous perspectives in identified pandemic preparedness plans and in identified evidence documents.

Key findings from included evidence documents

We identified 16 evidence documents including five evidence syntheses and 11 single studies addressing one or more parts of the framework above. The following section profiles the evidence documents organized by high-level categories in the framework above.

The first finding from one recent medium quality evidence synthesis is relevant to the entire framework. The evidence synthesis examined the extent to which themes emerging from global public-health preparedness plans aligned with those outlined in a Canadian all-hazards Resilience Framework for public health emergency preparedness.(2) While the synthesis noted that for the most part themes were in alignment, emergent themes were also identified in recently updated plans. In particular a theme on research and evidence-informed decision-making was identified.(2) The evidence synthesis explains that this theme is particularly focused on discussions in pandemic preparedness plans to build capacity for knowledge-sharing networks and the integration of data-, scientific- and evidence-informed decision-making.(2) However, additional details about how this was operationalized in plans was not provided.

Governance of pandemic preparedness plans

Four evidence documents address the governance of pandemic preparedness plans and the extent to which science and evidence are built-in to them. The first evidence document, a recent low-quality evidence synthesis, reviewed historic institutional arrangements for pandemic preparedness in the European Union and compared them to new plans to contend with challenges that surfaced during the COVID-19 pandemic. The synthesis described that prior to the pandemic the European Centre for Disease Control, the European Commission, and the European Health Security Commission all played central but supportive roles to member states with respect to pandemic preparedness and response. However, moving forward, plans are in place for these organizations to play more active roles in pandemic preparedness including in managing laboratories and surveillance activities, strengthening auditing capabilities for preparedness plans from countries in the European Union, and establishing a taskforce to provide direct assistance to member states.(3)

Two evidence documents, both single studies, included insights about membership of governance bodies and the experience of scientists working as part of scientific-advisory committees during the pandemic response. One recent single study found that Canada's COVID-19 response relied on an ad-hoc approach to science advice, with many temporary bodies being established and subsequently disbanded.(4) The study highlights the pressing need to consider more permanent structures and clear coordination mechanisms.(4) Another recent single study examined the experiences of scientists working on COVID-19 advisory boards in five European countries and noted common challenges of interdisciplinary collaboration (with an initial dominance of biomedical research as compared to social sciences), difficulty ensuring evidence was understood and acted on by decision-making bodies, and challenges of managing a new public-facing role.(5)

Finally, one recent single study focused on mechanisms to enable domestic data and evidence sharing. The study described the experience of Clinical Translational Science Award Program hubs in the U.S. and their critical role in coordinating and responding to requests for data during the COVID-19 pandemic.(6) In particular, the study describes the expanded role of these hubs from their typical role supporting the use of basic science research in clinical practice to include the development COVID-19 data dashboards, the development of an engagement platform for clinical researchers to collaborate, and COVID-19 educational activities for decision-makers.(6) In addition, one recent low-quality evidence synthesis considers mechanisms to enable global collaboration. The evidence synthesis found that although the pandemic resulted in unprecedented levels of international scientific collaboration and data sharing, there are still opportunities for improvement, namely strengthening disease surveillance infrastructure in a coordinated manner and with interoperable systems, and creating better systems for the sharing of tacit knowledge.(7)

Funding for research

Though only broadly speaking to funding arrangements, one recent single study that reported on a day-and-a-half-long deliberation with pandemic stakeholders in the U.S., identified select lessons including the importance of collaboration across research funders all those who are willing. It also underscored the importance of maintaining investments in science and considering the impacts of those investments over both the short- and long-terms.(8) Similarly, one recent single study examining the impact of health research systems during the pandemic found unprecedented amounts of funding and collaboration between the public and private sectors led to significant breakthroughs in science but also a concerning amount of research waste.(9) One older medium-quality evidence synthesis identified challenges and solutions to generating needed clinical research evidence during epidemics and pandemics, and notes the challenge of funding approvals often taking longer than the duration of outbreaks, as well as the need for dedicated funding for emergency research.(10) The evidence synthesis suggests that countries invest in sustainable research centres and research training (that is maintained during 'peace times').(10)

Activities described within the pandemic preparedness that support the integration of evidence i

The majority of identified evidence documents (e.g., evidence syntheses or single studies) relate directly to activities that support the integration of evidence into pandemic planning and response. Four evidence documents examine examples of *processes and mechanisms for timely demand-driven evidence support that were provided during the COVID-19 pandemic* including in Canada, Germany, Ireland, and the U.S. One single study examining the use of evidence syntheses in Canada during the COVID-19 pandemic found that creating a pre-determined network of synthesis providers and maintaining close relationships between those requesting evidence and those providing it was critical to enabling a rapid response. Despite the many positive aspects of the network, select challenges were noted including:

- a lack of understanding of what types of evidence are needed to answer certain research questions
- a lack of standardization of evidence-synthesis methods (including bypassing some traditional quality-assurance mechanisms)
- limited understanding from decision-makers about how traditional evidence syntheses compare to other types of evidence and how to interpret and apply the results.(11)

One recent single study from Germany describes the development of an evidence-support system through the COVID-19 evidence ecosystem (CEOsys) that produced demand-driven living guidelines and evidence syntheses throughout the pandemic. The study noted that this network acted as a proof-of-concept for a national evidence ecosystem should permanent funding be made available, and highlighted the importance of involving key stakeholders early in the network's development to help ensure success.(12)

One single study from Ireland found that rapid evidence products were considered invaluable to decision-making during COVID-19 with the use of the products being dependent on the credibility of the evidence providers, close relationships with decision-makers, and having highly skilled and adaptable teams.(13)

Finally, two single studies from the U.S. described mechanisms for evidence support for the department of health in Washington state and for a paediatric hospital in Colorado. One single study described the use of a daily COVID-19 literature review system that helped to organize and manage the huge quantity of literature related to COVID-19 that was emerging during the pandemic. The system and the article summaries produced through it were reported to have successfully supported evidence-based public-health decision-making by the Department of Health in Washington.(14) Similarly, one single study describes the establishment of a scientific advisory council within a hospital in Colorado to conduct rapid evidence reviews to answer institutional questions related to COVID-19.(15) The council was found to be highly successful and has since been integrated into the pandemic preparedness plan for the institution.(15)

The remaining evidence documents relate to *mechanisms to streamline approvals for ethics and regulatory reviews for new flows of evidence*. One older medium-quality evidence synthesis examined challenges and possible solutions to generating needed clinical research evidence during epidemics and pandemics, and identified the following challenges:

- length of time to complete administrative and regulatory procedures
- limited access to staff with research training
- multiple ethics committees, bureaucratic processes and inconsistencies in required documentation for ethics review processes.(10)

Some examples of proposed solutions from the synthesis include:

- incentivizing the use of clinical research response networks
- developing interventional and national research, administrative and logistics support platforms with funded coordinating mechanisms
- developing pre-designed and pre-approved study protocols and associated tools for different scenarios
- establish regulatory and ethical join approvals.(10)

One recent single study examined how South Korea expedited ethics reviews during the COVID-19 pandemic. The two-phased approach consisted of an initial urgent-response phase that accelerated ethics reviews and allowed temporary

adjustments to research procedures (e.g., expedited institutional review board meetings, non face-to-face consent processes, and the establishment of a centralized oversight institution). This was then followed by a long-term preparedness phase, where a review of the changes were made with decisions about which ones could be embedded into permanent institutional frameworks.(5) In addition, a single study that reported on a day and a half long deliberation with pandemic stakeholders in the U.S. identified select lessons, including the importance of balance rapidity and safety in research and ensuring there are processes in place for continued monitoring.(8) One recent single study found that the ability to accelerate ethics and protocol approvals enhanced the speed and efficiency of research production, but noted the importance of still ensuring quality and safety.(9)

Though not related specifically to ethics or regulatory approvals, one recent medium-quality evidence synthesis examined the use of machine learning in supporting pandemic preparedness planning and noted that it may be used to complement traditional modelling approaches to increase the pace and at times accuracy of models used, particularly at the outset of pandemics.(16)

Finally, related to new flows of evidence, one single study identified the lack of social sciences integration in the evidence ecosystem supporting pandemic preparedness as compared to basic science disciplines.(17)

Key findings from jurisdictional scan

Key findings from national pandemic preparedness plans

We identified 30 pandemic preparedness plans and related documents across the 13 jurisdictions (Australia, Canada, France, Germany, Italy, Hong Kong, Japan, Netherlands, Norway, New Zealand, Switzerland, United Kingdom, and the United States). In addition to the pandemic preparedness plans, we identified some reports that spoke to lessons learned and evaluations from Auditor Generals, government departments, and commissions. Overall, the documents were published from 2005 to 2024. Generally, across all the plans, the jurisdictions described activities that support the integration of evidence. However, there was limited publicly available information about how these activities would be implemented (i.e., the actual processes to support the flows of existing and new evidence).

Connections to advisory and decision-making processes and/or learning and improvement platforms

We identified some mentions of connections between advisory and decision-making processes and mechanisms to support evidence-informed decisions. In Canada, the Report of the Expert Panel for the Review of the Federal Approach to Pandemic Science Advice and Research Coordination identified that although the Canadian government was able to quickly stand up scientific advisory structures, their lack of coordination and limited clarity in mandate, organizational support and work patterns led to challenges in receiving and using the advice emerging from these committees. Embedding multidiscplinarity in advisor and decision-making bodies was also an included recommendation in a report authored by Canada's Chief Science Advisor - Strengthening the Use of Science for Emergency Management in Canada. The German Robert Koch Institute's Influenza Pandemic Preparedness Plan describes an advisory board on influenza to inform its preparedness plan development. In Hong Kong, its various Scientific Committees under the Centre for Health Protection review and recommend evidence on the effectiveness of public-health control measures as part of its Preparedness and Response Plan for Influenza Pandemic. Meanwhile, there are recommendations to establish such connections in other jurisdictions. In Australia, its COVID-19 Response Inquiry recommended establishing a Centre for Disease Control that can support government decisions on pandemic-related research priorities and research funding calls . In Norway, recommendations were made to the parliament to put in place an advisory expert committee as part of its Health Emergency Preparedness Council. In the U.K., the Scientific Advisory Group for Emergencies is convened to provide independent scientific advice to Cabinet.

Governance of pandemic preparedness plans

Some jurisdictions described ***membership of governance bodies on processes and mechanisms to support evidence-informed decisions with interdisciplinary perspectives, subject-matter expertise, and evidence-methods expertise***. In Australia, its inquiry into the government's COVID-19 response recommended establishing a Centre for Disease Control that is to be advised by a council with expertise in pandemic response, communicable disease epidemiology, behavioural insights and priority cohorts, international representation, adaptability to dynamic risk environments, and knowledge of industry stakeholders' interests. In Canada, the Report of the Expert Panel for the Review of the Federal Approach to Pandemic Science Advice and Research Coordination noted considerable duplication of experts across federal advisory bodies and commented that select bodies lack sufficient diversity and breadth of expertise, namely in relation to Indigenous health, behavioural sciences and health equity. Hong Kong's COVID-19 response included interdisciplinary expertise, such as epidemiology, paediatrics, geriatrics and pharmacology, in its scientific-advisory process on vaccinations. Other jurisdictions discussed interdisciplinary governance through the One Health approach. In France, the former scientific council was replaced by a committee for monitoring and anticipating health risks with the objective of maintaining a more independent and transparent multidisciplinary scientific advisory committee and to provide an integrated approach to health. The committee includes expertise from a wide range of fields including human health, animal health and environmental sectors as well as three civil society representatives. In Germany, The Robert Koch Institute's 2025 plan mentions adopting a One Health perspective (i.e., perspective that recognizes that the health of people, animals and the environment are interconnected) through interdisciplinary cooperation with veterinary medicine and environmental public health. In addition, the German Epidemic Preparedness Team has cross-sectoral expertise that supports its pandemic preparedness and response efforts internationally. Similarly, the UK Health Security Agency's science strategy mentions adopting a One Health approach that entails collaborating with content experts from its National Health Services and universities. However, we identified limited mentions of the inclusion of lived experience in governance bodies beyond the example from France and the UK Health Security Agency's science strategy that discusses engaging patients and community groups while emphasizing considerations for high-risk populations. In addition, the Scientific Advisory Group for Emergencies in the U.K. established ten expert committees that incorporate interdisciplinary perspectives and subject matter expertise, however additional considerations were not clearly listed.

We identified some mentions of ***secretariat support with documented capacity for evidence coordination and support*** in the U.S. Additionally, the US Homeland Security Council's National Strategy for Pandemic Influenza Implementation Plan documents the responsibility of the Secretary of Health and Human Services in coordinating the pandemic public-health response, including epidemiological and other pandemic-response research functions. Meanwhile, the National Institute of Allergy and Infectious Diseases Pandemic Preparedness Plan mentions leveraging a dedicated coordination team that allocates resources to ensure adequate coverage of scientific gaps.

We identified mentions of ***mechanisms to enable domestic and global data and evidence sharing*** in many jurisdictions, ranging from recommendations to more formalized mechanisms, including:

- the Canadian Report of the Expert Panel for the Review of the Federal Approach to Pandemic Science Advice and Research Coordination noted the ability to collect and share timely data within the country was a considerable short-fall of the pandemic response and ensuring a focus on establishing interoperable and sustainable data infrastructure should be a priority moving forward
- the German Robert Koch Institute's 2025 plan mentions targeted initiatives to promote knowledge sharing and transfer, including building a network of national and international academic institutions and stakeholders to facilitate data sharing
- documents from Norway mention investments in digital platforms to support data sharing, in addition to recommendations to parliament to establish data-linking systems and to share data internationally
- the UK Health Security Agency's science strategy mentions domestic and international data sharing as part of its broader data capabilities, including facilitating knowledge transfer among researchers through a central data and analytics platform

- in the US, there are plans to:
  - link data across jurisdictions through interoperable data infrastructure are mentioned in the White House National COVID-19 Preparedness Plan *(link has since been removed and is no longer active)*
  - collaboratively track health data in high-risk settings among various domestic entities
  - create platforms for data sharing to inform pandemic planning and responses as key actions to strengthen scientific infrastructure through the Pandemic Influenza Plan from the Department of Health and Human Services
  - enable 'maximal sharing' of scientific information between public, scientific, and private entities, as emphasized through the National Strategy for Pandemic Influenza from the Homeland Security Council.

All of the jurisdictions briefly mentioned some level of ***collaboration with other levels of government and governance, both domestically and globally***. However, there were some key examples of recommendations for mechanisms to enable collaboration (including the use of a One Health approach). These include:

- plans within France's global health strategy 2023-2027 to support bilateral and multilateral projects and initiatives aimed at improving global and regional pandemic preparedness including through the International Association of National Public Health Institutes and Team Europe Initiative
- fostering a strong network of national and international stakeholders (including academic institutions), developing an interdepartmental working group to coordinate healthy aging and monitor demographic changes when considering the development of health policy recommendations, and establishing new organizational structures as highlighted by the 2025 plan by the Robert Koch Institute in Germany and Japan's plan for pandemic influenza and new infectious diseases from 2013
- developing connections with across sectors focused on supporting pandemic prevention and early detection as part of a regional and international cooperation network like the German Epidemic Preparedness Team
- being involved in WHO efforts as Member States that are committed to strengthening regional, national, and global capacities to help the international community be better prepared for future health crises and respond to emerging pandemics
- fostering a One Health approach by leveraging interdisciplinary collaboration with content experts (e.g., veterinary medicine and environmental public health) as recommended by the U.K. Health Security Agency, Germany's Robert Koch Institute, Netherlands Organisation for Health Research (ERRAZE@WUR), France's global health plan for 2023-2027, and Public Health Agency of Canada's departmental plan from 2024.
- utilizing dedicated preparedness coordination teams to ensure adequate allocation of resources to cover scientific gaps while collaborating with other federal agencies, academic institutions, and the private sector as described the U.S. pandemic influenza plan from 2017, Homeland Security Council National Strategy for Pandemic Influenza and Implementation Plan, and the National Institute of Allergy and Infectious Diseases Pandemic Preparedness Plan.

Knowledge-management systems (i.e., platforms that help to store, organize and retrieve research evidence and other knowledge) ***to enable evidence support*** were mentioned briefly in some of the jurisdictions. For example, the development of a national repository of evidence with relevant data linkages was recommended by the independent inquiry on Australia's government response to COVID-19. Similarly, recommendations provided to Norway's parliament include to establish knowledge platforms and ensure appropriate data linkages to allow for access to relevant information across the platforms. The U.S. National COVID-19 Preparedness Plan stated that the Administration planned to strengthen data infrastructure and interoperability to facilitate data linking across jurisdictions. Finally, the U.K. Health Security Agency 10-year science strategy includes establishing a central data and analytics platform for improved knowledge transfer among scientists and researchers.

Some jurisdictions describe having an ***explicit plan for how evidence supports will pivot/ramp up alongside a pandemic***. Recommendations to the Norwegian government included the development of an explicit plan for how data analysis capacity should ramp up during a pandemic. The mechanisms for how this will be implemented were not reported in detail. In the independent inquiry on Australia's government response to COVID-19, recommendations to government included to curate evidence tools that can be rapidly adapted to specific pandemic threats. Additionally,

according to Australia's Health Management Plan for Pandemic Influenza, the federal government will commission research to determine the effectiveness of public-health measures which will inform the decisions of different levels of governments and any updates to pandemic plans. The U.S. National COVID-19 Preparedness Plan reported that they adapted a playbook at the time of the pandemic, which rapidly evaluated the impact of new variants on the effectiveness of vaccines, tests, and treatments. The report notes that this evidence was used to inform clinical and public guidance. Further, the U.S. pandemic influenza plan from 2017 reported that their scientific preparedness infrastructure would involve developing a preparedness framework with the ability to integrate scientific research into public health practice while aligning the two, respond to immediate questions of decision-makers during a pandemic based on the best available evidence.

Funding for research and evidence support

Relatively few countries directly addressed funding for research in their pandemic preparedness plans. In many instances broad terms were used such as invest in or build research hubs, however no funding amount or dedicated funding stream was described. A few outliers to this are Australia, Canada, France and Italy.

Pandemic preparedness plans from Australia, Canada and Italy all addressed core (non-emergency) funding for research and evidence support. In Australia, the Health Management Plan for Pandemic Influenza describes that a process is in place to facilitate rapid and directed research funding during a pandemic, however details of where this money comes from and to whom it is directed are not provided. In Canada, the Public Health Agency of Canada's COVID-19 response lessons learned report highlighted the rapid investments made in new scientific collaborations including for modelling, behavioural sciences and evidence syntheses. The report indicated that this was foundational to the emergency response and suggested that moving forward it be built into emergency planning. Further, the Report of the Expert Panel for the Review of the Federal Approach to Pandemic Science Advice and Research Coordination identifies the need for Canada to increase it's overall investment in scientific research and trainees to ensure sustained expertise.

The Canadian Institutes of Health Research has allocated core funds through the new Centre for Research on Pandemic Preparedness and Health Emergencies to strengthen the health emergency research system and its outputs. In addition, the Report of the Expert Panel for the Review of the Federal Approach to Pandemic Science Advice and Research Coordination noted that while new surveillance networks were funded during the pandemic, many have not received long-term funding and are at risk of not being sustained.

In Italy, the national recovery and resilience plan briefly describes research funding for improving the innovation, research and digitization of the national health service, however specific information regarding dollar amounts or how this funding will flow were not provided.

France's global health strategy 2023-2027 notes its intention to financially contribute to global networks including by financing of pandemic prevention, preparedness and response via the Financial Intermediary Fund for Pandemic Prevention Preparedness and Response hosted by the World Bank

Activities described within the pandemic preparedness plans that support the integration of evidence

Only one document briefly described ***processes on how to prioritize new research or for evidence support***. Italy's preparedness plan for influenza outbreaks describes using structured frameworks for priority setting and evidence commissioning (i.e., systematic reviews, risk modelling and technology assessments). We did not identify any jurisdiction that described their processes, standards, and reporting for determining who requested or commissioned to provide evidence support or produce new flows of evidence. However, in the U.S., a learning agenda question dashboard (*link has been deactivated and is no longer accessible)* has been created which compiles all the questions of government departments in a one-stop shop to identify what priorities are need of an evidence response.

Some of the jurisdictions described ***capacity building activities that enabled the use of evidence in decision-making processes***. For example, in the Public Health Agency of Canada's "COVID-19 Response Lessons Learned" report, it was noted that scientific capacity, collaboration, and evidence-based decision making was strengthened by several activities such as rapid investments, implementation of new scientific governance, and the coordination of evidence syntheses and mobilization activities (including 62 unique evidence syntheses produced by COVID-END and other evidence producers and 15 expert consultations and engagements).The report indicated that the rapid availability, contextualization and mobilization of scientific evidence was foundational and should be built into emergency planning, indicating an opportunity to formalize and build upon these mechanisms. Further, an evaluation of the Canadian National Collaborating Centres for Public Health describes their critical role in capacity building to support evidence in decision-making processes both in general and specific to COVID-19, including adapting and producing publications, frameworks and guidance to meet the Canadian context and support an equity-driven approach to the pandemic response.

Further, the Canadian government's Centre for Research on Pandemic Preparedness and Health Emergencies (within the Canadian Institutes for Health Research - CIHR) aims to strengthen coordination and capacity of health emergency research system through capacity building, as well as through other activities such as collaborative leadership, knowledge mobilization, and continuous improvement at CIHR (using new methods, tools and data analytics). The U.S. Department of Health and Human Services Pandemic Influenza Plan from 2017 noted that they aimed to ensure capacity for clinical, behavioural and epidemiological research that provided evidence to inform pandemic planning. Specifically, they aimed to enable scientists to quickly collect, analyze, and share time-sensitive data in response to immediate questions of decision-makers during a pandemic. Besides the mention of training, other activities related to capacity building were not reported in detail. Finally, Japan's national action plan for pandemic influenza and new infectious diseases recommended that the government develop ways to train experts and local governments to conduct epidemiological surveys and diagnostic tests quickly.

Specific enablers for the use of evidence in decision-making were identified not explicitly as part of the U.S.'s response to COVID-19 but in activities that occurred shortly following. In January 2022, the Memorandum on Restoring Trust in Government through Scientific Integrity and Evidence-based Policymaking (*link is no longer active)* was signed and included a wide range of enablers to support the use of evidence in decision-making. Examples included:

- the requirement that federal agencies publish learning agendas as part of their strategic plans
- explicitly pairing interested research with federal agencies to answer questions capture in their learning agendas
- rechartering of the Social and Behavioural Sciences subcommittee, which is responsible for assessing, recommending and extending the use of social and behavioural insights in government.

Though we did not identify jurisdictions that explicitly state their ***standards or requirements for transparency in how evidence is used to inform recommendations and decisions***, the U.K. Scientific Advisory Group for Emergencies published a list of scientific papers and other types of evidence supporting response decisions alongside meeting minutes for the advisory groups meeting with Cabinet. In addition, some jurisdictions mentioned the need for developing communication strategies to enhance public trust, Italy's preparedness plan for influenza outbreaks was the only plan to clearly state that their evidence-based decisions, recommendations, and scientific rationale will be clearly documented and shared, which will be accessible to stakeholders and the public.

Some of the jurisdictions described their ***processes and mechanisms to access timely, demand-driven evidence support*** (i.e., using existing flows of evidence) to inform pandemic preparedness planning and response, however most of them were described using broad terms. The majority of the pandemic preparedness plans describe the use of data analytics, modelling, behavioural research, qualitative insights, evidence syntheses, and existing guidance. For example, Public Health Agency of Canada's 2024-2025 departmental plan aims to develop guidelines and incorporate lessons learned from the Canadian Pandemic Influenza Preparedness to inform the development of a Canadian

Pandemic Preparedness Plan, and address recommendations from the Public Health Intelligence Network and the Auditor General on pandemic preparedness. The older pandemic influenza preparedness plans in Canada from 2015 and 2018 stated that it was important to develop rapid research response (e.g., seroprevalence studies), conduct knowledge translation, prepare pandemic planning scenarios, and use of risk management that support evidence-informed decision-making. Further, Netherland's National Institute for Public Health and the Environment (RIVM), is described as acting as a knowledge broker among government, professionals in the field and experts abroad to identify and transfer knowledge required by policymakers. Australia describes researching existing pandemic influenza management strategies to inform their preparedness activities. New Zealand's 2024 pandemic plan indicated that the government expects to use global epidemiological trends, modelling, and international experience to inform their approaches. Norway used evidence generated from Imperial College and from other Scandinavian countries to inform decisions in the first few weeks and months of the COVID-19 pandemic. However, there is no mention of how this organization was chosen to provide modelling and data support. According to the 2021 report on their 10-year science strategy, the UK Health Security Agency intends to establish evidence hubs on health security and reinforce partnerships with the National Institute for Health and Care Research (NIHR) Health Protection Research Units, which could be poised to provide evidence support. Finally, the U.S. National COVID-19 preparedness plan reported that they aimed to make investments to use both quantitative and qualitative data to understand health outcomes, response and intervention effectiveness, and health equity. Apart from generic statements about international comparisons, there were limited to no information about how other forms of information are used, particularly Indigenous Ways of Knowing.

Some jurisdictions provided recommendations of ***mechanisms for streamlined approval, regulatory and ethics processes***. In Australia, its inquiry into the government's COVID-19 response recommended establishing a Centre for Disease Control that can curate evidence tools that can provide a "running start" to pandemic risk-assessments (e.g., protocols and pre-agreements with clinical partners for rapid standing up of clinical trials and first case cohort studies). In Canada, the Accelerating Clinical Trials consortium was funded in 2022 to help facilitate conducting clinical trials including setting up and running a sustainable pan-Canadian, distributive, single research ethics board review and approval process for high-impact multicentre trials. The Coronavirus Commission in Norway recommended changes to the Health Research Act that exempts pure register studies for approval, as well as providing the Regional Committees for Medical and Health Research Ethics with the opportunity to grant exemptions from the requirement for consent from research participants if there is no risk to harm. In the United Kingdom's pandemic preparedness plans, one of the recommendations was to draft the Pandemic Influenza Bill which establishes processes to be used in the case of future pandemic events to allow for necessary legislation to be streamlined and pass rapidly. The U.S. Department of Health and Human Services Pandemic Influenza Plan from 2017 reported the creation of validated tools to facilitate the initiation of scientific response, including pre-approved protocols for clinical trials of multiple interventions and pre-agreements with clinicals networks for clinical evaluation of medical countermeasures. Further, they indicated the need for enhancing clinical trial evaluation networks, regulatory processes, databases and systems for rapid evaluation of safety and effectiveness of multiple interventions. Similarly, Australia's independent inquiry into their COVID-19 response, the report recommended curating evidence tools in advance for pandemic preparedness, including protocols and pre-agreements with clinical partners to set up clinical trial platforms, case cohort studies, and a collection of statistical models for rapid adaptation to specific pandemic threats.

Majority of the jurisdictions described the need for developing or strengthening real-time digital surveillance systems and tools to ***access flows of new research evidence to inform planning and policy in public health***, however other forms of evidence were also noted. These include:

- The independent inquiry into Australia's COVID-19 response recommended that the government establish a national repository of evidence, use behavioural insights, conduct real-time collection, analysis and synthesis of evidence through a nationally coordinated approach, and an evidence strategy to inform this process
- the Public Health Agency of Canada described the addition of policy development and modelling teams, as well as the establishment of a behavioural science office

- the 2025 plan by the Robert Koch Institute in Germany calls for investments in IT infrastructure and artificial intelligence to advance digital epidemiology by collecting and using data in real-time to detect, evaluate and respond to emerging health threats
- Hong Kong's Preparedness and Response Plan for Novel Infectious Disease of Public Health Significance from 2024 and Preparedness and Response Plan for Influenza Pandemic from 2014 explain that risk assessments (e.g., epidemiological surveillance data) will be reviewed by the government periodically to inform appropriate responses and measures
- Italy's preparedness plan for influenza outbreaks from 2021 aim to establish real-time surveillance systems and tools to monitor outbreaks (i.e., simulation exercises and epidemiological/virological studies), use "After Action Reviews" post-pandemic to gather lessons learned, and conduct periodic evaluations during inter-pandemic periods
- Japan's 2013 action plan for pandemic influenza and new infectious diseases indicated that they will cooperate with the WHO and other entities to develop a national surveillance system (including the National Institute of Infectious Diseases, Hokkaido University's OIE reference laboratory, ministries within the government)
- the Ministry of Health and Health New Zealand's 2024 plan indicates the intention to work with other agencies to collect and analyse data, which includes ensuring surveillance systems are fit for purpose and processes are in place to obtain intelligence to monitor the international and domestic situation
- Norway's Coronavirus Commission report from 2021 describe the need for integrating real-time data from the infection disease reporting system with municipal data systems, the national vaccination registery, and electronic patient records
- The UK Health Security Agency's 10-year science strategy from 2021 indicated that they will strengthen genomics surveillance and artificial intelligence efforts to enable detection, evaluation, and response (e.g., advanced modelling capabilities, access to data through secure systems, investments in laboratory-based services, and data-enabled research platforms and technologies), and make investments in behavioural, social, and implementation science.

Outcomes identified from pandemic preparedness and related plans

We could not identify outcomes from the majority of the pandemic preparedness plans across the jurisdictions. However, we found some evaluation reports from Auditor Generals and commissions, such as:

- the 2021 Auditor General of Canada report about the pandemic preparedness, surveillance and border control measures for the COVID-19 pandemic, which indicated that while the Public Health Agency of Canada prepared plans and national guidance, it did not complete a planned testing exercise, update their plans and guidance, and did not address the shortcomings in health surveillance information that impeded effective exchange of health data between agencies and provinces.
- a 2014 evaluation of the Pandemic Preparedness Strategic Research Initiative indicated that the Government of Canada allocated $422 million in funding to support preparedness for avian and pandemic influenza, including $21.5 million for pandemic influenza research
    - The report found that new knowledge was generated, contributed to building capacity and pandemic response systems at organizations such as the Bill and Melinda Gates Foundation, Public Health Agency of Canada, World Health Organization and the Ontario Health Plan for an Influenza Pandemic, and research findings were adopted by health professional regulatory bodies in Ontario and Nova Scotia
- the coronavirus commission for Norway identified that insufficient information flow between digital platforms during the pandemic was found to contribute to additional work, duplication and manual processing of data, and that this led to recommendations for parliament on how to improve the integration of data, particularly between different levels of governance (e.g., national vs municipal)
- in the U.S. National COVID-19 Preparedness Plan (*links is no longer active)*, the collection of equity data informed equity-driven decision-making on delivering vaccines and treatments
- Australia's independent inquiry into their COVID-19 response reported that while they had an existing pandemic preparedness plan, the country was not adequately prepared for a pandemic, and disclosed that they had had no playbook on what actions to take in a pandemic, no regular testing of systems and processes, unclear leadership

roles, no arrangements on sharing resources and data, and no discussion on who was best placed to communicate to the public.

Key findings from international and multinational pandemic preparedness plans

We identified 17 documents that spoke to pandemic preparedness planning from five international/multi-national organizations, namely the African Centre for Disease Control, the European Centre for Disease Control, the Pan-American Health Organization, the World Health Organization's Regional Office for Europe, and the World Health Organization (central/headquarters). While most of the included documents were recently published (in the last three years) and included lessons from the COVID-19 pandemic, we did include select pandemic preparedness plans from 2018 to act as a comparison to the content included in recently updated strategy documents. The included documents cover pandemics and epidemics in general, as well as for specific conditions, namely COVID-19, mpox and influenza.

As compared to the national pandemic preparedness plans there was less emphasis on ***connections between evidence and science directly to advisory and decision-making processes or governance structures*** related to decision-making. Notable examples however, include the mention of the Incidence Management Team working within the African Centre for Disease Control (described in the coordinated research roadmap for the mpox virus), which plays a role in evidence coordination, unifying research initiatives and ensuring the use of evidence in pandemic response across the continent as well as the mention in the European Centre for Disease Control's framework for strengthening, developing and implementing a One health approach to communicable diseases of developing standard operating procedures for providing scientific advice.

Across the identified plans, we found a significant focus on the following areas (with key insights from plans profiled in the sections below):

- mechanisms to enable domestic and global data and evidence sharing
- knowledge-management systems to enable evidence support
- core (non-emergency) funding for research and evidence support
- time-limited and/or flexible funding arrangements with a plan for how it pivots/ramps up alongside a pandemic
- priority setting processes for new research
- capacity building to enable the use of evidence in decision-making processes
- mechanisms for streamlined approval, regulatory and ethics processes
- processes and mechanisms to access flows of new research evidence needed to inform planning and policy in public health.

Across plans from all five international/multinational organizations there were consistent mentions ***mechanisms to enable domestic and global data and evidence sharing***. In particular, highlighting the importance of surveillance systems producing high-quality data that could be shared across member states and used by international/ multinational organizations to produce modelling and forecasting analyses. Examples include:

- a section from the World Health Organization Regional Office for Europe's Preparedness 2.0 report on collaborative surveillance and how member states can contribute
- the European Centre for Disease Control's capacity building initiatives for stronger surveillance systems as part of the 2024-26 workplan, which emphasizes the importance of data sharing across European countries
- a strategic framework from the African Centre for Disease Control on strengthening cross-border surveillance and information sharing, which provides guidance and proposed interventions that member states can consider adopting to enable cross-border surveillance and information sharing (e.g., standardized data collection and reporting protocols, establishing data sharing agreements, ensuring harmonization and interoperability of reporting tools, and the integration of operational research into surveillance, preparedness and response to inform policy)

- the African Centre for Disease Control mpox preparedness and response plan which includes the implementation of a robust data-sharing framework to ensure timely dissemination of research findings across the continent and notes that it must be linked to national public health strategies and policy decisions
- a recommendation from the World Health Organizations report on sustaining gains made during the COVID-19 pandemic to integrate COVID-19 data into existing respiratory diseases surveillance activities such as the Global Influenza Surveillance and Response System and the Global Coronavirus Laboratory Network.

However, other approaches to evidence sharing were also noted including WHO's BioHub system (for sharing biological specimens), networks for particular types of evidence (e.g., modelling) and communities of practice for knowledge sharing. The World Health Organization's Regional Office for Europe's implementation guide for Preparedness 2.0 also notes a number of other knowledge management systems or networks, including:

- behavioural, environmental, social and systems interventions for pandemic preparedness
- COHESIVE information system (an open-source database that integrates pathogen information)
- A case study compendia for risk communication, community engagement and infodemic management
- Knowledge and information management emergency platform for emergency medical teams.

Examples were also provided of ***knowledge-management systems that could be used to enable evidence support*** such as the European Centre for Disease Control's Scientific Advice Repository and Management System or the Public Health and Social Measures knowledge hub run by WHO. Further, the European Centre for Disease Control's workplan for 2024-2026 notes the intention to develop additional information and management systems to improve access and flows of evidence.

We identified relatively few mentions of specific flows of both ***core (non-emergency) funding and time-limited and/or flexible funding arrangements***, however documents did note the importance of sustaining and continuing to invest in research that addresses the critical unknowns, such as those related to potential epidemic and pandemic pathogens and the need to establish contingency budgets to rapidly secure flexible funding that can be used in times of crisis. In addition, the mpox preparedness and response plan from the African Centre for Disease Control notes the need to mobilize resources to accelerate operational and clinical research to enhance the response, though specifics of this funding were not included. The European Centre for Disease Control as part of its work plan for 2024-2026 is allocating EUR 8.4 million to supporting the development of pandemic preparedness plans across the Union and an additional EUR 16 million to evidence-informed decision-making information and recommendations including strengthening surveillance analysis, scientific advice and intelligence activities.

Related to ***priority setting processes for new research or the focus of evidence-support processes***, the African CDC Strategic Plan for 2023-2027 included in the section related to strengthening public-health research and innovation, the intention to develop a research prioritization framework across member states, as well as a set of public research priorities on pandemic preparedness. Though we were unable to identify the framework, we did identify the mpox pandemic preparedness and response plan and a roadmap for coordinating immediate research related to mpox, which clearly outlines a set of research priorities emerging from of three deliberative discussions with representatives from across the 22 member states. Other examples include:

- the World Health Organization R&D Blueprint, which provides a regularly updated list of priority pathogens for priority research and development to tackle emerging disease threats
- the development of One Health research priorities by the European Centre for Disease Control
- within the World Health Organizations mpox preparedness plan notes the establishment of a global coordination mechanism through the Global Research Collaboration for Infectious Disease Preparedness to streamline efforts for research on priority areas and prevent duplication in research evidence
- the Global Research Collaboration for Infectious Disease Preparedness, which is a coalition of research funders that to promote cooperation in investing in priority pandemic related research.

Capacity building to enable the use of evidence in decision-making processes were broadly mentioned in the included documents, however, they were frequently related to capacity building within countries for the production of specific forms of evidence (e.g., data analytics and modelling), particularly in low and middle income countries and frequently related to capacity building and strengthening domestic surveillance systems, conducting risk assessments, and developing guidance rather than capacity building among decision-makers to use evidence. However, one document from the WHO Regional Office for Europe provides an implementation guide for the latest health emergency preparedness, response and resilience plan that brings together all the tools, frameworks and products that may be needed by actors in Member States to implement the plans within Preparedness 2.0, including for decision-makers. In addition, the African CDC Strategic Plan for 2023-2027 notes the intention to provide technical assistance to decision-makers for the use of evidence in decision-making processes in African countries.

A number of the documents emphasize the potential for ***streamlining of ethics and regulations to allow for faster flows of new evidence when needed***. In particular, the African Centre for Disease Control mpox preparedness and response plan highlights the need to launch rapid research efforts and the use of cooperative/joint regulatory reviews. In addition, the Pan-American Health Organization report on catalysing ethical research in emergencies describes the use of streamlined ethics and regulatory reviews during health emergencies.

Finally, there were no mentions of ***evidence support (or better using existing forms of evidence to rapidly answer questions from decision-makers)***, apart from suggesting the use of the existing knowledge management systems, in the included documents, and while the need for new flows of evidence (e.g., evaluations, data analytics, behavioural and implementation research) are noted in the included documents, there are no mentions of where this evidence comes from, other than the occasional mention of national public-health agencies or national surveillance systems run by national public health agencies.

Next steps based on the identified evidence

The critical next step based on what was identified through the rapid evidence profile is the need for explicit descriptions of the processes and mechanisms that are expected to enable evidence-informed decisions within pandemic preparedness plans, including how evidence is commissioned, who is expected to provide it, and what processes are used to ensure its use in policy decisions. This transparency could support future assessments about the processes and mechanisms and the extent to which they enable evidence-informed decision-making and improve public trust. Further, it is critical to consider the role of robust health research systems and learn from experiences of where they supported a strong pandemic response and how they continue to support pandemic preparedness.

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This rapid evidence profile was funded by the Public Health Agency of Canada. The McMaster Health Forum receives both financial and in-kind support from McMaster University. The views expressed in the rapid evidence profile are the views of the authors and should not be taken to represent the views of the Public Health Agency of Canada or McMaster University.

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