Report of the WHO global technical consultation on public health and social measures during health emergencies

Online meeting
31 August to 2 September 2021
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This report was drafted by Victoria Haldane and Ramona Ludolph.
Executive summary

Public health and social measures (PHSM) include nonpharmaceutical individual and societal interventions to reduce or halt the transmission of an infectious disease. Despite widespread application of PHSM during the coronavirus disease (COVID-19) pandemic, there is much to learn about the use, implementation and effectiveness of such measures. This consultation was the first in a series of consultations for the larger World Health Organization (WHO) initiative measuring the effectiveness and impact of PHSM during health emergencies.

This global technical consultation aimed to learn from experiences with implementing PHSM during the COVID-19 pandemic, and to identify needs and next steps for systematic and comparable evidence generation on PHSM during future health emergencies. The consultation brought together 101 global experts across research and policy. Participants participated in group reflections and were also divided into two streams (methods and policy) for presentations and smaller discussions.

The first day reviewed the evidence on and experiences of PHSM during the COVID-19 pandemic. Group discussions highlighted the need to invest in and build capacity for local data collection on PHSM. It was acknowledged that the window for prospective research in this pandemic is closing and we must plan for the future. Methodological development can begin in periods between pandemics, to strengthen emergency preparedness. PHSM implementation must engage with complexity including the influence of contextual factors on uptake and acceptance. Ongoing multisectoral and community collaboration should be supported before, during and after emergencies for rapid mobilization.

The second day discussed challenges and solutions when evaluating and implementing PHSM. There is a need for a shared set of principles guiding PHSM research. Rapid and robust evidence synthesis is crucial during emergencies. Measuring PHSM requires approaches using multiple methods, including randomized controlled trials (RCTs) and standardized observational designs, to enable replication across contexts. Ethical approval processes that can duly consider and expedite research activities are necessary during emergencies. Structured participatory research approaches that involve decision-makers early and often can support the generation of actionable policy-relevant evidence. Knowledge translation is key, with researchers playing an important role in bringing together available evidence and communicating it to different audiences. Reflections on COVID-19 in Cox’s Bazar Refugee Camp highlighted the importance of community-based PHSM implementation in the humanitarian context.

The final day explored the guidance, tools and mechanisms needed to improve the PHSM evidence base for future decision-making. Group discussions began the conversation towards developing a PHSM research agenda. Successful implementation and evaluation of PHSM requires global multidisciplinary teams from research and policy. Diverse study designs are needed to generate robust, meaningful and rapid evidence. Standards, protocols, tools and common indicators for PHSM research can help in conducting methodologically sound research during emergencies that is comparable across contexts. The closing plenary emphasized the importance of identifying lessons learned from implementation and the need to examine the ethical considerations related to PHSM.

Next steps include developing a global PHSM research agenda, mapping and reviewing global evidence and analysing country experiences, and developing a global PHSM monitoring system to generate data for action.
Background

There are different approaches to reducing or stopping the spread of a pathogen during an epidemic or pandemic. Public health and social measures (PHSM) include individual actions (e.g. mask wearing and physical distancing) and measures that institutions, communities, local and national governments and international bodies can enact (e.g. closing schools, restricting public gatherings and limiting travel). By preventing infections, PHSM reduce the pressure on the health care system and support the continuation of essential services and businesses. Because PHSM are readily scaleable, they buy time for the development and dissemination of treatments and vaccines, especially in the beginning of a new outbreak.

In response to the coronavirus disease (COVID-19) pandemic, PHSM have been applied at an unprecedented scale and timespan globally. Despite their widespread application during the pandemic, there is a need to better understand PHSM across multiple dimensions:

- How do we evaluate the implementation and effectiveness of PHSM?
- How do we measure the social, health and economic consequences of PHSM, both intended and unintended?
- What methods can we use to answer complex questions about what PHSM should be introduced, in what combination, at what time and for how long?

Developing robust methods for evaluating the effectiveness and impact of PHSM is crucial to emergency preparedness and response. Insights on PHSM can enhance evidence-based decision-making on the implementation, combination and easing of PHSM before, during and after emergencies.
The WHO initiative to measure the effectiveness and impact of PHSM

During the COVID-19 pandemic, the World Health Organization (WHO) has contributed to international coordination and cooperation in clinical research. Examples include the WHO Solidarity clinical trial for COVID-19 treatments¹ and the UNITY research protocols.² Undertaking similar coordination for PHSM is of key interest to WHO and its Member States, both during the ongoing crisis and as a key pillar for global emergency preparedness.

This consultation was the first in a series of consultations for the larger WHO initiative on measuring the effectiveness and impact of PHSM during health emergencies. The initiative, launched in June 2021, aims at strengthening the global evidence base to provide actionable and evidence-informed guidance on such measures for decision-makers. The initiative will consider the societal impact of PHSM and apply a multimethod and multidisciplinary approach.³

The annexes to this document provide:
- a list of participants (Annex 1);
- the agenda of the consultation (Annex 2); and
- background document including the draft research agenda – participants were given this document beforehand, and informed that they could comment on it at the consultation.

Aims and objectives of the consultation

This global technical consultation has two key aims:
- to learn from experiences with implementing PHSM during the COVID-19 pandemic; and
- to identify needs and next steps for systematic and comparable evidence generation on PHSM during future health emergencies.

Specific objectives include:
- building a community of research and practice on PHSM with representatives from different sectors, professional backgrounds and geographic areas, to reflect the complex multidisciplinary and multisectoral nature of PHSM;
- compiling evidence on what is already known on the effectiveness and impact of PHSM;
- discussing methodological challenges and solutions to monitoring and evaluating PHSM from an interdisciplinary perspective;
- identifying global research needs to better understand and more efficiently implement PHSM during future emergencies; and
- discussing ethical and implementation considerations when applying and evaluating PHSM during health emergencies.

² See https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/early-investigations
Summary of presentations and discussions

The global technical consultation took place from 31 August to 2 September 2021, with a total of 101 global experts attending. Experts had extensive, multidisciplinary experience in implementing and evaluating PHSM, and they represented research, policy and practice. Participants included 67 external experts from 25 countries, 24 participants from WHO headquarters and 10 participants from WHO regional offices representing all six regions.

Themes guiding the 3 days of meetings were as follows:

- **Day 1**: Review of evidence on and experiences of PHSM during the COVID-19 pandemic.
- **Day 2**: Challenges and solutions when evaluating and implementing PHSM.
- **Day 3**: Guidance, tools and mechanisms needed to improve the PHSM evidence base for future decision-making.

Participants were divided into two streams for smaller group discussion. The methods stream explored methodologies and approaches for monitoring and evaluating PHSM. The policy stream explored implementation considerations and how to translate evidence into policy action.

### Day 1: Review of evidence on and experiences of PHSM during the COVID-19 pandemic

**Opening remarks and plenary session**

Facilitated by Dr Ramona Ludolph, High Impact Events Preparedness Unit, Epidemic and Pandemic Preparedness and Prevention, WHO

Dr Mike Ryan, Executive Director of the WHO Health Emergencies Programme, offered opening remarks underscoring the health, social and economic impact of PHSM on individuals and communities globally. Learning from PHSM implemented during the COVID-19 pandemic is crucial to ensure better pandemic preparedness and response. These learnings will chart an important course towards well-supported decision-making during emergencies.

Dr Sylvie Briand, Director of the WHO Department of Epidemic and Pandemic Preparedness and Prevention, welcomed the experts’ forthcoming feedback on PHSM. The term PHSM, in contrast to the previously used “nonpharmaceutical interventions” (NPIs), emphasizes the importance of these measures as complementary and key to pandemic response and management. The use and success of PHSM are closely linked to the unique contexts in which they are implemented. This uniqueness can make PHSM difficult to measure, implement and sustain. Despite these challenges, PHSM must be implemented and evaluated based on best available evidence.

Mr Tim Nguyen, Unit Head of the High Impact Events Preparedness Unit in the Epidemic and Pandemic Preparedness and Prevention Department, provided an overview of the need for further studies and evidence to measure PHSM effectiveness, impact, timing, setting and population of use. In doing so, he highlighted the imbalance in funding and research visibility of PHSM evaluation measures globally as compared with pharmaceutical research.
Plenary session – Implementation of PHSM in Singapore: challenges and opportunities for the future

Prof Vernon Lee, Senior Director for Communicable Diseases, Public Health Group, Ministry of Health, Singapore

Prof Lee reflected on Singapore’s experience in implementing PHSM. The session provided an overview of the four key foundations of the approach to COVID-19 in Singapore:

- preparedness;
- community surveillance;
- swift and decisive response that includes political will, a whole-of-society effort and multisectoral government collaboration; and
- clear communication, including interagency communication and public risk communication.

PHSM use in Singapore emphasized:

- minimizing the importation of cases through a risk-based and calibrated approach to border controls based on emerging and available evidence;
- early detection of cases through regular screening of target groups, asymptomatic persons around clusters and routine testing for at-risk personnel; these efforts are supported by active case finding, contact tracing, and epidemiological investigation supported by technology;
- containment through the piloting of home isolation of vaccinated cases and optimization of quarantine for close contacts;
- preventing spread by considering a spectrum of PHSM intensity (i.e. “the hammer versus the dance”); some interventions are perceived to be more suitable for long-term use in the Singaporean context (e.g. mask wearing, safe distancing and supports to work from home) whereas others are better for use in the short term or infrequently (e.g. lockdowns).

Lessons learned in Singapore include:

- the need to be adaptable and learning from experience;
- ensuring that response plans remain sustainable, with sufficient health care and surge capacity;
- ensuring transparency; and
- the need for a whole-of-society approach based on clear communication, to ensure that decision-makers have the full support of communities.
Methods stream

Session 1: Assessing the effectiveness and impact of PHSM

Facilitated by Dr Olivier le Polain, Health Emergency Information & Risk Assessment, Health Emergencies Programme, WHO

Presentation 1: Creating PHSM datasets: lessons learned from the WHO PHSM dataset

Dr. Chris Grundy, Department of Infectious Disease Epidemiology, London School of Hygiene & Tropical Medicine (LSHTM), United Kingdom of Great Britain and Northern Ireland

Dr. Grundy presented an overview of challenges and lessons learned from the collaborative process of creating the WHO PHSM dataset – a global database of PHSM applied during the COVID-19 pandemic. The aim is to collate PHSM data from other main trackers (Oxford University, the United States Centers for Disease Control and Prevention [CDC], ACAPS, Johns Hopkins University and the WHO Regional Office for Europe [EURO]), bringing them into a standard structure and coding them to a common taxonomy.

The key points were as follows:

- the collaborative approach used to define and develop the dataset allowed the group to see overlap between datasets;
- discussion and expert consultation are important in creating stable taxonomies for datasets during public health emergencies;
- measuring adherence is challenging – tracking what policies were adopted does not necessarily reflect enforcement, adherence or uptake of PHSM.

Key recommendations are to:

- build capacity for local data collection, collaborative collection of data and sharing of taxonomies;
- collect data that is fit for purpose by prioritizing simpler, more complete and consistent data, ensuring that global data reflect countries or “largest admin areas”; and
- ensure better planning, including creating advanced taxonomies and determining key variable lists before emergencies.

The main issues raised during the group discussion were as follows:

- local data collection efforts must be strengthened so that researchers can better understand uptake and adherence to measures;
- there is tension between simple, superficial data that can be consistently recorded over time, and locally collected, context-specific and more detailed data that are challenging to record over time; and
- datasets that purport to be global often lack global representation; hence, there is a need for investment, capacity-building and collaboration, particularly with researchers in low- and middle-income countries (LMICs), to build a truly global dataset.
Presentation 2: Nonpharmaceutical interventions: what have we learned from COVID-19 in China, Hong Kong Special Administrative Region (SAR)?

Dr Mario Martin-Sanchez, Lecturer, School of Public Health, The University of Hong Kong, China, Hong Kong SAR

Dr Martin-Sanchez presented a local example of lessons learned from implementing PHSM in China, Hong Kong SAR:

- assessing the effectiveness of individual measures is difficult when measures are implemented simultaneously and interact with each other (e.g. data show that high mask usage alone without complementary PHSM would not prevent community transmission in China, Hong Kong SAR); and
- the same measures may have different impacts, depending on the context and population response, and response fatigue needs to be considered as an explanatory factor.

The main issues raised during the group discussion were as follows:

- consider what can be learned both retrospectively and prospectively during a pandemic situation;
- it is important to account for context and effect modifiers across settings – replication of studies in multiple countries requires research infrastructure and support; and
- PHSM research can enable better preparation for outbreaks and pandemics by conducting formative work during seasonal outbreaks, to ensure that PHSM methods, protocols and processes can be rapidly operationalized and scaled during emergencies.

Methods stream – key messages from day 1

- New methodological approaches are required to measure the effectiveness of individual PHSM.
- PHSM tracking is prone to uncertainty owing to lack of official monitoring systems and discrepancies between measure recommendations and adherence.
- There is a need to strengthen local data collection mechanisms, particularly in LMICs, to improve data quality and comparability.
- Formative research and methodological development can begin in periods between epidemics or pandemics, to strengthen emergency preparedness.

Policy stream

Session 1: Implementing PHSM at different scales – learning from country experiences

Facilitated by Ms Sara Barragán Montes, Border Health, Global COVID-19 Response, Health Emergencies Programme, WHO
Prof Christos Hadjichristodoulou, Department of Clinical and Laboratory Research, University of Thessaly; EU HEALTHY GATEWAYS Joint Action Coordinator; WHO Collaborating Centre for Points of Entry

Prof Hadjichristodoulou provided an overview of the EU HEALTHY GATEWAYS Joint Action experience of moving PHSM policy into practice in the transport sector. The Joint Action aims to support cooperation and coordinated action among Member States, to improve their preparedness and response capacities at points of entry.

Strengths and lessons learned include the following:

- the rapid establishment of an ad hoc working group to proactively develop PHSM advice was strengthened through an embedded iterative process of feedback and dissemination to groups for consultation, review and updating;
- building on an established network of professionals with a history of collaboration and expertise allowed networks to activate quickly; and
- changes in advice may be warranted in light of uncertain and emerging evidence during the early stages of emergencies; communications strategies should mitigate confusion among stakeholders and the general public.
The main issues raised during the group discussion were as follows:

- evidence must be gathered about adverse or unintended effects of PHSM at borders;
- consistent communication about PHSM can create a cohesive social narrative across settings, including at borders and on transport; and
- a global mechanism or common approach to PHSM in the transport sector is needed and should include the multisectoral interests invested in border issues.

**Presentation 2: PHSM in COVID-19 response: the Nigerian story**

Dr Chinwe Lucia Ochu, Director, Prevention Programmes and Knowledge Management Department, Nigeria Centre for Disease Control

Dr Ochu provided a local example of PHSM implementation from Nigeria, where a multipronged approach has been used in the intergovernmental response to COVID-19.

Challenges, impacts and lessons learned from the Nigerian experience include the following:

- PHSM compliance was high during the first wave of COVID-19 but noncompliance increased in the second wave – public trust in governments and institutions is key to PHSM compliance;
- communicating risk in settings with fewer severe cases or less mortality is difficult when other infectious threats are perceived to pose a greater risk;
- best practices identified include:
  - review of PHSM based on evolving evidence and risk assessment;
  - epidemic intelligence, modelling and evidence synthesis;
  - engagement of trusted voices and opinion leaders;
  - adoption of a whole-of-society approach;
  - establishment of a multisectoral, multidisciplinary coordination platform using the incident management structure;
  - empowering subnational public health institutions to take ownership of the response;
  - extensive community engagement and partnerships based on a bottom to top risk communication strategy; and
  - a robust and strategic system for infodemic and rumour management.

The main issues raised during the group discussion included the following:

- risks and the need for PHSM may be perceived differently across populations, contexts and epidemiological situations, posing a challenge to risk communication;
- communications around PHSM are difficult to implement, considering that the evidence is rapidly evolving and can therefore appear to the public to be inconsistent over time; and
- barriers to PHSM understanding, acceptance and adherence are made more complex by the influence of political factors, mixed messaging and pandemic fatigue.
Policy stream - key messages from day 1

- Trusted relationships and multisectoral collaborations established ahead of an emergency facilitate a timely and coordinated response.
- PHSM uptake and acceptance are highly dependent on contextual factors, including trust in science and authorities.

Plenary session

Dr Camilla Stoltenberg, Director-General, Norwegian Institute of Public Health, Norway

Dr Stoltenberg reflected on the need for evidence on PHSM to inform advice and decisions on what measures to use, when and where. Thus far, PHSM have been implemented in ways that make measurement challenging, leading to uncertainties about the use and impact of PHSM. There is a need to chart a course towards better future decision-making, given the many outcomes of PHSM, including both intended and unintended consequences of PHSM that affect health, societies and economies.

Current research paradigms are not well equipped to measure and evaluate the effectiveness of PHSM. This includes government and public hesitancy or resistance towards experimental research studies (e.g. RCTs) conducted at the societal level during emergencies. When considering experimental designs, legal challenges around consent for participation in PHSM trials must be addressed. Additionally, there are challenges with observational data. We must better understand how to effectively and reliably use administrative datasets (where available) to inform policy decisions. WHO can play an important role in promoting the use and legitimacy of PHSM research methods.

Concluding reflections from the plenum

- Complexity arising from social and cultural differences should not be a deterrent to PHSM research. Researchers must unpack and examine complexity to strengthen preparedness and response activities.
- The window for prospective research in the COVID-19 pandemic is closing and we must plan for the future. Seasonal outbreaks can be leveraged to develop PHSM research methods that can be rapidly deployed during emergencies.
- Ethical considerations with experimental study designs must be considered during emergencies. Quasiexperimental designs should be assessed for use in PHSM research. Study replication is important to understand the contextualization of PHSM.
- The available data lack representation from marginalized groups – local data collection is crucial for shaping equitable responses. PHSM implementation must be built on good practices and partnerships, while also reaching excluded groups and communities.
- Knowledge translation is key to conducting community-engaged research; however, little is known about how to make community engagement a meaningful and safe experience, both culturally and physically.
Methods stream

Session 1: Choosing the appropriate study design

Prof Elie Akl, Department of Internal Medicine, Co-Director of the Center for Systematic Reviews of Health Policy and Systems Research, American University of Beirut

Prof Akl presented on choosing the appropriate study design for the evaluation of PHSM.

Key challenges to conducting research during health emergencies include:

- pressure from the political context to produce quick, policy-relevant results amid considerable uncertainty;
- a mismatch in expectations between evidence users (who want to know what interventions work) and evidence producers (where best practices may require individual interventions to be tested discretely, using experimental designs to measure effectiveness); and
- that emergencies pose unique challenges in acquiring appropriate funding, establishing research networks to design feasible policy-relevant studies and attending to the logistics of running studies.

Strategies to conducting robust PHSM research to guide decision-making during emergencies:

1. During the early phase of an emergency, extrapolate from indirect evidence and understand the effects, benefits and harms of interventions applied in other contexts:
   - Synthesize evidence quickly through up-to-date or “living” evidence synthesis for priority topics.
   - Establish a publicly available global repository of scientific articles to support evidence mapping and synthesis.

2. Prioritize research questions through a standardized process that involves stakeholders:
   - Use this process to inform decisions about which trials, studies or evidence syntheses are conducted.
   - A core set of outcomes, ideally predetermined before the emergency, could prioritize outcomes of interest.

3. Acknowledge the strengths, weaknesses and implications of study designs.
   - Improve the certainty of available evidence by using appropriate study designs.
   - Determine ways to design feasible and ethical RCTs during emergencies.
4. Consider a variety of research approaches and outcomes:
   • Move beyond traditional RCTs to use surveys, qualitative studies and novel methodologies (e.g. involving social media).
   • Develop better collaborations, processes, methods and tools to answer questions on the consequences of PHSM on the economy, and on education and other sectors.

5. Pursue greater collaboration between researchers globally:
   • Re-examine the incentives and credits given to researchers for sharing their data to support timely decision-making processes (e.g. sharing data ahead of publication in a peer-reviewed journal).
   • Explore alternative models adopted during the COVID-19 pandemic including pre-print servers and press releases.

6. Develop a shared set of principles:
   • Principles could include prioritizing a collaborative approach, reducing research waste, treating data as a public good, having open data and transparency, ensuring fairness in assignment of academic and other types of credit, and shared governance that involves all stakeholders.

The main issues raised during the group discussion were as follows:
   • it takes time to both generate and synthesize high-quality evidence, which is challenging during an evolving emergency;
   • data triangulation is an important approach to analysis and evidence generation;
   • research ethics must be considered, but current limitations in academic ethics committee processes hinder rapid research that can respond to an evolving emergency situation;
   • equipoise needs to be better considered in the context of experimental study designs to evaluate PHSM; a societal view is needed rather than the individual view used in clinical research; and
   • pre-agreed protocols for planned replication of studies across settings and contexts can strengthen evidence synthesis during emergencies.

Session 2: Evidence, policy and politics: benefits, limitations and challenges of participatory scenario-based modelling approach

Mr Keyrellous Adib, Consultant, Outbreak Analytics and Policy Support, WHO Regional Office for the Eastern Mediterranean

Discussion facilitated by Dr Katelijn Vandemaele, Global Influenza Programme, Epidemic and Pandemic Preparedness and Prevention Department, WHO

Mr Adib presented on a scenario-based modelling approach adopted by the COVID-19 modelling support team under the WHO Regional Office for the Eastern Mediterranean. The model was developed and updated through a structured engagement process to collect and review inputs. At the time of the presentation there had been 30 rounds of modelling across nine countries.
Benefits and challenges to the participatory modelling approach are summarized below:

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Challenges</th>
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<tr>
<td>The <em>scenario-based</em> component of the modelling approach was useful in:</td>
<td>The main challenges of the modelling approach were as follows:</td>
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<tr>
<td>• estimating the epidemiological outcomes under different PHSM scenarios to guide decision-making;</td>
<td>• insufficient data, requiring the model to be adapted based on assumptions;</td>
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<td>• estimating the timing of the peak of infections; and</td>
<td>• considerable uncertainty about modelling the dynamics of a novel virus using a scenario-based approach;</td>
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<tr>
<td>• providing a single framework to understand complex dynamics.</td>
<td>• different results being provided by different models (which can lead to confusion); this can be addressed through model-comparison initiatives; and</td>
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<tr>
<td>The <em>participatory-based</em> component of the modelling approach was useful in:</td>
<td>• several countries were experiencing armed conflict and political instability, and thus required collaboration with other modelling groups to investigate COVID-19 dynamics in internally displaced persons and refugee camps, to determine what modelling assumptions are valid and how these vary across contexts.</td>
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<tr>
<td>• responding in a timely manner to decision-makers’ policy questions;</td>
<td>• insufficient data, requiring the model to be adapted based on assumptions;</td>
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<td>• enhancing data sharing and discussion of data limitations;</td>
<td>• considerable uncertainty about modelling the dynamics of a novel virus using a scenario-based approach;</td>
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<tr>
<td>• improving the conversation between modellers and policy-makers; and</td>
<td>• different results being provided by different models (which can lead to confusion); this can be addressed through model-comparison initiatives; and</td>
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<tr>
<td>• building trust, ownership and support.</td>
<td>• several countries were experiencing armed conflict and political instability, and thus required collaboration with other modelling groups to investigate COVID-19 dynamics in internally displaced persons and refugee camps, to determine what modelling assumptions are valid and how these vary across contexts.</td>
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The main issues raised during the group discussion were as follows:

• conducting modelling studies is challenging when data are limited, but a participatory modelling approach can be useful in these situations;
• participatory approaches ensure that teams remain “close” to their model, and to decision-makers and other knowledge users;
• local knowledge is crucial in contextualizing models; it helps to ensure that models are readily applied and used to guide decision-making; and
• it is important to consider the purpose of the models being used (e.g. mechanistic and forecasting models have different goals and should be used appropriately to answer specific research questions).
Methods stream – key messages from day 2

- Rapid and robust evidence synthesis is crucial, and should be supported by a publicly available global repository of scientific articles.
- Structured participatory research approaches that involve decision-makers early and often can support the generation of actionable policy-relevant evidence.
- PHSM research must be guided by a shared set of principles between stakeholders; such principles include transparency, creating incentives for the sharing of data for decision-making and applying designs that use mixed methods.
Policy stream

Session 1: Weighing implementation considerations: the example of developing national guidelines for school measures

Prof Eva Rehfuess, Institute for Medical Information Processing, Biometry and Epidemiology, Ludwig Maximilian University (LMU) Munich; Pettenkofer School of Public Health, Munich

Discussion facilitated by Ms Monika Kosinska, Head, Economic and Commercial Determinants of Health, Department of Social Determinants of Health, WHO

Prof Rehfuess described the experience of developing and implementing national evidence- and consensus-based school guidelines in Germany, using a multipronged approach:

- Evidence was gathered through:
  - a Cochrane rapid review, which revealed a low or very low certainty of evidence according to Grading of Recommendations Assessment, Development and Evaluations (GRADE); and
  - a scoping review, which offered a thin evidence base on education and learning outcomes.

- Guidelines were developed using the six assessment criteria of the “evidence-to-decision framework”: balance of health benefits and harms; human rights and sociocultural acceptability; health equity, equality and non-discrimination; social implications; financial and economic considerations; and feasibility and health system considerations.

- There were two packages of measures:
  - those for prevention, such as cohorts, face masks, school travel measures, measures for music and physical education, classroom ventilation and air purification; and
  - those for managing suspected cases and processes around high-risk contacts in schools.

- Measures applied must depend on COVID-19 epidemiology, consider regional and local implementation, and include strong stakeholder engagement at the local level.

The main issues raised during the group discussion were as follows:

- bringing diverse stakeholder groups to consensus can promote confidence in guidelines; however, challenges can arise where sectors have different policy objectives, and a balance must be struck between gathering a representative stakeholder base and developing guidelines in a timely manner;

- transparency in guideline development and decision-making helps to ensure rigour and understanding of why certain decisions were made;

- in building consensus, researchers and scientists can bring together available evidence, synthesize recommendations and disseminate outputs to groups that can implement them; also, a well-prepared knowledge translation package can facilitate stakeholder uptake; and

- researchers and scientists must be well equipped to speak with different stakeholders, including the media – such knowledge translation helps to ensure that evidence guides decision-making during emergencies.
Session 2: Data for action – insights on adherence to PHSM and how it relates to trust and knowledge

Ms Eva Niederberger, Social Science Research Specialist, Risk Communication and Community Engagement (RCCE) Collective Service

Discussion facilitated by Dr Brian Riley, Interim Coordinator, RCCE Collective Service

Ms Niederberger provided an overview of the RCCE Collective Service data collaboration initiative. This initiative aimed to gather existing, validated social and behavioural data from a range of data sources; track sociobehavioural changes over time; and display indicators disaggregated by gender, age and specific population groups.

Trends in adherence to PHSM over time can be examined. Data suggest that when more stringent PHSM are implemented, more people adhere to the measures. Additionally, increased vaccination rates negatively influence the practices of physical distancing and mask wearing.

Data and knowledge gaps in relation to adherence to PHSM include:

- gaps in the data collection process;
- limitations in the current culture of data sharing;
- differences in self-reported data versus actual practice;
- correlations between multiple factors (e.g. adherence to mask wearing in the context of increasing vaccine coverage);
- lack of data disaggregation; and
- a lack of qualitative research and evidence, which is needed to provide contextual nuances and an indepth understanding of underlying sociobehavioural drivers.

The main issues raised during the group discussion were as follows:

- PHSM research methods can be strengthened by:
  - standardized data collection tools;
  - standards and protocols for the conduct of various study types across policy contexts and socioeconomic conditions;
  - standardized data reporting via a harmonized analytical framework;
- evidence from the individual level must be combined with contextual factors that shape individual behaviours and experiences; for example, working groups at the national level can bring context to sociobehavioural data and integrate it with the larger COVID-19 response;
- research engagement with trusted community leaders is key, but the channels and methods used to disseminate information will depend on where community trust is located; and
- traditional models of stakeholder engagement in research need to be re-imagined (e.g. through co-development processes that involve knowledge users from the start).
Policy stream – key messages from day 2

- Knowledge translation is important for ensuring that evidence is usable for policy and practice; it requires researchers to effectively communicate science to different audiences.
- Streamlining of PHSM research on social and behavioural aspects (e.g. through data collection tools and analytical frameworks) promotes comparability and accelerates processes.

Plenary session

Implementing PHSM in the humanitarian context: COVID-19 in Cox’s Bazar refugee camps: the community-based response

Dr Nazia Sultana, Hospital Program Team Lead – Severe Acute Respiratory Infection Isolation and Treatment Centre (SARI ITC), Relief International, Cox’s Bazar

Discussion facilitated by Dr Teresa Zakaria, Health Emergency Officer, Health Emergencies Programme, WHO
In Cox’s Bazar refugee camps, PHSM and risk communication to address COVID-19 have been grounded in community-based responses; they leverage the strong and trusted pre-pandemic relationships between community members and community health workers (CHWs). CHWs have played a key role in interpersonal risk communication on COVID-19. As part of the pandemic response, CHWs have also assisted with public health surveillance, case detection and referral activities.

Day 2 concluding reflections from the plenum

- Measuring PHSM requires a re-examination of current research paradigms. Decision-makers, knowledge users and communities must be involved early in the research process to inform the questions we ask, the evidence we generate, and how it is generated.
- A comprehensive approach is required to determine research methodologies that allow for holistic assessment of the impact of PHSM. Ethical approval processes that are able to duly consider and expedite research activities are necessary during emergencies.
- Measuring PHSM requires a multimethod approach including RCTs and standardized observational designs allowing for replication across contexts. Participatory modelling approaches can improve the relevance and applicability of models for decision-making.
- Standards, protocols and tools are needed to guide data collection on PHSM across policy contexts. These can ensure that decision-makers are provided information based on methodologically sound evidence shaped by accurate measures and indicators.

Day 3: Guidance, tools and mechanisms needed to improve the PHSM evidence base for future decision-making

Parallel session 1: Towards a global research agenda to measure the effectiveness and impact of PHSM during health emergencies – initial scoping discussion

Policy stream: Prof Jeremy Grimshaw, Senior Scientist, Ottawa Hospital Research Institute; Department of Medicine, University of Ottawa

Discussion facilitated by Dr Judith van Holten, Epidemic and Pandemic Preparedness and Prevention Department, WHO

Methods stream: Prof Susan Michie, Director of the Centre for Behaviour Change, University College London (UCL)

Discussion facilitated by Dr Ramona Ludolph, High Impact Events Preparedness Unit, Epidemic and Pandemic Preparedness and Prevention Department, WHO

The two streams joined in a parallel session that aimed to start a conversation about developing priority research questions that will enable a better understanding of the effectiveness and health, social and economic impact of PHSM during health emergencies over the next 10 years. Further information is given in Annex 3.
Draft research themes are as follows:

- mapping existing research to identify knowledge gaps;
- measuring effectiveness and impact on transmission, morbidity and mortality;
- assessing the impact of PHSM on health, social and economic outcomes;
- preparing for future health emergencies: resilience and response capacity;
- promoting uptake of and adherence to PHSM; and
- methodological research to advance implementation and evaluation of PHSM.

The main issues raised during the group discussions were as follows:

- studies to evaluate PHSM currently fall into three categories:
  » questions that need to be answered for this pandemic and are of urgent priority;
  » lessons learned; that is, studies that reflect on the pandemic;
  » studies between pandemics aimed at strengthening PHSM research methods, measures and implementation;
- clustering research questions can help researchers to differentiate between traditional evaluation questions and contextual, implementation or process-related questions;
- research paradigms (e.g. implementation science and operational research) may hold useful approaches for the PHSM research agenda;
- there is a need to develop multidisciplinary PHSM research team capacity and expertise – such teams are well placed to consider the contextual nuances and impacts across settings;
- robust PHSM research activities depend on global collaboration and funding – collaborating with existing research initiatives will strengthen research approaches and avoid duplication of efforts; also, the agenda-setting process can bring PHSM research groups together to create a global, interlinked community of practice; and
- research funders must be included in the agenda-setting process to ensure the funding landscape aligns with research priorities.

Methods stream

Session 2: Proposed analysis, challenges, insights and preliminary findings from the WHO EURO PHSM data

Prof Paulo Jorge da Silva Nogueira, Director, Biostatistics Autonomous Disciplinary Area (Laboratory of Biomathematics), Lisbon University

Discussion facilitated by Ms Jaya Lamichhane, High Impact Events Preparedness Unit, Epidemic and Pandemic Preparedness and Prevention Department, WHO

Prof Nogueira described exploratory and preliminary analysis to explore the effect of PHSM on mortality, based on the WHO EURO PHSM Severity Index. When considering PHSM data, it is possible to undertake multivariate analyses and to move beyond descriptive analysis to illustrate more complex correlations.
The main issues raised during group discussion were as follows:

- it is challenging to conduct data analysis that accurately captures the impact of those who voluntarily adhere to PHSM that are not imposed as policy;
- understanding the limitations of the data sources that models draw on is key to acknowledging the limitations of what modelling studies can illustrate; and
- strengthening primary data collection means that models can offer more accurate and complex evidence to guide decision-making.

**Policy stream**

**Session 2: WHO EURO experience in monitoring, presenting and analysing PHSM and using PHSM data for evidence-based policy options**

Ms Tanja Schmidt and Dr Ihor Perehinets, PHSM Pillar, Incident Management Support Team (IMST), WHO Regional Office for Europe

Dr Perehinets presented on the WHO Regional Office for Europe’s work on tracking implementation of PHSM in all 53 Member States of the region. Tools include a PHSM monitoring dashboard (which includes information on implementation stringency), a calibration tool and an operational framework with guidance to support decision-making.
The main issues raised during group discussion were as follows:

- dashboard indicators should be developed through an iterative process among stakeholders; the indicators must be accurate and meet stakeholders’ needs;
- data and outputs need to be policy-relevant so that they can be quickly interpreted and used by decision-makers; and
- unidimensional indices cannot accurately reflect diverse contexts and settings, and the temporal aspects that change these contexts and settings.

Key messages from day 3

- Working with stakeholders using iterative and participatory approaches can strengthen the selection of appropriate indicators and outcomes.
- Common indicators can make it easier to establish a globally comparable evidence base.

Plenary session

Input statements by:

Dr Kumnuan Ungchusak, Department of Disease Control, Ministry of Public Health, Thailand, and Chair of the PHSM Working Group under the Strategic and Technical Advisory Group on Infectious Hazards

Dr Florencia Luna, Principal Researcher, National Scientific and Technological Research Council, and Director, Program of Bioethics at the Latin American Faculty of Social Sciences (FLACSO), Argentina

To advance our knowledge and support of PHSM, it is important to identify lessons learned from implementation. This requires an approach to developing the PHSM research agenda that is multidisciplinary, multisectoral, multicountry and multiregional. We must look beyond RCTs to engage with the social sciences and implementation research, to develop pandemic response research that addresses the needs of communities.

There is a need to examine ethical considerations related to PHSM research in communities during emergencies. From a practical perspective, capacity must be built on ethics committees that can review studies from a breadth of research paradigms. From a philosophical perspective, ethical requirements of different study designs must be contextualized to an emergency setting. It is also important to consider how best to identify and weigh risks and benefits to research conduct and participation. To determine benefits and risks, PHSM research must engage with communities early, often and safely.
The main issues raised during group discussion were as follows:

- the legacy of PHSM researchers who responded to COVID-19 should be clear, evidence-based guidance about which PHSM are most effective, any associated trade-offs and how best to identify and mitigate potential harms;
- researchers must organize around PHSM and reflect on both the content of the science and how the science is conducted;
- a common language and shared approach to PHSM will enable diverse disciplines of researchers to work towards a common goal;
- an integrated and sustainable global platform would help to ensure readiness to collect and analyse multidisciplinary data on PHSM before, during and after emergencies;
- to build and maintain teams conducting PHSM research, adequate and sustainable investment in PHSM research is essential; and
- PHSM requires a breadth of inquiry and an equity lens – we must look to emergent fields related to pandemics (e.g. infodemiology, and the intersection between infodemics and adherence to PHSM globally).

Summary of discussions

- Successful implementation and evaluation of PHSM requires global multidisciplinary teams from research and policy.
- Diverse study designs are needed to generate robust, meaningful and rapid evidence.
- Standards, protocols, tools and common indicators for PHSM research can help in conducting methodologically sound research during emergencies that is comparable across contexts.
- PHSM research should proactively include communities and decision-makers early and often, to ensure that research outputs are relevant and actionable.
- Knowledge translation is key to ensure that evidence is usable for practice and policy.

Next steps

Based on the discussions, the following priority activities were identified for the WHO initiative to measure the effectiveness and impact of PHSM:

- develop a PHSM research agenda to set global research priorities for the next 5 years and to close existing knowledge gaps;
- conduct a global evidence review and analyse country experiences, developing:
  - a living systematic review database of PHSM research;
  - a repository of country case studies for an in-depth analysis of PHSM implementation across different geographical contexts, PHSM stringency and incidence rates;
  - a harmonized taxonomy of evidence-based PHSM, their outcomes and mitigation measures to address intervention burden;
• standardize PHSM research for comparability and timely data collection in case of an emergency by:
  » developing a framework to measure PHSM effectiveness and impact;
  » developing blueprints for PHSM data collection on effectiveness and impact;
  » streamlining and fast-tracking the ethical approval processes for PHSM data collection; and
• develop a global PHSM data-for-action monitoring system by:
  » creating a network of PHSM hubs trained in analysis and ready for timely data collection during an emergency; and
  » sharing research results before publication, for timely integration into decision-making processes.

Declaration of interests

Declarations of interests were collected from all external contributors and assessed for any conflicts of interest by the WHO Secretariat. There were no significant conflicts of interest, allowing all experts to participate and contribute to all parts of the consultation.

Funder

WHO gratefully acknowledges the funding received by the Norwegian Ministry of Health and Care to support the overall initiative and this consultation.

Annexes

Annex 1. List of participants
Annex 2. Consultation agenda
Annex 3. Background document: Draft research agenda on PHSM
Annex 1. List of participants

List of participants

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# World Health Organization Secretariat

**PHSM Secretariat at WHO headquarters**

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<tr>
<th>Name</th>
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<tr>
<td>Dr Sylvie Briand</td>
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<td>Mr Tim Nguyen</td>
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<td>High Impact Events Preparedness Unit</td>
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<td>Dr Ramona Ludolph</td>
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<td>High Impact Events Preparedness Unit</td>
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<td>Ms Jaya Lamichhane</td>
<td>Project Manager</td>
<td>High Impact Events Preparedness Unit</td>
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**WHO headquarters**

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<td>Ms Orlagh Ingeborg Quinn</td>
<td>Epidemiologist</td>
<td>Health Emergency Information and Risk Assessment Department</td>
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28 Global technical consultation on public health and social measures during health emergencies
Annex 2. Consultation agenda

Note:

Green = Focus on methodological challenges and solutions for monitoring and evaluating PHSM during health emergencies

Orange = Focus on policy and implementation considerations when applying and evaluating PHSM during health emergencies

Tuesday, 31 August 2021, 13:00–16:00 CET

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<th>Time</th>
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<tr>
<td>13:00–13:55</td>
<td><strong>Opening and welcome remarks</strong></td>
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<td><em>Dr Mike Ryan</em>, Executive Director, WHO Health Emergencies Programme</td>
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<td><em>Dr Sylvie Briand</em>, Director, Epidemic and Pandemic Preparedness and</td>
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<td>**Introduction to WHO’s initiative to measure the effectiveness and</td>
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<td>impact of PHSM during health emergencies**</td>
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<td>**Implementation of PHSM in Singapore: challenges and opportunities for</td>
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<td><em>Prof Vernon Lee</em>, Senior Director for Communicable Diseases, Public</td>
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<td>Health Group, Ministry of Health, Singapore</td>
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<td>13:55–14:00</td>
<td><strong>Sign-up to parallel tracks</strong></td>
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| **14:00–15:25** | **Session: Assessing the effectiveness and impact of PHSM**  
Facilitated by *Dr Olivier le Polain*, Health Emergency Information & Risk Assessment, Health Emergencies Programme, WHO  
Presentation 1:  
Creating PHSM datasets: lessons learned from the WHO PHSM dataset  
*Dr Chris Grundy*, Department of Infectious Disease Epidemiology, London School of Hygiene & Tropical Medicine (LSHTM)  
Discussion joined by *Ms Orlagh Quinn, Dr Prakash Sarnobat, Ms Stephanie Hayward*, LSHTM Volunteer network  
Presentation 2:  
Nonpharmaceutical interventions: What have we learned from COVID-19 in China, Hong Kong SAR?  
*Dr Mario Martin-Sanchez*, Lecturer, School of Public Health, The University of Hong Kong, China, Hong Kong Special Administrative Region (SAR) |
|              | **Session: Implementing PHSM at different scales – learning from country experiences**  
Facilitated by *Ms Sara Barragán Montes*, Border Health, Global COVID-19 Response, Health Emergencies Programme, WHO  
Presentation 1:  
PHSM in the transport sector: the EU HEALTHY GATEWAYS experience from policy to practice  
*Prof Christos Hadjichristodoulou*, Department of Clinical and Laboratory Research, University of Thessaly; EU HEALTHY GATEWAYS Joint Action Coordinator; WHO Collaborating Centre for Points of Entry  
Presentation 2:  
PHSM in COVID-19 response: the Nigerian Story  
*Dr Chinwe Lucia Ochu*, Director, Prevention Programmes and Knowledge Management Department, Nigeria Centre for Disease Control |
| 15:25–15:30  | Sign-up to plenum                                                                         |
| **15:30–15:55** | **Reflections on Day 1**  
Input remarks by *Dr Camilla Stoltenberg*, Director-General, Norwegian Institute of Public Health |
| **15:55–16:00** | **Closing and outlook on Day 2**  
*Dr Ramona Ludolph*, WHO |
## Time | Session
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| **13:00–13:05** | Opening of Day 2  
*Dr Ramona Ludolph*, WHO  
Opening of Day 2  
*Mr Tim Nguyen*, WHO
| **13:05–14:00** | Choosing the appropriate study design for the evaluation of PHSM  
*Prof Elie Akl*, Department of Internal Medicine, Co-Director of the Center for Systematic Reviews of Health Policy and Systems Research, American University of Beirut  
Weighing implementation considerations: developing national evidence- and consensus-based school guidelines  
*Prof Eva Rehfuess*, Institute for Medical Information Processing, Biometry and Epidemiology, LMU Munich; Pettenkofer School of Public Health, Munich
| **14:00–15:00** | Evidence, policy and politics: benefits, limitations and challenges of participatory scenario-based modelling approach  
*Mr Keyrellous Adib*, Consultant, Outbreak Analytics and Policy Support, WHO Regional Office for the Eastern Mediterranean  
Data for action – insights on adherence to PHSM and how it relates to trust and knowledge  
*Ms Eva Niederberger*, Social Science Research Specialist, RCCE Collective Service
| **15:00–15:05** | Sign-up to plenum
| **15:05–15:30** | Implementing PHSM in the humanitarian context:  
COVID-19 in Cox’s Bazar Refugee Camps: The Community Based Response  
*Dr Nazia Sultana*, Hospital Program Team Lead – SARI ITC, Relief International, Cox’s Bazar  
Discussion facilitated by *Dr Teresa Zakaria*, Health Emergency Officer, Health Emergencies Programme, WHO
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<tr>
<td>15:30–15:55</td>
<td><strong>Reflections on Day 2</strong></td>
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<td>Discussion with the audience</td>
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<td>15:55–16:00</td>
<td><strong>Closing and outlook on Day 3</strong></td>
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<td><em>Dr Sylvie Briand</em>, WHO</td>
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**Thursday, 2 September 2021, 13:00–16:00 CET**

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<tr>
<td>13:00–13:05</td>
<td><strong>Opening of Day 3</strong></td>
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<td><em>Dr Judith van Holten</em>, WHO</td>
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<td>13:05–14:00</td>
<td><strong>Towards a global research agenda to measure the effectiveness and impact of PHSM during health emergencies – initial scoping discussion</strong></td>
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<td><em>Prof Jeremy Grimshaw</em>, Senior Scientist, Ottawa Hospital Research Institute; Department of Medicine, University of Ottawa</td>
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<td>Discussion facilitated by <em>Dr Judith van Holten</em>, Epidemic and Pandemic Preparedness and Prevention Department, WHO</td>
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<td>14:00–15:00</td>
<td><strong>Proposed analysis, challenges, insights and preliminary findings from the WHO EURO PHSM data</strong></td>
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<td><em>Prof Paulo Jorge da Silva Nogueira</em>, Director, Biostatistics Autonomous Disciplinary Area (Laboratory of Biomathematics), Lisbon University</td>
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<td>Discussion facilitated by <em>Ms Jaya Lamichhane</em>, High Impact Events Preparedness Unit, Epidemic and Pandemic Preparedness and Prevention Department, WHO</td>
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<td>15:00–15:05</td>
<td><strong>WHO EURO experience in monitoring, presenting, analysing PHSM and using PHSM data for evidence-based policy options</strong></td>
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<td><em>Ms Tanja Schmidt</em> and <em>Dr Ihor Perehinets</em>, PHSM Pillar, IMST, WHO Regional Office for Europe</td>
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<td>15:00–15:05</td>
<td><strong>Sign-up to plenum</strong></td>
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<td>15:05–15:55</td>
<td>Final reflections</td>
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<td>Input statements by</td>
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<td>Dr Kumnuan Ungchusak, Department of Disease Control, Ministry of Public Health, Thailand, and Chair of the PHSM Working Group under the Strategic and Technical Advisory Group on Infectious Hazards</td>
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<td>Dr Florencia Luna, Principal Researcher, National Scientific and Technological Research Council, and Director, Program of bioethics at FLACSO, Argentina</td>
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<td>15:55–16:00</td>
<td>Closing and next steps</td>
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<td>Mr Tim Nguyen, WHO</td>
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Annex 3. Background document: Draft research agenda on PHSM

Towards a global research agenda to measure the effectiveness and impact of PHSM during health emergencies

Draft discussion paper for the WHO global technical consultation on PHSM

Prepared by Jacob Crawshaw, Atle Fretheim, Paul Glasziou, Jeremy Grimshaw, Susan Michie, Mareike Schomerus and Rae Thomas of the Behavioural, Environmental, Social and Systems Interventions (for pandemic preparedness) (BESSI) Collaboration, commissioned by WHO

Background

During health emergencies, different approaches are used to limit the spread of the virus and the illness it causes within communities. Public health and social measures (PHSM) include both actions that individuals can take (e.g. increased personal hygiene, physical distancing, mask wearing and limiting social contacts) and public health and social policies that authorities and communities can enact (e.g. closure of schools and businesses, mobility restrictions, banning mass gatherings, and mass testing). Hence, PHSM are a key defence to limit the transmission of viruses and infectious diseases during epidemics and pandemics, especially when pharmaceutical interventions are not yet available or not widely accessible.

There is growing evidence that PHSM have significantly reduced the transmission of coronavirus disease (COVID-19) during the current pandemic. However, some of the measures have adverse and unintended effects, also known as intervention burden, on the physical and mental health of individuals. PHSM may have also increased social and gender disparities, and caused economic and financial hardship as well as societal dissolution.

PHSM are complex and multidisciplinary in nature, which poses a barrier to their systematic implementation and evaluation. To date, the effectiveness of individually implemented versus simultaneously implemented PHSM is largely unknown, and there is little evidence on implementation considerations such as timing, setting, stringency and duration of interventions. Furthermore, the intervention burden of PHSM on societies and individuals still needs to be assessed.

The COVID-19 crisis has highlighted that countries need a better understanding of the effectiveness and broader health, social and economic effects of PHSM (including the cost–benefits of PHSM), to be able to make evidence-informed decisions about their implementation during future health emergencies. In addition, a global monitoring and evaluation system is required to ensure that evidence on PHSM is continuously and systematically compiled and shared, and can be integrated into future health emergency preparedness plans. In response to the request from Member States, the World Health Organization (WHO) launched a new research initiative to measure the effectiveness and social, health and economic impact of PHSM during health emergencies.

Objective

As part of a larger initiative, WHO aims to develop a global research agenda on PHSM. The agenda will present priority research questions, to gain a better understanding of the effectiveness and health, social and economic impact of PHSM during health emergencies over the next five years.
Methods

The research agenda will be developed through a multistep consultation approach that involves stakeholders from many disciplines. This draft background paper is intended as a basis for discussions on Day 3 of the WHO global technical consultation on PHSM. It will be revised based on the input received from experts at the consultation and will be submitted to a public online consultation. Outlined below are examples of themes and research questions, which can be altered during the consultation process.

Challenges of conducting research on PHSM

The current pandemic has highlighted the clear need for a better understanding of the effectiveness and impact of PHSM. However, research on PHSM faces several challenges:

- PHSM are complex interventions, necessitating diverse assessment approaches that draw (implicitly or explicitly) on knowledge and methods from a range of disciplines.
- PHSM often involve a number of separate interventions; thus, it is difficult to determine the relative contributions of each intervention and which are essential for effectiveness in specific contexts.
- PHSM uptake and effectiveness are influenced by factors operating at different levels (e.g. individual, community, public health system and jurisdiction). There are gaps in knowledge translation and implementation research on how best to promote and support the uptake of and adherence to PHSM.
- PHSM are multisectoral in nature, requiring interdisciplinary collaboration to improve research and implementation.

Generating more systematic research on PHSM requires:

- an interdisciplinary approach, bridging disciplines that do not traditionally work together (e.g. engineering, education and behavioural researchers working on safe school environments);
- a plurality of study designs according to the type of research question; for example, experimental designs or analysis of large datasets for questions of intervention effects (e.g. cross-country comparisons), whereas understanding of public beliefs in PHSM may be best understood by qualitative or theory-driven research that then informs future studies;
- knowledge translation and implementation research to identify approaches to promote adoption (and sustained use) of PHSM;
- systematic synthesis research to build cumulative bodies of evidence to support decision-making that is based on the best available evidence;
- a global approach to investigate how intervention effects vary across populations and settings; and
- building research capacity, especially in low- and middle-income countries (LMICs).
Suggested themes for a global research agenda

The issues outlined above are considered under six research themes, and possible priority research topics and questions are given. Boxes illustrate examples of research studies undertaken during the current pandemic.

Research theme 1: Mapping existing research to identify knowledge gaps

Previous outbreaks and the current COVID-19 pandemic have generated a substantial body of evidence on PHSM that can be used to inform policy and identify research gaps.

Possible priority research topics and questions include the following:

- Mapping of existing studies on the efficacy of separate or combined PHSM in reducing disease transmission, and their direct and indirect impact on morbidity and mortality.
- What do we know about the effectiveness and the health, social and economic burden of PHSM on individual and societal level across different contexts and populations?
- Which factors influence uptake of and adherence to PHSM?
- How do contextual factors (e.g. low-resource or humanitarian settings) influence the effectiveness and impact of PHSM?

Research theme 2: Measuring the direct effectiveness and impact of PHSM on transmission, morbidity and mortality

Owing to simultaneous implementation of PHSM and a lack of prospective data collection mechanisms, there are still large gaps in our knowledge of the effectiveness of single and combined measures on virus transmission and their direct effects on morbidity and mortality.

Possible priority research questions include the following:

- **Material environments**: What types of ventilation and sanitation measures are most effective in buildings and transport to reduce infection transmission?
- **Public health services**: What are the effects of PHSM on morbidity and mortality through reduced transmission?
- **Social systems**: What are the key high-risk events and settings for viral transmission? What impact do mobility restrictions have on virus transmission?
- **Social environments**: How can social norms and “cultures” be established (e.g. in workplaces, educational institutions, hospitality venues and shops) to support infection control practices?
- **Behaviours**: How can people be supported to build a risk management approach into their daily routines (e.g. hand and surface hygiene, use of tissues and masks at appropriate times, and staying at home when symptomatic)?
Research theme 3: Assessing the impact of PHSM on health, social and economic outcomes

PHSM have large, indirect consequences on health, social and economic outcomes at individual and societal level. As the social and economic impact is part of the determinants of health, any negative consequences in these areas will ultimately affect the health and well-being of individuals and societies. Thus, when making decisions about whether to implement a single measure or a set of measures, it is important to know their cost–benefit ratio and potential unintended effects.

Possible priority research questions include the following:

- **Health outcomes**: What are the mental health consequences of prolonged PHSM implementation? Do certain PHSM reduce morbidity and mortality from other infectious diseases (e.g. sexually transmitted diseases [STDs] or seasonal influenza)? Do PHSM lead to a disruption of routine medical care (e.g. cancer screening) and, if so, what are the consequences for morbidity and mortality? Do PHSM lead to an increase in domestic violence? What is the cost–benefit ratio of PHSM when comparing prevented morbidity and mortality with the intervention burden caused by PHSM?

- **Social outcomes**: Do PHSM increase gender inequality (e.g. through increased job losses among women or the increased care burden on women)? What effect do PHSM have on the educational attainment of children and young adults? How is social cohesion affected by PHSM?

- **Economic outcomes**: What are the individual and societal costs of prolonged business closures, travel restrictions and school closures? How do PHSM affect economic growth rates of countries? Do the benefits of implementing PHSM outweigh their costs?
Elimination versus mitigation policy?

A comparison of OECD countries

What did they want to know? The impact of government policies that were focused on the elimination or mitigation of COVID-19.

What did they do? Compared the COVID-19 response measures of OECD countries during the first 12 months of the pandemic.

What did they find? OECD countries with an elimination policy reported deaths from COVID-19 25 times lower (per 1 million population), superior gross domestic product (GDP) growth and less impact on civil liberties.

What could be improved? Future studies could clarify definitions and adjust for other factors.

Research theme 4: Building preparedness for future health emergencies: resilience and response capacity

PHSM are a key strategy to curb transmission, especially in the absence of pharmaceutical interventions; therefore, they will continue to play a major role in health emergency preparedness. There are opportunities to prepare for an evidence-based and commensurate implementation of PHSM in the future, both in terms of building resilience against their intervention burden and increasing response capacity.

Possible priority research questions include the following:

- **Resilience**: Which populations and settings are disproportionately affected by the intervention burden of PHSM? Which measures can be put in place to mitigate the intervention burden (e.g. social security schemes, eviction bans and teleworking arrangements)? How can we leverage existing services, supports and infrastructure to reduce the intervention burden and identify gaps where additional help and research is needed?

- **Response capacity**: Which PHSM can be studied outside of emergency situations to strengthen the evidence base ahead of a new emergency? What capacity-building is required to promote the systematic monitoring and evaluation of PHSM (especially in LMICs)? Which tools and guidance on PHSM monitoring, evaluation and implementation are useful in preparation for an outbreak?

Research theme 5: Promoting uptake of and adherence to PHSM

The effectiveness and impact of PHSM largely depend on whether the public engages in protective measures and adheres to them while they are being recommended. Factors that can lead to decreasing uptake of and adherence to PHSM among the public include pandemic fatigue, a lack of trust in authorities and science, and conflicting beliefs, values and preferences.

Possible priority research questions include the following:

- **Understanding influences on PHSM uptake and adherence**: What social, political, behavioural, cultural and economic factors influence the uptake and adherence of PHSM?
• **Promoting knowledge translation:** How can translation of research knowledge into policy or future research be built into all stages of the research process? Knowing that learning and uptake happen in social, political and economic contexts, what mechanisms could increase the uptake of and adherence to PHSM (e.g. involving community leaders and stakeholder groups)?

• **Promoting evidence-informed policy formulation:** How can we increase the policy relevance and timeliness of research within emergency situations? How can the uptake of actionable and evidence-informed guidance for decision-makers be improved? What are the best methods to develop partnerships and feedback loops between policy decision-makers and researchers to maximize the likelihood that research will have an impact?

**Research theme 6: Methodological research to advance implementation and evaluation of PHSM**

Evaluating the effectiveness and impact of PHSM poses methodological challenges for the multidisciplinary research community.

Possible research priority research questions include the following:

• **Research coordination:** How can we best conduct nationwide studies and foster international collaboration for comparisons among countries?

• **Research infrastructure:** How do we develop interdisciplinary teams to undertake PHSM research within and between outbreaks? What global and regional research infrastructure is needed to support high-quality, timely and relevant research (e.g. data platforms and trial platforms)?

• **Research preparedness:** How can we best prepare study protocols, procedures and materials so that research that can only be undertaken during outbreaks can be rapidly initiated? How can we best evaluate different types of research to increase our understanding of potential contextual, ethnocultural and political effect modifiers? How can we develop a core outcome set (including adherence measures) for specific PHSM? How can the reporting of PHSM be standardized?

• **Evidence synthesis:** How can we leverage automated study identification and data abstraction to support systematic reviews of PHSM?

• **Evaluation research:** What types of studies should be performed to evaluate the effect of separate or combined PHSM? What are the key barriers to conducting effectiveness studies of PHSM? In which circumstances, and to what extent, do legal or ethical issues hinder conducting evaluation studies of PHSM?
Masks for self-protection?

A randomized trial in Denmark

What did they want to know? Does wearing a surgical face mask protect against COVID-19 infections?

What did they do? A total of 4862 adults were randomized to mask wearing (except at home) or not for 1 month.

What did they find? There was no difference between the groups but the range of possible results were between a 46% reduction and a 23% increase in infections, so the study was inconclusive.

What could be improved? Larger studies are needed to reduce the uncertainty of results. Other study types are needed to assess how much wearing a mask protects others ("source control").

References for further reading:


References for examples in the boxes:

