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practice

Providing strategic information during a public health emergency: lessons learned during the COVID-19 pandemic in Germany

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Background: Timely strategic information is essential for decision makers to mount an effective public health response to infectious disease outbreaks, and public health actors must find an effective way to supply it. The Centre for International Health Protection at the Robert Koch Institute (Germany's national public health institute) developed a three-pronged approach to processing and supplying strategic information on the international state of the COVID-19 pandemic to the German Federal Ministry of Health: monitoring and analysis of international public health and social measures (PHSM); screening, validating, analysing and reporting the global epidemiological situation; and in-depth analyses and syntheses of COVID-19 evidence.

Aims and objectives: We discuss the approach taken by the Centre to provide strategic information and challenges and adaptations during the information provision process. We then distil lessons that will be critical to improve strategic information provision for evidence-informed decision making in future public health emergencies.

Key conclusions: Several lessons can be derived from the Centre's experience. Timeliness of evidence is essential for enabling decision makers to tailor a public health response to an outbreak, and requires sufficient and skilled staff to process evidence. Evidence formats should be adapted to decision makers' information needs; this requires open channels of communication to understand needs. Access to high-quality international data hinges on data sharing across countries and the capacity to collect and process such data in many countries. Heeding the lessons will strengthen pandemic response.

Key words strategic information • evidence-informed decision making • public health emergency • pandemic response

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Introduction

Timely strategic information is essential for decision makers to mount an effective public health response to infectious disease outbreaks. This strategic information can be provided by a variety of public health actors, especially those from national public health institutes, which play a prominent role in assessing and compiling up-to-date evidence as it becomes available during the course of a pandemic. In this paper, evidence is considered a component of strategic information. Evidence includes scientific evidence, for example peer-reviewed research articles, as well as tacit evidence that is based on experience, such as expert opinion (WHO, 2022a). In a public health emergency, part of the challenge for said public health actors is developing an effective approach to supplying strategic information. At the Robert Koch Institute (RKI; the German national public health institute) the Centre for International Health Protection (*Zentrum für internationalen Gesundheitsschutz*, or ZIG) developed a three-pronged approach to processing and supplying strategic information to the German Federal Ministry of Health (MoH) on the international state of the COVID-19 pandemic (Robert Koch Institute, 2022). While other RKI departments were mandated to provide virologic evidence on SARS-CoV-2, national epidemiological evidence, and how the national health system was coping with the pandemic (Robert Koch Institute, 2023a), ZIG compiled evidence from across the globe on epidemiological developments and related public health and social measures (PHSM) for the MoH. The World Health Organization (WHO) defines PHSM as 'actions taken by individuals, institutions, communities, local and national governments, and international bodies, to suppress or stop the spread of a disease' (WHO, nd). This strategic information fed into the pandemic response within Germany and contributed to international health protection through ZIG's international activities. In this paper, we first present how ZIG provided strategic information. We then discuss the challenges and adaptations of ZIG in the strategic information provision process. Finally, we distil lessons from challenges and adaptations that will be critical to improve strategic information provision for evidence-informed decision making in future public health emergencies.

Developing an approach to strategic information provision during the COVID-19 pandemic

ZIG developed an approach to provide strategic information in response to requests for information on COVID-19 pandemic developments, building on three complementary activities: the COVID-19 Measures Analysis report series focused on international monitoring of PHSM; the Public Health Intelligence (PHI) team screened, validated, analysed and reported the global epidemiological situation; and via the review, evaluation and synthesis of COVID-19 evidence, ZIG provided more in-depth analyses of published COVID-19 evidence. They formed part of a comprehensive strategy by RKI to support policymakers as well as the public health service in decision making during the pandemic.

While monitoring, analysis and reporting of the global epidemiological situation by the PHI team was a standing activity of ZIG that predated the COVID-19 pandemic, the monitoring and analysis of PHSM abroad and the COVID-19 evidence reviews were developed to complement the strategic information generated by the PHI team.

Other public health actors may find it instructive to learn which evidence generation processes, output formats and communication channels ZIG used to provide strategic information. Each of the activities is described below.

Monitoring and analysis of COVID-19 public health and social measures abroad

ZIG developed a dedicated project to monitor PHSM abroad. The COVID-19 Measures Analysis reports mapped the implementation of different PHSM for pandemic control across and within countries with differing epidemiological developments. ZIG produced these reports throughout 2021, wherein PHSM in select countries were presented and compared within their epidemiological context. Report topics were selected following continuous monitoring of pandemic developments by ZIG's staff and in particular PHSM trends across countries, as well as needs expressed by the MoH. To prepare reports, publicly available data on PHSM was curated and analysed. The primary recipient of the COVID-19 Measures Analysis reports was the MoH, but reports were also made publicly available to inform other stakeholders and the broader global health community. Reports were published roughly every three to four weeks (Robert Koch Institute, 2023b). Upon publication, reports' key messages were also promoted on RKI's science communication social media channel.

Monitoring, analysis and reporting of the global epidemiological situation

The PHI team formed another pillar of strategic information provision. PHI is a standing team that has existed since before the COVID-19 pandemic which screens, validates, compiles, analyses and disseminates information on international health events, and provides structured information to the MoH, to other departments of government as well as to public health authorities from the local to the national level. The PHI team provided scientific advice to the MoH based on international epidemiological data and contextual information, primarily to inform decisions about the designation of COVID-19 travel risk areas. It prepared and disseminated weekly reports for the MoH and other governmental departments, generated ad-hoc epidemiological updates and regularly attended interdepartmental meetings to present epidemiological analyses and risk assessments. The PHI team closely cooperated with other RKI departments and delivered regular information on international COVID-19 developments to the Emergency Operating Centre (EOC). It further supported the EOC with all related requests coming from the public, the media, or the MoH.

Reviewing, evaluating and synthesising COVID-19 evidence

ZIG researchers also evaluated and synthesised COVID-19 research to provide timely evidence regarding the impact of PHSM on controlling the spread of the COVID-19 pandemic, through statistical modelling and evidence reviews. Statistical modelling approaches were used to evaluate the comparative effectiveness of a wide range of PHSM across member states of the Organisation for Economic Co-Operation and Development (OECD) (Pozo-Martin et al, 2021). Data inputs for modelling came from high-quality open-source international databases such as the Oxford COVID-19 Government Response Tracker. In addition, a number of systematic reviews were undertaken to synthesise the evidence available internationally from the peer-reviewed

and non-peer reviewed literature regarding the effect of PHSM on COVID-19 pandemic control (Mendez-Brito, 2021). The target audience of these research activities were public health decision makers in Germany (specifically the MoH) and other countries, the public health research community and the general public. Evidence was shared amongst others in brief synthesis reports for decision makers and peer-reviewed journal articles, and disseminated via RKI's science communication social media channel.

Challenges and adaptations in providing strategic information

The teams providing strategic information faced a range of challenges during a dynamic pandemic situation. These challenges, and adaptations the teams made, are briefly synthesised below.

Fast evolution of scientific knowledge and accelerated work processes

At ZIG, the focus and pace of evidence generation had to continuously adapt to an evolving pandemic situation and a changing state of scientific knowledge. For instance, the review, evaluation and synthesis of evidence was developed to process the vast amounts of diverse evidence on COVID-19. The authors also felt the various effects of the acceleration of work processes during a public health emergency. These two trends combined – fast evolution of scientific knowledge and accelerated work processes – made it particularly challenging to produce timely evidence for decision makers while ensuring a high level of rigour and quality. The teams adapted in various ways: the PHI team acquired and mobilised surge capacity and added the expertise of a data scientist to automate processes for data retrieval and reporting. Similarly, additional capacity was acquired to complete the evidence reviews, such as the recruitment of graduate students who could use this work as part of their theses.

Tailoring evidence formats to decision makers' needs

Another set of challenges related to needing to tailor evidence formats to decision makers' information needs. The Measures Analysis report team tackled this proactively through an internal evaluation. Accordingly, the team adapted the analysis and writing cycle and the report format once two reports had been published. As a result of MoH feedback, Measures Analysis reports and evidence reviews were also accompanied by policy briefs presenting key report findings and policy implications in a condensed format. We also received feedback that the reports reached the highest levels of decision making, with one Measures Analysis report being re-tweeted by then-federal Minister of Health, Jens Spahn.

Dependency on availability and quality of public-domain data

ZIG drew on a range of data, including epidemiological, medical, and behavioural data. As ZIG monitored data and produced evidence on the international state of the pandemic, the department was dependent on the availability of such data and its quality as provided by other countries and international organisations. Particularly early on in the pandemic, publicly-available epidemiological data from

COVID-19 monitoring and surveillance, as well as PHSM policy data, was limited and incomplete in many instances. More data became available as time progressed, yet as of the summer of 2022 many countries had changed their COVID-19 testing strategies, meaning that data availability on COVID-19 incidence once again changed (see, for example, WHO, 2022b). In producing strategic information, the department reflected on limitations of the analysed data and reported on data quality in its publications.

The challenges and adaptations during the COVID-19 pandemic shared above also relate to some of the challenges and adaptations encountered in providing strategic information in a public health emergency more generally: dealing with increased and accelerated demand for evidence; fast evolution of scientific knowledge; adapting evidence formats to changing information needs of decision makers; and access to good-quality international data (European Centre for Disease Prevention and Control, 2019; Lancaster et al, 2020; Wieler, 2021). To stimulate further discussion and reflection beyond the context of ZIG, the final section shows how the challenges and adaptations provide lessons for pandemic response.

Lessons and conclusions

During an infectious disease outbreak, timely strategic information is crucial for decision makers to launch an effective public health response. Public health actors need to decide, first, how to generate the required strategic information and, second, pick suitable output formats and communication channels, among other considerations. At the German national public health institute, ZIG developed an approach to providing strategic information that compiled evidence from across the globe on COVID-19 epidemiological developments and PHSM for the German MoH. Specifically, ZIG engaged in three complementary activities to provide strategic information: screening, validation, analysis and reporting of the global epidemiological situation; international monitoring of PHSM; and in-depth analyses and syntheses of COVID-19 evidence.

During the COVID-19 pandemic, ZIG had to produce timely and high-quality evidence in the face of accelerated work processes, a dynamic pandemic situation and quickly changing scientific knowledge. Staff also had to tailor evidence formats to decision makers' information needs. Finally, in producing evidence on the pandemic globally, ZIG was dependent on the availability and quality of international data.

ZIG's challenges and adaptations provide lessons regarding what is needed to successfully provide strategic information in a public health emergency. Timeliness of evidence is essential in enabling decision makers to adequately tailor a public health emergency response to an outbreak. Timeliness is particularly challenging given the dynamics of infectious disease outbreaks and the time it takes to compile and analyse data from a variety of sources. Sufficient and skilled staff are essential to collect and process evidence in a timely manner. The need for continuous access to high-quality international data underscores the larger point that data sharing across countries, and having or building the capacity to collect such data, are crucial for all actors wishing to provide strategic information and to take evidence-informed decisions. Finally, adapting evidence formats to decision makers' information needs requires open channels of communication across institutions of government.

The challenges encountered provide important lessons on what is required to successfully provide strategic information for evidence-informed decision making. Heeding the lessons will strengthen pandemic response.

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Contributor statement

TB conceived the paper and wrote the first draft; all authors contributed to further drafts and editing. All authors read and approved the final manuscript.

Research ethics statement

The authors of this paper have declared that research ethics approval was not required since the paper does not present or draw directly on data/findings from empirical research.

Conflict of interest

The authors declare that there is no conflict of interest.

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