



# Methodological Considerations for Survey-Based Research During Emergencies and Public Health Crises: Improving the Quality of Evidence and Communication

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The novel coronavirus (COVID-19) outbreak has resulted in a massive amount of global research on the social and human dimensions of the disease. Between academic researchers, governments, and polling firms, thousands of survey projects have been launched globally, tracking aspects like public opinion, social impacts, and drivers of disease transmission and mitigation. This deluge of research has created numerous potential risks and problems, including methodological concerns, duplication of efforts, and inappropriate selection and application of social science research techniques. Such concerns are more acute when projects are launched under the auspices of quick response, time-pressured conditions—and are magnified when such research is often intended for rapid public and policy-maker consumption, given the massive public importance of the topic.

**Keywords:** survey, questionnaire, research methods, COVID-19, emergency, crises

## INTRODUCTION

The COVID-19 pandemic has unfortunately illustrated the deadly consequences of ineffective science communication and decision-making. Globally, millions of people have succumbed to scientific misinformation about mitigation and treatment of the virus, fuelling behaviors that put themselves and their loved ones in mortal danger.<sup>1</sup> Nurses have told stories of COVID-19 patients, gasping for air, and dying, while still insisting the disease was a hoax (e.g., Villegas 2020). While science communication has always had real world implications, the magnitude of the COVID-19 crisis illustrates a remarkable degree of impact. Moreover, the crisis has demonstrated the complexity and challenge of making robust, evidence-informed policy in the midst of uncertain evidence, divergent public views, and heterogenous impacts. This adds urgency to seemingly abstract or academic questions of how the evidence that informs science communication practice and decision-making can be made more robust, even during rapidly evolving crises and grand challenges.

<sup>1</sup>As just one example, Loomba et al. 2021 found that misinformation results in a decline of over 6% in vaccine intentions in the United States, or some approximately 21 million prospective American vaccine recipients.

There has been a massive surge of science communication-related survey research projects in response to the COVID-19 crisis. These projects cover a wide range of topics, from assessing psychosocial impacts to attempting to evaluate different interventions and containment measures. Many of the issues being investigated connect to core themes in science communication, including (mis)information on scientific issues (e.g., Gupta et al., 2020; Pickles et al., 2021), trust in scientific technologies and interventions, including vaccines (e.g., Jensen et al., 2021a; Kennedy et al., 2021a; Kwok et al., 2021; Ruiz and Ball 2021), and more general issues of scientific literacy (e.g., Biasio et al., 2021)—themes being investigated in a context of heightened public interest, significant pressure for effectiveness in interventions, and with highly polarized and contentious debate. Such survey research can be instrumental in informing effective government policies and interventions, for example, by evaluating the acceptability of different mitigation strategies, identifying vulnerable populations experiencing disproportionate negative effects, and clarifying information needs (Van Bavel et al., 2020).

However, the rush of COVID-19 survey research has exposed challenges in using questionnaires in emergency contexts, such as methodological flaws, duplication of efforts, and lack of transparency. These issues are especially apparent when projects are launched under time-pressured conditions and conducted exclusively online. Addressing these challenges head on is essential to reduce the flow of questionable results into the policymaking process, where problematic methods can go undetected. To truly succeed at evidence-based science communication (see Jensen and Gerber 2020)—and to support evidence-based decision-making through good science communication—requires that survey-based research in emergency settings be conducted according to the best feasible practices.

In this article, we highlight the utility of questionnaire-based research in COVID-19 and other emergencies, outlining best practices. We offer guidance to help researchers navigate key methodological choices, including sampling strategies, validation of measures, harmonization of instruments, and conceptualization/operationalization of research frameworks. Finally, we provide a summary of emerging networks, remaining gaps, and best practices for international coordination of survey-based research relating to COVID-19 and future disasters, emergencies, and crises.

## SUITABILITY OF SURVEY-BASED RESEARCH

Social and behavioural sciences have much to offer in terms of understanding emergency situations broadly, including the COVID-19 crisis, and informing policy responses (see Van Bavel et al., 2020) and post-disaster reactions (Solomon and Green, 1992). Questionnaires have unique advantages and limitations in terms of the information that can be gathered and the insights that can be generated when used in isolation from other research approaches (e.g., see Jensen and Laurie,

2016). For these reasons, researchers should carefully assess the suitability of survey-based methods for addressing their research questions.

In emergency contexts, survey research can offer several advantages. Questionnaire-based work can:

- Allow for relatively straightforward recruitment and consenting procedures with large numbers of participants, as well as increasing the geographical scale that researchers can target (versus, for example, interview or observational research).
- Gather accurate data about an individual's subjective memories or personal accounts, knowledge, attitudes, appraisals, interpretations, and perceptions about experiences.
- Allow for many mixed or integrated strategies for data collection, including both qualitative/quantitative; cross-sectional/longitudinal; closed-/open-ended; among others.
- Integrate effectively with other research methods (e.g., interviews, case study, biosampling) as supplemental or complementary (see Morgan, 2007) approaches to maximise strengths and offset weaknesses that allow for data triangulation.
- Allow for consistent administration of questions across a sample, as well as carefully crafted administration across multi-lingual contexts (e.g., validating multiple languages of a survey for consistent results).
- Enable highly complicated back-end rules ("survey logic") for tailoring the user experience to ensure only relevant questions are presented.
- Create opportunities for carefully-crafted experimental designs, such as manipulating a variable of interest or comparing responses to different scenarios across a population.
- Deploy with relatively low costs and rapid timeframes compared to in-person methodologies.

At the same time, surveys can have significant limitations in the context of crisis research that can undermine their reliability or create temptations for methodological shortcuts. For example:

- Surveys face important limits in terms of what information can be reliably obtained. For example, respondents generally cannot accurately report about the attitudes, experiences, and behaviors of other people in their social groups. Likewise, self-reports can be systematically distorted by psychological processes, especially when it comes to behavioural intentions and projected future actions. Retrospective accounts can also be unreliable, particularly in cases of complex event sequences or events that took place long ago (e.g., Wagoner and Jensen 2015).
- The quality of survey data can degrade rapidly when there is low ecological validity (i.e., participants are not representative of the broader population), whether through sampling problems, systematic patterns in attrition for longitudinal research, or other factors.

- Seemingly simple designs may require extensive methodological or statistical expertise to maximise questionnaire design and data analysis (i.e., ensuring valid measures, maximizing best practice, and avoiding common mistakes).
- The limited ability to adjust measures once a survey has been released, without compromising the ability to develop inferences from comparable data, can be challenging in rapidly evolving crisis contexts where relevant issues are changing rapidly.
- Cross-sectional surveys can give a false impression of personal attributes that are prone to change if assumptions of *cross-situational consistency* are applied (e.g., factors that are expected to remain stable across time) (e.g., Hoffman, 2015).
- Personal impacts: Reports from individuals who are exposed or negatively affected, such as with chronic stress or loss of loved ones, employment, health, and stigmatization.
- Risk perceptions: Hopes and fears related to the disease, end points of the emergency, and return to normalcy.

Given these advantages and limitations, there are several appropriate targets for survey research in crises and emergencies. Alongside other methods—including observational, ethnographic, and interview-based work, depending on the specific research questions formulated—surveys can help to gather reliable data on:

- Knowledge: What people *currently* believe to be true about the disease (e.g., origin of the coronavirus, how could they catch it, or how they could reduce exposure).
- Trust: Confidence in different political and government institutions/actors, media and information sources, and other members of their community (e.g., neighbors, strangers) (e.g., see Jensen et al., 2021).
- Opinions: Approval of particular interventions to slow the spread; belief about whether policies or behaviours have been effective or changed the emergency outcome; or personal views about perceptions of vaccine efficacy or safety.

Even when aware of the limitations, launching and conducting survey research is a specialized skill that requires training, experience and mentorship. This expertise is comparable to conducting epidemiological, biomedical, or statistical research. Even when questionnaires appear ‘simple’ because of the skillful use of plain language and straightforward user interfaces, there are substantial methodological learning curves associated with proper research designs. In the next sections, we provide several project design, coordination, and methodological recommendations for researchers launching or conducting rapid-response research projects on these topics inherent with emergency contexts, in both COVID-19 and beyond. In the next section, we discuss overall research coordination, project designs, and specific methodological approaches.

## PROJECT DESIGN

Researchers face important choices when designing survey-based research within the fast-moving context of disasters and emergencies. There can be a substantial pressure to conduct research *quickly*, including funder timelines, the perceived race to publish, or pressure to collect ephemeral data. Each of these factors can necessitate difficult decisions about project and research designs. At a high level, we recommend that survey-based projects on COVID-19 adopt the following standards (**Table 1**):

**TABLE 1** | Key factors for effective COVID-19 survey-based research.

Key Factors	Explanation
<p><b>Open access</b> Make instruments, data, and research findings accessible to a wide base of researchers and non-academic audiences</p>	<p>Open access knowledge practices support practitioner access to research, enable future re-analysis and comparison of data, and facilitate more effective comprehensive and meta reviews. Paywalls are especially problematic for those in developing countries.</p> <p>Best practices include</p> <ul style="list-style-type: none"> <li>–making full instruments available for inspection.</li> <li>–anonymized datasets, including qualitative data, available for re-analysis.</li> <li>–pre-registering studies when appropriate and coordinating with similar projects (see <i>Research and Coordination</i>).</li> </ul>
<p><b>Integrating relevant social science expertise</b> Engage experts in the design, administration, and analysis in survey-based projects</p>	<p>Emergency situations often increase the risk of mistakes in research design, sampling approaches, and instrument development. It is important to recognize that survey design is a specialist field with well-developed methods, longstanding challenges and potential for seemingly small errors to create problematic conclusions. High-quality survey research requires considerable training and experience.</p> <p>Most commonly mistakes arise with researchers who</p> <ul style="list-style-type: none"> <li>–are outside of the social sciences who lack training and expertise in survey research methodologies.</li> <li>–may have difficulty recognizing survey methods as a specialist social science domain.</li> <li>–publish in journals that struggle to find reviewers with extensive survey-based experience.</li> </ul> <p>This is particularly relevant to researchers from areas such as health, environmental, natural, and physical sciences who do not have extensive training and experience working with survey methodology. Of course, this does not preclude interdisciplinary, multi-disciplinary and transdisciplinary research: indeed, such approaches are</p> <p>(Continued on following page)</p>

**TABLE 1 |** (Continued) Key factors for effective COVID-19 survey-based research.

Key Factors	Explanation
	<p>most fruitful when collaborators' complementary expertise is respected. "Epistemic trespassing" (see Ballantyne 2019) in the form of disregarding either specialized methodological skills or topic expertise can undermine collaboration.</p> <p>Good practices include</p> <ul style="list-style-type: none"> <li>–Involving formally trained survey research experts in the project design and ensuring that their advice is heeded as much as possible. Survey experience alone is insufficient, if it is not accompanied by a familiarity with the literature on survey methodology and how that literature can be put into practice.</li> <li>–Recognising the relevant field-specific topics included in your project and involve appropriate subject matter experts (e.g., if measuring aspects of mental health, including someone with formal training in psychology and experience operationalizing psychological concepts in surveys).</li> </ul>
<p><b>Longitudinal research structures</b> Collecting data in a way that tracks or monitors changes over time</p>	<p>Longitudinal research allows for understanding changes in individuals' experiences (e.g., see Wagoner and Jensen 2015) during emergency situations. This form of data has unique potential to yield valuable insights about effective emergency responses and relief efforts by showing unfolding processes and emerging attitudes. Moreover, because many of the measures used (e.g., risk perception) measure subjective perceptions, their results are of limited value without the ability to conduct temporal comparisons.</p> <p>Best practices include</p> <ul style="list-style-type: none"> <li>–developing funding and institutional mechanisms to enable pre-event data collection to establish baselines.</li> <li>–maximizing, where possible, both the duration and frequency of data collection.</li> <li>–minimizing, where possible, variation in sampling and instrument design throughout the project through careful planning and anticipation of future data needs.</li> </ul>
<p><b>Repeated measures design</b> Rather than recruit new participants in subsequent rounds or studies, return to the same individuals</p>	<p>Emergency situations can produce rich information about individuals' development during that can occur in personal circumstances, knowledge, trust, opinions, impacts and risk perceptions.</p> <p>Consider</p> <ul style="list-style-type: none"> <li>–targeted "top-up" of under-represented demographic categories where necessary.</li> <li>–reporting on current experiences on a repeated basis delivers more precise data than asking someone to report retrospectively.</li> <li>–minor adjustments between data collection rounds such as adding a new item to the survey to account for emerging context, while avoiding unnecessary adjustments to existing items.</li> </ul>
<p><b>Probability sampling strategies</b> Random sampling approaches that are <i>simple</i> and <i>stratified</i> allow population-level claims</p>	<p>In general, probability sampling must be used if making inferences about a wider population such as citizens of a nation or a city (Smith and Jensen, 2016). Careful consideration must be given to systematic sampling problems, which can be exacerbated in emergency contexts (e.g., economic disparities leading to under-participation by low income groups during times of additional uncertainty).</p> <p>When non-probability sampling techniques are used, such as <b>convenience</b> (e.g., recruitment via advertisements, mailing list, social media, etc.) or <b>purposive sampling</b> (e.g., deliberately perusing certain respondents rather than others), claims must stay tethered to the sample and should not be used to make inferences about the wider population.</p> <p>Great care should be taken to assess the representativeness of different potential sampling sources when using commercial providers. Many public opinion research firms offer access to respondent pools—useful for obtaining comparatively quick and cheap responses—which may not reflect the population in important ways. Researchers should be careful to identify the strengths, limitations, and appropriateness of such pools for a given research question.</p>

## METHODOLOGICAL CONSIDERATIONS

In emergency situations, avoiding common pitfalls in methodological designs can be challenging because of temporal pressures and unique emergency contexts. We

recommend the following standards in methodological designs for COVID-19 research (**Table 2**):

We also encourage readers to explore other resources for supporting methodological rigour in emergency contexts. In particular, the CONVERGE program associated with the Natural

**TABLE 2 |** Key methodological considerations for COVID-19 survey research.

<p><b>Validated measures</b> Surveys designs should use previously validated measures wherever possible</p>	<p>Individuals go through complex psychological processes when answering survey questions (e.g., Tourangeau et al., 2000; Wagoner and Valsiner 2005; Smith and Jensen 2016). Validated scales offer accurate ways of measuring different dimensions of attitudes and behavioral intentions, where quality has already been established. In contrast, first attempts to generate quantitative survey measures (e.g., levels of trust towards the government) can often produce invalid or unreliable measurement. Indeed, building on existing validated measures can be the difference between having a process of quantifying public attitudes and interests through rating scales (e.g., level of agreement Likert-type scales) that is straightforward and effective or fraught with measurement error and other methodological issues.</p>
	<p>Research frameworks for surveys must be carefully <b>conceptualized</b> (i.e., "what are we measuring") and <b>operationalized</b> (i.e., "how will we measure it"). It is easy to make errors in conceptualization (e.g., not clearly defining the group being studied)</p> <p style="text-align: right;">(Continued on following page)</p>

**TABLE 2 |** (Continued) Key methodological considerations for COVID-19 survey research.

<b>Research frameworks</b> Align research questions, concepts, and operations	or the phenomenon being measured) and operationalization (e.g., choosing a sample that doesn't represent the conceptualized group or using a measure that captures something other than the phenomenon) when creating new measures or straying from pre-existing definitions of groups. Triangulation between results from open-ended and closed-ended survey items in a questionnaire can be helpful to provide more comprehensive coverage of a topic than would otherwise be feasible.
<b>Standardized surveys and questions</b> Ensure comparability with other studies	Survey items and scales should be <b>standardized to enable comparisons</b> , allowing for benchmarking and identification of patterns across research studies. For example, demographic questions can be aligned with census questions, the local equivalent of the General Social Survey, or other investigations being run on COVID-19 or related topics (e.g., influenza; see Kennedy et al., 2020 for an example of such coordination in a Canadian context and Jensen et al., 2021b in a German context). Moreover, outcome (e.g., attitude or behavior) measures can be aligned to prior studies to allow for comparisons and/or future meta-analyses.

Hazards Center at the University of Colorado Boulder maintains a significant community resource via tutorials and “check sheets” to support method design and implementation (see <https://converge.colorado.edu/resources/check-sheets/>).

## RESEARCH COORDINATION

Research coordination during emergencies requires pragmatic strategies to maximise the impact of evidence from rapid-response research. Despite massive government attention and resulting funding

schemes, the available funds for social science research are outstripped by research needs—a situation made worse through duplication of research, overproduction, and inefficient use of resources in some topics. This results in fewer topics and populations receiving research attention, and investigations spanning a shorter period. It also generates a “wave profile” of investigation that is temporary and transient, disappearing as funds become limited due to economic constraints or further displacements occur to new topics.

We recommend the following practical considerations to maximize the efficiency, coordination, and effectiveness of survey-based research efforts (Table 3):

**TABLE 3 |** Primary considerations for coordination of survey-based COVID-19 research.

<b>De-duplication</b> Avoid unintentional repetition across projects	Where possible, significant effort should be taken to avoid multiple projects investigating the same questions in the same populations, instead joining efforts to increase granularity and representativeness of data and extend duration of project. This will allow for greater prioritization of strategic replication and diversified inquiry.
<b>Coordination</b> Collaborating across regions and disciplines can help to reduce costs, increase data comparability, and improve long-term data utility	Given the unprecedented number of projects investigating COVID-19 topics, efforts should be made to coordinate with other investigations in similar jurisdictions to avoid public survey fatigue, reduce overhead expenses, and allow for richer data analysis. For instance, Kennedy et al. (2020, 2021b) used one probabilistic survey to collect data on behalf of four separate funded research projects, while aligning survey items with several other jurisdictions—thereby allowing each research team to investigate a wider array of interactions (e.g., mental health, stigmatization, and social determinates) and reducing overhead costs in survey administration. To aid coordination in the context of COVID-19, the Natural Hazards Center at the University of Colorado Boulder has launched a research registry and a series of COVID-19 working groups through its long-established CONVERGE program (funded by the National Science Foundation), which provides coordination and networking functions within the disaster research community. CONVERGE provides training for researchers, supports ongoing projects through networks and funding, and runs a social science data repository for research in the field of natural hazards and disaster studies. <sup>2</sup> Researchers should be attuned to coordination efforts within their fields of study. For instance, a collaboration between University College London and the University of Copenhagen has launched the COVID Minds Network for registering surveys, sharing protocols, harmonizing measures, and facilitating cross-national comparisons of results for projects focused on mental health during COVID-19. <sup>3</sup>
<b>Harmonization</b> Use validated survey measures to improve comparability	Where possible, harmonization on survey items should be achieved by using pre-existing and previously validated measures. For instance, Kennedy et al. (2021b) borrow from Statistics Canada, the General Social Survey, and several previous epidemic surveys. Coordination networks, as described above, provide a framework for identifying emerging harmonized approaches, although more must be done—including in the wake of COVID-19—to identify best practices going forward for establishing these standards in advance, rather than on-the-fly.
<b>Evidence synthesis</b> Invest in scholarship to clarify existing knowledge	Given the vast proliferation of COVID-19 survey research (dozens to hundreds of results being released daily), researchers and practitioners alike face a high degree of difficulty in conducting real-time literature and evidence reviews of the topics investigated. Significant investment should be made into efforts that make this research easily identified, navigated, and searched. Robust systematic reviews, rapid evidence reviews or even scoping reviews can assist practitioners and data users to gain an understanding of what has already been established about a topic. It is important for funders to invest in reviews and secondary analyses, rather than always expecting more and more new empirical data to be produced.

<sup>2</sup>To view or add a project to the research registry, visit <https://converge.colorado.edu/resources/covid-19/public-health-social-sciences-registry>. To review opportunities and join a working group (including an international COVID-19 working group on survey research), visit <https://converge.colorado.edu/resources/covid-19/working-groups>.

<sup>3</sup>See [covid-minds.org](https://covid-minds.org).

## CONCLUSION

Evidence-based science communication and decision-making depends on the reliability and robustness of the underlying research. Survey-based research can be valuable to supporting communication and policy-making efforts. However, it can also be vulnerable to significant limitations and common mistakes in the rush of trying to deploy instruments in an emergency context. The best practices outlined above not only help to ensure more rigorous data, but also serve as valuable intermediate steps when developing the project (e.g., meta-analysis helping to inform more robust question formulations; methodological transparency allowing more scrutiny of instruments before deployment). For example, by drawing on existing survey designs prepared by well-qualified experts, you can both help to enable comparability of data and reduce the risk of using flawed survey questions and response options.

In this article, we have presented a series of principles regarding effective crisis and emergency survey research. We argue that it is essential to begin by assessing the suitability of questionnaire-based approaches (including the unique strengths of surveys, potential limitations related to design and self-reporting, and the types of information that can be collected). We then laid out best practices essential to reliable research such as open access designs, engaging requisite social science expertise, using longitudinal and repeated measure designs, and selecting suitable sampling strategies. We then discussed three methodological issues (validation of items, use of standardized items, and alignment between concepts and operationalizations) that can prove challenging in rapid response contexts. Finally, we highlighted best practices for funding and project management in crisis contexts, including de-duplication, coordination, harmonization, and evidence synthesis.

Survey research is challenging work requiring methodological expertise. The best practices cannot be satisfactorily trained in the immediate race to respond to a crisis. Indeed, even for those with significant expertise in survey methods, issues like open access, de-duplication of projects, and harmonization between designs can pose significant challenges. Ultimately, the same principles hold true in emergency research as in more “normal” survey operations, and “the quality of a survey is best judged not by its size, scope, or prominence,

but by how much attention is given to dealing with all the many important problems that can arise” (American Statistical Association, 1998, p. 11).

The emergency context should not weaken commitments to best practice principles, given the need to provide robust evidence that can inform policy and practice during crises. For researchers, this means creating multidisciplinary teams with sufficient expertise to ensure methodological quality. For practitioners and policy makers, this means being conscientious consumers of survey data—and seeking ways to engage expert perspectives in critical reviews of best available evidence. And, for funders of such research, it means redoubling a commitment to rigorous approaches and building the infrastructure that supports pre-crisis design and implementation, as well as effective coordination during events. Building resilience for future crises requires investment in survey methodology capacity building and network development before emergencies strike.

## AUTHOR CONTRIBUTIONS

All three authors contributed to the drafting and editing of the manuscript, with EBK as lead.

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