

Introduction

The coronavirus disease 2019 (COVID-19) pandemic, caused by SARS-CoV-2, has had unprecedented impacts on health systems, public health, societies and individuals globally.(1) In response to outbreaks, physical distancing measures, national lockdowns and travel restrictions to control the spread of COVID-19 have been implemented in many countries.(2) In response to these measures, many public health researchers are choosing to switch from standard face-to-face data collection methods to remote data collection in support of continued research. Remote data collection is defined here as the collection of data via the phone, online or other virtual platforms, with study participants and researchers physically distanced.

The aim of this commentary is to summarise methods, key challenges and opportunities of remote qualitative and quantitative data collection for public health research in low- and middle-income countries (LMIC). The framework we use to structure our discussion is the research process, starting from sampling and culminating in analysis. Within this we draw out the steps in research most likely to be affected by the pandemic and attendant need to cease face-to-face interactions with research participants. We identify which steps are most affected and what are potential alternatives based on interviews and discussions, held between May and June 2020, with approximately 30 researchers from the London School of Hygiene and Tropical Medicine and collaborating partners, representing a range of disciplines, and are summarised for each step in the research process, including sampling and recruitment, informed consent, and response. Interviewees were selected or volunteered themselves, based on their experience and expertise in designing and conducting remote data collection. These consultations identified the following as the steps in research most likely to require attention: sampling and recruitment; informed consent; response rates; rapport with participants; privacy and safety; and analysis. Whilst the focus of this commentary is on LMIC, many of the lessons learnt are relevant to remote data collection in high-income countries.

What remote data collection methods can I use?

Remote qualitative methods include online or phone-based interviews and focus group discussions, audio-diary methods,(3) photovoice (use of photography to capture lived experiences),(4) video-documenting, documentary analysis of social media (e.g. Facebook and WhatsApp groups, YouTube comments or podcasts), and auto-ethnography (ethnographic study on self).(5,6) Remote quantitative methods include mobile phone surveys implemented using: interactive voice response (IVR), short messaging service (SMS), or computer-assisted telephone interviews (CATI), and self-completed online questionnaires, shared via email or social media platforms. These methods are not new,(7) with telephone and postal surveys used in higher income countries; yet their use has become essential during the COVID-19 era to support the collection of data directly from individuals and populations.

Each remote data collection method has advantages and disadvantages, which affect their feasibility and acceptability in specific settings (Table 1). For example, when considering a mobile phone survey, although IVR and SMS surveys are cheaper than CATI, they require participants to have high levels of literacy; CATI allows for the inclusion of individuals regardless of literacy, and provides opportunities for researchers to encourage participation and study participants to clarify questions.(7) With widespread ownership of mobile phones in LMIC, but lower access to smartphones and the internet, mobile phone methods are more commonly used than online methods and are a key focus of this commentary. Few of the experts interviewed had implemented or were planning online methods due, in part, to their limited reach in certain LMIC. Exceptions include online surveys planned with specific target groups, for example, members of an established association of professionals and university students.

In the following sections, we describe the specific challenges of remote data collection throughout the design, conduct and analysis of a research study, and discuss the implications for: ethics, sampling and recruiting study participants, obtaining informed consent, maximising response, protecting participants' privacy and confidentiality, and data analysis and interpretation.

Is it ethically appropriate to conduct my research study during the COVID-19 pandemic?

Individuals, communities and societies face heightened social, physical and emotional challenges during the COVID-19 pandemic. Decisions on whether to conduct research using remote methods need to consider the research burden and COVID-19-related risks to study participants. For example, remote collection of data may require greater effort on the part of the study participant, who may be required to use their own phone, their own resources to charge this phone, and to identify a private space to participate in the study. On the other hand, remote methods may be more preferable to study participants, removing the time and opportunity cost associated with travel to study sites. As with any research, potential risks need to be weighed against benefits and the ethical imperative to continue with research to generate evidence of benefit to public health.

How do I sample and recruit study participants?

Key challenges in remote data collection include garnering diverse experiences (qualitative research), obtaining a sampling frame representative of the population of interest (quantitative research) and contacting "harder to reach" populations.(9) Whilst some of these challenges are present in face-to-face research, the limited ability to recruit participants in person, either at home, in a clinic or other venue, alongside the reliance on mobile phones for recruitment, heightens these challenges and creates the need for alternative sampling

methods. For qualitative research, sampling approaches include purposive sampling, snowball and convenience sampling. Purposive sampling aims to ensure diversity according to key factors theorised to influence experience. Recruitment can be facilitated via community-based organisations and leaders, neighbourhood health committees or established networks (Sudan case study, Box 1). Snowball sampling can be effective for qualitative research, although drawing from multiple initial participants (who then recruit others from within their networks) is important to achieve diversity.^(10,11) These sampling methods can also be used in quantitative research; snowball sampling may be useful for online surveys shared via email or social media platforms,⁽¹²⁾ and a convenience sample can be recruited through online social networking platforms.

For quantitative research, representative samples from the population of interest are either important to maximise internal validity (descriptive research) or useful to maximise external validity (aetiological/evaluation research). In countries where mobile phone ownership is high, a sampling frame of the general population can be obtained by contacting mobile phone network operators or mobile phone survey companies who maintain lists of phone numbers. A sample can then be randomly selected using these lists. Alternatively, random digit dialling could be used to generate a study sample. These methods, however, have limitations. Network operators may be unwilling to provide phone numbers and random digit dialling is unlikely to yield a representative random sample of the population. For a descriptive, population-based survey, lack of representativeness limits the validity of this approach.

As with qualitative research, established relationships, for example with participants recruited to a cohort study (Malawi case study, Box 2), can be leveraged to facilitate continued or new research. Where the target population is a specific group, for example female sex workers or adolescents, respondent-driven sampling (where individuals representative of the target population are provided a fixed number of coded coupons to incentivise recruitment of their peers to the study),^(13,14) is an established method that can be implemented using mobile phones or online to, in principle, obtain a representative sample. Depending on the target population, existing lists that are representative of the population, for example registers of school students or email addresses/phone numbers for members of a professional association, can be leveraged. However, data protection and ethical issues around sharing personal details need to be considered; lists should be anonymised to maintain confidentiality and the owners of these lists should inform potential study participants about the research prior to recruitment. Where the target population is individuals attending particular spaces, for example bars and sport facilities, or indeed geographical areas, open source maps can be used to generate a sampling frame and existing social networks leveraged to initiate data collection.

In practice, a combination of approaches may be necessary to recruit study participants. However, limitations related to diversity of experience and representativeness are likely to

persist as is restricted participation of more vulnerable populations, including individuals with vision or hearing impairments, low literacy, and older populations. Where a mobile phone survey or interview is planned, one strategy to reach individuals without a phone is contacting, or even interviewing, a phone-owning friend or relative; however, this may not be appropriate for sensitive research topics.

How can I obtain informed consent remotely?

Oral consent (over the phone or via a voice note) or written consent (via email, WhatsApp or SMS) is being accepted by some ethics committees as written informed consent becomes challenging, or impossible. For mobile phone-based research with adolescents, which requires parental/guardian consent, additional challenges emerge in confirming the age of the participant to establish whether parental/guardian consent is needed and in ensuring consent is being provided by the parent/guardian rather than the respondent themselves, a friend or other relative. For these reasons, oral consent, which can be recorded or conducted in combination with written consent where feasible, may be preferable to written consent only. Concise and simple language is required to convey complete information remotely, while maintaining the rigorous ethical standards of face-to-face research. Consent should always be appropriately documented, while protecting patient data and confidentiality. Documentation could be in the form of a list of participants, stored on a password-protected computer, who consented to participate in different study components which could also serve as a record for audit purposes.

How do I navigate technological challenges in recruitment to maximise response rates?

Researchers should anticipate higher non-response than face-to-face methods in sample size calculations. For mobile phone surveys, response rates are influenced by factors including phone ownership and autonomy to use phones. In some settings, this means rural women and elderly populations are under-represented. Even where mobile phone ownership is high, low response rates threaten study validity (15) as how representative study participants are of the broader, target population would remain unclear. Among individuals with a phone, response rates are affected by distrust of unknown phone numbers, phone-based harassment,(16) time required to complete the survey, poor network coverage and inadequate access to electricity to charge phones (Malawi case study, Box 2). Online surveys can achieve high participation yet they overrepresent higher-income, urban populations with higher literacy and access to smartphones and/or the internet.(12)

To improve response rates to mobile phone surveys, researchers can use established relationships with participants or community-based organisations or send an SMS, prior to the phone call, to introduce the study and inform individuals that they should anticipate a call. In the absence of transport refunds, the provision of airtime to compensate for

participants' time and their own resources needed to charge their phones is important from an ethical standpoint. Airtime incentives to participate in the study and to refer friends to the study can achieve higher response.(7,15) However, issues of joint phone ownership need to be navigated, in which case other compensation, such as vouchers redeemable at local shops, could be considered. Perseverance (i.e. repeatedly contacting participants at different time and day combinations) is also required, which can be facilitated through protocols detailing the frequency and timing of contacts (Malawi case study, Box 2). To increase survey completion rates, questionnaires and interview guides need to be short (lasting no longer than 30 minutes).(17) Placing the most pertinent questions near the start of a survey is of greater importance in remote data collection, as technological challenges may occur, participants may be more likely to experience fatigue, be distracted by other activities, or have their privacy compromised.

How do I build rapport with participants?

Intensive training of interviewers, including role play for phone-based interviews, is critical for developing strategies to build rapport. Rapport should be established in the first few minutes of a call, with informal conversations incorporated in the consent process (Zimbabwe case study, Box 3). Phone-based in-depth interviews and CATI enable researchers to develop rapport with study participants, which can improve response rates and be more appropriate for asking complex and sensitive questions.(7,18) To increase response to sensitive questions, for example sexual behaviours, and the validity of these data, researchers should consider combined approaches, providing individuals the opportunity to respond via SMS or IVR. This is similar to the use of audio computer-assisted survey instruments within face-to-face surveys, which can reduce reporting bias.(19) However, combining methods may have implications on the cost, time and technical expertise required to complete the study.

How do I protect participants' privacy and safety?

When research is face-to-face, the researcher is responsible for establishing privacy and halting data collection when privacy is compromised. Remote research places this onus on the study participant. Yet, establishing privacy can be difficult where participants share homes and have limited private space or time (Zimbabwe case study, Box 3). Privacy is particularly important for studies exploring sensitive topics, such as gender-based violence, where the consequences of compromised privacy could be harmful.(20) At the start of data collection, participants should be advised of the potentially sensitive nature of the study and that they should seek a private space. To mitigate risk, strategies include using 'code words' or an 'exit button' that participants can say or press when their privacy is compromised.(20) IVR and online surveys enable participants to complete surveys at a time and place of their choosing, offering more flexibility for participants to establish privacy. These surveys could include a

question on whether the respondent completed the survey in private, or in the presence of, for example, their child, parent/guardian or friend.

Data protection, including end-to-end encryption of phone calls and security of platforms used to deliver online surveys and interview transcripts, is an additional issue relevant to privacy and confidentiality that requires consideration.(21) Additionally, researchers have a duty of care and need to carefully consider safeguarding issues, especially where COVID-19 has impacted the availability of support services. Information on online or phone-based services should be made available during the consent process. Specific protocols need to be developed for referrals, interviewers need to be informed if particular responses may trigger automatic referrals, and follow-up is required where safe-guarding issues emerge. As part of this protocol, researchers need to establish a system to regularly check that these services have remained operational.

How do I analyse and interpret data collected remotely?

Remotely-collected quantitative data will likely be affected by response bias.(22) Weighting results using existing data from a census or population-based survey known to be representative of the population of interest can be used to reduce this bias.(18) However, the use of weights in data analysis reduces precision and may have little effect on estimates.(15,18) As with face-to-face data collection, transparency regarding limitations is essential, including reporting response rates and other potential sources of bias.(23) Data on whether or not the respondent was alone while completing a mobile phone or online survey can be used in a sensitivity analysis to assess whether having another person present compromised responses. Analysis of remote qualitative data needs to account for issues around rapport; triangulation of data from different methods can help provide depth. Findings emerging from remote methods should be interpreted in light of these limitations and the implications on generalisability discussed.

What opportunities do remote data collection methods present?

Remote data collection presents opportunities as well as challenges. The methods enable data collection in contexts where face-to-face data collection is less feasible, for example during violence and unrest, when travel restrictions are in place, a natural disaster and during other disease outbreaks. The methods may provide greater autonomy and privacy, for example, through use of a pseudonym during online FGD and surveys. Self-collected remote qualitative methods, such as audio-diaries, photo-voice, video documenting and auto-ethnography enable more participant-centred data collection. The engagement of members from the population of interest in the research activities demonstrates to the public the value placed on their perspectives and lived experiences, and can be used to inform and strengthen activities already being implemented by communities (Sudan case study, Box 1). Remote data

collection also provides an opportunity for more efficient data collection, being less expensive and time-consuming than face-to-face data collection. The methods may be preferred by some study participants who may also have more time for participation, particularly during lockdowns. This efficiency, particularly with automated phone surveys, facilitates data collection from a large number of study participants over a short timeframe, providing critical information to inform the response to COVID-19 or similar crises. The benefits may be greatest for follow-up surveys among cohorts already engaged in research. Leveraging the widespread use of mobile phones among younger adult men, often under-represented in face-to-face population-based surveys, provides opportunities to reach broader cross-sections of a population.(18,24)

Concluding remarks

In a COVID-19 era, remote data collection is needed to inform the response to the pandemic and other public health issues. The remote collection of data presents key ethical challenges and particular challenges related to identifying and recruiting study participants. With high and increasing ownership, remote data collection is likely to continue to rely on mobile phones, which remains easiest when building on existing relationships, where contact details are known, rapport is developed and trust established. A key challenge requiring further research and navigation is how to involve individuals who do not own mobile phones and have limited access to the internet. Furthermore, available approaches to remote data collection are restricted in their ability to establish personal connections. Personal connections are more easily developed through face-to-face interaction and can be critical to public health research, for example in the case of qualitative research or to quantitative research particularly on sensitive topics. Despite limitations, remote methods can be more efficient than face-to-face data collection and provide platforms to empower individuals to engage in generating and analysing data. Lessons learnt in designing and implementing remote data collection methods in a COVID-19 era are critical to inform future execution of these methods, which are likely to become fundamental to continued research in public health.

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