Remote data collection for public health research in a COVID-19 era: ethical implications, challenges and opportunities

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic, caused by the SARS-CoV-2 virus, has had unprecedented impacts on health systems, public health, societies and individuals globally (The Lancet Public Health, 2020). 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 (Chu et al., 2020). 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 summarize 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 ~30 researchers from the London School of Hygiene and Tropical Medicine and collaborating partners, representing a range of disciplines. 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 (FGDs), audio-diary methods.
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 the 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 (Tran et al., 2015). 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 theorized to influence experience. Recruitment can be facilitated via community-based organizations and leaders, neighborhood 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 (Shaghaghi et al., 2011; Kirchherr and Charles, 2018). 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 (Roy et al., 2020), 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 maximize internal validity (descriptive research) or useful to maximize 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, e.g. 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, e.g. female sex workers or adolescents, respondent-driven sampling (where individuals representative of the target population are provided a fixed number of coded coupons to incentivize recruitment of their peers to the study) (Heckathorn, 1997; Johnston and Sabin, 2010), 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, e.g. 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 anonymized 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, e.g. 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 the 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.
### Qualitative methods

| Method | Description | Strengths | Limitations | Strategies to improve data quality and navigate challenges |
|--------|-------------|-----------|-------------|----------------------------------------------------------|
| **Phone interviews** | In-depth and semi-structured interviews can be conducted by phone. Interviews can also be via WhatsApp calls or online platforms (e.g. Skype or Zoom) | • Can facilitate the collection of high-quality data on personal experiences<br>• Real-time interviews allow for the interviewer to probe, check understanding and follow the direction of conversation | • Challenge to develop rapport and trust with the participant<br>• Inability to see visual cues reduces understanding and appropriate prompting<br>• Technological challenges with network, airtime, batteries<br>• Cost of phone technologies<br>• Disturbance by other noises and activities if participants cannot find a private space<br>• Responsibility of privacy placed on participant | • Training is key to developing rapport with participants over the phone, including role-play practice of interviews, especially how to set the tone at the beginning of the interview with informal conversation<br>• Phone interviews should be shorter than face-to-face interviews, to account for participant fatigue<br>• Perseverance is required to repeatedly call participants at different times of day and days of the week and call back if the interview is disturbed or cut off<br>• If desired, participants can join anonymously, through providing a pseudonym and not using a video<br>• Group phone calls may be most appropriate in lower-income settings, where access to online is lower, but incurs additional airtime costs |
| **Phone or online FGDs** | Online platforms or group phone calls can be used to facilitate group discussions remotely. These real-time discussions can be through writing, speaking or with video. | • Facilitates interaction to understand socially normative perceptions<br>• Can provide some peer support | • Moderation can be challenging, and requires a skilled facilitator<br>• Data security of online platforms need to be considered, including end-to-end encryption as some platforms (e.g. Zoom) are less secure<br>• If not participating anonymously, ensuring confidentiality is challenging | • If desired, participants can join anonymously, through providing a pseudonym and not using a video<br>• Group phone calls may be most appropriate in lower-income settings, where access to online is lower, but incurs additional airtime costs |
| **Self-collection of data (including diaries, photovoice, video documenting and auto-ethnography)** | Participants record elements of their lived experiences themselves. Diaries or journals can be handwritten, voice memos or through online platforms or applications. Photovoice or video documenting involves participants taking photos or videos about their everyday practices and interactions that they can share with researchers. Auto-ethnography situates the researcher as the participant, documenting their own lives, experiences and perceptions. | • Enables participants to generate data at a time and a place that is convenient for them<br>• Facilitates tailoring data collection to participants’ personal experiences | • Attrition to continue data collection can be a problem, especially for longer term studies<br>• Data recorded may deviate from desired areas of enquiry or research questions<br>• Challenges in transferring self-collected data to researchers<br>• Participants using and keeping photo and video technology may not be appropriate in lower-income settings | • Asking participants what method of self-collection of data suits them can better tailor the method to the participant<br>• Providing relevant prompts and guiding questions can help direct participants’ documentation<br>• Keeping in touch with participants maintains participation<br>• Self-collection of data can be used as prompts for further discussion in combination with interviews and other methods |
| **Documentary analysis** | Analysis of naturally occurring online data, e.g. analysing YouTube | • Data are already existing and available in the public domain | • Lack of depth, or ability to probe, compared to interviews or FGDs | • Can capture and transfer text, videos and |
Table 1 (continued)

| Method          | Description                                                                 | Strengths                                                                                                                                                                                                 | Limitations                                                                                                                                                                                                 | Strategies to improve data quality and navigate challenges                                                                 |
|-----------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
|                 |                                                                             | • Data are not produced for the purpose of research, and not directed by the researcher                                                                                                                   | • Capturing and analyzing emojis is a challenge, but important for understanding meaning                                                                                                                   | images to analytical software (e.g. Nvivo)                                                                                   |
|                 |                                                                             | • Relative to other phone surveys, may be more representative of women (Lau et al., 2019)                                                                                                                  | • Low response rates compared to CATI                                                                                                                                                                     | Analytics (e.g. through YouTube) can provide data on demographics of those interacting (watching and commenting) |
|                 |                                                                             | • More inclusive for individuals who are hard of hearing                                                                                                                                                | • Potential for question-level breakoff, which can increase with each subsequent question                                                                                                                   |                                                                                                                                 |
|                 |                                                                             | • May be appropriate for sensitive questions                                                                                                                                                    | • Under-represents participants with lower literacy levels                                                                                                                                             |                                                                                                                                 |
|                 |                                                                             | • Relative to CATI, cheaper and may provide more language options                                                                                                                                         | • Questions need to be highly specific, as there is no opportunity for participants to clarify questions and limits in character numbers                                                                 |                                                                                                                                 |
|                 |                                                                             | • Allows individuals to respond at times most convenient to them                                                                                                                                          | • Navigating keyboard can be a challenge (Leo et al., 2015), particularly for older populations (who are under-represented in SMS surveys) (Broich, 2015) |                                                                                                                                 |
|                 |                                                                             | • Least expensive relative to CATI and IVR (Lau et al., 2019)                                                                                                                                               | • Participants may have concerns regarding data charges for submitting responses                                                                                                                         |                                                                                                                                 |
|                 |                                                                             | • Some evidence to suggest this is more inclusive of individuals with lower literacy levels (Gibson et al., 2017; Lau et al., 2019)                                                                      | • More expensive than SMS surveys, but cheaper than CATI                                                                                                                                                  | Send reminders to increase response rates                                                                                       |
|                 |                                                                             | • More representative of rural populations                                                                                                                                                              | • Lacks personal touch of CATI surveys, no opportunity for rapport development                                                                                                                           | Combine with other mobile phone survey method to increase reach                                                                 |
|                 |                                                                             | • Higher response rates than SMS survey, although not necessarily more representative overall (Lau et al., 2019)                                                                                           | • Not inclusive for individuals who are hard of hearing                                                                                                                                                  | Provide an incentive to minimize concerns regarding data charges                                                             |
|                 |                                                                             | • Relative to CATI, provides more language options (Lau et al., 2019)                                                                                                                                   | • No opportunity for individuals to clarify questions                                                                                                                                                  |                                                                                                                                 |
|                 |                                                                             | • Individuals may not answer unknown phone number                                                                                                                                                         | • Individuals may not answer unknown phone number                                                                                                                                                         |                                                                                                                                 |
| Quantitative methods |                                                                             | • Higher response rates relative to IVR and SMS surveys (Lau et al., 2019)                                                                                                                             | • Costlier than IVR and SMS surveys                                                                                                                                                                       |                                                                                                                                 |
| SMS survey      | Individual questions sent via SMS to phone number                              | • Higher survey completion rates, as interviewer able to build rapport and explain the purpose of the study                                                                                                 | • Requires more quality control and training                                                                                                                                                                | Make phone calls on different days/times of day                                                                             |
|                 | Participants respond with a number corresponding to a response list          |                                                                                                                                                    | • Potential for interviewer bias introduced (Gibson et al., 2017)                                                                                                                                         | Schedule a time to interview the study participant                                                                             |
| IVR survey      | Automated phone survey, with individuals asked to key in or state their response to the questions | • Send survey at different day/time combinations                                                                                                                                                         | • Send survey at different day/time combinations                                                                                                                                                           | Send SMS prior to the phone call to introduce the study                                                                    |
| CATI            | Participants are phoned by an individual and asked to complete a survey over the phone |                                                                                                                                                    | • Combine with SMS reminder to increase response rates                                                                                                                                                   |                                                                                                                                 |
|                 |                                                                             | • Combine with other mobile phone survey method to increase reach                                                                                                                                          | • Combine with other mobile phone survey method to increase reach                                                                                                                                          |                                                                                                                                 |

(continued)
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, whilst maintaining the rigorous ethical standards of face-to-face research. Consent should always be appropriately documented, whilst 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 maximize 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 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 (Lamanna et al., 2019), 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 over-represent higher-income, urban populations with higher literacy and access to smartphones and/or the Internet (Roy et al., 2020).

To improve response rates to mobile phone surveys, researchers can use established relationships with participants or community-
Based organizations 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 (Gibson et al., 2017). 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) (Dabalen et al., 2016). 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.
Box 3 Phone interviews with healthcare providers to understand the perceptions and experiences of lockdown measures: a case study from Zimbabwe

Between March and April 2020, a process evaluation nested within an existing cluster randomized trial of a community-based integrated HIV and sexual and reproductive health service for youth in Zimbabwe was adapted to explore healthcare providers’ perceptions and experiences of national lockdown measures. In the first week of the lockdown, 15 phone-based interviews were conducted. Written informed consent was obtained at a face-to-face meeting prior to the lockdown with the providers, who were purposively selected to provide diverse experiences across location, role, age and gender and whose phone numbers were already known.

For participants who had existing relationships with the interviewer, rapport was easily established, although lack of visual cues obstructed the ability to probe. To work around more formal and formulaic responses, particularly, for those the interviewer had not met before, the interviewer built informal conversation into the interview, particularly during the first few minutes of discussion. Some participants were, in fact, more open over the phone: the interview offered them a rare chance to express their feelings and concerns during lockdown, knowing that they would not see the interviewer in the foreseeable future.

Logistical and technological challenges were faced. Network issues interrupted interview flow, forcing the interviewer to be flexible with re-scheduling interviews. Many participants could not find a quiet and private space to participate in the interview, with children and other conversations disrupting the interview. Perseverance and flexibility were required, such as allowing participants to reschedule the interview at a time convenient to them.

Despite challenges, conducting the interviews by phone circumvented the need to travel, enabling the rapid collection of data which the researchers considered to be of high quality. Importantly, participants expressed gratitude at having the opportunity to talk to someone and share the challenges they were facing as a result of the lockdown.

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 (Gibson et al., 2017; Lau et al., 2019). To increase response to sensitive questions, e.g. 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 (Langhaug et al., 2010). 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 when 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 (Peterman et al., 2020). 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 (Peterman et al., 2020). 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, e.g. 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 (Eynon et al., 2017). In addition, 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 safeguarding issues emerge. As a 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 (Labrique et al., 2017). 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 (Lau et al., 2019). However, the use of weights in data analysis reduces precision and may have little effect on estimates (Lau et al., 2019). As with face-to-face data collection, transparency regarding limitations is essential, including reporting response rates and other potential sources of bias (Greenleaf et al., 2017). Data on whether the respondent was alone whilst 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 generalizability discussed.

What opportunities do remote data collection methods present?

Remote data collection presents opportunities and challenges. The methods enable data collection in contexts where face-to-face data collection is less feasible, e.g. 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, e.g. through use of a pseudonym during online FGDs and surveys. Self-collected remote qualitative methods, such as audio diaries, photovoice, 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 (Lau et al., 2019; L’Engle et al., 2018).

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, e.g. 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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