

User perceptions and experiences of receiving and responding to an interactive voice response mobile phone survey in Uganda: a qualitative study

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Abstract

Background: With the growing burden of non-communicable diseases (NCDs) in low- and middle- income countries, the World Health Organisation recommended a stepwise approach of surveillance for NCDs. This is expensive to conduct on frequent basis and using interactive voice response mobile phone surveys (IVR) has been fronted as an alternative. However, there is limited evidence on how to design and deliver IVRs that are robust and acceptable to respondents.

Objective: This study aimed to explore user perceptions and experiences of receiving and responding to an IVR in Uganda in order to adapt and refine the instrument prior to national deployment.

Methods: A mixed methods design was used, comprised of a locally translated audio recorded IVR survey delivered in four languages to 59 purposively selected participants mobile phones in five survey rounds guided by data saturation. The IVR had modules on socio-demographic characteristics, physical activity, fruit and vegetable consumption, diabetes and hypertension. After the IVR survey, study staff called back participants and used a semi-structured interview; to collect information on the participant's perceptions of IVR call audibility, instruction clarity, interview pace, language courtesy and appropriateness, the validity of questions, and the lottery incentive. Descriptive statistics were used for the IVR survey, while a framework analysis was used to analyse qualitative data.

Results: The key findings that favoured IVR survey participation or completion included preference for brief surveys of 10 minutes or shorter, preference for evening calls between 6pm and 10pm, preference for courteous language, and favourable perceptions of the lottery type incentive. While key findings curtailing participation were suspicion about the caller's identity, if the voice was unclear, skip patterns were confusing, difficulties with phone interface for the IVR interface, such as for selecting inappropriate digits for both ordinary and smart phones, and poor network connectivity for remote and rural participants.

Conclusions: IVR surveys should be brief as possible and considerate of local preferences to increase completion rates. Caller credibility needs to be enhanced through either masking the caller, or prior community mobilisation. There is need to evaluate the preferred timing of IVR calls, as the finding of evening call preference is inconclusive, and might be contextual.

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ABSTRACT

Introduction: With the growing burden of non-communicable diseases (NCDs) in low- and middle-income countries, the World Health Organisation recommended a stepwise approach of surveillance for NCDs. This is expensive to conduct on frequent basis and using interactive voice response mobile phone surveys (IVR) has been fronted as an alternative. However, there is limited evidence on how to design and deliver IVRs that are robust and acceptable to respondents. This study aimed to explore user perceptions and experiences of receiving and responding to an IVR in Uganda in order to adapt and refine the instrument prior to national deployment.

Methods: A qualitative study design was used, comprised of a locally translated audio recorded IVR survey delivered in four languages to 59 purposively selected participants mobile phones in five survey rounds guided by data saturation. The IVR had modules on socio-demographic characteristics, physical activity, fruit and vegetable consumption, diabetes and hypertension. After the IVR survey, study staff called back participants and used a semi-structured interview; to collect information on the participant's perceptions of IVR call audibility, instruction clarity, interview pace, language courtesy and appropriateness, the validity of questions, and the lottery incentive. Descriptive statistics were used for the IVR survey, while a framework analysis was used to analyse qualitative data.

Results: The key findings that favoured IVR survey participation or completion included preference for brief surveys of 10 minutes or shorter, preference for evening calls between 6pm and 10pm, preference for courteous language, and favourable perceptions of the lottery type incentive. While key findings curtailing participation were suspicion about the caller's identity, if the voice was unclear, skip patterns were confusing, difficulties with phone interface for the IVR interface, such as for selecting inappropriate digits for both ordinary and smart phones, and poor network connectivity for remote and rural participants.

Conclusions and Recommendations: IVR surveys should be brief as possible and considerate of local preferences to increase completion rates. Caller credibility needs to be enhanced through either masking the caller, or prior community mobilisation. There is need to evaluate the preferred timing of IVR calls, as the finding of evening call preference is inconclusive, and might be contextual.

Key words: Interactive Voice Response (IVR); Non-Communicable Diseases (NCDs), Qualitative, Uganda

Word Count: 4,699 words

INTRODUCTION

Lower- and middle-income countries (LMICs) suffer approximately 75% of all non-communicable disease (NCD) deaths annually (approximately 32 million deaths)[1,2]. More-over, over 15 million of the NCD deaths occurring in the LMICs are pre-mature (affecting people aged 30 to 69 years), and accounting for about 85% of the global premature deaths from NCDs[2].

The use of mobile phone surveys to collect data is expected to increase, leveraging the growing ownership of mobile phones in LMICs, although the evidence of this utility is still limited[3,4]. Mobile phone surveys could complement existing NCD risk factor surveys such as the World Health Organization (WHO) recommended stepwise approach for surveillance of non-communicable diseases (STEPS)[5].

Interactive voice response (IVR) surveys are one type of mobile phone survey that could be used. IVR surveys use pre-recorded audio files that ask participants to use the keypad on their mobile phone to answer. IVRs are mainly renowned for their use in customer service, and public health

work, such as in the USA since the 1970's[6], but also increasingly for continuity of patient's healthcare beyond the hospital setting[7-9]. More recently in LMICs, international development work uses IVRs, alongside other multimedia such as radio, with the former offering advantages for interactive reach to their audiences to stimulate behaviour change[6].

IVR technology has been piloted and used mainly in healthcare settings of high-income countries dating back to the early 2000s[7,8], although the IVR use is still limited in LMICs[10,11]. Within high-income countries, IVR use is generally limited to explore aspects of self-care[12,13], follow-up of patient care[7,14,15], and evaluating patient-provider interactions in clinical settings[9], but is rarely used for research or surveillance purposes[8,16,17]. Since mobile phone surveys are a relatively new methodology particularly for LMICs, evidence from community respondents on their perceptions on mobile phone surveys and possible reasons for taking the survey and non-response can contribute to better future mobile phone survey design and programming efforts.

A qualitative study in Ghana that used focus groups to evaluate the experience of caregiver's healthcare seeking for their sick child, based on receiving health information through an IVR, reported that all the 37 participants were naïve to IVR, but held favourable perceptions about its use for symptom screening, and providing guidance for care seeking[10]. Negative perceptions included the fear for non-human interaction in using the IVR, a lack of familiarity with the IVR, and the related cost[9,18]. Small-scale studies have reported IVR use in LMICs mainly for medication adherence, such as for TB and HIV[19-22]. Within sub-Saharan Africa, sectors other than health, such as agriculture, and social development report the successful use of IVR for surveillance, and community engagement[6,23].

It is unclear why some respondents take and answer questions in surveillance using IVR and what reasons there are for non-response. The present study sought to explore user perceptions and experiences of receiving and responding to an interactive voice response (IVR) mobile phone survey for NCD risk factors, so as to inform the design and delivery of future surveys delivered using mobile phones.

METHODS

Researcher reflexivity

RT the first author was the interviewer for all interviews of this study, collected field notes, transcribed and led the coding and data analysis. RT is a male public health physician (MD, MPH, PhD), a native of the country of this study. About a third of the participants were known to the researcher, while the rest were obtained through his networks.

Study design

A qualitative study design[24] was used to elicit experiences of participants that had just completed a structured interview on NCD risk factors using an IVR survey delivered over mobile phones to respondents who owned or had access to a mobile phone[16]. This entailed call-backs to all the phone numbers of respondents to the initial automated IVR survey, irrespective of their response status. Those who answered and consented to being interviewed through follow up calls delivered by a human caller were administered an in-depth interview over the phone to explore reasons for the initial response or non-response.

Development and adaptation of survey tools

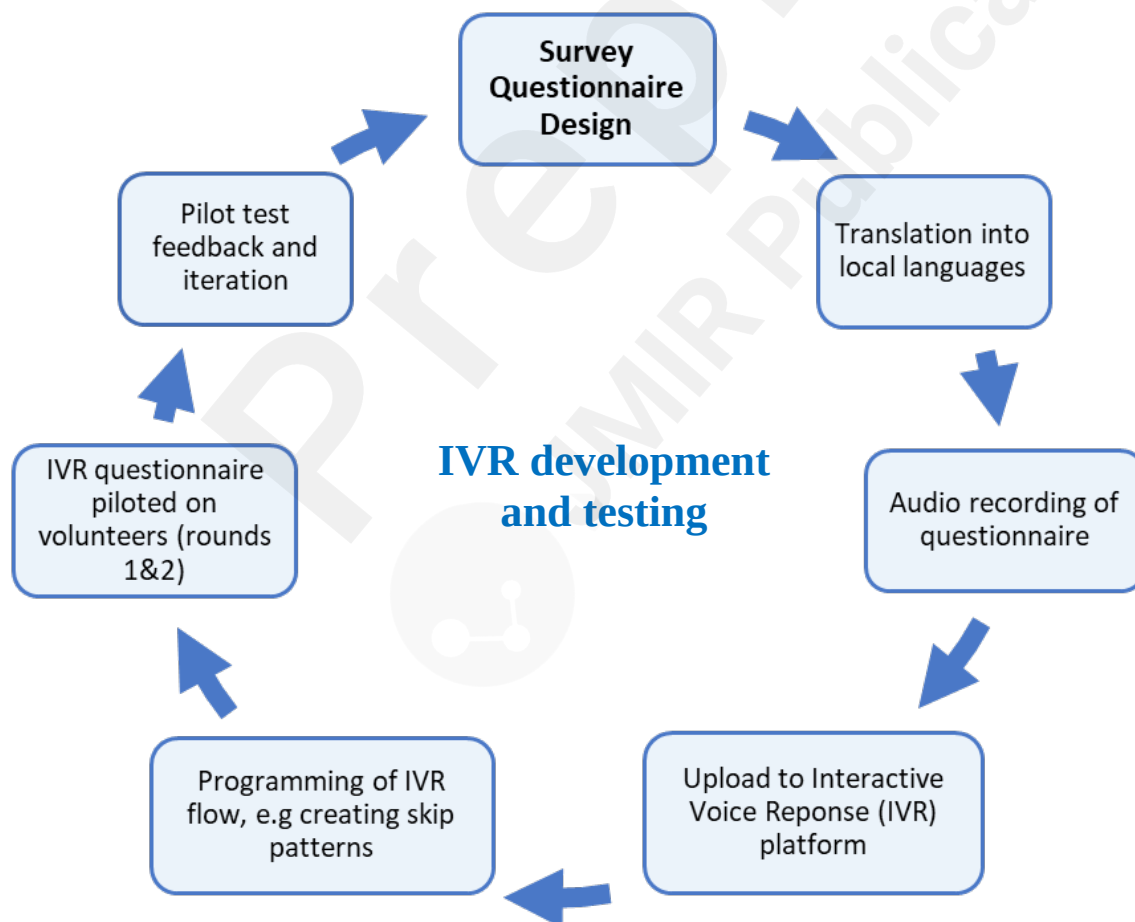
The study deployed an adapted questionnaire based on an original English language version of questions selected by a joint team from the Johns Hopkins University, WHO and the United States Centers for Disease Control and Prevention[16]. These questions had been derived from the WHO STEPS survey[5] as well as the behavioural risk factor surveys[25,26] and the Tobacco Questions

for Surveys[27]. The questions were adapted to the local Ugandan context and included local examples of fruits and vegetables, questions on smoking and tobacco use, alcohol consumption, physical activity, and history of checking for high blood pressure or blood sugar. Although English is one of the official languages in Uganda, a significant part of the population do not speak English and in order to increase the reach of the survey, the adapted questionnaire was translated and back-translated into 3 out of 6 other major languages spoken in various regions of the country; Luganda, Runyakitara and Luo. The four language versions of the questionnaire (including English) were audio-recorded using MP3 format and loaded onto an IVR platform. The audio-recorded questionnaire had 69 items and was delivered to all participants via an IVR platform (Viamo).

The IVR platform was a software interface developed by a global social enterprise. The platform used connectivity through the local mobile network operators registered and active in Uganda. The researchers requested the IVR platform provider to use pre-generated random digit dialling codes such as 077XXXXXXX, or 070XXXXXXX, to dial across different mobile network operators, with a pre-recorded voice IVR. The platform used a call-in number to randomly call across the network operators to access survey participants.

This platform delivery mechanism required pre-testing to assess feasibility and aspects of acceptability, the subject of this article. The survey also informed participants of a chance to win a lottery type of airtime incentive following completion of the IVR, described elsewhere[28]. Figure 1 summarises the process of conducting the pilot study, before feeding into the main mobile phone survey.

Figure 1 Process of IVR development and testing



Study population and Sample size

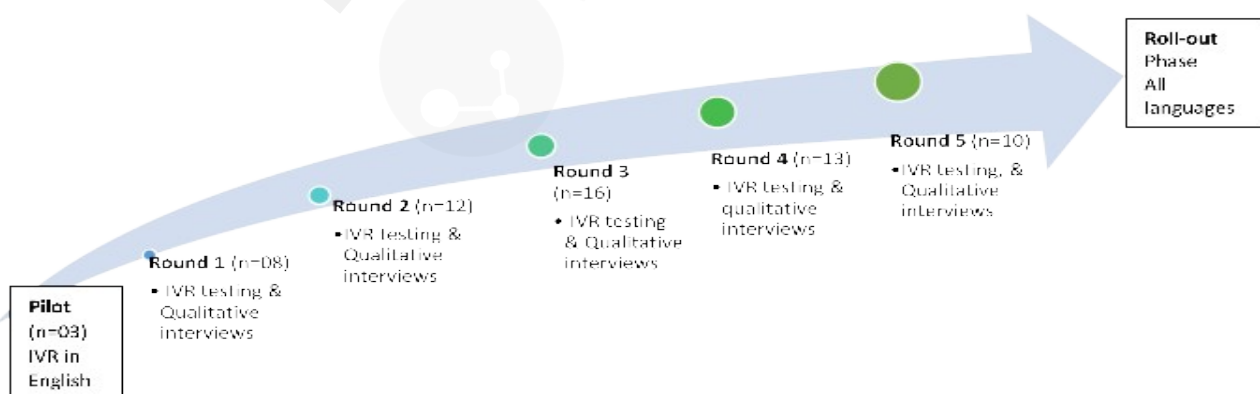
The study population comprised adults that could understand or potentially speak any of the four languages in which the survey was deployed. Through contacts with communities in and around Kampala, Uganda. A purposive sample of 60 volunteers, was recruited to target 15 participants for each of the four languages of the questionnaire. The phone contacts of all the 60 volunteers were uploaded onto the IVR platform, which then delivered an IVR for up to 3 call attempts per testing round, if there was no answer. For example, surveys were programmed to call out at 4pm, then for all unanswered calls, two hours and four hours later. Any incomplete IVR surveys, following the three attempts were not repeated. The IVR was followed by a human caller to all the 60 volunteering participants, irrespective of their IVR response or completion status. The purpose of the human caller was to explore the participant's feedback on their experiences with the IVR encounter, and perceptions about the survey. Responses were recorded from 59 participants, representing a response rate of 98.3%.

Data collection

The IVR survey and interview guide were pilot tested on three researchers in English prior to study deployment. Thereafter, as depicted in Figure 2, the IVR survey testing followed by qualitative interviews was conducted iteratively across five rounds guided by data saturation. All the rounds occurred in April and May 2018. There were a minimum of two native speakers taking the survey in each language at each of the times of roll-out of the survey, designed to validate any differences in opinion for the same reported finding/ query from the survey. However, after three rounds of piloting, participants were selected purposively from within the network of the study coordinator, and not necessarily informed that they would receive a survey, so as to mimic the real-life context whether prior survey booking may be impractical.

Following survey delivery, a research assistant called each IVR respondent in the appropriate language of the IVR, and asked about their perception on whether or not the IVR was audible, if the subject in the questions was clear, if the pace was right, if the language was polite/ courteous, and if the questions were understandable and appeared to be relevant based on the information provided at the beginning of the survey. Respondents were also asked about the difficulties they faced in receiving and navigating the survey, for example, if the instructions for responses such as pressing phone digits were comprehended, if they felt they were in control of the survey, and if they had any other feedback to the survey team.

Figure 2: Data collection process



Survey testing rounds 1 to 5 were conducted in all languages, as depicted in Table 1.

Data and theoretical analysis approach

A framework analysis, as first described by Ritchie and Spencer (1994) was used to explore the themes[29,30] in the study related to audibility, question clarity, pacing of the study, language courtesy, and validity of questions. Framework analysis is advantageous in that it is purposive in nature (is not bounded to a specific epistemological position) guiding a researcher to identify themes that speak to specific objectives within a study, while exploring experiences within the narratives of participants[29-31]. In essence, both a-priori coding from the objectives, and in-vivo coding from emergent data are pursued in framework analysis[30,31]. Further to identifying themes within the study, we then explored for variability, and the meaning of such divergent views using the Arnold's "Janus-face theoretical constructs", thereby introducing post-ante codes to complement some a priori codes.

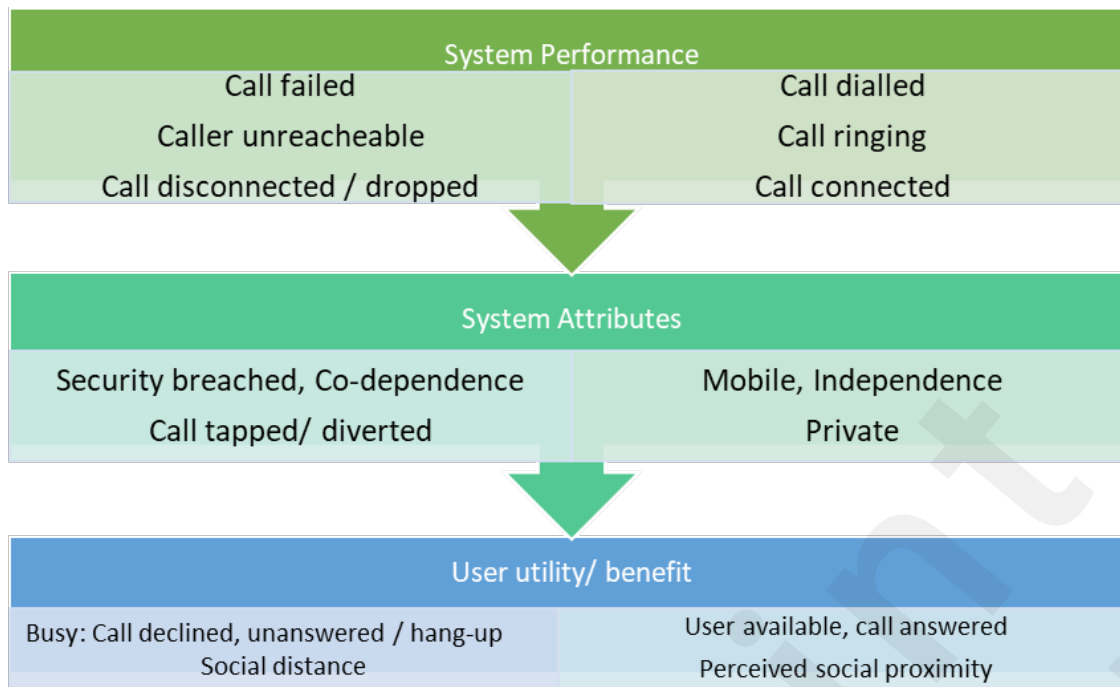
We use Arnold's "Janus-faced" theory[32] (metaphorical perspective) on mobile phones to understand the interaction of participants with the mobile phone survey. The choice of the Janus-faced theory is based on its simplicity for exploring the distinct characteristics along the continuum across the dichotomy of high- or low- interest regarding a naïve individual's behavioural response while engaging with a technology[32]. We conceptualise the encounter of a naïve IVR user as one likely to elicit a multiplicity of reactions, which may take the form of either acceptance or rejection of the IVR technology-interface. There were explanatory limitations for the use of potential alternative behaviour change theories specifically, the Theory of Reasoned Action, The Theory of Planned Behaviour and the Social Exchange Theory. Notably, the trio were limited in their assumption of and individual's prior positive behavioural exposure, thus the choice of the Janus-faced theory[33-35].

The "Janus-faces" model proposed by Arnold[32] is derived from the metaphor of the Roman deity Janus who was cursed and blessed with two faces – each facing a different direction, both backwards and forwards at the same time[32,36]. The significance of this is that while mobile phones, or other technology are designed and built to direct a specific purpose, the reality is that a growing evidence base reports that socio-technical systems of interaction find that people's reactions to technology, its use and adoption can be ironic and paradoxical, rather than unified and purposeful[36,37].

An example of Arnold's Janus-face theoretical model of mobiles phone utility, and performance is presented in Figure 3. As depicted in the figure 3, system performance criteria includes on the one-hand, issues such as call dialled, call ringing (reached), call connected, while on the other hand, it includes things such as – call failed, caller unreachable, call disconnected / dropped, which could be perceived by a user as either advantageous or not.

Figure 3 Janus-faced mobile phone utility





Ethics approvals were obtained from the Makerere University School of Public Health, Uganda and the Uganda National Council for Science and Technology, while participant informed consent was embedded within the IVR, and the process is published elsewhere[38].

RESULTS

Table 1 below shows the characteristics of respondents that took the IVR survey, (including the language selected), who later were interviewed qualitatively. Fifty-nine of the respondents provided feedback to the IVR and participated in the qualitative interviews. Nearly a half of the participants were female 44% (26 of 59), and the age ranged between 23 to 47 years (median age was 31 and 35 years for female and male respondents respectively).

Table 1 Characteristics of IVR survey participants, n=59

Respondent Language selection	IVR Round					Completed survey n=18	Failed [Cancelled/ No answer], (n=10)	Received (incomplete) (n=31)	Of incomplete n=31 Wrong language selected(22.5%)
	1 (n=08)	2 (n=12)	3 (n=16)	4 (n=13)	5 (n=10)				
English		••	••••	•		6	0	0	0
Luganda	••	••••	•••••	•••••	•••	3	3	10	2
Runyakitara	••••	••••	•••••	•••••	•••••	5	3	10	1
Luo	••••	•••••	••••••	•••••	•••	4	4	11	4
Percent of Total						30.5%	17.0%	52.5%	

Qualitative interview findings

For the qualitative interviews, the majority of the respondents did not complete their surveys on the first attempt, rather on the second or third. However, in summary, and as depicted in Table 2, reasons stated as having favoured survey completion were related to the perceived credibility of the institution providing the survey (Makerere University), the fact that the survey was health-related, clarity of questions, language and instruction, being of short duration (10 minutes or less), and the possibility of winning an airtime incentive. On the other hand, the reasons reported for non-

completion were related to being busy, poor network connectivity, suspicion and unknown identity of the caller.

The summary findings in Table 2 are synthesised according to six emergent themes related to the process of IVR survey delivery: timing of the survey, call quality, language related issues, phone type used, survey duration, network connectivity, and perceptions on the incentives. Within each of these themes, we explore the concepts of overall experience with the survey, audibility, question and language clarity, courtesy and question validity. Further, the presentation of the results contrasts between successful and unsuccessful encounters, from the provider standpoint of intended survey delivery.

Table 2 Summary of themes and issues related to survey completion/ non-completion

Theme/Issue	Observation/Comment	Possible impact or implication
Timing of survey	Evening times between 6pm and 10pm were preferred. Wrong timing (day times), had lower completion rates.	Timing of IVR surveys should be evaluated for increasing reach and completion rate.
Call quality, and credibility of the caller	Inaudibility and challenges with skip patterns compromised receiving calls. The credibility of the caller was paramount for motivating participation.	Platform programming should be tested and piloted for robustness prior to rolling out IVR surveys. Caller credibility should be ascertained in the IVR introduction.
Language related issues	Language courtesy provided favourable IVR experiences, while wrong language selection affected validity of responses.	A double prompt for the selection of appropriate language is essential. Piloting should ensure courtesy in translations.
Phone type used	Both ordinary and smart phone users encountered similar challenges with IVR instructions, such as pressing the wrong digits.	User-technology interface is a barrier to the validity of IVR surveys, whose impact requires continuous evaluation.
Survey duration	Shorter realistic survey duration such as 10 minutes is preferred.	IVR surveys need not last longer than 10 minutes.
Mobile network connectivity	Rural respondents, and those located geographically distant from the Capital City had mobile connectivity challenges.	IVR surveys require additional strategies for reaching rural and remote populations, such over-sampling.
Perceptions about the incentive	The lottery type incentive for airtime was perceived favourably by participants	There is need to evaluate various IVR incentive thresholds to find which one increases survey completion.

Timing of the survey

Several volunteer participants preferred their surveys in the evening (between 6pm and 10pm local

time), because several reported they were less busy then, off their day's commitments.

P4 English: "It is very difficult for me to receive any call for a survey during the day, because I am not in charge of my schedule at work".

P13 Runyakitara: "I saw the call, it actually came in twice, but I was in the field, and I merely ignored it. Maybe next time, if you call me in the evening, I may pick the call".

In general, calls that were sent in the evening within the first two rounds of delivery, had higher response rates than those sent out during the day (9/15 compared to 4/15), of the total 20 participants in the first two rounds (including failed calls).

Once the call got received, some encounters (participant- phone interaction) were either successful – resulting into a completed call or were unsuccessful – resulting into early termination or non-acceptance. Details of call receipt are described in the subsequent phrases.

Call quality and credibility of caller

Successful encounters

Successful call recipients were mostly those that received their calls in the evenings between 6pm and 10pm local time. Also, repeat calls had higher chances of acceptance compared to the initial calls. Informing participants to expect the calls prior – although requested for some, did not seem to increase successful encounters. Also, from the final two rounds of the pilot, the majority of the recipients reported that a health-related survey from the Ministry of Health and Makerere University School of Public Health interested them, and motivated their participation.

However, two participants that narrated an early termination of the survey, for unknown reasons, voiced dissatisfaction with the follow-up call because it commenced the interview afresh.

P15 Luganda: "My survey stopped abruptly, but when I received the next call introducing the same survey, it just begun afresh, and this was really disappointing. Hmm, because it meant that I had to spend more time on your survey".

Unsuccessful encounters

Within the first round of pilot interviews, there were four main reported reasons for call failure, including missing calls due to wrong timing, inaudibility, challenges with the skip pattern, and also suspicion and scepticism as to the identity of the caller for some.

Several of the volunteer participants who missed their calls, requested to receive call backs later – so that they can take the survey. At least 17/39 participants made this request. A majority of the participants took their call during the second call attempt. Several participants explained that this was because they did not have the phone with them all the time. In fact, some participants shared their phones with other members of their household.

P7 Luganda: "I am at home focussing on some other chores, after work, so I had forgotten that I had an important in-coming call, I am sorry".

P26 Runyakitara: "I saw the calls, they came in twice, but I did not know that I had to take

the call. The caller number looked strange, it was not a usual call, so I thought it might be a conman from [location named], or another country”.

Eight call recipients (two for each different language) reported inaudible calls during the first round of the pilot survey. They all struggled to listen in to make sense of what the survey was about, irrespective of the survey language. When we scrutinised these participants, some held ordinary mobile phones, while others used smart phones. However, all of them were in a rural setting, although based on routine phone calls, the network connectivity was fine. An alteration within the platform, improved audibility with the second and subsequent rounds of the pilot survey.

Two participants discussed the difficulties they encountered with skip patterns, which either altered the flow of the survey, or curtailed their ability to complete the survey.

P9 English: “The tobacco screening question kept repeating itself, whether I pressed that I was a smoker, or not. It did not allow me to proceed to the next set of questions. Each time I punched in 1 or 3, it merely repeated the question until I was fed up and ended the survey”.

P16 English: “The survey kept asking me what my age was, and as an example to enter 18 on the phone’s keyboard if my age was eighteen. However, each time I entered my age, it kept on asking me the same question”.

Similarly, the initial calls for other languages other than Luo, (English, Luganda and Runyakitara) had challenges with skip patterns, such as automatically moving to the next question irrespective of the selection of a prompted answer option. These required altering from the programming side within the IVR platform, following which the challenge of skip patterns was resolved for subsequent survey testing rounds. There were also varied experiences of IVR-mobile phone survey participation related to the language of delivery itself.

Language related issues

Successful encounters

Within the first round of the pilot survey, two Luo speakers reported that their survey went very well. It was audible, it was clear, the timing was appropriate, the skip patterns worked very well, and the survey was easy to comprehend.

However, none of the participants who took the survey in any of the other three languages of the IVR described it as courteous. On the whole, after providing feedback to the recording studio and re-recording following the first round of pilot surveys, the second round onward attained the required benchmark for language courtesy, question clarity, appropriate pace, audibility and validity as gauged from the participant’s feedback.

Unsuccessful encounters

At least seven respondents reported taking the survey in the wrong language which they could not comprehend, although the introduction of the IVR provided for selecting an appropriate language option. The quote below exemplifies the challenge of selecting the wrong language.

P33 Luganda: “I am a Swahili speaker, but I received the survey and took it in Luganda. I am not sure if my answer options were accurate or not”.

Mobile network connectivity

Limited clarity of survey questions was only consistently reported by participants that were in rural locations – either on the farm, in a University, or in homes that were more than 250KM distant from the Capital city. Their mobile phone survey was generally inaudible, and it self-terminated after a couple of attempts at talking back. The survey team therefore interpreted this as due to poor mobile network connectivity.

Survey duration

Three participants responding in English voiced strong opinions based on their experience with the IVR survey lasting about 10 minutes that the information about the survey's duration in the introduction need to be altered from 20 to the realistic 10 minutes, so as to manage a participant's expectations. When asked how long the survey took, the majority of the participants who had completed the survey responded:

“about ten minutes” [P7 English],

Thus, resonating well with the experiences of those voicing the concern on survey duration.

Perceptions about study incentives

When asked about what they thought of the method of incentive, all the participants were pleased about the promised lottery type incentive for receiving airtime. Some also reported that it encouraged them complete the survey, as they stood a chance of winning this incentive. Further, it was reported by a few that this type of incentive in research was generally new to them, but it did not really matter.

DISCUSSION

This pilot survey aimed at exploring the perceptions of users of the survey and non-response. The key findings that favoured IVR survey participation or completion included preference for short surveys of 10 minutes or shorter, preference for evening calls between 6pm and 10pm, preference for courteous language, caller's credibility, and favourable perceptions of the lottery type incentive. While key findings curtailing participation or survey completion included, if the voice was unclear, skip patterns were confusing, difficulties in interfacing with the phone to complete the survey, such as erroneous selection of digits for response options on both the ordinary and smart phones, suspicion about the caller's identity, and poor network connectivity for remote and rural participants. Most of the participants in this study preferred their IVR calls between 6pm and 10pm, suggesting a preference for calls outside normal working hours. Intuitively, late evening call preference is related to a period of limited interruption from the rest of the day's competing demands. As reported from other studies[3,39,40], from a cultural perspective, it seems interruptive to receive a call while at work, especially if conducting formal work requiring team-effort, such as teaching in class, working in an operation theatre among others. In rural places where phone-charging is rationed to locations where there is power. It could be that phones are charged during part of the day making them inaccessible to a user, while in the evening the user catches up with missed phone calls. Similarly, if a phone is shared between a couple, or household members, the individual that did not have it during day might only have access in the evening when the phone holding partner or family member returns[3,39,40].

While for the majority, audible calls that were clear were received favourably, thus offering a

promise to the acceptability of the mobile phone survey, the inaudible IVR calls, and those where skip patterns had errors compromised call completion. Considering that an IVR recipient requires to first listen to the voice call then to accurately interact with the phone to complete provided instructions. A high voice quality call that has simple and clear instructions is likely to maintain a respondent's interest. Future IVR surveys require an extensive piloting phase to ensure the qualities of voice clarity, simplicity, non-ambiguity and respondent's motivation / captivation for guaranteeing a successful IVR survey – as evidenced from other studies in sub-Saharan Africa decrying the IVR interaction[10,18-20].

Relatedly, a major finding in this study is that the quality of call reception (both the audibility, and skip patterns) was related to programming challenges. In this IVR-mobile phone survey, the audios did not require re-recording, rather, an adjustment within the platform to increase their audibility. Likewise, the skip pattern errors were rectified within the platform, rather than with the audio-recording. This goes to confirm that in a software-based interface, programming, testing and verifying appropriateness is important before roll-out of a software/ m-Health program, in this case the IVR-mobile phone survey platform. Contrary to the Janus-faced theory which anticipates varied responses for each scenario[32,36,37], for the case of errors in the platform development, the resulting unintended errors elicited laborious encounters with the IVR survey for participants. Essentially, irrespective of the participant or their phone type, it appeared that errors in IVR delivery elicited annoyance and a poor experience with the IVR. Therefore, as with all communication strategies, piloting of IVR platforms (the communication channel) is important prior to mobile phone survey delivery for ensuring the expected quality of the IVR for recipients and the appropriate delivery of the intended message.

We found that caller credibility was crucially important as a motivator for survey participation. About a third of the participants reported that this survey from the Makerere University, with the Ministry of Health motivated their interest and participation. On the other hand, there was a sense of scepticism for some regarding responding to IVR (automated voice) calls because of fears of privacy – related to capturing individual's identity, conmen - relating to potential fraud, and political interests that were unwelcome, as reported elsewhere[38]. This finding demands the prior sensitisation of a community about planned research, including conducting community mobilisation, an important pre-step in routine house-to-house surveys such as the census. Regarding IVR-mobile phone surveys, considering the competing agents using the automated voice calls for information dissemination, or mobilisation, an alternative of a prior SMS message clarifying the intent of an IVR-mobile phone survey, the planned survey timelines and clearly stating the authority sanctioning the survey will be useful for increasing survey participation. If resources are inadequate for prior community mobilisation or SMS messaging, a viable alternative might be for caller masking, such as using a label like "Health Survey from Organisation X", instead of an identifiable caller phone number that is unfamiliar to recipients.

Perceiving the language as courteous motivated participation and survey completion. This finding appears related to the social connectivity with one's local language – an important aspect of communication. Since IVR survey delivery mimics a human interaction, the quality of experience is important for motivating participation and completion, as reported in a Ghanaian study[10,18]. Therefore, language courtesy should be an important attribute considered in IVR survey development, piloting and testing, prior to roll-out. Relatedly, but although infrequent in this survey, taking the survey in an inappropriate language compromised the quality of survey responses. It might be that in a multi-lingual society such as Uganda, participants might not readily locate their preferred language in the IVR instructions. However, it is expected that this limitation will improve with increasing familiarity with IVRs, because respondents are not required to read and write, rather to listen and act accordingly. None-the-less, it is important for future IVR-mobile phone survey developers for multi-lingual settings to explore the extent of this problem – of selecting the wrong language option. Also, a double-checking prompt would be useful to confirm that a given language is

the appropriate choice.

Network connectivity was responsible in some instances for dropped calls. To explore the magnitude of this, a stratified analysis (for network operators) was conducted to assess the dropped calls. Among the four mobile phone providers, one had higher prevalence in the rural compared to others, and their call drop rate was considerably lower. Relatedly, the limited clarity of survey questions, alongside dropped calls was consistently reported by volunteers that were in rural locations – either on the farm, in a University, or in homes that are more than 250KM distant from the capital city. Their mobile phone survey was generally not too audible, and it self-terminated after a couple of attempts at talking back. We concluded that this was due to limited network connectivity. Mobile phone network coverage in Uganda is best in urban locations, likely due to economic motives of capturing high-density communities – thus depicting economies of scale. Therefore, developers and implementers of IVR surveys require strategies that capture rural populations, when representativeness is critical for answering survey objectives – such as considering over-sampling of the rural remote populations.

Our finding for the preference for surveys lasting 10 minutes or shorter suggests existing competing work or leisure demands, thereby requiring shorter and precise mobile phone survey, as evidenced from the main Uganda IVR-mobile phone survey which lasted averagely 13 minutes, yet with a low completion rate of 35.2%[28]. While routine face-to-face surveys such as the Demographic and Health Survey conducted every 5 years in LMICs may last an average of one hour. The absence of physical human interaction in the IVR encounter tends to remove the normative desire to avoiding disappointing the interviewer, lest the participant is judged as rude - frontstage, back-stage acting. IVR participants are in control of their survey's continuation or termination, which might shield their fears for potential retribution. Also, the lack of human interaction, negates the opportunity to negotiate the timing and duration of the IVR. Therefore, commencing the IVR might somewhat rely on the curiosity of a respondent wanting to discover what the survey is about. However, considering that the average survey duration was about 10 minutes in this pilot, and there were no complaints that it took very long, this finding strongly implies that IVRs require brevity to maintain the interest of participants.

Conclusions and Recommendations

Our findings show a willingness of participants to take an IVR. Key attributes of an IVR survey with promise for high uptake and completion within a multi-lingual context include: a preference for evening calls, of high voice quality and clear instructions, lasting 10 minutes or shorter, from a credible caller, and in a courteous language.

Findings emphasise the need for extensive platform development in the testing period to ensure stability, prior to roll-out of an IVR survey. There is need to further evaluate these attributes to increase IVR acceptability, and completion rates in such settings.

It appears from our findings that both ordinary and smart phone users encounter interactive challenges with an IVR, thus emphasising a need for education of the community on use of IVRs. Suspicion as to the credibility of the survey authority suggests a need for caller masking. There is need for further research to explore reasons for low completion rates of IVRs compared to face-to-face surveys, and as to whether language selection, and education status affect quality of surveys.

Study limitations

While this study uses a qualitative methodology, user perceptions on the IVR and non-response were collected through a phone interview and were not validated physically, which within the context of the study could have introduced some socio-desirability bias, however, phone interviews are a widely accepted method in qualitative research[24].

The pilot was limited to three nationally representative languages in addition to English, although

four languages would have been more representative. Being an explorative study, the nuances from the findings might as well apply to the rest of the country, given that the cultural context is similar. Additionally, at least a third of the participants were known to the first author who did the recruitment. This could have positively affected participation in the IVR and the qualitative interviews. However, both followed standard research ethical practice, following obtaining informed consent.

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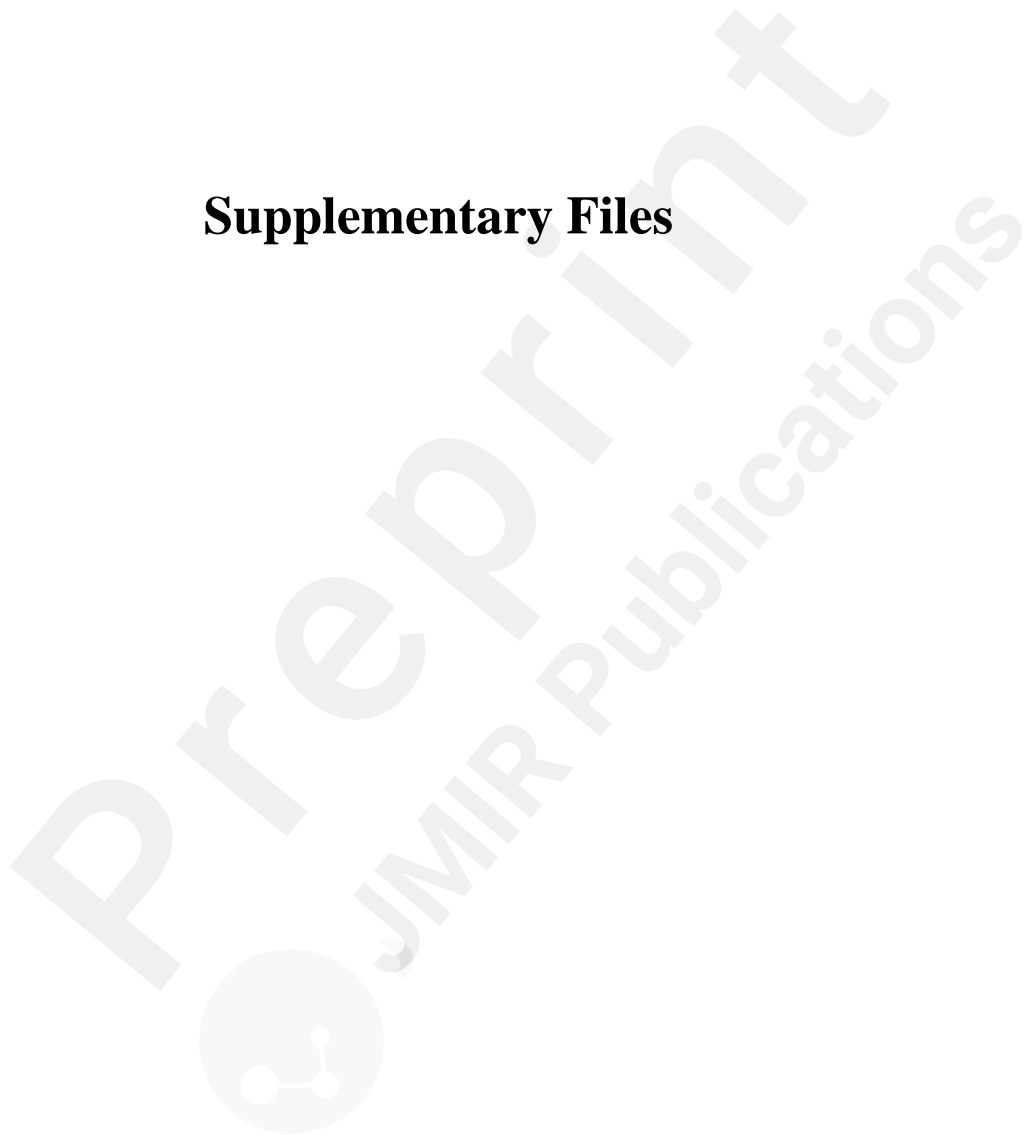
Conflict of interest statement: All authors declare no competing interests.

Abbreviations:

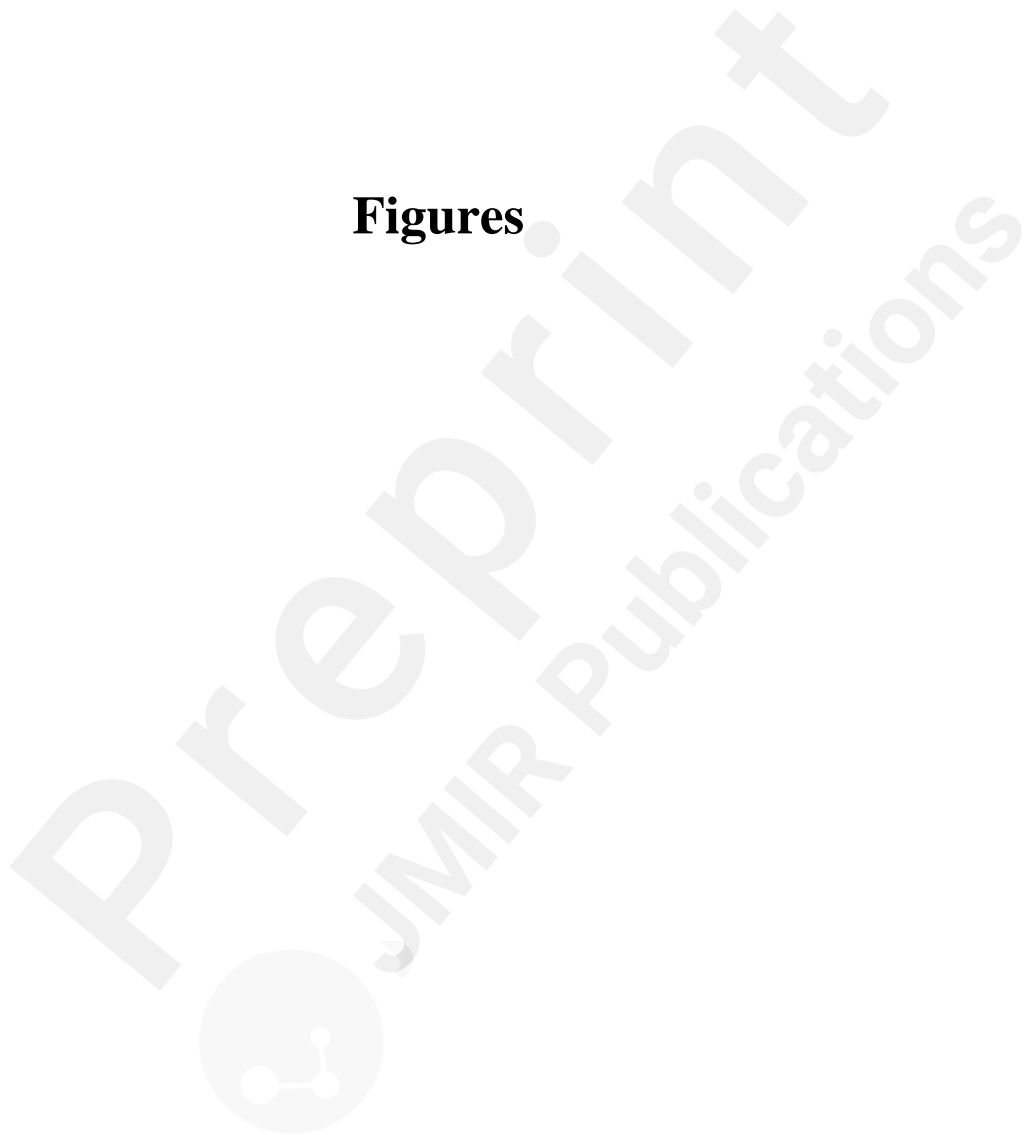
HIV Human Immunodeficiency Virus
IVR Interactive voice response
LMICs Low- and middle- income countries
NCD Non-communicable disease
STEPS Stepwise surveillance approach for non-communicable diseases
TB Tuberculosis
WHO World Health Organisation

REFERENCES

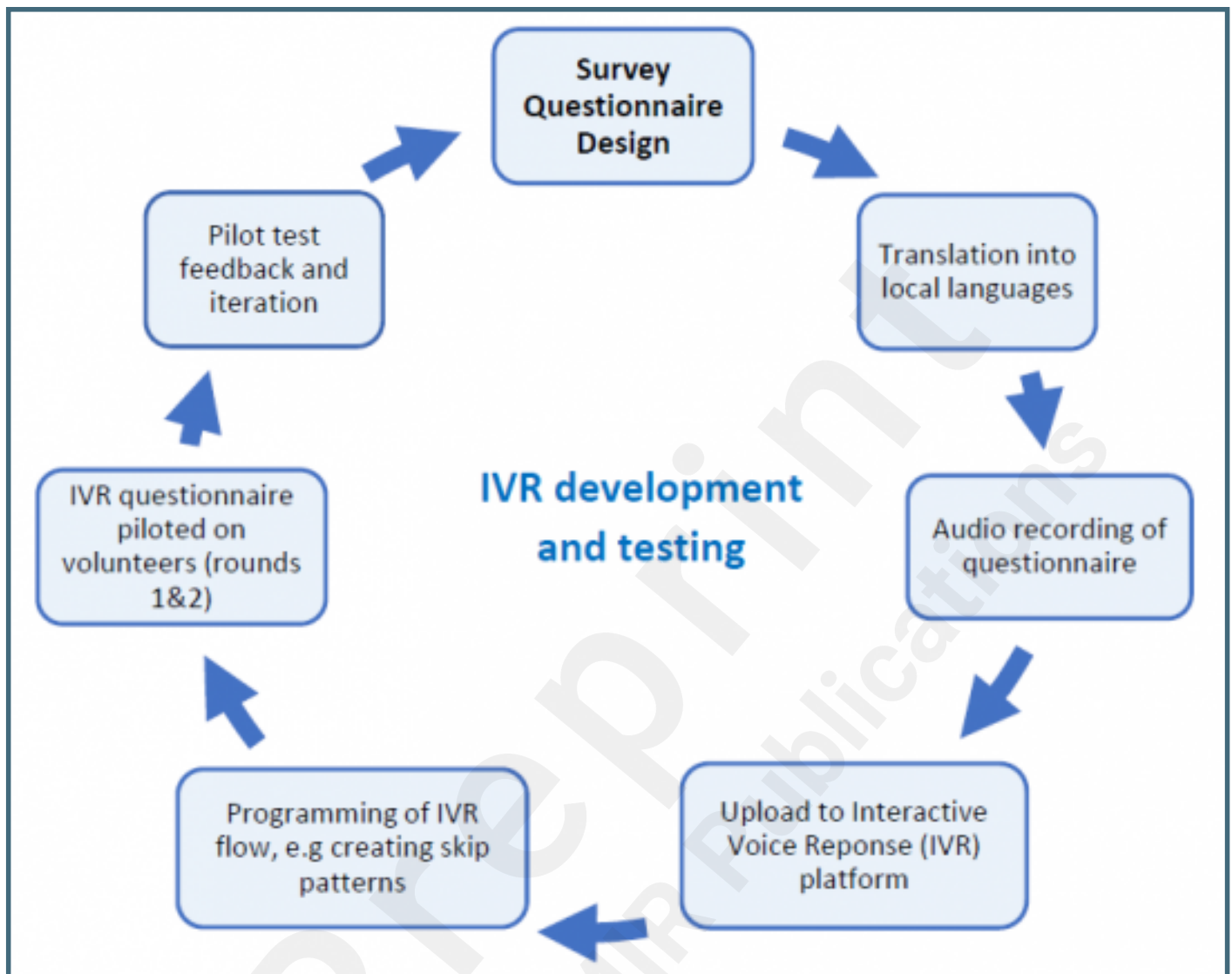
Supplementary Files



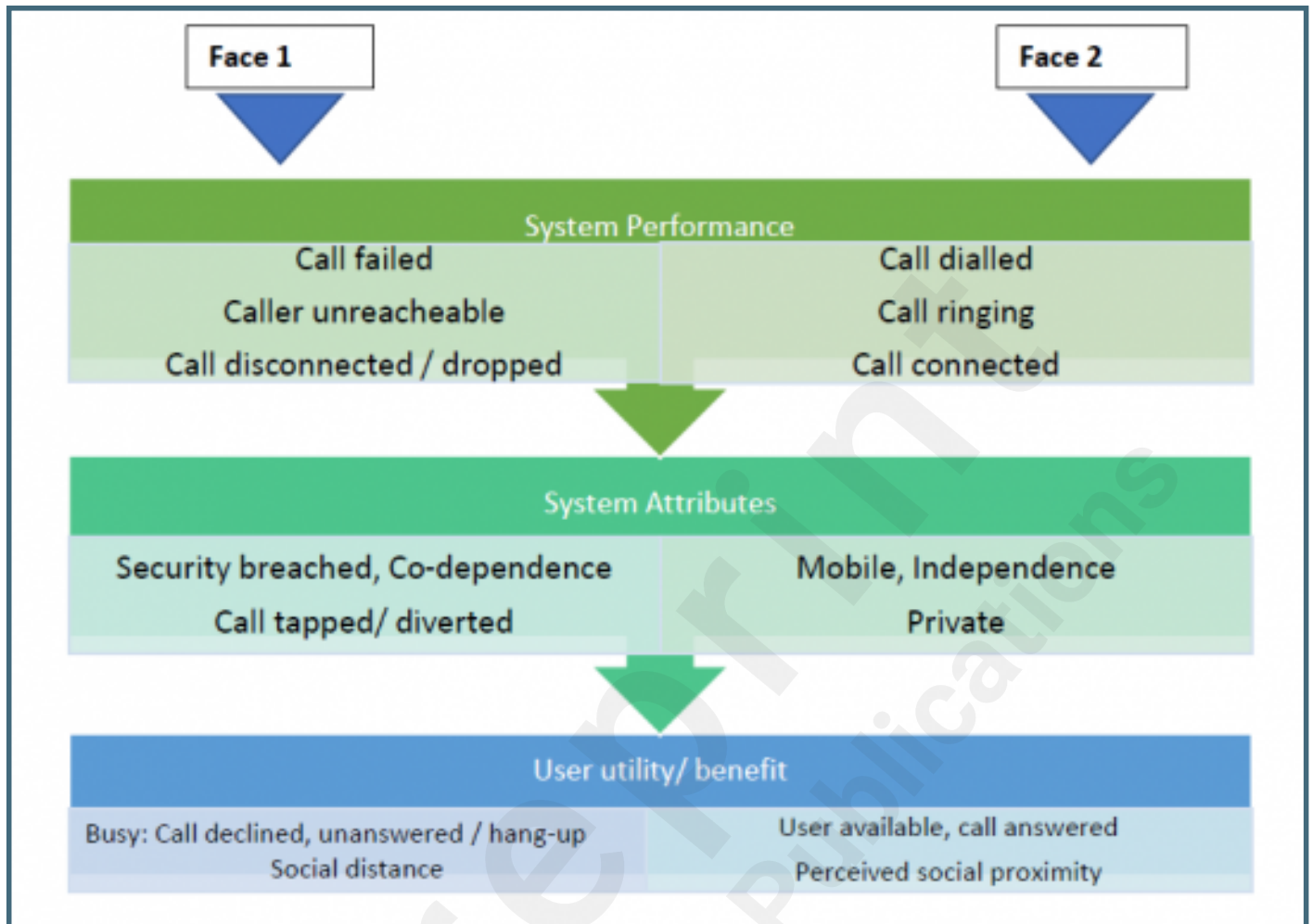
Figures



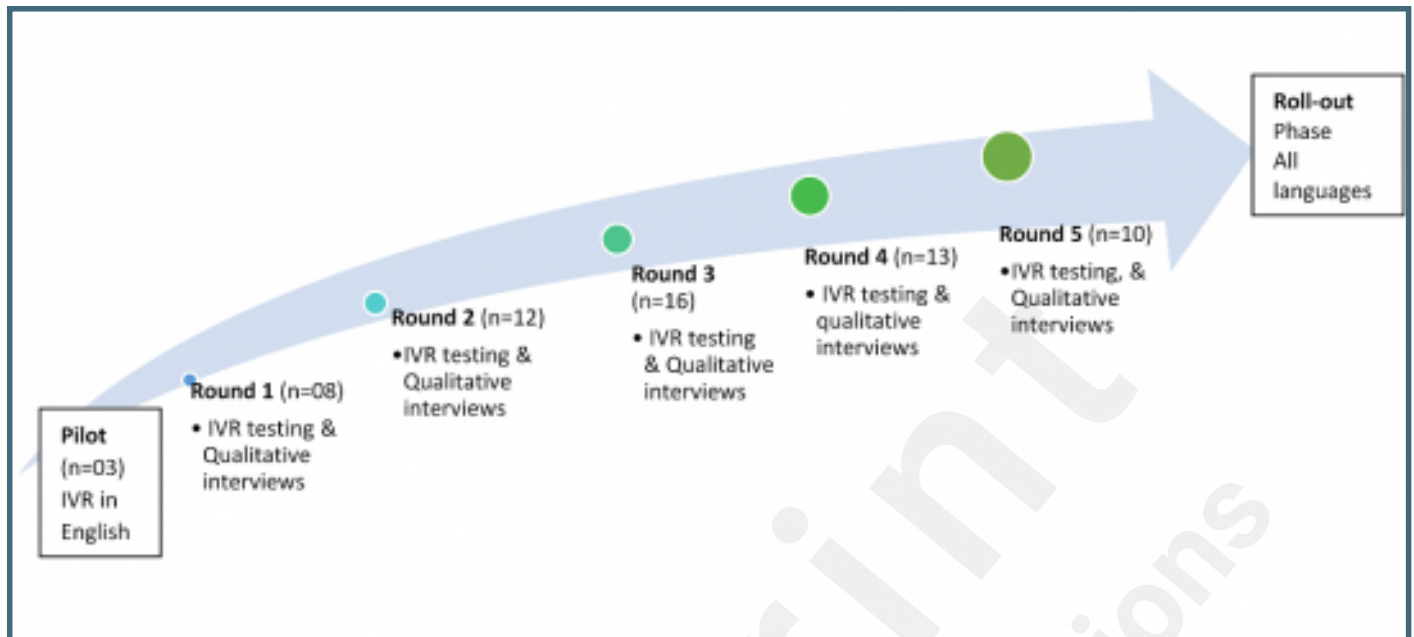
Process of IVR development and testing.



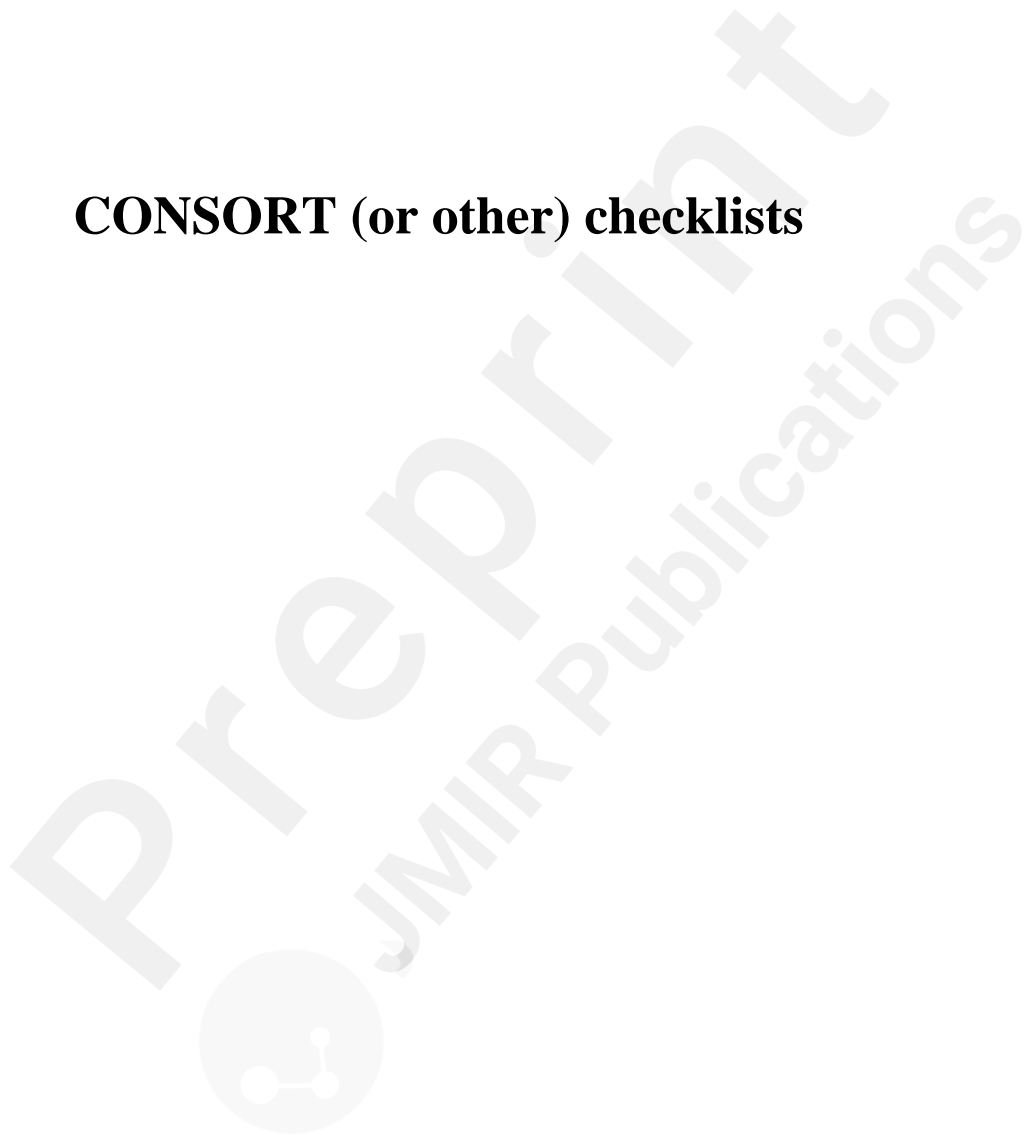
Janus-faced mobile phone utility.



Data collection process.



CONSORT (or other) checklists



filled checklist_Consolidated criteria for assessing qualitative studies.

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