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A mobile-based healthcare utilization assessment in rural Ghana

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Abstract

Background: Identifying the needs of disadvantaged populations is essential to addressing those needs. Investigations of healthcare access in rural sub-Saharan Africa rely on in-person interviews and SMS, which have distinct limitations.

Objectives: To use interactive-voice-response (IVR) technology to survey healthcare utilization patterns in rural Ghana.

Methods: This project used IVR to survey healthcare behavior by mobile phone users in rural Ghana. Automated voice messages offered an 18-question survey in 5 local languages.

Results: Out of >64,000 placed calls, 8,601 proceeded to the survey. Survey completion rate was 1.3%, for 827 full respondents, at a total cost of 5 USD for each full survey response.

Conclusions: IVR has limitations, but the ability to engage rural populations with low time and resource investment is valuable.

Keywords: Mobile health; Interactive Voice Response; IVR; Rural; Healthcare access; Ghana

1. Background

In 2003, the Republic of Ghana, a largely rural sub-Saharan African nation, became one of only three countries in the region to provide universal healthcare coverage. As a result, Ghana has become a focus of numerous international and domestic healthcare interventions aimed at improving health at the population level; despite this, the health behavior of Ghana's rural population remains a relative unknown.[1]

Understanding the behavior of rural populations is challenging for many socio-demographic and logistical reasons. Traditional efforts to document and understand healthcare access in rural sub-Saharan Africa have utilized 1:1 interviews, which are extremely time, funding, and human capital intensive. Ghana is no different in this respect. [2,3] More recent efforts increasingly utilize short message services (SMS) for mobile phone users to access the most difficult-to-reach populations, and there is a growing understanding of the scalability and potential impact of this technology. [4] However, SMS communication faces considerable limitations: recipients must be literate, there must be language concordance between the message and recipient, and there are strict limitations on the extent of the interaction—the infamous 140 characters. Smartphones ease some of these restrictions, but the use of newer technology often distances disenfranchised populations further. As a result, the most difficult-to-reach populations—those that are illiterate, socially disempowered, or removed from national infrastructure—remain a challenge

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to access despite best efforts. This project explored the feasability of Interactive Voice Response (IVR) technology to learn about the health behavior of rural Ghanaians.

2. Methods

IVR combines pre-recorded messages with touch-tone technology that allows for direct participant response, as well as the aggregation of meta-data such as the date, time, linguistic preference and duration of calls. VOTO Mobile, a Ghana-based survey software company (www.votomobile.org), provides a platform that allows for automated dialing with pre-recorded voice surveys at pre-selected times across multiple telecommunications company platforms. This automated process places a high volume of calls efficiently, allowing for extensive sampling despite the reality of low survey completion rates. The software also aggregates data concurrent to the distribution of the survey, allowing us to monitor response rates in real time.

As IRB approval did not allow random number generation, we utilized a collection of >30,000 phone numbers (predominantly urban (78%) and male (65%)) that had been previously accessed by VOTO Mobile surveys. We sourced questions from a bank of pre-tested survey questions from the Ghana Development Health Survey and Women's Health Survey of Accra (II). [5,6] All questions were multiple choice, provided in the five most common languages of rural Ghana, with one final open-ended response item where respondents could provide additional information. The full 19-question survey was piloted in the 5 languages prior to distribution.

Respondents were asked for socio-demographic information and about their healthcare utilization behaviors, including questions of the types of healthcare facilities closest to them (e.g. government health centers, hospitals, family planning clinics); their preferred means of treating illness (e.g. visit to a healthcare facility, traditional healer, family advice); the conditions that drive them to a formal health facility (e.g. fever, injury, illness of spouse or child); and their perceived barriers to formal healthcare facilities (e.g. distance, previous negative experience, lack of safety in transit or at clinic). The full survey took between 8-12 minutes, and respondents were queried regarding the activity of the previous six months, roughly May-November, 2014.

3. Results

827 rural respondents completed the 18 multiple-choice questions, 615 men and 212 women. This response required 64,103 calls, many of which were voicemail activations, to engage an initial 8,601 respondents past language selection. 1,366 (15.8%) were excluded for responding that they were <18 years of age, and an additional 3,804 (59.6%) were excluded for classifying themselves as urban residents. The consent process, which was 12 seconds long and immediately followed questions of urban location and age, lost 4,084 (64%) of all remaining respondents. The full survey completion rate was 1.3% (827/64,103) overall, though it rises to 18.3% (827/4,517) if a respondent continued beyond the paragraph of informed consent. After consent was obtained, 14 questions remained, each of which lost an additional 3-14% of respondents. Voicemail messages were also captured and recorded, but their qualitative analysis is beyond the scope of this study.

The cost of completing the 18 question survey came to 5 USD/respondent, two-thirds of which were airtime charges and one-third of which was administrative. This cost per respondent includes all calls placed, not just for surveys completed. Importantly, there was no cost incurred by respondents for completing the survey, as there is no charge or airtime costs for answered calls. Project completion took 13 days including all survey calls and data aggregation.

4. Limitations

There is no question that the power of IVR is limited: it lacks much of the soft touch and complexity of in-person surveys; and its rapid interaction, while more personal than SMS, is still automated and of limited depth. IVR also relies on anonymous user report, so there is no way to check veracity or comprehension. Notably, this survey also utilized a database of pre-accessed phone numbers, which both increases our likelihood of response and the participants' likelihood of user fatigue. The extent of this impact on survey engagement cannot be known.

5. Discussion

Through this project, we have shown that IVR can provide dynamic, up to date information about a difficult-to-reach rural population at a cost that is widely scalable. With mobile technology saturating nearly every market and household, the current dearth of up-to-date information about entire sections of the world's population is unacceptable—especially since the populations we hear from the least are typically those most in need of a voice.

Particularly exciting is the fact that IVR has been used successfully in evaluation of high-sensitivity topics such as HIV/AIDS education and research, medication compliance, and behavior change projects. [7,8,9] The privacy of this technology—it leaves no text-based trace of the respondent's information, does not consume air time or credit, and only requires one interaction for those who do not consistently own a mobile phone—is extremely compelling when inquiring after the healthcare behaviors and needs of the disenfranchised.

As Ghana undergoes a major change in its healthcare infrastructure, it is critical to understand the behavior of its rural population in a dynamic way that reflects recent changes in healthcare delivery. For designing interventions and targeting public health efforts, IVR provides a means of gaining insight and access to difficult-to-reach populations in a way that is considerably more time, cost and resource efficient than previous efforts.

Acknowledgements

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