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Barriers and Facilitators to Serosurvey Participation in Southern Zambia: A Socio-Ecological Model Analysis from Data Collector and Caregiver Perspectives

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Abstract

The determinants influencing individuals' decisions to take part in serosurveys remain insufficiently explained. Examining perceptions from several viewpoints—including those of both participants and data collectors—within a comprehensive framework such as the socio-ecological model allows for consideration of influences operating at the individual, interpersonal, and structural levels of research participation. We applied a mixed-methods design to describe motivations and deterrents related to serosurvey participation in communities in Zambia's Southern Province, where a serosurvey took place in 2016.During the initial phase, focus group discussions and in-depth interviews were carried out with 24 data collectors involved in a measles–rubella serosurvey in 2016. In the subsequent phase, 34 caregivers attending health facilities were surveyed to identify perceived facilitators and barriers to participation. Themes that emerged were organized according to the socio-ecological model, encompassing individual, interpersonal, and structural domains. Similar patterns were identified across responses from data collectors and caregivers. At the individual level, incentives encouraged participation, whereas certain religious beliefs were noted as obstacles to involvement in serosurveys. At the interpersonal level, household relationships and peer influences within the community could either promote or discourage participation. Community health workers were repeatedly highlighted as key enablers. At the structural level, concerns were raised regarding the process of specimen collection, the criteria for participant selection, and the failure to receive test results. The most commonly cited facilitator was receiving clear information about the purpose of the serosurvey (85% of respondents). The most frequently reported barrier was uncertainty about how collected blood samples would be used (53% of respondents). Regarding collection methods, caregivers consistently favored finger-prick blood sampling compared with venous blood draws or oral swabs. Overall, participation in serosurveys was considered acceptable by most respondents. Application of the socio-ecological model identified specific barriers and facilitators that can inform strategies to enhance participation, including in ongoing SARS-CoV-2 serosurveys. Future serosurveys should strengthen community engagement by explaining blood collection procedures in advance and clearly communicating study objectives through trusted intermediaries such as community health workers and traditional leaders.

Keywords: Socio-ecological model, Serosurveys, Key enablers, Barriers

Introduction

The scientific validity of serosurveys depends on successfully enrolling a population that reflects the broader community. Despite this, the factors shaping individuals' willingness to participate in serosurveys are not well defined. Motivations for engaging in health research generally include personal benefits [1], altruism, perceived benefits to the community, and a sense of fulfillment derived from contributing to scientific knowledge [2].

Several conceptual frameworks—including the health belief model, the active community engagement continuum, and the socio-ecological model—have been applied to understand determinants of health-related behaviors [3, 4]. The socio-ecological model suggests that behavior is shaped not only by individual

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characteristics but also by intrapersonal, interpersonal, institutional, community, and policy-level influences [5]. This framework is useful for examining participation in health research, including serosurveys, as well as the roles played by social norms and community or religious leadership [6].

Because serosurveys involve the collection of biological samples, typically blood, they require additional investment in social mobilization efforts [7]. Surveys that include blood collection often experience higher refusal rates than those limited to questionnaires, due to discomfort, longer participation time, or mistrust regarding how blood samples are handled [8]. To assess the potential for participation bias, refusal rates are routinely documented, as individuals who decline may differ systematically from those who agree. Nonetheless, there is limited evidence explaining reasons for non-participation in serosurveys within sub-Saharan Africa [6]. Enhancing participation requires a deeper understanding of community perceptions of serosurveys. Incorporating insights from both participants and data collectors offers a more complete perspective on factors influencing participation and can guide improvements in engagement strategies [9].

To address this gap, we carried out a study in Southern Province, where at least two serosurveys were implemented in 2016. Southern Province is the fourth largest by population, with an estimated adult HIV prevalence of 13% and first-dose measles vaccination coverage of 86% [10, 11]. Early in 2016, the ZamPHIA HIV incidence and prevalence survey was conducted as a household-based study using venous blood collection, with an 11% refusal rate [12]. Later that year, a measles and rubella seroprevalence survey was implemented as part of a vaccination coverage assessment, collecting dried blood spots and incorporating a sensitization strategy targeting key stakeholders [13]. Although data collectors collaborated with community health workers from local clinics, a refusal rate of 12% was still observed [14]. We employed a mixed-methods approach to gain a more detailed understanding of factors influencing serosurvey participation from the perspectives of both data collectors and caregivers.

Materials and Methods

Study design

This study employed a convergent mixed-methods framework in which qualitative and quantitative components were implemented in sequence, analyzed in parallel, and interpreted collectively. Research activities were carried out in Southern Province using a two-stage approach. The initial stage took place immediately after the measles–rubella serosurvey conducted in December 2016 and focused on gathering perspectives from data collectors through in-depth interviews and focus group discussions. These activities aimed to assess both operational aspects of the serosurvey and perceived levels of community acceptance. The second stage involved a facility-based cross-sectional survey administered in April 2017 to caregivers, examining perceived motivators and deterrents related to serosurvey participation.

Participants and data collection

In phase one, members of the measles and rubella serosurvey field teams were deliberately selected to ensure inclusion of individuals representing a range of responsibilities and roles. Recruitment occurred during the serosurvey, with participation taking place immediately upon completion of field activities. Eleven supervisors participated in individual interviews, while 13 additional data collectors took part in two focus group discussions. These sessions were led by a locally based qualitative researcher affiliated with Macha Research Trust who was independent of the serosurvey activities. Verbal consent was obtained from all participants. Data collection guides explored community responses to data collectors and views regarding acceptance of blood specimen collection. All interviews and discussions were conducted in English, audio-recorded, and subsequently transcribed.

For phase two, a convenience sample of 34 caregivers was recruited from individuals present at health facilities during a two-week data collection window. Participants were enrolled across nine health facilities located in three districts of Southern Province, Zambia. These districts had previously participated in the 2016 post-campaign coverage survey and associated serosurvey. Caregivers in waiting areas were invited to participate by healthcare staff. Previous involvement in a serosurvey was not a requirement, though all facilities were situated within catchment areas eligible for earlier serosurveys. After providing verbal consent, caregivers completed a questionnaire covering topics such as community attitudes toward blood collection, willingness to participate in serosurveys, perceived barriers and facilitators, preferences regarding specimen type, and self-efficacy. Surveys were administered in Tonga by a trained collaborator from the Ministry of Health in a private area of the facility.

Ethical approval for this study was obtained from the institutional review boards of the Johns Hopkins University School of Public Health and Macha Research Trust, as well as from the Zambia National Health Research Authority.

Data analysis

Qualitative data from phase one were analyzed using grounded theory techniques with Atlas TI (version 10.1). This analytic approach emphasizes inductive interpretation, allowing themes to emerge directly from the data without predefined assumptions [15]. Analysis proceeded through multiple iterations of codebook development, beginning with open coding to identify initial concepts, followed by axial coding to establish relationships among categories, and concluding with theory-based grouping [16]. Coding discrepancies between two analysts were resolved through discussion and consensus. A constant comparative method supported iterative theme refinement throughout the analysis process [15]. Insights generated during phase one were used to inform the development of the caregiver survey instrument for phase two.

Quantitative data collected in phase two were cleaned and analyzed using STATA 14. Descriptive statistics were generated to assess response frequencies, while qualitative responses to open-ended survey questions were coded using grounded theory principles in Excel. Qualitative and quantitative findings were integrated and organized within a modified socio-ecological framework, classifying themes according to individual-, interpersonal-, and structural-level influences.

Findings from both phases were synthesized to identify acceptability-related factors influencing serosurvey participation, with barriers and facilitators mapped across each level of the socio-ecological model.

Results and Discussion

Participant characterization

Phase one participants included both male and female data collectors and represented multiple districts, survey teams, and functional roles **(Table 1).**

Table 1. Characteristics of data collectors participating in in-depth interviews and focus group discussions

Characteristic	n	%
Role		
Supervisors	11	45.8
Field data collectors	13	54.2
Gender		
Male	8	33.3
Districts assigned per team		
Kazungula and Livingstone	6	25.0
Choma, Kalomo, and Namwala	5	20.8
Choma and Pemba	4	16.7
Gwembe and Monze	6	25.0
Provincial level	3	12.5

In phase two, all 34 surveyed caregivers were women. A majority were younger than 30 years (68%), and the most commonly reported religious affiliation was Seventh Day Adventist (38%) **(Table 2).** Nearly half of the respondents indicated that travel time to the health facility exceeded one hour. Most caregivers were attending the facility for childhood immunization services, and 91% reported having children under 5 years of age.

Table 2. Socio-demographic characteristics and serosurvey-related responses among caregivers

Characteristic	n	%
District		
Namwala	12	35.3
Kazungula	11	32.4
Choma	11	32.4
Religion		
Catholic	7	20.6
Pentecostal	3	8.82
Protestant	4	11.8
Seventh Day Adventist	13	38.2
Other	7	20.6

Time to vaccination clinic		
Less than 30 minutes	8	23.5
30–59 minutes	10	29.4
60 minutes or more	16	47.1
Who influences decision making *		
Self (caregiver themselves)	23	67.65
Family	14	41.18
Healthcare worker	5	14.71
Community health worker	2	5.88
Chief or leader	0	0
Received information from community health workers		
Yes	13	38.2
Type of information (among those who received, n=13):		
Vaccination	8	61.5
Measles	2	15.4
Nutrition	2	15.4
Other	1	7.7
Previously participated in surveys		
Yes	10	29.4
Type of survey ^ (among participants, n=10):		
HIV	4	40.0
Malaria	5	50.0
Sanitation	1	10.0
Doesn't remember	2	20.0
Bodily fluid collected ^ (among participants, n=10)	8	80.0
Results received (among those with collection, n=8)	5	62.5
Number of surveys participated in ^ (among participants, n=10):		
0	1	10.0
1	6	60.0
2–4	3	30.0
Willingness to participate in future serosurveys		
Willing to allow finger prick (self)	25	73.5
Willing to allow child’s finger prick	21	61.8

(*) Respondents could report more than one influencing source. (^) Questions regarding survey type, specimen collection, and number of surveys were limited to those who reported prior survey participation.

Ten caregivers (29%) reported previous participation in a household-based survey, including studies focused on malaria, HIV, and sanitation. Among these individuals, eight (80%) indicated that biological specimens had been collected, approximately half (50%) received test results, and three (30%) had participated in more than one household survey. When asked specifically about willingness to permit finger-prick blood collection at home, 74% agreed for themselves, while 62% indicated they would allow their children to participate.

Acceptability-related themes are summarized by socio-ecological level in **Figure 1** and described below. Individual-level factors included personal incentives and religious beliefs. Interpersonal influences affecting serosurvey decision-making encompassed community context, household dynamics, and the role of community health workers. Structural-level factors related to survey execution, including concerns about specimen collection methods, participant selection processes (sampling), and whether test results were provided to participants.

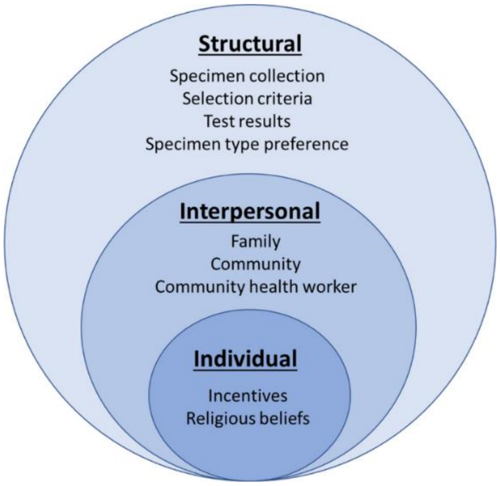

Figure 1. Conceptual themes influencing acceptance of serosurveys within a socio-ecological framework

Acceptability: individual influences

At the individual level, caregivers described several factors that supported willingness to participate in serosurveys. These included curiosity or interest in gaining health-related knowledge (29%) and motivations associated with helping others or contributing to the greater good (3%) **(Table 3).** From the perspective of data collectors, participants frequently expected some form of compensation, either financial or material, in return for providing specimens. Both caregivers and data collectors identified religious beliefs as a major deterrent to participation, particularly when blood collection was involved.

Table 3. Individual-level facilitators and barriers to serosurvey participation as reported by caregivers (n = 34)*

Barriers and Facilitators to Serosurvey Participation	n	%
Barriers		
Uncertainty about the use of blood samples	18	52.9
Religious beliefs	15	44.1
Fear of learning test results	14	41.2
Not receiving test results	4	11.8
Fear of needles	4	11.8
Perceived stigma associated with testing	3	8.8
Beliefs about satanic practices involving collected blood	2	5.9
Concerns about safety during blood collection	2	5.9
Research fatigue	1	2.9
Facilitators		
Provision of information about the study	29	85.3
Conducting the serosurvey at a central location	16	47.1
Involvement of trusted community members (e.g., CHW)	10	29.4
Desire to learn about personal health issues	10	29.4
Community perception of potential benefits	4	11.8
House-to-house approach for the serosurvey	1	2.9
Desire to contribute to societal improvement	1	2.9

(*) Respondents were allowed to identify more than one facilitator or barrier; therefore, percentages do not total 100%.

- *Incentives*

Data collectors repeatedly emphasized that compensation was perceived as an important motivator at the individual level. However, they explained that cash payments were deliberately excluded due to ethical concerns, as direct payment could be interpreted as purchasing blood samples rather than voluntary participation. One data collector described that discussions during preparatory meetings concluded that financial incentives could be viewed as coercive, even though participants expressed a strong desire for compensation.

In addition to monetary incentives, data collectors reported that participants requested small, non-cash items. These included refreshments or basic consumables, which community members noted were commonly provided in other blood collection activities and, therefore, expected in this context as well.

- *Religion*

Religious beliefs were frequently identified as obstacles to serosurvey participation, particularly due to objections to blood collection. Among caregivers, 15 individuals

(44%) indicated that religious considerations influenced their unwillingness to provide blood samples. Zionism—a religious movement that favors traditional healing approaches over biomedical practices [17]—was specifically mentioned as prohibiting blood collection. Additionally, among caregivers affiliated with the Seventh Day Adventist faith, approximately one-third stated they would not consent to blood sampling. Two caregivers also expressed fears linked to Satanism, described as associations with evil practices or devil worship, which they believed could be connected to blood collection.

Data collectors similarly reported that resistance often stemmed from traditional beliefs that blood samples might be used for harmful or supernatural purposes. In some communities, blood collection was believed to be associated with ritual practices, leading to fear and mistrust.

Several data collectors reported that community members directly accused survey staff of engaging in satanic activities, resulting in hostility or refusal. In some cases, these accusations led to survey teams being chased away or denied entry.

Despite these reports, one supervisor expressed skepticism regarding the actual prevalence of such beliefs. The supervisor suggested that while rumors about satanic blood use were common, there was little evidence that community members had personally witnessed such practices, indicating that these fears may have been based largely on misinformation rather than lived experience.

Acceptability: interpersonal influences

Decisions regarding participation in serosurveys were embedded within broader household and community healthcare decision-making structures. Caregivers identified multiple interpersonal actors who influenced participation decisions, including themselves, family members, and community health workers **(Table 2).** Data collectors echoed the importance of family members and community health workers, but additionally highlighted the influence of local social norms and respected individuals within the community. Caregivers also emphasized the importance of receiving clear explanations of the serosurvey's purpose (85%) and preferred that such information be delivered by trusted figures, particularly community health workers (29%).

- *Family*

Household dynamics played a substantial role in determining whether children could participate in serosurveys. Fourteen caregivers (41%) reported that fathers or grandparents influenced healthcare decisions for children **(Table 2).** Data collectors described situations in which mothers were willing to consent to participation, but fathers objected and actively prevented children from being included, sometimes by physically removing them from the household or keeping them hidden.

Data collectors also noted that maternal presence was essential for children's participation, as mothers typically held accurate information about their children's immunization histories and health records. According to one supervisor, male heads of households often lacked sufficient knowledge about their children's health status to respond to survey questions.

In addition, participation decisions for adolescents and young adults were frequently governed by parental preferences rather than by individual choice.

- *Community*

In communities where refusal rates were high, data collectors attributed non-participation to inadequate engagement and information-sharing prior to survey implementation. Some believed that community members discussed the survey among themselves and reached a collective decision to decline participation.

Data collectors also reported that communities sometimes refused participation because local leaders—such as village headmen—or nearby health facilities had not been informed ahead of time. This indicated that traditional leaders and health institutions functioned as gatekeepers whose awareness and approval were critical for community acceptance of serosurveys.

Community health worker

Community health workers (CHWs) were identified as key drivers of serosurvey participation. Among caregivers, about one-third reported receiving health-related guidance from CHWs, including information about immunizations **(Table 2).** Both caregivers and data collectors emphasized that CHWs facilitated participation because they were familiar with the community and considered reliable sources of information.

Caregivers highlighted the importance of having known and trusted individuals on the survey team as a condition for participation:

The survey team should include someone from the local clinic whom we know. Otherwise, I wouldn't feel comfortable participating.
—Caregiver 26

Data collectors overwhelmingly agreed that CHWs helped teams navigate the community and assist in explaining the purpose of the survey. One data collector described:

We would travel with both the clinic health worker and the CHW. The CHW would introduce us to households first, which made it much easier to gain entry and explain the study.
—FGD 2, data collector 4

Most caregivers (85%) reported that understanding the survey's objectives was the main factor encouraging their participation **(Table 3).** Data collectors reinforced this, suggesting that prior sensitization by CHWs could improve comprehension, especially in rural areas where literacy levels are low:

People in rural areas often cannot grasp detailed explanations on the spot, and they might repeat questions. If CHWs visited beforehand to explain the survey, it would be easier for participants to understand when the survey team arrived.
—IDI, PCES supervisor 2

Another data collector noted:

Providing accurate information in advance to those tasked with community sensitization greatly simplifies fieldwork.
—IDI, serosurvey supervisor 1

CHWs were seen as ideal conduits for information to the community, helping people understand why survey teams travel from distant locations:

Using CHWs to explain the survey ensures that residents are aware of the purpose of the program, which helps them understand why outsiders come to conduct these activities. Lack of understanding is often the main obstacle.
—IDI, PCES supervisor 2

Acceptability: structural influences

Structural factors influencing participation were grouped into three categories: specimen collection, criteria for inclusion, and return of test results. Caregiver concerns included the method and amount of blood collected and a desire to receive results. In the caregiver survey, uncertainty about how blood would be used (53%) and apprehension about learning test results (41%) were prominent barriers **(Table 3).** At the same time, both caregivers and data collectors noted that receiving results acted as a strong motivator to participate.

- *Specimen collection*

Barriers reported by both groups centered on specimen collection. Over half of caregivers (53%) cited not knowing the purpose of the blood draw as a major concern. Data collectors observed that participants frequently asked multiple questions despite consent explanations, including queries about why their blood was needed and questions related to rubella, vaccines, and antibody function.

Comments about specimen collection often reflected prior survey experiences. In areas that had previously participated in HIV serosurveys, questions focused on where blood would be taken and past interactions with survey teams. About half of caregivers indicated that central collection sites, such as local clinics, would make participation more acceptable **(Table 3).**

Selection criteria

Both caregivers and data collectors noted concerns about repeatedly targeting the same communities. One caregiver mentioned that frequent visits from researchers collecting blood were a discouraging factor **(Table 3).** Data collectors echoed this:

Programs come repeatedly to collect blood for different Ministry of Health surveys, which makes people feel overburdened.
—FGD 1, data collector 5

Data collectors also described questions from community members regarding inclusion criteria. Some participants wanted to know why certain households were selected while others were excluded. One supervisor shared:

Selected households asked why they were chosen and why others were left out, sometimes expressing frustration for having paused work or rearranged schedules for participation.
—IDI, serosurvey supervisor 1

Community members in rural areas sometimes asked why they were repeatedly targeted while urban populations were not:

People wondered why rural households were chosen so often when their relatives in town were not approached for similar surveys.
—FGD 1, data collector 3

Participants also questioned why older individuals were included, despite not receiving certain vaccines:

People asked why surveys collected blood from older individuals who had not been vaccinated, or why not everyone who received a vaccine was included.

—IDI, serosurvey supervisor 2

These concerns about fairness in selection were not reported in the caregiver survey results.

- *Test results*

The return of test results was reported as both a motivator and a barrier to serosurvey participation. In the caregiver survey, 41% indicated that fear of receiving potentially unfavorable test results reduced their willingness to participate, yet all respondents emphasized the importance of obtaining their results. A smaller group (12%) noted that the lack of personal test results was a deterrent. Additionally, 79% indicated willingness to accept summary results at the community level submitted to the district health office rather than individual results. Data collectors similarly observed that the most frequent requests from participants concerned learning the outcome of their blood tests. Communities expressed dissatisfaction that previous surveys collected blood without returning results. One data collector explained:

After explaining the survey, participants sometimes refused, saying that many people take their blood but never return with results. They wanted to know their own results and were frustrated when we said the results were general. They even asked for their blood back, insisting that they deserved to see what was found.

—FGD 1, data collector 6

Another data collector noted:

Community members were eager to learn the results, as often studies are conducted but findings are not shared with the participants.

—IDI, serosurvey coordinator

One supervisor highlighted that failure to return results negatively affected community trust and willingness to engage:

The main issue was that people were very willing to participate, but when we collected their blood, we left without reporting the findings. Participants expressed frustration, saying they had paused their work and given their blood, yet no results were communicated.

—IDI, PCES supervisor 2

While HIV testing was not explicitly included in the survey, there were indications that participants feared HIV testing and potential stigma. Nearly half expressed concern about learning their test results, and 9% mentioned worries about stigma associated with blood collection **(Table 3).** Caregivers' comments suggested indirect references to HIV, including concerns about long-term treatment without symptoms or fear of social judgment. Data collectors also reported that some participants assumed blood was being collected for HIV testing. Privacy was another concern; participants emphasized that names should not be required to ensure confidentiality.

- *Specimen preference*

Questions about specimen type were only asked in the caregiver survey. Findings showed that participants preferred finger-prick blood collection over venous blood draws (59%) and over oral swabs (71%), but there was no strong preference between venous blood and oral swabs **(Figure 2).**

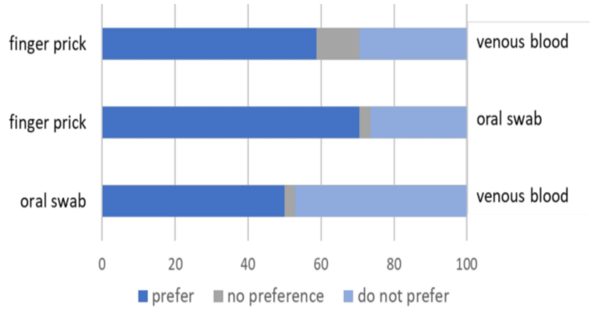

Figure 2. Pairwise specimen preferences among caregivers (n = 34)

Participants compared oral swabs, venous blood, and finger-prick collection, indicating either preferred, no preference, or not preferred for each pairwise comparison.

Reasons for choosing a particular specimen included simplicity (24%), least pain (24%), desire to know results (21%), and following the doctor's advice (15%) **(Table 4).** About one-quarter of respondents considered blood easier to collect than saliva, while a smaller group (9%) preferred saliva, possibly due to unfamiliarity with saliva-based tests. One caregiver explained:

Diseases can be detected in blood, but I am unsure if saliva can show anything.

—Caregiver 27

Table 4. Reasons for caregivers' specimen preferences (n = 34)

Reason for Preference*	n	%
Ease and simplicity of the procedure	8	23.5
Level of pain associated with the procedure	8	23.5

Desire to receive test results	7	20.6
Recommendation from a doctor	5	14.7
Volume of blood required	4	11.8
Belief that blood provides better results than saliva	9	26.5
Belief that saliva provides better results than blood	3	8.8
No prior knowledge of saliva-based testing	5	14.7

(*) Respondents could give more than one reason for their preference.

Another participant mentioned prior experience with blood collection:

I've never had an oral swab, so I wouldn't know how it works. I'm used to blood draws and finger pricks.

—Caregiver 24

Overall, caregivers were more familiar and comfortable with blood-based collection methods than oral swabs.

This study examined both the obstacles and enablers affecting participation in serosurveys, capturing insights from two perspectives: data collectors and caregivers who could participate in serosurveys. According to the socio-ecological model, participation was not primarily driven by individual-level factors; instead, interpersonal dynamics and, importantly, structural aspects related to survey implementation had an indirect yet substantial influence on engagement.

At the interpersonal level, community health workers (CHWs) played a critical role because they provided trusted information and guidance about the serosurvey. Family decision-making was also relevant; caregivers described involving other family members in the decision, while data collectors noted that in some cases, fathers needed to provide consent for children's participation. Integrating these family perspectives in future research could provide more nuanced insights. Structurally, factors such as clarity on how specimens were used and whether test results would be returned affected willingness to participate. Leveraging these facilitators can help design messaging that encourages engagement and could be applied to upcoming serosurveys, including those for SARS-CoV-2.

Differences emerged between caregiver and data collector perspectives at interpersonal and structural levels. Caregivers considered themselves the primary decision-makers, while data collectors identified religious and community leaders as major influencers. Structurally, concerns about fairness in participation were noted by data collectors, with some households perceiving overrepresentation while others felt excluded. Privacy regarding test results was also a concern, likely not captured in the caregiver survey because respondents were not actively participating in a serosurvey. Similar privacy issues have been reported in other studies using dried blood spot collection [18]. Across both perspectives, religion was a key individual-level barrier, CHWs were an essential interpersonal facilitator, and uncertainty about specimen handling and not receiving results were notable structural barriers. Mention of HIV testing emerged as both a motivator and deterrent.

There was general agreement on the importance of providing results to participants, either individually or aggregated at the community level. Sharing community-level outcomes during local meetings can help address logistical challenges in distributing individual results. While some participants expressed concern about learning results when asymptomatic, this appeared primarily related to HIV rather than measles or rubella. Return of test results has been previously identified as a factor influencing participation in studies involving blood draws [1]. In conditions such as HIV/AIDS, malaria, or SARS-CoV-2, point-of-care tests allow immediate feedback, whereas this is not yet feasible for measles and rubella serosurveys.

Although this study focused on the acceptability of participation in serosurveys, some insights may apply to household surveys generally. Unique to serosurveys were religious barriers to specimen collection at the individual level, and structural concerns regarding how specimens were handled and whether results were returned. Lack of knowledge about specimen use is a commonly reported barrier to research participation [19]. Caregivers emphasized that providing clear information to the community could address these concerns, a strategy previously implemented in some populations through engagement with religious leaders and community education [20]. Evaluating dropout rates with and without blood collection is important for planning serosurveys.

Regarding specimen type, caregivers preferred finger-prick blood collection, consistent with a study in Zambia showing similar preferences among participants and providers [21]. In contrast, research from Tanzania reported that community members favored venipuncture over finger-prick sampling [22]. In this study, blood was generally preferred due to perceived reliability in detecting diseases, while saliva testing was unfamiliar to most participants. Local exposure to programs and research monitoring HIV/AIDS and malaria [12, 23] likely influenced these preferences, as participants were accustomed to finger-prick tests. Although conducted prior to COVID-19, these findings suggest that serosurveys considering oral or nasopharyngeal swabs for SARS-CoV-2 should account for local preferences for finger-prick collection.

This study captured caregiver perspectives via theoretical questions rather than requiring actual serosurvey participation. Although 30% of respondents reported previous participation, responses did not differ substantially between experienced and inexperienced participants. Recruitment at health facilities may bias the sample toward individuals already inclined to accept specimen collection. Additionally, most data collectors and all caregivers were female, which may underrepresent male caregiver perspectives despite their influence on participation decisions. Responses were influenced by underlying concerns about HIV/AIDS, such as fear of disclosure of status, whether linked to blood collection, prior HIV serosurveys, or community campaigns. The setting, with endemic HIV and malaria and familiarity with blood testing, may limit generalizability to areas where finger-prick collection is less common. Acceptance of oral swabs remains unknown in the post-COVID-19 context.

Conclusion

This study successfully identified barriers and enablers affecting community participation in serosurveys in Southern Zambia. Overall, participation was generally acceptable. While individuals have the right to refuse, understanding the factors that influence participation can help reduce refusal rates. The socio-ecological model highlights critical individual, interpersonal, and structural factors, providing guidance for strategies to enhance engagement. Key lessons for serosurveys, including SARS-CoV-2 studies, involve ongoing community engagement, clear communication about blood collection before the survey, and use of trusted messengers such as CHWs. Given the increasing number of SARS-CoV-2 serosurveys, additional research is warranted to explore whether preferences for specimen collection methods have evolved.

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References

1. Chatio S, Baiden F, Achana FS, Oduro A, Akazili J. Knowledge and perceptions about clinical trials and the use of biomedical samples: findings from a qualitative study in Rural Northern Ghana. PLoS ONE. 2016;11(4): e0152854.
2. Dhalla S, Poole G. Motivators to participation in actual HIV vaccine trials. AIDS Behav. 2014;18(2):263–77.
3. Salihu HM, Wilson RE, King LM, Marty PJ, Whiteman VE. Socio-ecological model as a framework for overcoming barriers and challenges in randomized control trials in minority and underserved communities. Int J MCH AIDS. 2015;3(1):85–95.
4. Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the health belief model. Health Educ Q. 1988;15(2):175–83.
5. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. Health Educ Q. 1988;15(4):351–77.
6. Travassos MA, Beyene B, Adam Z, Campbell JD, Mulholland N, Diarra SS, et al. Strategies for coordination of a serosurvey in parallel with an immunization coverage survey. Am J Trop Med Hyg. 2015;93(2):416–24.
7. Bryant Borders AE, Grobman WA, Amsden LB, Collins ET, Holl JL. Factors that influence the acceptability of collecting in-home finger stick blood samples in an urban, low-income population. J Health Care Poor Underserved. 2007;18(1):100–15.
8. MacNeil A, Lee CW, Dietz V. Issues and considerations in the use of serologic biomarkers for classifying vaccination history in household surveys. Vaccine. 2014;32(39):4893–900.

9. Hamer DH, Herlihy JM, Musokotwane K, Banda B, Mpamba C, Mwangelwa B, et al. Engagement of the community, traditional leaders, and public health system in the design and implementation of a large community-based, cluster-randomized trial of umbilical cord care in Zambia. Am J Trop Med Hyg. 2015;92(3):666–72.
10. Central Statistical Office/Zambia, Ministry of Health/Zambia, University of Zambia Teaching Hospital Virology Laboratory, University of Zambia Department of Population Studies, Tropical Diseases Research Centre/Zambia, and ICF International. 2015. Zambia Demographic and Health Survey 2013-14. Rockville, Maryland, USA: Central Statistical Office/Zambia, Ministry of Health/Zambia, and ICF International. Available at http://dhsprogram.com/pubs/pdf/FR304/FR304.pdf.
11. Zambia Central Statistical Office. 2010 Census of Population and Housing. Lusaka, Zambia: Population Summary Report; 2012. https://www.zamstats.gov.zm/download/5648/?tmstv=1676494185&v=5659. Accessed December 12, 2019.
12. Columbia University. Zambia population-based HIV impact assessment: ZAMPHIA 2015–2016: Columbia. 2016. http://phia.icap.columbia.edu/wp-content/uploads/2016/09/ZAMBIA-Factsheet.FIN_.pdf. Accessed Dec 12, 2019.
13. Hayford K, Mutembo S, Carcelen A, Matakala HK, Munachoonga P, Winter A, et al. Measles and rubella serosurvey identifies rubella immunity gap in young adults of childbearing age in Zambia: the added value of nesting a serological survey within a post-campaign coverage evaluation survey. Vaccine. 2019;37(17):2387–93.
14. Mutembo S, Carcelen A, Mwansa FD, Searle K, Wanyiri JW, Book C, et al. Integrating blood collection within household surveys: lessons learned from nesting a measles and rubella serological survey within a post-campaign coverage evaluation survey in Southern Province Zambia. Am J Trop Med Hyg. 2018;99(6):1639–42.
15. Glaser B, Strauss A. The Discovery of Grounded Theory: Strategies for Qualitative Research. Mill Valley, CA: Sociology Press; 1967.
16. Charmaz K. Coding in grounded theory practice. constructing grounded theory a practical guide through qualitative analysis. London: SAGE Publications Ltd; 2006. p. 42–71.Google Scholar
17. Sugishita K. Traditional Medicine, Biomedicine and Christianity in Modern Zambia. Africa. 2009;79(3):435-454. doi:10.3366/E0001972009000904
18. Hendrix KS, Meslin EM, Carroll AE, Downs SM. Attitudes about the use of newborn dried blood spots for research: a survey of underrepresented parents. Acad Pediatr. 2013;13(5):451–7.
19. Nakalembe M, Mutyaba T, Mirembe F. Acceptability of study procedures (self-collected introital swabs, blood draws and stool sample collection) by students 10–16 years for an HPV vaccine effectiveness study: a pilot study. BMC Res Notes. 2016;9:170.
20. Machekanyanga Z, Ndiaye S, Gerede R, Chindedza K, Chigodo C, Shibeshi ME, et al. Qualitative Assessment of Vaccination Hesitancy Among Members of the Apostolic Church of Zimbabwe: A Case Study. J Relig Health. 2017;56(5):1683–91.
21. Sutcliffe CG, Searle K, Matakala HK, Greenman MP, Rainwater-Lovett K, Thuma PE, et al. Measles and Rubella Seroprevalence Among HIV-infected and Uninfected Zambian Youth. Pediatr Infect Dis J. 2017;36(3):301–6.
22. Ostermann J, Njau B, Mtuy T, Brown DS, Muhlbacher A, Thielman N. One size does not fit all: HIV testing preferences differ among high-risk groups in Northern Tanzania. AIDS Care. 2015;27(5):595–603.
23. Larsen DA, Chisha Z, Winters B, Mwanza M, Kamuliwo M, Mbwili C, et al. Malaria surveillance in low-transmission areas of Zambia using reactive case detection. Malar J. 2015;14:465.