Vaccine Acceptance & Demand

SABIN VACCINE INSTITUTE

HEALTH SYSTEMS AND VACCINATION: TRUST, HEALTHCARE WORKERS, & LIVED EXPERIENCES

INITIAL FINDINGS FROM THE 2021-2022 SOCIAL AND BEHAVIORAL RESEARCH GRANTS PROGRAM

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A PRIMER FOR DECISION-MAKERS AND IMPLEMENTERS

According to the IA2030 framework, effective childhood and adult immunization programs serve as core components for strengthening overall primary health care systems, as well as global health security. A robust literature supports the notion that public trust – not just in vaccines, but in the providers of vaccines (healthcare workers [HWs], public health authorities, and governments) - is a key factor of vaccination success[1,2,3]. However, understanding public trust in health systems is still a nascent concept[4], including its relationship to the delivery of vaccination[5].

For example, HWs play a critical role in building trust between the public and the local immunization program. Often HWs are cited as the most trusted source of information on vaccination and can serve as conduits of vaccine confidence to their patients, family, friends, and community members. However, as members of the public themselves, HWs are at-risk of encountering mis- and dis-information about vaccines which leads to public mistrust and concerns over vaccine safety. This exposure has been demonstrated to be a complicating factor in promoting an accurate understanding of and response to the COVID-19 pandemic, which has in turn further diminished public trust in vaccination.

An improved understanding of current health system and HW readiness remains an imperative for the continued implementation of COVID-19 vaccination, as well as redoubled efforts to address the backsliding in essential childhood immunization brought on by the pandemic. Understanding HW trust in and perceptions and behavior around vaccination is critical to promoting their roles as advocates. Assessing public trust in health authorities must be undertaken to appropriately contextualize vaccination delivery strategies.

Launched in 2019, Sabin Vaccine Institute's Social and Behavioral Research Grants Program supports a global network of interdisciplinary and multisectoral researchers to investigate the social and behavioral drivers behind vaccination acceptance, demand, delivery, and decision-making. The program supports the design, piloting, and testing of community-informed interventions in LMICs in order to elevate locally contextualized evidence that can be used to reduce barriers and identify opportunities that ultimately increase vaccination uptake.

This case study report includes three of the ten projects from the third cohort of Sabin's Grants Program, which conducted research in 2021-2022. While varying by setting and community

1. Liu, S., & Chu, H. (2022). Examining the direct and indirect effects of trust in motivating COVID-19 vaccine uptake. Patient education and counseling, 105(7), 2096-2102.
2. Thomson A, Robinson K, Valle´ e-Tourangeau G. The 5As: A practical taxonomy for the determinants of vaccine uptake. Vaccine. 2016 Feb 17; 34(8):1018–24. https://doi.org/10.1016/j.vaccine.2015.11.065 PMID: 26672676
3. Larson HJ, Clarke RM, Jarrett C, Eckersberger E, Levine Z, Schulz WS, et al. Measuring trust in vaccination: A systematic review. Hum Vaccines Immunother. 2018 May 10; 14(7):1599–609. https://doi.org/10.1080/21645515.2018.1459252 PMID: 29617183
4. Aboueid, S. E., Herati, H., Nascimento, M. H., Ward, P. R., Brown, P. R., Calnan, M., ... & Meyer, S. B. (2023). How do you measure trust in social institutions and health professionals? A systematic review of the literature (2012–2021). Sociology Compass, e13101.
5. Ahorsu, D. K., Lin, C. Y., Yahaghai, R., Alimoradi, Z., Broström, A., Griffiths, M. D., & Pakpour, A. H. (2022). The mediational role of trust in the healthcare system in the association between generalized trust and willingness to get COVID-19 vaccination in Iran. Human vaccines & immunotherapeutics, 18(1), 1-8.

and focusing on different aspects of vaccination, central aims across all three projects were tied toward understanding public trust in and/or support for health authorities, HWs, and health systems, regarding COVID-19 vaccine delivery for adults. It is this central focus of trust that truly binds these studies together – understanding *who* is trusted by communities and *why* and utilizing those dimensions of trust to inform vaccination delivery strategies.

Considering these three case studies together provides an array of different but effective evidence-based strategies to inform further development of policy, programs, and practices that are both responsive to strengthening health system vaccination delivery and the needs to communities, themselves. The findings within this report are relevant to efforts designed to generate demand and increase uptake for not only COVID-19 vaccination, but life-course vaccination more broadly.

Approaches for Generating Localized Evidence for Global Solutions

All three studies aimed to understand more about COVID-19 vaccination acceptance, demand, and uptake amongst various cadres of community members: HWs, women, young people, national-level decision-makers, and local groups with known high levels of vaccine hesitancy. In designing these projects as mixed methods studies, research teams could investigate their research aims comprehensively, seeking out differing perspectives and understanding the detail and nuance of these perspectives and vaccination behaviors through qualitative methods.

- Johns Hopkins University: *COVID-19 Vaccine Hesitancy, Trust, and Inequities in Rural Sarlahi District, Nepal*
- Loma Linda University: *Understanding the social and behavioral dimensions of COVID-19 vaccine acceptance among healthcare workers in Sierra Leone: Implications for community vaccine uptake*
- University of Liberia, *College of Health Sciences: Assessing Social, Demographic, and Clinical Drivers of COVID-19 Vaccination Behavior in Post-Ebola Liberia.*

Emerging Insights for Community Action

Insights can be synthesized from across all three case studies and center around issues of trust in healthcare systems and HWs, broadening the idea of who is considered a HW and building a comprehensive understanding of the needed resources for successful messaging strategies and vaccination campaigns. Specific insights include:

- Trust in the healthcare system may increase likelihood of vaccine uptake;
- Broadened definitions and understanding of the workforce responsible for the vaccination among communities can support more effective strategies for building trusted messengers and vaccine confidence;
- Service and treatment experiences from HWs are an important component of building trust between the health system and community;
- Trusted messengers need not only technical knowledge and skills, but also training on approaches to building effective narratives and storytelling skills for communicating with community members;
- Understanding a community's collective history and/or lived experiences is essential to

understanding trends in vaccination acceptance, demand, and uptake and designing successful delivery services;

- Planning vaccination drives and campaigns should account for the service delivery environment. For example, the management of supplies and logistics beyond vaccines should include procurement of sanitizers, gloves, tables, and materials to support crowd management; and
- Investigate and understand trends in the acceptance of booster doses of vaccines, as well as newly available vaccines to inform introduction planning and demand forecasting.

Informing & Investing in Vaccine Confident Communities to Drive Vaccine Demand & Uptake

The goals of sharing these initial results are to:

Provide researchers and program implementers in LMICs with blueprints of successful research methodologies and approaches for piloting and evaluating strategies to increase vaccine confidence and acceptance in their communities.

Demonstrate the value of including these types of approaches and perspectives to sub-national, national, and global funders and policy and program decision-makers.

Considered together, these three projects have brought forth actionable insights for vaccination policy, programs, and practice. While individual, contextually-relevant recommendations are outlined in detail in each country's case study, broad insights have been synthesized from across all three case studies, as outlined.

The case studies demonstrate community-centric approaches and/or localized solutions for health system and provider readiness for vaccine introduction and for public trust building around vaccination to enable optimal vaccine acceptance, demand, delivery, and uptake. These early learnings aim to inspire and inform similar methodologies that can and should be used to continue generating critical knowledge and solutions to strengthen vaccine confidence in LMICs. One size does not fit all, and resources should focus on understanding effective approaches to design context-appropriate messaging and policy. These strategies should be embraced universally to drive vaccine uptake amongst historically marginalized social groups.

CASE STUDY FROM SARLAHI DISTRICT, NEPAL

COVID-19 VACCINE HESITANCY, TRUST, AND INEQUITIES IN RURAL SARLAHI DISTRICT, NEPAL

This mixed methods study was conducted between November 2021 and February 2023 in Kathmandu and at the Nepal Nutrition Intervention Project (NNIPS) field site in Sarlahi District, Nepal. It was implemented by the Johns Hopkins Bloomberg School of Public Health NNIPS team, with funding from the Sabin Vaccine Institute. The project received ethics approval from the Nepal Health Research Council and the Johns Hopkins Bloomberg School of Public Health. Investigators: Porcia Mandahar, Dr. Joanna Katz, Dr. Tsering P Lama, Dr. Rupali Limaye, Dr. Subarna K Khatry, and Dr. Daniel J Erchick.

KEY TAKEAWAYS

- **COVID-19 vaccination campaigns should focus on population segments with higher vaccine hesitant younger age groups, women, and social media users; address concerns around vaccine safety and efficacy; and be sustained to combat high second and third COVID-19 vaccine dose attrition rates.**
- **The government's handling of the COVID-19 pandemic was highly trusted by community members through accurately informing the public of both health risks and benefits of COVID-19 vaccines and being non-discriminatory against certain economic, social, or caste groups when providing help and relief.**
- **Healthcare workers are considered highly trusted messengers of vaccine information by community members; however, frontline health worker knowledge on vaccine safety and benefits was limited, especially for pregnant and lactating women.**
- **TikTok was the only social media platform reported as an important and trusted source of information on COVID-19 vaccination.**

HISTORICAL CONTEXT

The COVID-19 pandemic has eroded trust in public health systems and increased anti-vaccine sentiment. Research on health system readiness, public trust, and COVID-19 vaccine hesitancy has been predominantly focused on high-income settings. In the South Asian context, few studies have assessed vaccine hesitancy among the public or sought the perspectives of national stakeholders or healthcare workers.

At the onset of the pandemic in Nepal, uncertainty about vaccine availability, due to global and regional shortages, and the circulation of misinformation, impacted attitudes toward COVID-19 vaccination, including among primary-level healthcare workers. While one study of young adults in Nepal showed encouraging acceptance of COVID-19 vaccines,[1] another study conducted in a medical college in early 2021 found that only 38% of respondents were willing to get vaccinated due to concerns over vaccine safety.[2] Studies conducted to date in Nepal have mostly taken the form of rapid online surveys or focused on special groups, not representative of the overall population.

Understanding current health system readiness, public trust in health authorities, and COVID-19 vaccine hesitancy are critical to the development of evidence-based communication approaches to achieve equitable access and high demand in Nepal.

APPROACH

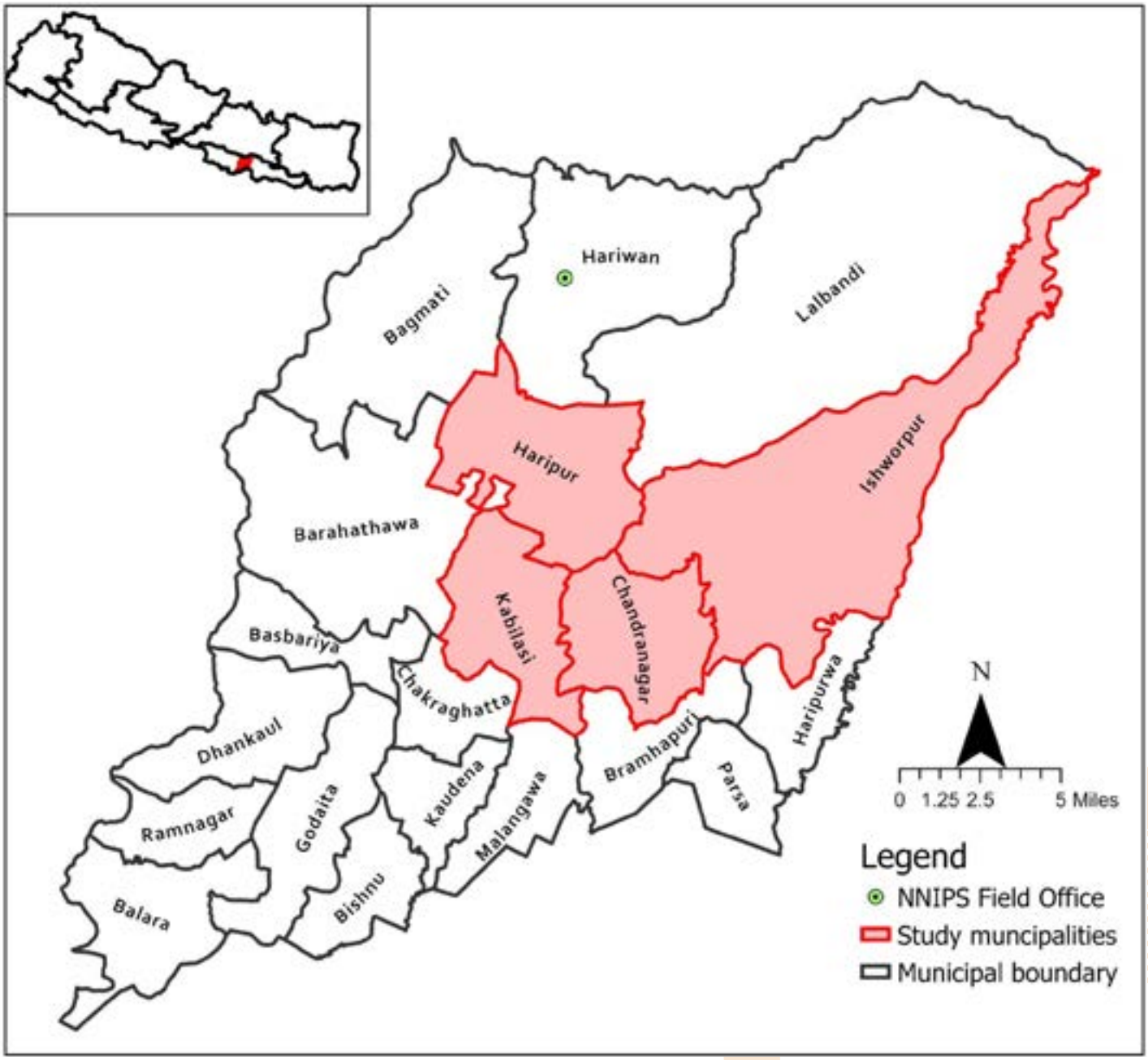
This mixed-methods study was conducted in Kathmandu and Sarlahi District in Nepal's Terai region, which borders Bihar, India. The overall aim was to generate practical evidence and recommendations to support the Government of Nepal's COVID-19 vaccine demand generation and communication efforts. This was achieved by describing the drivers of mistrust and hesitancy and informing potential communication approaches, especially for rural areas and low-income, disadvantaged communities.

1. Subedi D, Pantha S, Subedi S, Gautam A, Gaire A, Sapkota D, et al. Perceptions towards COVID-19 Vaccines and Willingness to Vaccinate in Nepal. Vaccines 2021;9:1448. https://doi.org/10.3390/vaccines9121448.
2. Paudel S, Palaian S, Shankar PR, Subedi N. Risk Perception and Hesitancy Toward COVID-19 Vaccination Among Healthcare Workers and Staff at a Medical College in Nepal. Risk Manag Healthc Policy 2021;14:2253–61. https://doi.org/10.2147/RMHP.S310289.

The specific objectives were as follows:

- Describe Nepal's COVID-19 vaccine rollout, with a focus on demand generation and communication, through qualitative interviews with national immunization stakeholders;
- Assess COVID-19 vaccine readiness and acceptance among rural healthcare providers and Female Community Healthcare Volunteers (FCHVs) in Sarlahi District through quantitative surveys; and
- Estimate the extent and drivers of COVID-19 vaccine hesitancy and trust in government related to COVID-19 vaccines and vaccination programs, and the associations with sociodemographic factors through a quantitative household survey of adults in rural Sarlahi District.

Figure 1: Sarlahi district and the study municipalities



IMPLEMENTATION STAGES

Qualitative in-depth interviews with national stakeholders

Six qualitative in-depth interviews (IDIs) were conducted with national stakeholders, including two with government officials and four with civil society members, to describe Nepal's COVID-19 vaccine rollout. Participants were identified using purposive and snowball sampling to select those with diverse roles and expertise involved in the COVID-19 vaccination response. Interviews were conducted by Zoom. The interview guide was informed by the World Health Organization's COVID-19 Vaccine Country Readiness Assessment Tool,[3] with a focus on demand generation and communication.

Information collected assisted with:

- Capacity building of technical research skills;
- Collective reflection and team integration;
- Self-reflection through an ethnographic diary to document their thoughts, observations, and lessons learned throughout the data collection process; and
- Participatory activities including, power mapping and rumor tracking group exercises

A qualitative framework analysis was used to summarize lessons learned and health system readiness for the COVID-19 vaccine scale-up.

Quantitative surveys of health providers and FCHVs in rural Sarlahi District

Quantitative surveys were conducted with 42 health providers and FCHVs involved in COVID-19 vaccination-related activities to assess vaccine readiness and acceptance in rural Sarlahi District. Healthcare providers included medical doctors, health assistants, nurses, assistant nurses, or midwives at health facilities in the study area. FCHVs are locally resident women who promote and distribute maternal and child health services in their communities.

Healthcare professionals involved in COVID-19 vaccination were recruited from 13 health posts in four municipalities. Interviews were conducted in-person at health facilities using appropriate COVID-19 infection prevention protocols, including masking and social distancing.

The quantitative survey was based on a tool, adapted for the Nepali context, originally developed for use in India by the International Vaccine Access Center (IVAC), Johns Hopkins Bloomberg School of Public Health.[4] The interview guide focused broadly on:

- Social inequities;
- Vaccine hesitancy, including COVID-19 personal experience, knowledge and attitudes, risk perceptions, and vaccine acceptance; and
- Health facility readiness for COVID-19 vaccine rollout.

Descriptive analyses were used to summarize vaccine readiness and acceptance among rural healthcare providers as well as their perspectives on the determinants of vaccine acceptance and hesitancy in the community.

3. Pan American Health Organization. COVID-19 Vaccine Country Readiness Assessment Tool (VIRAT). https://www.paho.org/en/documents/covid-19-vaccine-country-readiness-assessment-tool-virat (accessed February 23, 2022).
4. Mehta K, Dhaliwal BK, Zodpey S, Loisate S, Banerjee P, Sengupta P, et al. COVID-19 vaccine acceptance among healthcare workers in India: Results from a cross-sectional survey. PLOS Global Public Health 2022;2:e0000661. https://doi.org/10.1371/journal.pgph.0000661.

Quantitative surveys of health providers and FCHVs in rural Sarlahi District

A quantitative survey was conducted with community members to describe trust in authorities, social inequities, and hesitancy related to COVID-19 vaccination in the rural Sarlahi District. The target sample size was 300 individuals. This sample size was based on estimating hesitancy with a certain level of precision. To include representation of a predominantly Muslim-populated area, the sample size was later increased by 63.

Census infrastructure from an ongoing trial, implemented by the Nepal Nutrition Intervention Project Sarlahi (NNIPS), was used to randomly select households in 17 wards in four municipalities that were included within the catchment area of the parent study. At each household, one resident aged 18 years or older was selected at random to participate in the interview. Interviews were conducted in-person at participant households using appropriate COVID-19 infection prevention protocols.

The survey collected the following data from participants:

- COVID-19 vaccination status;
- COVID-19 vaccine knowledge, attitudes, and beliefs (including misinformation and rumors);
- Reasons for COVID-19 vaccine acceptance;
- Trust in public health authorities, using a scale adapted for use in Nepal;[5]
- Vaccine hesitancy, using a scale developed specifically for COVID-19;
- Perspective on maternal COVID-19 vaccination;[6] and
- Sources and trust on information sources.

Descriptive analyses were conducted to estimate levels of trust and hesitancy. Scales were also constructed to assess vaccine hesitancy, trust in government, vaccination accessibility, and wealth index. Logistic regression modeling was used to estimate odds ratios and 95% confidence intervals of vaccine hesitancy, adjusting for participant characteristics, including age, education, ethnicity, religion, wealth quintile, vaccine accessibility, and social media use. Table 1 details the scales used for trust, vaccine hesitancy, vaccine accessibility, and the wealth index.

5. Holroyd TA, Limaye RJ, Gerber JE, Rimal RN, Musci RJ, Brewer J, et al. Development of a Scale to Measure Trust in Public Health Authorities: Prevalence of Trust and Association with Vaccination. Journal of Health Communication 2021;26:272–80. https://doi.org/10.1080/10810730.2021.1927259.
6. Opel DJ, Taylor JA, Zhou C, Catz S, Myaing M, Mangione-Smith R. The Relationship Between Parent Attitudes About Childhood Vaccines Survey Scores and Future Child Immunization Status. JAMA Pediatr 2013;167:1065–71.

Table 1. Description of scales used for trust, vaccine hesitancy and accessibility, and wealth

Trust in Public Health Authorities Scale	Vaccine Hesitancy Scale	Vaccine Accessibility Scale	Wealth Index
Ordinal scale (0 to 6) using six questions related to trust in government: 0 - strongly disagree or disagree 1 - strongly agree or agree Trust level was calculated as a proportion. Participants were categorized by level of trust as either <0.50 (less trusting) or ≥0.50 (more trusting).	Ordinal scale (0 to 4) using four questions related to vaccine confidence/ hesitancy: 0 - vaccine confident responses 1 - vaccine hesitant responses Vaccine hesitancy level was calculated as the proportion of hesitant responses out of the total number of questions answered for each participant. Participants were categorized by level of hesitancy as either score <0.50 (more hesitant) or ≥0.50 (more confident) for further analyses.	Accessibility scale (0 to 5) using five questions. Values were weighted by the number of questions answered to get a scale from 0 (least accessible) to 1 (most accessible). Final groupings were <0.50 (less accessible) or ≥0.50 (more accessible) for the area's vaccination facilities.	Ordinal scale (0 to 20) based on 20 socio-economic questions relevant in this community, then divided into quintiles: • Water source, • Presence of electricity, • Type of latrine use, • Land ownership, • Receipt of remittance from abroad, and • Ownership of household items and vehicles.

Key Findings

Description of Nepal's COVID-19 vaccine rollout

Key successes and challenges of Nepal's COVID-19 vaccine rollout reported from the interviews are summarized in Table 2.

Table 2. Key successes and challenges of Nepal's COVID-19 vaccine rollout

Successes	Challenges
Policy/Program	
• Interviewees reported high-level support for COVID-19 vaccination among political leaders and officials in Nepal. • Senior leaders and officials worked early in the pandemic to allocate sufficient funding for COVID-19 vaccination procurement and delivery. • Nepal relied on provincial and local governments to implement the COVID-19 vaccination program. • A decentralized approach, which leveraged Nepal's strong foundation of local-level microplanning, was critical to the success of the COVID-19 program. • An increase in cold-chain capacity across the country was a critical aspect of early preparation for COVID-19 vaccine rollout.	• The program had difficulties procuring supplies, including syringes and safety boxes, due to insufficient stocks and global shortages, which hampered early vaccine rollout across the country. • Human resources were also a major challenge, particularly when Nepali migrant workers returned suddenly after a lockdown was announced in India, and no proper testing or quarantine facilities were in place in the country. • Healthcare professionals struggled to provide COVID-19 services in addition to regular healthcare services. • COVID-19 vaccination and services also largely missed populations of very low-income individuals.
Communication	
• Media briefs from the Ministry of Health and Population were taken up by national media channels and broadcasted through radio and television. • The Ministry of Health and Population also utilized popular mobile messaging applications to share messaging. • Social mobilization training was conducted with Female Community Health Volunteers (FCHVs). Hotlines were established and used when cases were high in communities, with questions and concerns received through the hotline used in national press briefs. • Other strategies included co-branding vaccination efforts with UNICEF and the government, and use of local community media personalities/online influencers. • In rural areas, main sources of information were the FCHVs and healthcare workers. • Face-to-face information sharing was reported as the most trusted method, followed by the radio and television.	• Communication was a challenge, due to the regular scarcity of vaccines early in the pandemic. The government and its media partners faced a constant dilemma about whether and how to conduct demand generation and communication activities. • Initially, the government mandated use of national identity cards for vaccination to confirm ages during vaccine drives. However, when the ID card requirement was removed later in the vaccination program, inadequate communication around this led to individuals skipping vaccine drives. • Interviewees mentioned that although there was little governmental distrust related to COVID-19 vaccines, the public expressed dissatisfaction during periods of vaccine shortages.

COVID-19 vaccine readiness and acceptance among rural healthcare providers and FCHVs

A total of 42 healthcare professionals, including 21 healthcare providers and 21 FCHVs, were

interviewed across 16 health facilities and 14 wards in Sarlahi District. Healthcare professionals ranged from 23 to 60 years of age, and the majority were female (76.2%). Overall, 71.4% of respondents received three doses of COVID 19 vaccine. Respondents reported high levels of confidence in the COVID-19 vaccine but noted areas for improvement (summarized in Table 3).

Table 3. Key findings from quantitative surveys of health providers and FCHVs in rural Sarlahi District

Topic	Key Findings
Vaccine acceptance and access	• Participants showed high levels of confidence in COVID-19 vaccination, with 100% of providers reporting that the COVID-19 vaccine is safe, and nearly all reporting that the vaccine is effective (97.6%) and can prevent serious illness and death (97.6%). • Most providers were positive about their access to COVID-19 vaccination in their communities, although 19% reported that they had to travel too far or wait too long to receive the vaccine. • Some participants reported a belief in common misconceptions, including that the vaccine can cause COVID-19 infection (yes: 7.1%, don't know: 2.4%), and 4.8% reported that obtaining immunity from natural infection is better than through vaccination. • Half of respondents (19 Female Community Health Volunteers (FCHVs) and two healthcare providers) reported that COVID-19 infection can be effectively treated with ayurvedic medicine. • Three-quarters of healthcare providers (76.2%), but less than half of FCHVs (42.9%) would recommend the COVID-19 vaccine to family or friends who are pregnant or lactating.
Areas for improvement	• Both FCHVs (100%) and healthcare providers (88.1%) agreed that supervision and training was an important area of improvement, as well as disease surveillance (reported by 57.1% of FCHV and 71.4% of healthcare providers). • Over one-quarter (28.6%) of FCHVs and healthcare providers reported that the COVID-19 cold chain still required improvements. • Suggestions for potential improvements included the need for timely compensation of nurses and FCHVs who help organize vaccine drives, the need for training of local providers, and targeted strategies to reach communities with higher levels of vaccine hesitancy.

Extent and drivers of COVID-19 vaccine hesitancy, and trust in government related to COVID-19 vaccines and vaccination programs

A total of 363 community members from four municipalities and 17 wards in Sarlahi District were interviewed. Participants ranged from 18 to 60+ years of age, and the majority were female (78.2%). Half of the interviewees had no formal education (53.4%). Most participants were Madeshi (95.7%), Hindu (81.5%) or Muslim (17.9%). Key findings by topic are summarized in Table 4.

Table 4. Vaccine hesitancy and trust in government related to COVID-19 vaccines and vaccination programs

Topic	Key Findings
Extent of vaccine hesitancy	• Most participants had at least one dose of COVID-19 vaccine (88.4%), although only 46.0% had two doses, and 19.0% three or more doses. • A large percentage of the unvaccinated (88%) reported that they would be open to receiving a COVID-19 vaccine in the future. • However, 22.6% of participants reported delaying COVID-19 vaccination, and over a third reported that they had some concern about vaccine safety (40.5%) or effectiveness (39.1%).
Public trust in government	• Respondents reported high trust in the government handling of the COVID-19 pandemic. • Most agreed that the government is doing everything to protect the public from COVID-19 (98.9%), that the government accurately informed the public of both health risks and benefits of COVID-19 vaccines (97.6%), and that the government did not discriminate against certain economic, social, or caste groups when providing help and relief (96.4%).
Beliefs around COVID-19 vaccination	• Few participants reported believing in common misconceptions, e.g., that the COVID-19 vaccine causes infertility (1.7%) or the vaccine can cause COVID-19 infection (1.1%); however, many did not know (38.6% and 6.6%, respectively) answers to these questions. • Around 20% of respondents said that obtaining immunity from natural infection is better than through vaccination. • Over fifteen percent (16.3%) reported that COVID-19 infection can be effectively treated with ayurvedic medicine. • Almost all participants would recommend that a pregnant or lactating family member or friend (93.1%) receive the vaccine. • The most common reasons for accepting COVID-19 vaccination were to stop social distancing and mask wearing (87.6%); to protect yourself, family, and community from illness (88.4%); to allow travel (72.7%); because someone close to me was vaccinated (70.2%); because a Female Community Health Volunteer or other health professional recommended vaccination (66.7%); and because a family member or community leader recommended vaccination (58.4%).
Barriers to access	• Overall, 88.5% of respondents said that vaccination facilities were accessible in their community. • However, barriers to accessing COVID-19 vaccination included having to travel too far (31.7%), wait too long (57.6%), lose income (33.1) or incur expenses (21.2%).
Trusted sources of information	• The most trusted sources of information on COVID-19 vaccination were family, healthcare professionals, television, and radio. Nearly all respondents (94.8%) reported that they trusted COVID-19 vaccine information delivered by healthcare professionals. • Among several social media platforms, only TikTok was reported as an important and trusted source of information on COVID-19 vaccination, used by 28.9% of the study population.

In a final regression model, likelihood of being more vaccine hesitant was significantly higher among younger age groups compared to the oldest age group (56+ years old) and among women compared to men. There was also an indication that vaccine hesitancy may be higher among social media users compared to non-users. No other characteristics, including education, ethnicity, religion, wealth, or accessibility, were significantly associated with vaccine hesitancy.

INFORMING COMMUNITY ACTION

Policy

- Develop programs and policies for healthcare professionals, including FCHVs, to conduct crisis and rumor management related to vaccination in their communities.
- Improve clarity and timeliness of communication of new or revised policies and recommendations especially for special populations to healthcare workers, including FCHVs, and provide materials and tools for them to communicate changes to the public.

Program

- Develop a national "search and vaccinate" program to increase coverage of COVID-19 booster doses through mass campaigns, with focus on specific target populations, such as pregnant and lactating women, school children, or religious minorities.
- Focus mass campaigns on populations and communities missed during initial drives using strategies such as frequent sessions, mobile stations for hard-to-reach areas and populations, and targeted communications.
- Improve management of supplies and logistics beyond vaccines during planning of vaccination drives, including procurement of sanitizers, gloves, tables, and chairs to manage crowds.
- Involve healthcare workers, especially local FCHVs, in planning and implementing future booster and targeted vaccination programs in their communities to utilize their local insights and build commitment to the campaigns.
- Extend cold chain capacity to health facilities at the ward-level. Although there are fridges in each district, high-quality, small fridges (vs. current ice packs) are required at every health-post level, along with a back-up power supply.
- Provide fair and timely compensation to FCHVs, and not just vaccinators, for their efforts in vaccination drives to ensure effective implementation of the vaccination program at the community level.
- Consider targeted strategies to improve vaccine confidence among certain populations in rural communities in the Terai region shown to have higher vaccine hesitancy. This includes younger people and women, and potentially individuals with fewer years of education and social media users.
- Undertake similar studies of vaccine hesitancy and trust in other communities, including those living in the mountain and hilly regions, urban areas, and special and high-risk populations.

Practice

- Communicate about the availability of vaccines in health facilities to public and healthcare professionals through clear and timely announcements, as the majority of community members and FCHVs did not know vaccine availability status at their local health facility.
- Utilize a combination of nationwide traditional media (especially radio and television) and new social media platforms (especially Facebook and TikTok) to communicate with the public about vaccine availability and misinformation, misconceptions, and rumors.
- Improve training and supervision of healthcare workers around the communication of vaccine side effects, safety, and benefits to community members. Healthcare workers were seen as highly trusted sources of information regarding vaccines, but their knowledge on vaccine safety and benefits was limited, especially for pregnant and lactating women.

RESEARCH LEADS

Porcia Manandhar, MSPH

Porcia Manandhar, MSPH, is a doctoral candidate at the Johns Hopkins Bloomberg School of Public Health (BSPH) in the Department of International Health. She has field experience and a keen interest in conducting vaccine science and policy research in low-resource settings.

Joanne Katz, ScD

Joanne Katz, ScD, is a Professor of International Health at BSPH. Dr. Katz has served as an investigator for all the NNIPS studies in Nepal since 1989. Her work includes a community-based individually randomized trial of a maternal influenza vaccine.

Tsering P. Lama, PhD, MPH

Tsering P. Lama, PhD, MPH, is the Director at the NNIPS research site and has experience in maternal, neonatal, and child health community trials in Nepal. Dr. Lama is responsible for planning, partner coordination, and oversight of the implementation of all research activities in NNIPS.

Rupali J. Limaye, MPH, MA

Rupali J. Limaye, PhD, MPH, MA, is an Associate Professor at BSPH and Director of Behavioral & Implementation Science at the International Vaccine Access Center (IVAC), JHSPH. An expert in social and behavioral science, Dr. Limaye studies vaccine hesitancy, including misinformation on social media, vaccine safety, and patient-provider communication.

Subarna K. Khatry, MBBS

Subarna K. Khatry, MBBS, is the country representative for Johns Hopkins University in Nepal and has previously served as principal or co-investigator on all major field studies conducted at the NNIPS research site since 1989. Dr. Khatry is responsible for partner coordination and oversight of the JHU projects in Nepal.

Daniel J. Erchick, PhD, MPH,

Daniel J. Erchick, PhD, MPH, is a BSPH faculty member in the Department of International Health at BSPH. Dr. Erchick's research focuses on community-based studies of maternal and infant health, drivers of vaccine hesitancy, social inequities, and approaches to improve health communication.

CASE STUDY FROM SIERRA LEONE

UNDERSTANDING THE SOCIAL AND BEHAVIORAL DIMENSIONS OF COVID-19 VACCINE ACCEPTANCE AMONG HEALTHCARE WORKERS IN SIERRA LEONE:

IMPLICATIONS FOR COMMUNITY VACCINE UPTAKE

This mixed methods project was conducted between March and December 2022 with healt care workers across 14 districts of Sierra Leone. It was implemented by Loma Linda University in partnership with the Adventist Health System of Sierra Leone with funding from the Sabin Vaccine Institute. The project received ethics approval from the Institutional Review Board (IRB) at Loma Linda University and the Office of the Sierra Leone Ethics and Scientific Review Committee. Investigators: Dr. Zephon Lister, Dr. Susanne B Montgomery, and Dr. Jacinda C Abdul-Mutakabbir.

KEY TAKEAWAYS

- **According to the Sierra Leone Ministry of Health and Sanitation, healthcare workers are the number one source of trusted health information in the country;**
- **Regardless of role, individuals working in healthcare settings are viewed as a trusted source of information;**
- **Healthcare workers want training on how to speak to myths and concerns about vaccines and vaccination in general, especially relating to COVID-19;**
- **Following a half day training, healthcare workers reported a statistically significant increase in intention and willingness to answer patients' questions about COVID-19 vaccines; and**
- **Trainings should go beyond direct care providers, recognizing that the community looks to anyone working within a healthcare facility as a trusted source of information.**

IN CONTEXT

A key factor in increasing vaccine acceptance is receiving information from trusted sources.[1,2,] A strong recommendation from a healthcare provider can be one of the most influential factors leading to vaccine acceptance and demand[2,3]. However, recent research examining COVID-19 vaccine hesitancy among healthcare workers found that acceptance rates varied significantly across various regions of Africa ranging as low as 27% in the Congo to as high as 90% in South Africa[4,5]. A recent needs assessment carried out in Waterloo, Sierra Leone found that almost half of healthcare providers indicated they would not receive the COVID-19 vaccine if it were available, with the most common reasons being concerns about safety and side effects[6]. If healthcare workers have lower levels of vaccine acceptance, they may be less likely to educate and recommend vaccination to their patients. This reality has been shown within Sierra Leone, where over 50% of individuals who reported being unwilling to take the vaccine also cited fear of the side effects as the primary concern[1]. Therefore, understanding the social and behavioral dimensions of COVID-19 vaccine acceptance among trusted health messengers, such as healthcare workers, can be an important component in increasing vaccine uptake in the general public.

APPROACH

The initial first two aims of this project were to assess the perceptions and acceptance of COVID-19 vaccination among healthcare workers (HWs) within the Christian Health Association of

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6 Adventist Health System. (2021). Healthcare Worker Perceptions about COVID-19 Vaccination. Sierra Leone District Health Management Team (DHMT) Assessment Report

Sierra Leone (CHASL) network, a health network that comprises 30-35% of the healthcare facilities within Sierra Leone, with the goals of:

- Understanding factors that contribute to non-acceptance and negative perceptions of the vaccine, and
- Identifying a strategy to support vaccine acceptance among HWs.

However, after initial data collection and analysis, it was found that vaccine acceptance was already very high among HWs, with over 90% self-reporting being vaccinated within the CHASL network. However, it was also discovered that only 50% of HWs within CHASL health facilities had been trained on the epidemiology Corona viruses, including COVID-19, and/or how vaccines worked. Additionally, just half of HWs were trained on how to talk to patients about the COVID-19 vaccine. This finding was significant, because, HWs who were trained were more comfortable in talking about COVID-19 vaccines and answering questions, as well as recommending the vaccine to patients, family members, friends, and other community members. Based on these preliminary findings, the first two aims of the project were revised to:

- Understand the resources and support needed and barriers present in providing training to providers on COVID-19 vaccines and how to translate this information into patient care and collaboration with community leaders,
- Use preliminary data to develop an intervention curriculum/strategy to train and equip HWs with the education and shared decision-making skills to support their interactions with patients and community members related to the vaccine acceptance with the goal of improving overall uptake in the community, and
- Disseminate findings with key stakeholders to share lessons learned and further support COVID-19 vaccine uptake in the region.

To achieve these aims, a concurrent nested mixed-method study (quantitative survey and key informant interviews [KIIs]) was implemented to gather information from different levels of the healthcare sector, which was utilized to create and pilot the curriculum intervention. A pre-post evaluation design was used to evaluate changes in knowledge and attitudes about COVID-19 and COVID-19 vaccination. Focus groups were also conducted at each facility with a sub-group of participants.

IMPLEMENTATION STAGES

Survey Assessment Phase

Investigators surveyed 594 HWs, of which 406 were medical providers/workers (i.e., doctors, nurses, pharmacists, hygienists, community health officers, laboratory technicians, etc.) and 188 were non-medical staff members (e.g., administrators, community health officers, etc.) from 40 of the 44 facilities within the CHASL network. Surveys contained closed-ended questions and

were conducted in-person. A sub-set of semi-structured interviews were conducted amongst 53 HWs. Prior to exploring issues related to COVID-19 vaccine knowledge and acceptance, the investigators first examined the overall experience of participants with COVID-19:

- 8.9% (n=53) HWs reported being formally diagnosed with COVID-19
- 27.1% (n=161) reported that although not formally diagnosed, they believe they had COVID-19 based on what they knew about the symptoms
- 20% (n=53) of participants reported knowing someone close to them who had been diagnosed with COVID-19
- 13.6% (n=81) said they knew of someone personally who had died of COVID-19
- 92.9% of medical providers/staff (92.9%) and 88.3% of non-medical health facility staff (88.3%) reported receiving the COVID-19 vaccine

Knowledge, Attitudes, Perceptions, and Acceptance

Just under 95% of all respondents reported knowing COVID-19 could result in additional health complications. However, when asked to identify some of the most common complications related to COVID-19 (e.g., respiratory and lung problems, heart issues, kidney problems, blood clots, mental health challenges, infections), only 50% of participants could list specific complications beyond lung and respiratory problems. Most participants shared that they knew a little about COVID-19 vaccines (76.3%), while 9.4% reported not knowing anything about them. When asked about where they received their information, the most common sources were radio (79.8%), colleagues (57.9), their place of employment (71.9%), and social media (55.1%). Interestingly, two of the least common sources of information were scientific literature (9.9%) and organizations such as the WHO and UNICEF (19.2%), although their places of employment might access these sources to educate and inform their employees. Just half of participants (52%) reported receiving some training or orientation about COVID-19 vaccines.

Although almost all participants were vaccinated against COVID-19 and more than half reported that they received some training or orientation about COVID-19 vaccines, most HWs still had some significant gaps or misconceptions in knowledge about COVID-19 and the related vaccine. For example:

- 79.6% believed that the COVID-19 vaccine would prevent someone from getting the virus,
- 57.4% did not think COVID-19 was a serious disease
- 30% did not know that the COVID-19 vaccine has side effects
- 82.1% of those who knew about COVID-19 side effects reported concern about them
- 34.2% either believed or did not know if they could become infected with COVID-19 through vaccination

Patient Interaction and Training

Only half (53.4%) of those surveyed reported receiving some training on how to talk to patients about COVID-19 vaccines. Most providers felt *somewhat comfortable* to *very comfortable* talking to patients, family, and friends about COVID-19 vaccines, answering their questions,

and recommending that they take the vaccine. When examining factors that were associated with *feeling* comfortable when interacting with patients, family, and friends around COVID-19 vaccination, investigators found moderate associations between knowledge about COVID-19 vaccines, having training or orientation about COVID-19 vaccines, and being trained in how to talk to patients about COVID-19 vaccines.

Specifically looking at training to talk to patients about COVID-19 vaccines, there was a moderate positive correlation between being trained to talk to patients about COVID-19 vaccination and answering patient questions about COVID-19 vaccines. A similar positive association was also found with talking to patients about COVID-19 vaccines and encouraging patients to take COVID-19 vaccines. Similar, but slightly weaker, correlations were found for perceived knowledge about COVID-19 vaccines and those who had received training on COVID-19 vaccines.

Key Informant Interview Phase

A subsample of 53 of those HWs surveyed were systematically recruited to participate in an additional qualitative KII. Interviews were audio-recorded, translated (Krio to English), transcribed verbatim, and then coded and themed by two independent coders, using thematic descriptive methods. Four main themes emerged:

- Knowledge or the lack thereof,
- Community trust in anyone associated with the health care system,
- Need for HWs to receive communication training around risk communication, and
- Wrestling with their own and loved ones' lingering, often somewhat confused, attitudes which made it hard for them to step up and be messengers of vaccine promotion.

Looking across these themes, the results suggest that HWs know that they are the most trusted local sources for effective pro-vaccine messaging. They are, however, often under-prepared to do so (only 53.4% received even limited vaccine education), and as a result feel uncomfortable to play this role. They asked to be better educated, not just about how to perform COVID-19 testing and vaccine delivery, but to be able to speak to the many myths and concerns about COVID-19 vaccines, and vaccines in general. These needs cross from those working in direct clinical care to anyone who works in health care settings, as they are often assumed to be the local experts.

Not only would the respondents like to learn to better address knowledge, misconceptions, and fears, but they want to learn to do so more effectively in the often-stressful environment with intense discussions which challenge their own attitudes and often raise lingering fears. Risk communication training is new to the context but is a felt need—not only in their clinical settings but is also seen as a responsibility they have to the broader community which looks to them for guidance.

The Intervention: Training Curriculum

Investigators developed and piloted a half-day training curriculum informed by data collected during the assessment and KII phase of the study. The nine-member behavioral health field research team in Sierra Leone and the Loma Linda University (LLU) research team reviewed the

assessment phase data and cooperatively developed a training curriculum to be piloted within two of the ten healthcare facilities that had the lowest knowledge and patient engagement scores around the COVID-19 vaccine. Utilizing a task-shifting strategy, the LLU research team trained the behavioral health field research team on the technical knowledge, content, and presentation skills for the intervention, and supervised practice sessions prior to intervention implementation. A pre-post evaluation design with paired sample t-test analysis and focus groups were used to evaluate changes in:

- Knowledge about COVID-19 vaccines and vaccines, in general;
- Comfort (self-efficacy) and intention around answering patient questions;
- Talking to patients and recommending the COVID-19 vaccination to patients; and
- An overall evaluation of the training experience.

Pre-post evaluation

Knowledge

There was a significant difference in the scores for perceived knowledge about COVID-19 vaccines prior to the training intervention and perceived knowledge about COVID-19 vaccines after the training $t(39)=2.29$, $p=0.027$. Results indicated that participants perceived themselves to be much more knowledgeable about COVID-19 vaccines after the intervention training.

Comfort

There was a significant difference in the scores for reported comfort (self-efficacy) in answering questions patients ask about COVID-19 vaccines prior to the training intervention and after the training $t(39)=2.270$, $p=0.029$. There was no significant difference in scores for talking to patients about COVID-19 vaccination, although overall percentage rates did increase by 8% for participants reporting feeling very comfortable talking to patients about the COVID-19 vaccine.

Intention

There was a significant difference in the scores for reported intention and willingness to answer questions patients ask about COVID-19 vaccines prior to the training intervention and after the training $t(39)=2.211$, $p=0.03$. There was also a significant difference in the scores for reported intention and willingness for talking to patients about the COVID-19 vaccine prior to and after the training $t(39)=3.365$, $p=0.002$. For intention and willingness in encouraging patients to take the COVID-19 vaccine, there was no significant difference in scores for talking to patients about the COVID-19 vaccine, although overall percentage rates did increase by 12% for participants reporting that they would definitely encourage patients to become COVID-19 vaccinated.

Intervention Evaluation

Overall, participants reported finding the intervention session very useful, with 87.8% reporting that the information was not difficult to understand, 75.6% reporting that the session was fun, 95.1% sharing the session was both interesting and that the information was understandable and well organized. Approximately 93% of participants felt like they would be able to use the information presented with patients and family members.

Focus Group Feedback

Regarding knowledge and patient communication one participant shared,

> "Well, I learnt a lot of things about the training especially the manner in which the vaccine should be administered and the duration. I learnt about the principle of communication, especially in certain areas. You should not shout at someone, and you must always try to collaborate with them."

Another participant wrote about attending their first training on COVID,

> "Well, I learnt a lot, because I have never attended a training on COVID-19 related matters. This is my first training; I learned a lot because people were saying that this is a man-made disease, and they deliberately came with it to make money out of it. The training has helped me a lot by broadening my horizon especially those that were afraid of accepting the vaccine, I have more factual information now to help convince them to take the vaccine."

Another participant shared,

> "The training was so educative, and I have learnt something about the misconception the community people have about the vaccines but now I will have the courage to talk to them that the information they have been receiving from people are lies and the vaccines is good for everyone."

INFORMING COMMUNITY ACTION

Policy

- Create policies that ensure healthcare workers receive the resources and training they need to share correct information with patients, family, and community members.
- Create policies that improve access to reliable information that is freely and easily accessible to healthcare facilities and workers.

Program

- Equip healthcare workers with the education and shared decision-making and risk communication skills to support their interactions with patients, community members, and family.
- Ensure trainings go beyond direct care providers, recognizing that the community looks to anyone working in a healthcare facility as a trusted source of information.

Practice

- Leverage task-shifting as a strategy to help scale-up capacity to deliver education and training to healthcare workers, by having specialists train local, less specialized health and community workers to disseminate information, especially within low resource contexts.
- Develop collaborations that connect healthcare organizations to trusted community organizations and leaders to increase the continuity of messaging and support buy-in from key stakeholders.

RESEARCH LEADS

Susanne Montgomery, PHD, MPH, MSN

Dr. Montgomery is a social/behavioral epidemiologist with a focus on hard-to-access, underserved populations experiencing health disparities. She has received funding from National Institutes of Health, Centers for Disease Control and Prevention, the state of California and many foundations. She has published over 140 peer-reviewed articles and has conducted and/or served as a consultant on many evaluation and research projects in the U.S. as well as in internationally (i.e. Cameroon, Congo, India, Rwanda, Sierra Leone, South Africa, South America, South East Asia and refugee projects in Europe). She is part of a regional vaccine hesitancy research group, is certified as a Community Resiliency Model (CRM) guide and leads several translational CRM research efforts.

Zephon Lister, PhD, MA, LMFT

Dr. Zephon D. Lister is a family/behavioral scientist, with a focus on the recursive relationships between family dynamics and chronic health conditions, integrated behavioral health (IBH) and global mental health. He leads several projects examining the integration of behavioral health services into low-resourced contexts and improving the quality-of-life among individuals/families living with chronic disease. Internationally, he has examined how to use the Community Resiliency Model (CRM) as a task-shifting capacity building strategy for mental health in Kenya, Nigeria, Samoa and Sierra Leone, and vaccine uptake in Sierra Leone. He is the coordinator of IBH services for the Loma Linda Sickle Cell Disease Center and provides clinical oversight to at the SAC Health System a specialty-based and teaching health center Federally Qualified Healthcare Center (FQHC).

Dr. Jacinda (JAM) Abdul-Mutakabbir, PharmD, MPH, AAHIVP

Dr. Jacinda Abdul-Mutakabbir is a clinical and research pharmacist whose research focuses on the intersection of antibiotic resistance and health/vaccine equity, with a specific focus on racial differences observed across racially and ethnically minoritized groups. Her research in mitigating antimicrobial resistance has led her to be recognized by the European Congress of Clinical Microbiology and Infectious Diseases. Dr. Abdul-Mutakabbir currently serves as the Lead Pharmacist and Educator for Congregations Organized for Prophetic Engagement-Health Equity Collaborative. Jacinda's work and research to expand vaccination efforts to increase uptake and confidence amongst people with substance use disorders is also featured on the National Institutes of Health, National Institute on Drug Abuse web page, Jacinda was appointed to the CVSH National Health Equity Advisory Board as a Pharmacist Expert based on her published research on vaccine equity.

CASE STUDY FROM LIBERIA

ASSESSING SOCIAL, DEMOGRAPHIC, AND CLINICAL DRIVERS OF COVID-19 VACCINATION BEHAVIOR IN POST-EBOLA LIBERIA

The project was conducted in Liberia between January and December 2022. It was implemented by the University of Liberia School of Public Health (ULSOPH) within the College of Health Sciences, with funding from the Sabin Vaccine Institute. The project received ethics approval from the University of Liberia Institutional Review Board.
Investigators: Dr. Laura Skrip and Dr. Wahdae-Mai Harmon-Gray.

IN CONTEXT

Years of conflict stemming from ethnic divisions, economic disparities, and political unrest saw Liberia through its First (1989-1996) and Second (1999-2003) Civil Wars, costing hundreds of thousands of lives and causing internal displacement of thousands of nationals. In March 2014, there was an outbreak of the Ebola Virus Disease (EVD) in Liberia, which grew to become the largest outbreak in history, particularly affecting three West African countries. Liberia was declared free from the virus in January 2016, after nearly 5,000 deaths.

The consequences of the COVID-19 pandemic have caused disruptions to the country's peace-building; post-conflict and post-Ebola economic recovery and health systems strengthening efforts. In March 2021, Liberia received its first doses of COVID-19 vaccine (AstraZeneca) as part of the COVAX initiative. Prioritized groups for vaccination included healthcare workers (HWs), elderly persons aged 60+ years, and individuals with known comorbidities. However, due to low uptake amongst the target groups and approaching vaccine expiration dates, the first batch of doses was ultimately made available to the general population. The community's lived experience with visibly and terrifyingly symptomatic Ebola is hypothesized to have led to apathy and, in some cases, disbelief around COVID-19.

Understanding the reasons for seeking vaccination and the expressed plan to complete the two-dose regimen, given lived experiences, will be important to guide the (EPI).

APPROACH

A mixed-methods study was implemented in Liberia amongst adults who opted for COVID-19 vaccination to provide evidence to support the Expanded Programme on Immunization (EPI) in planning its campaign to reach the vaccinated population with the second dose and to expand the overall coverage of vaccination. The scale and diversity of the data collected provided actionable insight that may not otherwise have reached EPI. Specific objectives of the study were as follows:

- To characterize the sociodemograhics and health characteristics of the vaccinated population
- To understand the experience during and after vaccination
- To investigate associations between motivations and/or reasons for accepting COVID-19 vaccination and the reported intention of accepting subsequent COVID-19 vaccination and/or booster doses, depending on chosen vaccine regimen
- To determine the incidence of acute respiratory illness (ARI) symptoms amongst adults who received the first dose of the COVID-19 vaccination

To achieve the study objectives, the EPI Unit at the Liberian Ministry of Health was engaged in all study-related activities, which are depicted below:

- Stakeholder engagement and community outreach;
- Phone-based survey to collect data on vaccinated adults aged 18+, with sampling conducted at the county-level, proportional to the county's contribution to the overall vaccinated population; and
- Phone-based, in-depth interviews with a subset of survey participants to provide more detail on.

Analysis

Descriptive statistics were tabulated for the overall sample from the vaccinated population. Comparisons between the proportional sampling used to generate the sampling frame and the final analytical sample of consenting participants were visualized.

A stratification analysis investigated independent factors associated with vaccination behavior, specifically people pursuing either the AstraZeneca or single dose regimens (Johnson & Johnson or Pfizer), and people's likelihood of pursuing future vaccination, namely COVID-19 booster shots. Thematic analysis of the qualitative interview explored how different experiences with vaccination and with the COVID-19 outbreak itself, relative to Ebola, may have influenced reported likelihood of accepting a second dose.

IMPLEMENTATION STAGES

1. Stakeholder Engagement and Community Outreach

Radio programs, videos, and mass text messaging campaigns, with messages developed in collaboration with EPI Unit and health promotion experts, were disseminated to create awareness about the study. Ahead of data collection, a meeting was held with research stakeholders at the Ministry of Health and the National Public Health Institute of Liberia to be briefed on the study and discuss the proposed methodology.

2. Phone-based Survey

Cluster sampling was conducted at the county-level. The sample size of 1,093 adults was calculated with sufficient power for all selected outcome variables. Using a listing of all documented vaccinated adults aged 18+ years provided by the EPI Unit and in anticipation of high non-response rates, the project team randomly sampled five times as many adults as would be needed to achieve the target sample size from each county. Upon contact and after verbal consent, the 20-minute structured, phone-based survey was implemented and collected data on the following topics:

- Sociodemographics and health profile: sex, age, community of residence, employment status, household characteristics (e.g., total number of people in household), and history of comorbidities (e.g., diabetes, hypertension, etc.);
- Knowledge of COVID-19 vaccines: awareness of different vaccine regimens available in Liberia and their effectiveness in protecting against COVID-19;
- Reasons for vaccination;
- Experience of vaccination: Site of vaccination (e.g., clinic, church, etc.), time spent pursuing vaccination, and experience of any adverse effects or ARIs since vaccination;
- Intention of vaccination: Likelihood of receiving a second dose and/or booster dose (Likert scale response), and likelihood of acceptance of a prophylactic Ebola vaccine, if made available; and

- Other lived experiences: Whether a family member was infected during the Ebola outbreak or had tested positive for COVID-19, and frequency of mask-wearing.

At the end of the survey, participants were notified of a small 500LD ($3USD) credit that would be sent via Mobile Money to compensate for their time and ensure they had funds to call the investigators with any questions or concerns about their participation.

Preliminary Findings

Data was collected on a total of 1120 adults, and there was 'under-representation' of some counties (i.e., Lofa and Maryland) and 'over-representation' (i.e., Margibi and Montserrado) in comparison to the proposed proportional sampling approach. This was reflective of issues in data quality (access to contacts of vaccinated persons versus data clerks) and inter-county variance in willingness to consent to participate in a phone survey.

Sociodemographic data of the study sample is summarized in Table 1. This study sample is more highly educated with a larger percentage fully employed than the national population, based on the most recent (2019-2020) Demographic and Health Survey.

Table 1: Study Sample Characteristics

Median Age	39 years (IQR 32-48)
Male	59.1%
Median # Household Members	5 (IQR 3-8)
University Educated	41%
Unemployed	12%
Occupation	23% Selling/Business
Received single dose AstraZeneca	1.9%
Received two doses AstraZeneca	58.8%
Receieved J&J	39.2%
Received Pfizer	<1%

Preliminary survey findings are listed below, covering several areas related to participants' motivation for vaccination, experiences reveiving their vaccination, post-vaccination experiences, and their likelihood of receiveing subsequent vaccination.

Motivation for Vaccination

- A majority (51.9%) of participants indicated that their main motivation for getting vaccinated was a personal desire to not get sick with COVID-19.
- Fulfilling a requirement for work was the next most common motivation (13.1%).

Experiences Receiving Vaccination

- About half (50.4%) of participants reported receiving their vaccination at a health facility, with 50% also reporting that they waited 10 minutes or less to receive their vaccine.
- Most participants seemed to have a positive experience at the site where they received their

vaccination, with 73% of participants indicating they would recommend that site to their family and friends, while only 3% reported that they would not recommend the site to their family and friends.

Post-vaccination Experiences

- A little less than half of participants (43%) reported experiencing side effects the same or next day post-vaccination, with most reporting mild side effects (78.7%).

Likelihood of Subsequent Vaccination

- Close to half of participants (49.9%) reported not knowing the definition or purpose of a boostervaccination.
- 15% were *not at all likely* or a *little likely* to get a booster (n=164/1109), and 36% were *very likely* or *certainly likely* (n=394/1109).
- About 70% of participants reported that they would accept an Ebola vaccine if it were available, indicating about a third of participants would reject and/or be skeptical of an Ebola vaccine.

3. Phone-based In-depth Interviews

A randomly selected subset of 30 survey participants was contacted to also participate in in-depth interviews. Random selection was made from separate lists of individuals who did not have adverse events and individuals who reported feeling adversely after immunization. Phone-based interviews via speaker phone were undertaken to enable the recording of responses. Interview participants were provided with $5USD credit sent via Mobile Money.

For the in-depth interview, participants were asked to provide more detail about what drove their motivation to be vaccinated (including experiences during Ebola and now during COVID-19), what their vaccination experience was like (during and after), whether they had considered alternative vaccine regimens and their motivations for pursuing the one they did, and what they would like to see in future campaigns to facilitate higher coverage and less hesitancy.

At the time of the publication of this case study report, preliminary results were not available.

INFORMING COMMUNITY ACTION

Policy

- Develop policies to formalize and facilitate the use of mobile vaccination centers as a mechanism of reducing barriers to access.

Program

- Prioritize programmatic data management for improved access to and utilization of vaccination data during outbreaks.
- Develop communication plan to educate Liberians about booster vaccine doses, given their availability in country.
- Utilize rapid phone surveys to routinely collect data from communities and facilities on vaccination experiences.

Practice

- Investigate further into acceptance of booster doses of vaccines and future vaccines to inform introduction planning.
- Understand hesitancy around the Ebola vaccine among those who have been willing to take the COVID-19 vaccine.
- Document best practices for use of phone survey data collection—including outreach to make community members aware—during outbreaks in resource-constrained settings.

RESEARCH LEADS

Laura Skrip, PhD, MPH

Associate Professor, University of Liberia School of Public Health

Dr. Laura Skrip is a quantitative epidemiologist with expertise in mathematical modeling and statistical analysis. At the University of Liberia School of Public Health, she teaches Biostatistics and Epidemiology, supports efforts to engage students in practicum and thesis opportunities, and directs a mathematical modeling lab. As a researcher, it is her goal to collaboratively generate evidence that can guide public health decision-making in complex emergencies. During and following her PhD, she worked extensively with social scientists, clinicians, basic science researchers, and communities to inform mathematical models for quantifying the potential impact of specifically behavior-focused tools and approaches, including risk communication and community engagement. This involved significant field experience to guide policy development in Liberia, the Democratic Republic of the Congo, and Cameroon.

Wahdae-Mai Harmon-Gray, MD, MSc

Program Director of Sociobehavioral Risk Factors Lab

Dr. Harmon-Gray has over five years of experience working as a medical doctor in various health facilities with significant clinical contributions to the fight against Ebola and COVID-19 in Liberia. She is an early career health researcher but has worked in varied organizations, locally and internationally, including the Ministry of Health of Liberia, Aspen Medical Liberia, Maternity Care Coalition Philadelphia, KEMRI Wellcome Trust in Kenya and Infectious Disease Data Observatory (IDDO), UK. She thus has a strong understanding of the health sector and context in Liberia as well as the added value of quality data in decision-making. Her professional experiences have required strong analytical skills and the ability to work both independently and on teams with members of diverse backgrounds. She has contributed to a research project at IDDO that seeks to develop a data reservoir on five hemorrhagic diseases including Ebola, Lassa fever, Crimean Congo Yellow Fever and Rubella viruses. She is also a local consultant and country Lead for a Maternal and Neonatal Research project with the University of Oxford. She supported the National Public Health Institute of Liberia (NPHIL) to develop and validate the National Rapid Response Framework (nRRT) document for the preparedness and Response Plan for Liberia and provided technical support to 15 counties of

RESEARCH LEADS (cont.)

Wahdae-Mai Harmon-Gray, MD, MSc

Program Director of Sociobehavioral Risk Factors Lab

Liberia to update the National Epidemic Preparedness and Response Plan. Presently, she serves as Acting Director of the Masters of Public Health Program at the University of Liberia. The position demands regular demonstration of good interpersonal, organizational, and time management skills to effectively achieve the goals of the program. It also positions her—among students, faculty, and national health leadership—as a champion for high-impact public health research that can generate evidence for addressing contextually relevant questions.

ABOUT SABIN

The Sabin Vaccine Institute is a leading advocate for expanding vaccine access and uptake globally, advancing vaccine research and development, and amplifying vaccine knowledge and innovation. Unlocking the potential of vaccines through partnership, Sabin has built a robust ecosystem of funders, innovators, implementers, practitioners, policy makers and public stakeholders to advance its vision of a future free from preventable diseases. As a non-profit with more than two decades of experience, Sabin is committed to finding solutions that last and extending the full benefits of vaccines to all people, regardless of who they are or where they live. At Sabin, we believe in the power of vaccines to change the world.

For more information, visit sabin.org and follow us on Twitter, @SabinVaccine.

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