# Boston College

School of Social Work

Beyond Trust: Socioeconomic, Experiential, and Perceptual Drivers of Healthcare Utilization in a High Disease Burden, Low-Income Country

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## Abstract

Few studies have examined drivers of healthcare trust and vaccine hesitancy in the context of low- and middle-income countries (LMIC) where healthcare systems are most fragile. This study focuses on healthcare trust and vaccine hesitancy in Sierra Leone, a country that has a history of infectious disease outbreaks. This study examines drivers and impacts of healthcare mistrust in caregivers of children and Covid-19 vaccine intention and behavior both for caregivers and for their children. This study also examines current community members trust in healthcare providers, including doctors, nurses, and traditional healers. This study uses two data sets: quantitative data for Aim 1 and Aim 3 come from a two-wave longitudinal NICHD-funded study (#R01HD096699; PIs: Thomas M. Crea, PhD, MSW and John S. Schieffelin, MD) and includes a sample of EVDinfected (n=222), EVD-affected (n=208), and control children (n=233) and their caregivers (n=663). Qualitative data were used for Aims 2 and 3 and were collected in August of 2023 in Freetown, Sierra Leone, as part of a study funded through Boston College Vice Provost Office (PI: Oladoyin Okunoren, LCSW).

This study has three specific aims:

AIM 1: Examine the influence of mental health and healthcare trust on Covid-19 vaccine behavior and intention among caregivers.

AIM 2: Explore healthcare perceptions, utilization, and trust in Sierra Leone, and implications for vaccine uptake and intention.

AIM 3: Explore community and healthcare worker perceptions of traditional healers within healthcare interventions before and after EVD.

#### Chapter 1: Introduction

## Background

#### Health disparities in sub-Saharan Africa

Low- and middle-income countries (LMICs) carry a high disease burden due to limited access to quality care and a variety of endemic and difficult to treat diseases (Lowes & Montero, 2021). Sub-Saharan Africa carries a disproportionate disease burden from infectious diseases, including diarrheal and respiratory diseases (Torto & Tchouassi, 2021). For example, 90% of all malaria deaths, 70% of HIV occurrences, and some of the highest under 5 mortality rates all occur in sub-Saharan Africa (Lowes & Montero, 2021). The Global Health Forum for Disease Research adopted the phrase "90/10 gap" to highlight the fact that 90% of preventable diseases occur in LMICs, yet less than 10% of worldwide resources were devoted to health research there (Kerasidou, 2019). Infectious disease exposure is compounded with other social and macro-level determinants of health, including underfunded healthcare systems, access to healthcare facilities, poverty, and access to clean water (Chewe & Hangoma, 2020).

These compounded vulnerabilities mean that communities are especially impacted when faced with an infectious disease outbreak, such as the Ebola Virus Disease (EVD) outbreak that hit West Africa (Sierra Leone, Liberia, and Guinea) in 2014. The 2014-2016 EVD epidemic was the largest EVD outbreak in history, resulting in over 28,000 infections and 11,000 deaths (World Vision, 2014). Healthcare infrastructures in these regions were strained even before EVD broke out. At the time, Liberia had only 51 physicians for their population of 4.3 million people (Boozary et al., 2014) and a lack of basic supportive equipment such as personal protective equipment (PPE) not only limited the reach of service providers but meant that health care workers died at a higher rate than other groups, weakening already fragile healthcare systems (Cohen & Gex, 2015). In Sierra Leone, over a quarter of the entire healthcare workforce reported EVD infections during the outbreak, 72% of whom died (Elston et al., 2016).

The epidemic's strain on an already weakened healthcare system impacted people's ability to access other basic health services, including pediatric and maternal care, including routine vaccines (Elston et al., 2016). During and after the EVD epidemic, survivors and family members of survivors experienced stigmatization, including social isolation, verbal abuse, and healthcare neglect (Crea et al., 2022; James et al., 2020). These negative experiences impacted overall perceptions of healthcare, as community mistrust of healthcare providers and formal Ebola Treatment Units (ETUs) was common (Yamanis et al., 2016). Because of mistrust, people delayed seeking formal care, often choosing instead to turn towards traditional healers or hide their symptoms completely (Miller et al., 2018; Yamanis et al., 2016).

Despite the high prevalence of infectious diseases, receiving a diagnosis or seeking treatment has resulted in high levels of community stigmatization, discrimination, and forced isolation. This was seen not only in Sierra Leone during and after the EVD epidemic (Crea et al., 2022; James et al., 2020), but is also reported by people impacted by HIV/AIDS (Mbonu et al., 2009), tuberculosis (Daftary 2012), and epilepsy (Beghi et al., 2019). Disease diagnosis may be associated with already-stigmatized personal characteristics such as sexual identity or socio-economic status, or perceived some moral failing (Daftary, 2012). Such stigmatization and discrimination may not only come from community members, but may also come from healthcare workers who have biases or fear disease transmission (Mbonu et al., 2009).

#### *Healthcare mistrust and vaccine hesitancy*

Healthcare mistrust is a growing field of global health research, particularly in the context of the recent COVID-19 pandemic (Stoop et al., 2021; Turhan et al., 2022). Healthcare mistrust is a predictor of decreased health utilization, including vaccines (Turhan et al., 2022), and has been shown to predict decreased vaccination intention across vaccine types (Adeyanju, et al., 2021; Torun et al., 2010; Wu et al., 2021) and regions (Iwu et al., 2022; Jain et al., 2021; Khankeh et al., 2021). Predictors of healthcare mistrust include prior experiences of discrimination, stigmatization, and inadequate communications from healthcare workers (Bemrich-Stolz et al., 2015; Williams et al., 2013).

Mistrust in healthcare and vaccine hesitancy has the potential to prolong disease outbreaks worldwide, facilitate the emergence of previously rare diseases, and strain already overwhelmed and fragile healthcare systems (Bitanihirwe & Ssewanyana, 2021). Healthcare trust is associated with health-seeking behavior, treatment adherence, consistency of care, and disease containment (Arakelyan et al., 2021; Gilson et al., 2017). Conversely, mistrust is associated with decreased healthcare utilization and even violent resistance towards healthcare initiatives (Gulland, 2012).

Decreasing vaccine uptake has been a growing global concern for the past two decades (Schuster et al., 2015) and has only worsened since COVID-19 (Huynh et al., 2021). In 2014, vaccine hesitancy was named one of the top ten greatest concerns by the World Health Organization (WHO) (Nandi & Shet, 2020). Vaccine hesitancy is not a new phenomenon in LMIC, specifically in contexts with numerous endemic diseases, low health literacy, and limited formal healthcare exposure. As early as the 1980s, people in sub-Saharan Africa feared a linkage between the polio vaccine and the newly discovered HIV (Demuyakor et al., 2021).

Decreased vaccine uptake has been associated not only with mistrust of vaccines (McClure et al., 2017) and healthcare systems (Antinyan et al., 2021), but also with supply chain issues and

overburdened health systems (Buonsenso 2021), especially in rural areas (Harapan et al., 2022), and increased anti-vaccination information (Demuyakor et al., 2021). Additionally, prior healthcare experiences have been cited in a number of global studies as a possible explanation for decreasing vaccine rates both at an individual and a community level, especially when prior experiences involved discrimination or distress (Milan and Dáu, 2021; Vergara, 2021). While some literature examines potential links between infectious disease and wellbeing (Wang et al., 2020), the extent to which surviving an infectious disease outbreak leads to healthcare trust or utilization (including vaccine hesitancy) is unknown. While there are global efforts to increase access to vaccinations in LMIC (Loembé & Nkengasong, 2021), vaccine hesitancy remains a barrier to the containment and eradication of infectious diseases, and much is still unknown about the nature of vaccine hesitancy in LMIC (Dror et al., 2020).

As vaccines, particularly routine childhood vaccines, are highly effective and cost-effective in preventing disease morbidity and mortality (Nandi & Shet, 2020), understanding the reasons for decreased vaccine uptake is of global concern, and is an essential part of understanding healthcare trust and mistrust (whether from vaccine or prior infection) (Solís Arce et al., 2021). In particular, understanding caregiver decision-making around children's vaccines can prevent disease spread and child mortality (Ruggiero et al., 2021).

## Impacts of mental health and disease exposure

The relationship between mental health and vaccine uptake is not well understood. Some studies have found that poor mental health is associated with increased mistrust in healthcare (Klest et al., 2019) and vaccine hesitancy (Batty et al., 2022; Gerretsen et al., 2021) and chronic stress is associated with hyper-vigilance and mistrust of others (including HCWs) (Miller et al., 2011; Trasher et al., 2008). In other studies, severe mental illness was associated with decreased

flu vaccine uptake and people with severe mental illness required extra support to access vaccines, including integrating vaccination appointments with mental and primary healthcare appointments, increased vaccination education, and focused outreach and monitoring (Smith et al., 2021).

Healthcare trust, specifically the extent to which individuals trust and seek out healthcare for themselves and their children, may play an important role in the relationship between mental health and vaccine hesitancy. One study showed that post-traumatic stress disorder (PTSD) among mothers was associated with an increased mistrust and negative view of people and institutions, including healthcare institutions, and was also associated with decreased trust in COVID-19 vaccines and diminished intentions of getting the vaccine for themselves or their children (Milan and Dáu, 2021). However, there are few studies that evaluate the role of mental health in driving mistrust in healthcare (Klest et al., 2019) and vaccine hesitancy (Nemani et al., 2021; Smith et al., 2021) in LMIC.

## Traditional and formal healthcare utilization

Throughout the world, people seek treatment for physical ailments through a diverse array of healing practices, which may include doctors, nurses, pharmacists, herbalists, diviners, and faith healers. While these categories are traditionally dichotomized into biomedical (or Western) practices and traditional (or indigenous) practices, there are a vast array of definitions, interpretations, and categorizations of healing practices (Redvers & Blondin, 2020).

There remains a high demand and high utilization of traditional medicine; the WHO estimates that nearly 90% of people in African countries utilize some form of traditional medicine, which is similar to the global percentage of utilization (World Health Organization, 2019). Medical pluralism, wherein formal and traditional medical modalities are integrated (Leslie 1976; Penkala-Gawęcka & Rajtar, 2016), is utilized throughout countries in sub-Saharan Africa (Hampshire &

Owusu, 2013; Olson & Sargent, in Stroeken et al., 2017). Typically, this involves individuals pursuing different treatments for different ailments or complementary services; less frequently this may involve formal initiatives to integrate modalities (Asiimwe et al., 2023; Shizha & Charema, 2011; Bakshi et al., 2013). In South Africa, a hospital was founded by a traditional healer to integrate traditional African, Asian, and homeopathic medications with western anti-retroviral practices in order to develop HIV/AIDs treatments that were sustainable, affordable, and scalable (Morris, 2001). In Ghana, pilot projects are researching best practices for integrating traditional and biomedical practices in the hospital settings (Adu-Gyamfi & Anderson, 2019).

Policy makers, healthcare workers, and researchers are increasingly recognizing the important role that traditional medicine plays in people's lives (World Health Organization, 2013). Understanding both the health choices people make and the reasons for these choices is a necessary step in the development of successful, sustainable, and scalable healthcare policies and programs. Thus, understanding why, and in what ways, people turn to traditional medicine has important implications for improving health outcomes in communities with high disease burden (Olson & Sargent, in Stroeken et al., 2017).

#### Theoretical frameworks

This study is rooted in the SAGE Working Group Determinants of Vaccine Hesitancy, which was developed by the Strategic Advisory Group of Experts (SAGE) on Immunization, a working group of the World Health Organization (WHO) in 2011. In this model, vaccine hesitancy determinants are arranged in three categories: contextual, individual and group, and vaccine/vaccination specific influences. This model explicitly recognizes that hesitancy is more than just an individual's thought process, and that context-specific elements - such as access, perceived risk and benefits, and historical influences - are all potential determinants for vaccine

uptake (World Health Organization, 2014) (see Figure 1).

<u>CONTEXTUAL</u> <u>INFLUENCES</u> Influences arising due to historic, socio-cultural, environmental, health system/institutional, economic or political factors	<ul> <li>a. Communication and media environment</li> <li>b. Influential leaders, immunization program gatekeepers and anti- or pro-vaccination lobbies.</li> <li>c. Historical influences</li> <li>d. Religion/culture/ gender/socio-economic</li> <li>e. Politics/policies</li> <li>f. Geographic barriers</li> <li>g. Perception of the pharmaceutical industry</li> </ul>
INDIVIDUAL AND GROUP INFLUENCES Influences arising from personal perception of the vaccine or influences of the social/peer environment	<ul> <li>a. Personal, family and/or community members' experience with vaccination, including pain</li> <li>b. Beliefs, attitudes about health and prevention</li> <li>c. Knowledge/awareness</li> <li>d. Health system and providers-trust and personal experience.</li> <li>e. Risk/benefit (perceived, heuristic)</li> <li>f. Immunisation as a social norm vs. not needed/harmful</li> </ul>
VACCINE/ VACCINATION- SPECIFIC ISSUES Directly related to vaccine or vaccination	<ul> <li>a. Risk/ Benefit (epidemiological and scientific evidence)</li> <li>b. Introduction of a new vaccine or new formulation or a new recommendation for an existing vaccine</li> <li>c. Mode of administration</li> <li>d. Design of vaccination program/Mode of delivery (e.g., routine program or mass vaccination campaign)</li> <li>e. Reliability and/or source of supply of vaccine and/or vaccination equipment</li> <li>f. Vaccination schedule</li> <li>g. Costs</li> <li>h. The strength of the recommendation and/or knowledge base and/or attitude of healthcare professionals</li> </ul>

Figure 1: SAGE Working Group Determinants of Vaccine Hesitancy

This dissertation is also informed by the Health Belief Model, a widely-used value-

expectancy theory that was developed during the 1950s by social psychologists working in

public health to find a way to explain health related behavior (Champion & Skinner, 2008). The

Health Belief Model consists of individual health beliefs: perceived susceptibility to

experiencing a risk, perceived severity of the condition, perceived benefits of the health

behavior, perceived barriers (both tangible and psychological), perceived self-efficacy (Patwary

et al., 2021). Prior research has linked a number of these individual beliefs (specifically,

perceived benefits of health behavior) to an overarching trust in the healthcare system (Wong et al., 2021). These individual beliefs are influenced by a variety of demographic and individual factors, and lead to behaviors such as vaccine uptake (see Figure 2) (Champion & Skinner, 2008; Limbu et al., 2022).



Figure 2. Health Belief Model Components and Linkages (Champion & Skinner, 2008).

Taken together, these theories consider factors across multiple levels that impact an individual's healthcare decision-making, with specific focus on the role of trust as a potential mediator between individual characteristics and one's actions.

### Purpose and aims

This dissertation focuses on healthcare trust and mistrust, vaccine hesitancy, and community perceptions of healthcare in Sierra Leone in order to explore the current context of healthcare utilization today. Specifically, this dissertation examines drivers and causes of healthcare mistrust in caregivers, assessing the relationship between mental health, prior exposure to infectious disease outbreak, and vaccine uptake for caregivers and intention to vaccinate their children. There are three specific aims, each corresponding to one paper of this dissertation. <u>AIM 1: Examine the influence of mental health and healthcare trust on Covid-19 vaccine</u> <u>uptake and intention to vaccinate.</u> Using a sample of caregivers (n=663) of EVD-infected (n=222), EVD-affected (n=208), and control children (n=233) in Sierra Leone, analysis for this aim involves regression analysis between individual factors (including mental health variables and survivor status), healthcare trust, and vaccine uptake and intention. I hypothesize that higher trust in formal HCWs promotes vaccine uptake and intention for oneself and for one's child. I also hypothesize that mental health variables anxiety, depression, and helplessness are associated with decreased vaccine uptake and intention, and self-efficacy is associated with increased vaccine uptake and intention.

<u>AIM2: Explore the influence of healthcare trust in formal HCWs on vaccine uptake and</u> <u>intention for caregivers and children.</u> This aim was addressed through qualitative methodology, using interview and focus group data from EVD-survivors, nurses, and doctors conducted in Freetown, Sierra Leone. This analysis was guided by the Health Belief Model and SAGE Working Group Determinants of Vaccine Hesitancy, and used an analytic strategy derived from thematic content analysis (Smith et al., 1992).

<u>AIM 3: Explore community and healthcare worker perceptions and trust of traditional</u> <u>healers within healthcare interventions before and after EVD</u>. For this aim, I used a mixed methods approach using both the sample of caregiver data used in Aim 1 and the focus group and interview data used for Aim 2. There are two outcome variables of interest: trust in formal healthcare workers, and trust in traditional healers. I used dependent sample t-tests to look at mean differences in these two scores. I then ran two seemingly unrelated regression models for the two trust scores. This approach allowed me to compare the relative influence of mental health, Ebola experiences, and other factors on trust across formal healthcare and traditional healer contexts. Then, using thematic coding, I used qualitative data to explore how and why caregivers utilize formal versus traditional healthcare methods. The overall hypothesis is that experiences during the epidemic impact perceptions of traditional healthcare, and that traditional and formal healers play important, and different, roles in healthcare interventions.

#### *Gaps in research*

There are a number of gaps in the literature that this dissertation aims to address. There is limited research exploring extent of mistrust in healthcare. The dearth of literature utilizing multi-question measurement tools for healthcare trust and for vaccine hesitancy means that while these are often conceptualized on a spectrum, they are rarely operationalized as such. It often appears in studies as a determinant of a behavioral outcome, such as vaccine behavior, and is frequently operationalized as a one-item variable asking if the participant trusts healthcare institutions or providers (Morales-García et al., 2022). There is little understanding of the spectrum of healthcare trust as it impacts health behaviors, and the ways in which this might result in differing levels of hesitancy for one's child as opposed to one's self. Nor are the nature and drivers of healthcare mistrust well understood.

While there is an emerging body of research investigating potential links between infectious disease and wellbeing (Wang et al., 2020), and healthcare experiences and current vaccine intentions (Milan & Dau, 2021), few studies have examined drivers of healthcare trust and vaccine hesitancy in the context of prior infectious disease outbreaks. In the aftermath of epidemics and pandemics, these drivers are essential to explore. Though literature has shown that, in sub-Saharan Africa, disease diagnosis and symptoms often bring stigmatization, and that there is a connection between prior negative healthcare experiences and medical mistrust, few studies have explicitly looked at the impacts of having survived a prior epidemic and having had children survive an epidemic, upon healthcare trust and utilization. The studies that explore mental health primarily explore the role of trauma, which is not measured consistently and is culturally bound (Milan & Dáu, 2021). Stress is missing from these analyses. The NICHD-funded parent study offers an unprecedented access to cohorts of EVD survivors in Sierra Leone which can enhance the ability to answer the extent to which prior infectious disease outbreaks and survivor status impacts public perception and trust in healthcare.

Though traditional healers are utilized as healthcare providers throughout much of the world (Gyasi et al., 2017; McPake, 1993; Olson & Sargent, in Stroeken et al., 2017; Turshen, 1999), they are not frequently included in studies of healthcare trust and mistrust, and thus their role in impacting healthcare perspectives and formal healthcare utilization is not well known. *Methods* 

#### Context

This dissertation used quantitative data collected as part of an existing longitudinal NICHD-funded study (#R01HD096699; PIs: Thomas M. Crea, PhD and John S. Schieffelin, MD) with two waves of data collection in regions most heavily affected by the EVD epidemic. This parent study mobilized close-working relationships with in-country partner organizations and research collaborators, including Caritas-Freetown, Sustainable Health Systems, and SLAES, to implement the study. The existing study (2018-2023) included a sample of EVD-infected (n=222), EVD-affected (n=208), and control children (n=233) and their caregivers (n=663). This study relied on data collected from Wave 1 (completed May 2022) and Wave 2 (completed April 2023). Formal and traditional healthcare trust questions were added for the purpose of this study. All questions have been translated from English to Krio.

In addition, qualitative data was collected as part of a study funded through Boston College Vice Provost Office (PI: Oladoyin Okunoren, MSW, LCSW; Co-PI Thomas M. Crea, PhD). Data for qualitative components of this study was collected in Freetown, Sierra Leone, in August of 2023. Focus groups and key informant interviews were conducted in Sierra Leonean Krio. Recordings were translated by Caritas-Freetown research assistants and transcribed following protocols established by the World Health Organization (Toma et al., 2017).

## Quantitative sampling

This dissertation included all <u>adult caregivers (n=663)</u> of children aged 10-17 enrolled in the parent study. <u>Caregiver inclusion criteria</u> were (a) being the primary caregiver of the index child participant in the parent study; (b) being >20 years of age; (c) cohabitating with the child; and (d) living with the child as caregiver for the previous year. <u>Caregiver exclusion criteria</u> were not being either a biological parent or guardian caregiver of an enrolled child. Aim 1, and the quantitative component of Aim 3 rely on data collected from both waves of the parent study. Independent variables are from Wave 1, completed May 2022, and healthcare trust and vaccine hesitancy are from Wave 2, which was collected from October to April 2023.

To identify any missing data, the NICHD study utilized Sierra Leonean and American research assistants who checked for data consistency and completeness over the course of data collection, and examined the completed dataset for percentage of missing cases versus complete cases. Missingness was handled with listwise deletion.

Questions around vaccine intention and uptake for self and child, and trust in traditional and formal healthcare workers were added for the purpose of this dissertation. All questions have been translated from English to Krio.

Quantitative measures

See Table 1 for variable descriptions included in quantitative analyses.

Self-efficacy and helplessness were operationally defined by two subscales in the Perceived Stress Scale (Cohen et al., 1983): self-efficacy (4 questions, with a Cronbach's alpha of .85 from this study sample) and helplessness (6 questions, Cronbach's alpha = .81). Together, these subscales are used to assess stress levels in young people and adults aged 12 and above, evaluating the degree to which an individual has perceived life as unpredictable, uncontrollable and overloading over the previous month. Sample items include "In the last month, how often have you been upset because of something that happened unexpectedly?" and "In the past month, how often have you been able to control irritations in your life?" Positive items were reverse coded, and all questions were summed. The Perceived Stress Scale had not been validated within sub-Saharan Africa, but had been cross-culturally validated in the Jordanian context (Almadi et al., 2012) and had been used in previous Sierra Leonean studies (Waterman et al., 2018). These scales were completed by all 663 participants.

Anxiety and depression were operationally defined by two subscales of the Hopkins Symptom Checklist (Derogatis et al., 1974): Anxiety (10 questions, Cronbach's alpha = .86 in this sample) and Depression (15 questions, Cronbach's alpha .88 in this sample), with all questions on a 4-point Likert. A sample item for the Depression subscale include: "During the past month, including today, how much did you lose interest things?" A sample item for the Anxiety subscale include "During the last month, including today, how much did you experience fear without cause?" The Hopkins Symptom Checklist has been validated in a number of sub-Saharan contexts, including Tanzania (Lee et al., 2008) and Uganda (Ashaba et al., 2017), and has been used in previous studies in Sierra Leone (Betancourt et al., 2015). Some data was missing for two scales: two cases (0.3%) for Anxiety and ten cases (1.5%) for Depression. Therefore, listwise deletion was employed to manage these cases.

Economic Status was a variable calculated from 10-item Wealth Index questionnaire created for the parent study, based off of Demographic Health Surveys wealth index (Fisher & Way, 1988). It involved questions regarding sources of drinking water and cooking fuel, type of toilet facility, availability of household appliances and technology such as cell phones and vehicles, main flooring and roofing material, and ownership of agricultural land. The index for each house was a weighted summation; principal component analysis was run three times, with three indices calculated: once each for all households, rural households, and urban households. The composite index was regressed on the rural and urban indices to develop weights to create a wealth index comparable across rural and urban areas. The composite index was divided into quintiles, with each quintile containing 20% of the total sample. There were no missing cases for this variable.

<u>Survivor status</u> was a dichotomous variable referring to if the individual in question was infected by EVD (yes/no). There were no missing cases for this variable.

<u>Child's survivor status</u> was a dichotomous variable referring to if the individual's child was infected by EVD (yes/no). There were no missing cases for this variable.

Trust in healthcare workers was operationally defined as the Adapted Wake Forest Scale (Hall et al., 2006), a 5-item questionnaire (Cronbach alpha=.72 in this sample), with all questions on a 5-point Likert ranging from "strongly agree" to "strongly disagree" assessing trust in formal HCW and traditional HCW. Healthcare trust was calculated by mean score. The Wake Forest Scale has been validated in the context of China (Enhong & Yong, 2012) and has been translated into Spanish for usage in the United States (Vissman et al., 2013), but has limited usage globally.

3.7% of cases were missing for both of these variables, due to the fact that the questions for these scales were not asked in one district of interest (Kenema).

<u>Covid-19 Vaccine Behavior</u> was a dichotomous variable referring to adult's Covid-19 vaccine status (yes/no) for adults who had access to the Covid-19 vaccine. This composite variable was derived from two questions: whether the Covid-19 vaccine was available in the participants area, and for those with access, whether they had received at least one dose. Participants who responded 'no' (n=237, 35.7% of the total) or 'not sure' (n=4, 0.6% of the total) were excluded from the analysis. This exclusion aimed to focus specifically on participants who had access to the vaccines and investigate whether they had been vaccinated.

<u>Covid-19 Vaccine Intention for Child</u> was also a dichotomous variable, referring to parents' intention to vaccine their child for COVID-19, if the vaccine were to become available. There were no cases missing from this variable.

Variables	Description and definition of measures
Independent Variables	
Self-efficacy and Helplessness Personal Stress	Perceived Stress Scale (Cohen et al., 1983): 10-item questionnaire (5- point Likert; Cronbach's alpha = .78) with two subscales: Self-efficacy (4 questions, Cronbach's alpha = .85) and Helplessness (6 questions, Cronbach's alpha .81)
Anxiety and Depression Levels	Hopkins Symptom Checklist (Derogatis et al., 1974): 25-item questionnaire (4-point Likert) with two subscales: Anxiety (10 questions, Cronbach's alpha = .86) and Depression (15 questions, Cronbach's alpha .88).
Economic Status	Brief Sierra Leone Wealth Index. 10-item questionnaire created for parent study, based off of Demographic Health Surveys wealth index.
Survivor Status	Prior EVD-infection status (Dichotomous: yes/no)
Child's Survivor Status	Child's prior EVD-infection status (Dichotomous: yes/no)

Table 1. Variables included in quantitative analyses

Trust in Healthcare Workers	Adapted Wake Forest Scale (See Appendix C; Hall et al., 2006). 5-item questionnaire (5-point Likert; Cronbach alpha=.72) assessing trust in formal HCW (aim 2) and traditional healthcare HCWs (aim 3). Healthcare trust is calculated by mean score.
Dependent Variables	
Vaccine uptake for self	Caregiver vaccine uptake for Covid-19 vaccine
Vaccine intention and child	Caregiver intention to vaccinate child for Covid-19

## Qualitative sampling

Qualitative data addressed the second part of Aims 2 and 3, to deepen understanding of drivers and extent of healthcare mistrust and vaccine hesitancy. Focus group discussions were conducted in August 2023 with healthcare workers (doctors and nurses) who practiced during the 2014-2016 EVD epidemic. Key Informant interviews were collected with caregivers who were infected with EVD (n= 18) as well as caregivers who were not themselves infected but their children were (n=4). Questions included *what factors, if any, contribute to trusting relationships between community members and health care? What factors, if any, contribute to mistrust in healthcare and vaccines specifically? In what ways, if at all, has the EVD outbreak influenced trust in healthcare and healthcare utilization?* 

#### Ethics approval

Studies from which this data was obtained received approval from all necessary IRBs, including Boston College, Tulane University, and the Sierra Leone Ethics and Scientific Review Committee. See Appendix A for information regarding protection of human subjects throughout the study.

## Data analysis

<u>Analysis for AIM 1</u>: A series of logistic regressions were conducted, first with outcome variable vaccine uptake, and then with outcome variable vaccine intention for one's child. Predictor variables included (1) mental health variables and (2) trust in healthcare. <u>Analysis for AIM 2</u> utilized a qualitative, grounded theory analytic approach (Miles & Huberman, 1994; Straus & Corbin, 1998) and thematic content analysis (Smith et al., 1992). All data underwent a process of open-coding with themes inductively identified. This aim utilized questions from qualitative data collection that focus on formal healthcare utilization and perception, as well as COVID-19 vaccine behavior.

<u>Analysis for AIM 3</u> utilized both quantitative and qualitative methods. For the quantitative component of this aim, two seemingly unrelated regressions were run; one with outcome variable of trust in traditional healthcare, and one with outcome variable of trust in formal healthcare. Independent variables in the in the model include: self-efficacy, helplessness, anxiety and depression, economic wealth, and survivor status.

Qualitative analysis in Aim 3 was conducted in the same way as in Aim 2, focusing on questions related to traditional healers from focus groups and key informant interviews conducted in August 2023.

#### Limitations

Given that the EVD epidemic ended in 2016, the salience of people's survivor status as a predictor of healthcare trust warrants consideration. However, a primary aim of this study was to understand the historical and current drivers of healthcare trust and healthcare utilization for caregivers and their children, and care received in Ebola Treatment Units was for many people the most intimate interaction with formal healthcare workers and the healthcare system. Another limitation is the reliance on "intention to vaccinate children" as an outcome measure, since vaccines were not yet approved for children. As intention and behavior may differ, this variable does not fully capture actual behavior. Another study limitation is the potential for bias. One potential place of bias was that the study team for the parent study and development of this

proposal was led primarily by U.S.-based researchers. However, the team coordinated closely with Sierra Leone-based researchers at every step of the development process. In addition, social desirability bias may have impacted how participants respond to questions about healthcare trust and vaccine uptake and intention. Attempts to mitigate that potential bias included multiquestion measures with Likert-scale responses, and the incorporation of a qualitative aim that may allow more open discussion. Qualitative components of this dissertation may provide some nuance as to people's decision-making. Another limitation is that the voice of traditional healers is missing from data collection, which then provides an incomplete representation of the role of traditional medicine in Sierra Leone. This study (specifically, the third paper) aimed to capture perspectives and decision-making around traditional healthcare utilization, providing a starting point for future research that can incorporate a wider array of voices and perspectives.

## Potential implications

Despite these limitations, this study sheds some light as to how context, including mental health and prior infectious disease experiences may impact trust and vaccine decision-making for caregivers and for their children in LMIC contexts. By capitalizing on the parent study, the timing of the EVD outbreak and subsequent COVID-19 pandemic, and the established set of relationships existing in Sierra Leone, this study was able to capitalize on an opportunity to examine the role of the prior healthcare exposure and psychological stress upon trust in HCWs and healthcare utilization.

Findings, including an emphasis on the role of self-efficacy and cost barriers, may be applicable across multiple settings and to other health behaviors, including HIV screenings and prenatal care. Identifying barriers to vaccination and healthcare may lead to more tailored, more culturally specific, and ultimately more effective interventions to address health disparities in children and families. This in turn can help fill an essential gap in addressing health disparities, specifically in LMIC.

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#### Chapter 2

Paper 1: An examination of the influence of mental health and trust in formal healthcare workers on vaccine uptake for caregivers and intention to vaccinate their children.

#### Background

This study focused on caregivers of children in Sierra Leone. Sierra Leone is a low-and middle-income country (LMIC) with a history of infectious disease outbreaks, including Ebola Virus Disease (EVD), Lassa fever, and malaria (Buonsenso et al., 2021). Healthcare infrastructures were strained even before the EVD epidemic of 2014-2016, and the epidemic had impacts on community health even beyond those who were infected. A lack of basic supportive equipment such as personal protective equipment (PPE) not only limited the reach of service providers but meant that health care workers died at a higher rate than other groups, weakening already fragile healthcare systems (Cohen & Gex, 2015; Jones et al., 2017). During the EVD epidemic, resources such as ambulances were redistributed to prioritize the outbreak, (Jones et al., 2017), and utilization of other health services, including maternal care, HIV/AIDs, and malaria, decreased (Jones et al., 2017; Ndawinz et al., 2015). Children's health services, including vaccinations, also decreased (Barden-O'Fallon et al., 2015; Doctors of the World, 2015; UNICEF, 2014).

This overall decrease in healthcare utilization during the EVD epidemic has been linked to rising mistrust (Richardson et al., 2019; Yamanis et al., 2016), as people avoided clinics and hospitals due to fears of EVD exposure (Jones et al., 2017; Yerger et al., 2020) and expressed the belief that Ebola Treatment Units were places where people went to die (Collier et al., 2024). These fears were not always unfounded, as healthcare centers were short-staffed and healthcare workers were not always effectively trained in infection prevention and control, especially in the early days of the EVD outbreak (McPake et al., 2015). Community members contextualized this mistrust within a long history of inadequate healthcare, corrupt leadership, and poorly designed public health responses (Richardson et al., 2019). Such mistrust can be further contextualized within a colonial legacy of foreign extraction, which supported rumors that EVD was fabricated by politicians and non-governmental organizations for personal gain (Ali & Rose, 2022; Collier et al., 2024).

Though the EVD epidemic ended in 2016, and Sierra Leone has seen reductions in maternal, child, and infant mortality rates in recent years (Mduli & Batidzirai, 2023), the country still maintains a high disease burden for infectious diseases and mortality rates are still among the highest in the world (Cardon-Marsh et al., 2022; WHO, 2022). On top of endemic diseases, the COVID-19 pandemic further overwhelmed already overburdened and under-resourced healthcare systems, which lacked an adequate ability to respond at the necessary scale (Bitanihirwe & Ssewanyana, 2020).

#### Vaccine hesitancy

This study's focus is on the drivers and barriers of healthcare trust and health utilization, specifically Covid-19 vaccine utilization. In high-disease burden areas of sub-Saharan Africa, vaccination coverage for diseases such as rotavirus and measles are low, particularly concerning the completion of the full vaccine series rather than just receiving a single dose. These regions face some of the highest rates of vaccines-preventable death globally (Islam et al., 2024; Mihigo et al., 2018). Vaccines are highly effective in preventing disease mortality and one of the last century's most notable public health successes, driving down childhood deaths globally (UNICEF, 2023; Nandi & Shet, 2020), and so it is essential to investigate reasons for decreased vaccine uptake, including vaccine hesitancy.

Decreasing vaccine uptake has been a growing concern for the past two decades (Schuster et al., 2015), due in part to supply chain issues and strained health systems (Buonsenso et al., 2021) but also with increased anti-vaccination information (Demuyakor et al., 2021), misinformation and conspiracy theories (Malik et al., 2021; Morales-Garcia et al., 2022) and overall distrust of healthcare systems and healthcare workers (Antinyan et al., 2021). COVID-19 has exacerbated these issues globally (Huynh et al., 2021), but vaccine hesitancy has been a concern for many years. In 2014, years before COVID-19 brought the issue to the forefront of public attention, the World Health Organization (WHO) named vaccine hesitancy one of the top ten threats globally (Sabahelzain et al., 2020). UNICEF and WHO have reported that routine childhood vaccinations have fallen in Sierra Leone in recent years (Global Health Observatory, 2021).

Vaccine hesitancy exists along a spectrum, ranging from accepting and receiving all vaccines to refusing all vaccines (see Figure 1). Between the two extremes, people may accept some vaccines while refusing others, and may delay vaccination due to perceptions of risk and benefit of vaccination as well as risk and severity of disease (World Health Organization, 2014). Vaccine hesitancy remains a barrier to the containment and eradication of infectious diseases, and much is still unknown about the nature of vaccine hesitancy in LMIC (Dror et al., 2020). Understanding predictors of vaccine hesitancy is a global concern: lags in vaccination may result in new variants that can overcome immunities (whether from vaccine or prior infection) (Solis et al., 2021). Furthermore, understanding caregiver decision-making around children's vaccines, so that targeted strategies and interventions can be developed, can prevent disease spread and child mortality (Ruggiero et al., 2021)



### Healthcare mistrust

Mistrust in healthcare and vaccines impact healthcare utilization, and are likely to result in emergent and prolonged disease outbreaks and increased suffering and death (Bitanihirwe & Ssewanyana, 2021; Dal & Tokdemir, 2022). Healthcare mistrust is a predictor of decreased health utilization, which includes vaccine behavior (Gulland, 2012), and has been shown to predict decreased vaccination utilization across vaccine types (Adeyanju et al., 2021; Torun et al., 2010; Wu et al., 2021) and regions (Iwu et al., 2022; Jain et al., 2021; Khankeh et al, 2021), even when access is not a barrier (Lowes & Montero, 2021). The nature of healthcare trust has not been conceptualized consistently in research (Ozawa & Sripad, 2013), with measurements ranging from one-item question asking if the participant trusts healthcare institutions or healthcare providers (Morales-Garcia et al., 2022), multi-item questions investigating the participants trust within a specific patient-provider dyad (Choy & Ismael, 2017), providers broadly (Ozawa & Sripad, 2013), and healthcare institutions (including Ministry of Health, Government, and Pharmaceutical) (Stoop et al., 2021).

Studies have shown that global politics and identity inform trust (Dal & Tokdemir, 2022; Khan et al., 2020), as do prior experiences with healthcare and preconceptions as to how one will be treated by healthcare workers (Mbonu et al., 2009; Williamson et al., 2019). Mistrust of healthcare is linked to mistrust of other institutions, such as the government and public health departments (Ali et al., 2022; Simas et al., 2021) as well as producers of vaccines, including pharmaceutical companies (Katoto et al., 2022; Vignier et al., 2021).

## Mental health, healthcare trust, and Covid-19 vaccine hesitancy

An emerging body of literature shows that poor mental health is linked with COVID-19 vaccine hesitancy, infection, and mortality (Nemani et al., 2021; Smith et al., 2021) and subsequent mental health problems (Taquet et al., 2021). Mental health issues may play a role in the extent to which individuals trust and seek out healthcare for themselves and their children, though much of this emergent research comes from high-income countries. Recent studies have found associations between poor mental health and COVID-19 vaccine hesitancy (Tosun & Akyazi, 2024; Nemani et al., 2021), which may be explained by patients' prior negative experiences with healthcare and increased institutional distrust (Milan & Dau, 2021; Taquet et al., 2021). Other studies have found that poor mental health is associated with increased mistrust in healthcare (Klest et al., 2019) and vaccine hesitancy (Batty et al., 2022; Gerretsen et al., 2021) while chronic stress is associated with hyper-vigilance and mistrust of others (including health care workers) (Miller et al., 2011; Thrasher et al., 2008).

Self-efficacy, the belief in one's capacity to execute specific actions and achieve desired actions, was introduced by Albert Bandura in the 1970s. Self-efficacy is a fundamental component of a number of theoretical frameworks, including Bandura's social cognitive theory and social learning theory (Nabavi, 2012), as well as self-concept theory (Mercer, 2012), all of which explore how individuals learn and develop perceived competencies as behaviors.

Prioritizing trust is essential to success not only of ongoing health programs but also in preparing for epidemics and pandemics (Greene et al., 2013; Richardson et al., 2019). Understanding the complex nature of healthcare distrust and trust, and potential influencing factors, can lead to interventions that ultimately improve experiences so that healthcare systems are trusted, utilized, and effective at meeting the needs of people in the community.

## Gaps in research

A number of gaps still exist. While mistrust has been associated with vaccine hesitancy (Adeyanju et al., 2021; Wu et al., 2021), there is limited research exploring causes and extent of mistrust in healthcare across levels of the social ecology. In addition, the dearth of literature utilizing multi-question measurement tools means that there is little understanding of the spectrum of healthcare trust as it impacts vaccine behavior, and the ways in which this might result in differing levels of hesitancy for one's child as opposed to one's self.

Overall, there is limited research of the role of mental health in explaining mistrust or vaccine hesitancy in LMIC (Turhan et al., 2022) or making explicit connections between one's prior healthcare experiences and current vaccine uptake trends. People with symptoms of mental illnesses may have a number of barriers to accessing healthcare, including community stigmatization (Esterwood & Saeed, 2020; Smith et al., 2021) and thus it is useful to explore associations of a variety of mental health issues (including anxiety, depression, and stress) with healthcare trust and vaccine hesitancy.

Due to the unprecedented access to established cohorts of EVD survivors, there is an opportunity to further explore the role in which prior healthcare exposure, and mental health symptoms, are associated with healthcare trust and vaccine behavior.

#### Theoretical framework

This study is rooted in the SAGE Working Group Determinants of Vaccine Hesitancy. This model presents three categories for determinants of vaccine hesitancy: contextual, individual and group, and vaccine/vaccination specific influences. This model explicitly recognizes that hesitancy is more than just an individual's thought process, and that contextspecific elements, such as access, perceived risk and benefits, and historical influences, all are potential determinants for vaccine uptake (World Health Organization, 2014) (see Appendix B).

This study is also informed by the Health Belief Model, a model used widely in public health to explain health-related behaviors. The Health Belief Model consists of a variety of constructs, including perceived risks, benefits, and barriers (including psychological and tangible barriers) of engaging in a health behavior (such as vaccines), which are modified by demographic and individual factors (Champion & Skinner, 2008) (See Appendix C). The Health Belief Model also incorporates the concept of self-efficacy; in addition to perceiving a risk to be strong enough to warrant action and a belief that the health intervention will result in a positive outcome, the HBM also posits that people must feel themselves to be able to navigate existing barriers (Champion & Skinner, 2008).

#### *Study objectives*

This study aimed to understand if and how mental health and trust in healthcare workers (HCWs) might be related to Covid-19 vaccine intention and uptake for one's self and one's child. The central hypotheses were that (1) poor mental health negatively influenced Covid-19 vaccine intention and uptake for one's self and one's child and (2) higher trust in healthcare workers positively influenced vaccine uptake and intention for one's self and child.
# Methods

#### Context

This study used data from an existing NICHD-funded longitudinal study (#R01HD096699; PIs: Thomas M. Crea, PhD, and John S. Schieffelin, MD) conducted from 2018-2023. The sample included EVD-infected (n=231), EVD-affected (n=228), and control children (n=234) and their caregivers (n=663). Data for this study were from Wave 1 (May 2022) and Wave 2 (April 2023), with added questions on vaccine hesitancy and trust in healthcare workers. Questions were translated into Krio by Caritas-Freetown research assistants

### Sampling

All adult caregivers (n=663) of children aged 10-17 in the parent study were included. Inclusion criteria required caregivers to be the primary caregiver, aged >20, cohabitating with, and living with the child for the prior year. Exclusion criteria excluded non-biological parents or guardians. Missing data were handled with listwise deletion after checks by Sierra Leonean and American research assistants.

# Measures

Independent measures for this study were self-efficacy, helplessness, anxiety, and depression, trust in healthcare workers, one's survivor status, and one's child's survivor status. The dependent variables were one's vaccine uptake and one's vaccine intention for their child. Data was collected before children's Covid vaccines were widely available in Sierra Leone (WHO, 2023) (see Table 1).

<u>Self-efficacy and helplessness</u> were operationally defined as two subscales of the Perceived Stress Scale (Cohen et al., 1983): self-efficacy (4 questions, Cronbach's alpha .85) and helplessness (6 questions, Cronbach's alpha .81). Together, they are used to assess stress levels in young people and adults aged 12 and above, evaluating the degree to which an individual has perceived life as unpredictable, uncontrollable and overloading over the previous month. Positive items were reverse coded, and all questions were summed. These scales were completed by all participants (n=663).

<u>Anxiety and depression</u> were operationally defined by two subscales of the Hopkins Symptom Checklist (Derogatis et al., 1974): Anxiety (10 questions, Cronbach's alpha = .86) and Depression (15 questions, Cronbach's alpha .88), with all questions on a 4-point Likert. Some data was missing for these scales: two cases (0.3%) for Anxiety and ten cases (1.5%) for Depression. Therefore, listwise deletion was employed to manage these cases.

Economic Status was calculated using a 10-item questionnaire created for the parent study, based off of the Demographic Health Surveys Wealth Index (Fisher & Way, 1988). Participants were asked questions regarding sources of drinking water and cooking fuel, type of toilet facility, availability of household appliances and technology such as cell phones and vehicles, main flooring and roofing material, and ownership of agricultural land. Index for each house was a weighted summation; principal component analysis was run three times, with three indices calculated: once each for all households, rural households, and urban households. The composite index was regressed on the rural and urban indices to develop weights to create a wealth index comparable across rural and urban areas. For this study, the wealth index was measured in quintiles. There were no missing cases for the wealth index variable.

<u>Survivor status</u> was a dichotomous variable: was the caregiver infected by EVD (yes/no). There were no missing cases for this variable.

<u>Child's survivor status</u> was also a dichotomous variable: was the caregiver's child infected by EVD (yes/no). There were no missing cases for this variable. <u>Trust in healthcare workers</u> was operationally defined as the Adapted Wake Forest Scale (Hall et al., 2006). The *Adapted Wake Forest Scale is a* 5-item questionnaire (Cronbach alpha = .72), with all questions on a 5-point Likert ranging from "strongly agree" to "strongly disagree" assessing trust in formal HCW. Healthcare trust was calculated by mean score. 3.7% of cases were missing from this variable, due to the fact that the questions for this scale were not asked in one district of interest (Kenema).

<u>Adult Covid-19 Vaccine Behavior</u> is a binary composite variable, composed of two questions: whether the Covid-19 vaccine was available in the participant's area, and for those with access, whether they had received at least one dose of the vaccine. Participants who responded 'no' (n=237, 35.7% of the total) or 'not sure' (n=4, 0.6% of the total) were excluded from the analysis, in order to focus specifically on participants who had access to the vaccines and investigate whether they had been vaccinated.

<u>Child Covid-19 Vaccine Intention</u> was likewise a binary variable, indicating whether parents intend to allow their child to receive the Covid-19 vaccine when it becomes available. There were no cases missing from this variable.

Other covariates included gender (male or female), type of residence (urban or rural) and district. There were 5 cases missing from the type of residence variable (0.7% of all cases), which were accounted for with listwise deletion.

Table 1	1. (	Quanti	tati	ve	measures	inc	lud	led	in	this	stud	ly
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Variables	Description
Independent Variables	
Self-Efficacy and Helplessness	Perceived Stress Scale (Cohen et al., 1983): 10-item questionnaire with 2 subscales: Self-efficacy (4 questions, Cronbach's alpha =.85), helplessness (6 questions, Cronbach's alpha .81).

Anxiety and Depression Levels	Hopkins Symptom Checklist (Derogatis et al., 1974): 25-item questionnaire with two subscales: Anxiety (10 questions, Cronbach's alpha = .86) and Depression (15 questions, Cronbach's alpha .88).
Economic Status	Brief Sierra Leone Wealth Index. 10-item questionnaire created for parent study, based off of Demographic Health Surveys wealth index, divided into quintiles.
Adult Survivor Status	Prior EVD-infection status (Dichotomous: yes/no)
Child's Survivor Status	Child's prior EVD-infection status (Dichotomous: yes/no)
Trust in Healthcare Workers	Adapted Wake Forest Scale (Hall et al., 2006). 5-item questionnaire (5-point Likert; Cronbach alpha=.72) assessing trust in formal HCW (aim 2) and traditional healthcare HCWs (aim 3). Healthcare trust is calculated by mean score.
Dependent Variables	
Vaccine uptake for self	Caregiver vaccine uptake for COVID-19
Vaccine intention for child	Whether caregiver intends to get child the COVID-19 vaccine when it is available.
Adult Survivor Status Child's Survivor Status Trust in Healthcare Workers <b>Dependent Variables</b> Vaccine uptake for self Vaccine intention for child	<ul> <li>Prior EVD-infection status (Dichotomous: yes/no)</li> <li>Child's prior EVD-infection status (Dichotomous: yes/no)</li> <li>Adapted Wake Forest Scale (Hall et al., 2006). 5-item questionn (5-point Likert; Cronbach alpha=.72) assessing trust in formal H (aim 2) and traditional healthcare HCWs (aim 3). Healthcare tru calculated by mean score.</li> <li>Caregiver vaccine uptake for COVID-19</li> <li>Whether caregiver intends to get child the COVID-19 vaccine w it is available.</li> </ul>

### Data analysis

Bivariate analyses were conducted using independent samples t-tests and chi-squares. The first multivariate analysis examined predictors of one's COVID-19 vaccine uptake through three regression models. Model 1 included mental health variables (self-efficacy, helplessness, anxiety, depression), survivor status, and covariates. Model 2 replaced mental health variables with the trust variable, alongside survivor status and covariates. Model 3 included all variables.

The second analysis focused on vaccine intentions for one's child, following the same model structure as the first analysis. Each model was a mixed-effects logistic regression with random intercepts to account for district-level clustering. Analyses were performed in STATA.

A sensitivity analysis was conducted to determine the appropriate model type. Given that formal trust data was collected in only five out of the six districts, the additional district (Kenema) was excluded in the sensitivity analysis to assess the impact of changes in sample size on the models. Additionally, sensitivity analysis was performed with district as a fixed effect due to the limited number of clusters.

## Ethics

This study received approval from Boston College and Tulane University IRBs, as well as the Sierra Leone Ethics and Scientific Review Committee. See Appendix A for information regarding protection of human subjects throughout the study.

## Findings

# Sensitivity analysis

Upon conducting the sensitivity analysis, it was concluded that retaining the largest dataset possible for each model was the optimal approach. No changes in findings were observed when district was included as a fixed effect. Notably, in the mixed-effects model, the variance of the intercept was found to be greater than zero, indicating the presence of some variance accounted for by the mixed-effects model

#### Descriptive and bivariate analysis

Descriptive statistics are presented in Table 2. The sample was 72.55% female, and 60.03% urban. 74.80% responded that they intended to vaccinate their child for Covid when a vaccine became available, and of those eligible, 53.68% said that they had received the Covid-19 vaccine themselves.

Variable	Freq (%)	Mean (SD)	Min	Max
Intention to Vaccinate Child for Covid-19				
No	154 (25.20%)			
Yes	457 (74.80%)			
Adult Covid-19 Vaccine Status				
No	195 (46.32%)			
Yes	226 (53.68%)			
Trust in Formal Healthcare		2.40 (.50)	1.2	3.2
Self-Efficacy		1.51 (1.06)	0	4
Helplessness		.94 (.76)	0	3.17
Anxiety		1.54 (.50)	1	3.2
Depression		1.52 (.47)	1	3.47

Table 2. Descriptive statistics of variables in model

Urbanity		
Rural	263 (39.97%)	
Urban	395 (60.03%)	
District		
Western Area Urban	120 (18.10%)	
Kailahun	70 (10.56%)	
Port Loko	225 (33.94%)	
Western Area Rural	79 (11.92%)	
Bombali	131 (19.76%)	
Wealth Index		
1 <sup>st</sup> quintile	132 (20.06%)	
2 <sup>nd</sup> quintile	132 (20.06%)	
3 <sup>rd</sup> quintile	131 (19.91%)	
4 <sup>th</sup> quintile	132 (20.06%)	
5 <sup>th</sup> quintile	131 (19.91%)	
Carer Infection Status		
No	438 (66.06%)	
Yes	225 (33.94%)	
Child Survivor Status		
No	441 (66.52%)	
Yes	222 (33.48%)	
Gender		
Male	182 (27.45%)	
Female	481 (72.55%)	

Table 3. Chi-square tests with categorical variables, by Covid-19 vaccine uptake and intention

	Adult vaccin	ation uptake	Intention to vaccinate child		
Variable	Responded yes	Chi-square value	Responded yes	Chi-2 value	
District		19.492**		22.532***	
Bombali	35 (48%)		86 (70%)		
Kailahun	44 (80%)		61 (87%)		
Kenema	9 (60%)		31 (86%)		
Port Loko	64 (59%)		134 (67%)		
Western Area Rural	36 (59%)		60 (83%)		
Western Area Urban	38 (42%)		85 (77%)		
Wealth Index		9.877*		11.935*	
1 <sup>st</sup> Quintile (poorest)	31 (48%)		80 (67%)		
2 <sup>nd</sup> Quintile	44 59%)		85 (75%)		
3 <sup>rd</sup> Quintile	57 (60%)		101 (79%)		
4 <sup>th</sup> Quintile	41 (42%)		81 (68%)		
5 <sup>th</sup> Quintile	50 (59%)		106 (83%)		
(wealthiest)					
Type of Residence		3.570		0.250	
Urban	133 (50%)		278 (75%)		
Rural	90 (60%)		175 (74%)		
Adult Survivor Status		0.082		0.892	
Ebola Survivor	76 (55%)		153 (73%)		
Control	150 (53%)		304 (76%)		
Child's Ebola Status		2.605		0.053	
Ebola Survivor	58 (47%)		150 (75%)		
Control	168 (56%)		307 (74%)		

\* p < .05, \*\* p < .01, \*\*\* p < .001.

Table 3 presents chi-square results between outcome variables and covariates. District was significantly associated with adult COVID-19 vaccination uptake (p<0.001) and Covid-19 vaccination intention for child (p<0.01). Wealth index was also significantly associated with both adult Covid-19 uptake (p<0.05) and vaccination intention for child (p<0.05).

		_		
Variable	Responded yes	Responded no	Responded yes	Responded no
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Formal Trust	2.38 (0.03)	2.36 (0.04)	2.38 (0.02)	2.41 (0.04)
Self-Efficacy	1.73 (0.07)	1.68 (0.07)	1.53 (0.05)	1.39 (0.09)
Helplessness	1.02 (0.05)	1.03 (0.05)	0.92 (0.04)	1.02 (0.06)
Anxiety	1.57 (0.03)	1.61 (0.03)	1.52 (0.02)	1.57 (0.04)
Depression	1.56 (0.03)	1.60 (0.03)	1.52 (0.02)	1.53 (0.38)
* . 05 ** . 01 ***	< 001			

Table 4. T-tests with mental health and trust variables, by Covid-19 vaccine uptake and intentionAdult vaccination uptakeIntention to vaccinate child

\* p < .05, \*\* p < .01, \*\*\* p < .001.

Bivariate statistics between outcome variables and independent variables (mental health variables and trust in formal healthcare) are presented in Table 4. None of these tests were statistically significant.

Table 5 and 6 show the logistic regression results for our main models. Table 5 shows all

findings for adult Covid-19 vaccine variable outcome and Table 6 shows all findings for child

Covid-19 vaccine variable outcome.

-	Mod Mental Health v	el 1a ariables ( <i>n</i> =407)	Mod Formal Trust va	lel 1b ariables ( <i>n</i> =380)	Mo Formal Trust a ( <i>n</i> =	del 1c nd Mental Health =373)	
Predictor	Odd's Ratio (SE)	95 <sup>th</sup> CI	Odd's Ratio (SE)	95 <sup>th</sup> CI	Odd's Ratio (SE)	95 <sup>th</sup> CI	
Self-Efficacy Helplessness	1.052(0.120) 1.150 (0.223)	[0.842, 1.313] [0.782, 1.689]			1.072 (0.132) 1.202 (0.250)	[0.842, 1.364] [0.799, 1.808]	
Anxiety Depression Formal Trust Rural (compared to urban)	0.757 (.259) 0.809 (.291) 1.810 (.515) *	[0.388, 1.479] [0.400, 1.636] [1.036, 1.161]	1.001 (0.224) 1.699 (.500)	[0.645, 1.553] [0.955, 3.024)	0.791 (0.285) 0.678 (0.255) 0.990 (0.237) 1.747 (0.524)	[0.391, 1.604] [0.324, 1.417] [0.620, 1.581] [0.970, 3.143]	
Wealth Index 2 <sup>nd</sup> quintile 3 <sup>rd</sup> quintile 4 <sup>th</sup> quintile 5 <sup>th</sup> quintile Male (compared to	1.624 (.621) 2.293 (.886) * 1.431 (.596) 2.779 (1.201) * 1.402 (.352)	[0.767, 3.437] [1.075, 4.891] [0.632, 3.236] [1.191, 6.483] [.860, 2.297]	1.609 (0.630) 2.097 (0.838) 1.383 (0.598) 2.750 (1.222) * 1.693 (0.438) *	[0.747, 3.467] [0.958, 4.588] [0.592, 3.228] [1.152, 6.568] [1.020, 2.810]	1.660 (0.671) 1.967 (0.795) 1.262 (0.552) 2.508 (1.143) * 1.593 (0.410)	[0.752, 3.666] [0.891, 4.343] [0.536, 2.975] [1.027, 6.125] [0.950, 2.671]	
female) Infection Status Child: Infection status	1.275 (.305) 0.699 (.165)	[0.798, 2.038] [0.439, 1.111]	1.181 (0.289) 0.639, (0.157)	[0.731, 1.907] [0.395, 1.033]	1.321 (0.336) 0.624 (0.155)	[0.802, 2.175] [0.384, 1.014]	
Constant District variable constant	2.470 (1.572) 0.278 (0.230)	[0.710, 8.596] [0.055, 1.406]	1.659 (1.233) 0.323 (0.282)	[0.386, 7.123] [0.058, 1.793]	3.359 (2.926) 0.298 (0.269)	[.609, 18.525] [0.051, 1.746]	
AIC BIC	559.581 615.704		518.231 561.573		513.186 572.010		

Table 5. Binary Logistic Regressions Examining Odds of Adult Covid-19 Vaccine with Mental Health and Healthcare Trust Predictors

*Note*: SE = standard error; CI = confidence interval; AIC=Akaike information criterion; BIC = Bayesian information criterion. \* p < .05, \*\* p < .01, \*\*\* p < .001.

#### Adult vaccine models

Table 9 presents three models predicting COVID-19 vaccine uptake. In Model 1a, mental health variables were not significant. However, rural residents (OR=1.811, 95% CI: 1.036–1.161), individuals in the 3rd wealth quintile (OR=2.293, 95% CI: 1.075–4.891), and those in the 5th wealth quintile (OR=2.779, 95% CI: 1.191–6.483) had higher odds of vaccination. In Model 1b, the highest wealth quintile was significantly associated with higher odds of vaccination (OR=2.750, 95% CI: 1.152–6.568), as were men compared to women (OR=1.693, 95% CI: 1.020–2.810). Healthcare trust was not a significant predictor. In Model 1c, which included mental health and trust variables, only the highest wealth quintile remained significant (OR=2.508, 95% CI: 1.027–6.125). In all models, own or child's infection status was not significantly associated with vaccination. Additionally, no mental health variables were significant in the models with mental health (1a and 1c), and trust was not significant in models including trust variables (1b and 1c).

	Mode	l 2a	Model 2b	)	Model 2c Mental Health and Trust ( <i>n</i> =539)		
	Mental Health va	riables (n=507)	Trust variables (	( <i>n</i> =546)			
Predictor	Odd's Ratio (SE)	95 <sup>th</sup> CI	Odd's Ratio (SE)	95 <sup>th</sup> CI	Odd's Ratio (SE)	95 <sup>th</sup> CI	
Self-Efficacy	1.264 (0.141) *	[1.016, 1.572]			1.258 (0.147) *	[1.001, 1.581]	
Helplessness	0.723 (0.141)	[0.494, 1.059]			0.683 (0.138)	[0.459, 1.016]	
Anxiety Depression Trust in Healthcare Rural (compared to	0.787 (0.253) 1.519 (0.543) 1.141 (0.315)	[0.419, 1.478] [0.754, 3.062] [0.664, 1.962]	0.876 (0.190) 1.154 (0.323)	[0.572, 1.341] [0.667, 1.998]	0.916 (0.306) 1.441 (0.531) 0.838 (0.189) 1.101 (0.316)	[0.476, 1.762] [0.670, 2.967] [0.538, 1.304] [0.627, 1.931]	
urban) Wealth Index							
2 <sup>nd</sup> quintile 3 <sup>rd</sup> quintile 4 <sup>th</sup> quintile	1.469 (0.492) 1.954 (0.692) 1.122 (0.423)	[0.761, 2.833] [0.976, 3.911] [0.536, 2.349]	1.5490 (0.527) 1.817 (0.649) 1.140 (0.436)	[0.795, 3.019] [0.903, 3.658] [0.538, 2.413]	1.599 (0.562) 1.895 (0.688) 1.160 (0.453)	[0.803, 3.183] [0.930, 3.860] [0.540, 2.492]	
5 <sup>th</sup> quintile Male (compared to female)	2.590 (1.041) * 2.882 (0.758) ***	[1.178, 5.693] [1.721, 4.827]	2.500 (0.999) * 2.661 (0.691) ***	[1.143, 5.470] [1.599, 4.429]	2.587 (1.070) * 2.867 (0.770) ***	[1.150, 5.818] [1.693, 4.854]	
Infection Status Child: Infection status	0.873 (0.191) 1.0471 (0.226)	[0.568, 1.341] [0.686, 1.599]	0.944 (0.212) 0.932 (0.205)	[0.608, 1.467] [0.605, 1.434]	0.892 (0.204) 0.945 (0.212)	[0.570, 1.398] [0.608, 1.467]	
Constant District variable constant	4.577 (2.446) ** 0.179 (0.162)	[1.606, 13.046] [0.030, 1.061]	7.227 (4.986) ** 0.146 (0.142)	[1.870,27.937] [0.022, 0.977]	5.698 (4.427) * 0.167 (0.161)	[1.243,26.125] [0.025, 1.114]	
AIC BIC	653.963 715.451		615.001 662.330		604.570 668.916		

Table 6. Binary Logistic Regressions Examining Odds of Intention to Vaccinate Child Against Covid-19, With Mental Health and Healthcare Trust Predictors

*Note:* SE = standard error; CI = confidence interval; AIC=Akaike information criterion; BIC = Bayesian information criterion. \* p < .05, \*\* p < .01, \*\*\* p < .001.

#### Child vaccine models

Table 10 presents three models predicting COVID-19 vaccine intention for one's child. In Model 2a, which included mental health variables, only self-efficacy was significantly associated with vaccine intention. Higher self-efficacy was linked to increased odds of vaccine intention for one's child (OR=1.264, 95% CI: 1.016–1.572). Parents in the wealthiest quintile had higher odds of intention to vaccinate their child compared to those in the lowest quintile (OR=2.590, 95% CI: 1.178–5.693). Fathers had higher odds of vaccine intention for their child than mothers (OR=2.882, 95% CI: 1.721–4.827). In Model 2b, trust in healthcare was not a significant predictor. Similar to Model 2a, parents in the wealthiest quintile had higher odds of vaccine intention for their child (OR=2.500, 95% CI: 1.143–5.470), and fathers had higher odds than mothers (OR=2.661, 95% CI: 1.599–4.429). In Model 2c, which included mental health and healthcare trust variables, self-efficacy was again the only significant mental health variable (OR=1.258, 95% CI: 1.001–1.581). The wealthiest quintile remained significantly associated with higher odds of vaccine intention for one's child (OR=2.587, 95% CI: 1.150–5.818).

In all models, parent and child infection status, urban versus rural residence, and belonging to any wealth quintile other than the wealthiest were not significantly associated with vaccine intention. Anxiety, depression, and helplessness were not significant predictors in the models where they were included (Model 2a and 2c), and trust in healthcare was not significant in the models where it was included (Model 2b and 2c).

Post-hoc tests included Akaike's information criterion (AIC) and Bayesian information criterion (BIC) to assess model fits. Results are reported in Table 10 for each model. Results were not conclusive; while the lowest AIC scores were for Models 1c and 2c, the lowest BIC scores were for Models 1b and 2c. Together, these suggest that Model 2c is the most suitable of the child vaccine models, although the fact that trust variables are not statistically significant might suggest Model 1c, a more parsimonious model, to be the best fit.

#### Discussion

This study examines possible impacts of mental health and healthcare trust upon Covid-19 vaccine uptake and intentions for oneself and one's child in the aftermath of the Ebola outbreak. Despite high levels of self-reported childhood vaccine uptake (96% for adults in the sample and 98% for children), we observed more variance regarding the Covid-19 vaccine. Roughly half of adults (53.68%) in the sample had received at least one dose of the Covid-19 vaccine and three-quarters of adults intended to vaccinate their child for Covid-19 when it became available (74.80%). While the threat of Covid-19 is perceived to be less acute at present, there are lessons learned that can inform healthcare utilization, both generally and in the face of future outbreaks and epidemics.

We found that self-efficacy was the only mental health variable that was a significant predictor, and only for vaccination intention for one's child. Self-efficacy, as well as anxiety, depression, and feelings of helplessness did not affect the odds of an individual's own Covid-19 vaccine uptake. Though high rates of childhood vaccines indicate that people appear to trust healthcare, healthcare trust was not statistically significant in any model, and was not a significant predictor of adult vaccine status or intention to vaccinate one's child. Self-efficacy is a key factor for initiation and execution of disease-coping behaviors (Bandura, 1977; Zhou et al., 2021). It has been linked to health promoting behaviors and health outcomes, such as medication adherence, preventive healthcare practices, and disease management (Sheeran et al., 2016). Significant self-efficacy findings in this study align with existing research on Covid-19 vaccine uptake which further underscores its importance in enhancing vaccination intentions and behaviors for individuals and their families (Allen et al., Fontenot, 2023). In low-income settings, self-efficacy may encompass one's confidence accessing healthcare, which may include difficult transportation, under-resourced facilities, and a variety of other socioeconomic and physical barriers (Davis et al., 2022; Adugna et al., 2020).

While self-efficacy shows significance in certain models in this study, there are noteworthy implications with covariates in the model. Though literature has highlighted the elevated role of mothers in child immunization in sub-Saharan Africa (Bangura et al., 2020), fathers in this study had a higher odds of vaccine intention for children. Additionally, the high odds ratios for the highest wealth index quintiles are noteworthy. Across all models, individuals in the highest wealth quintile exhibited a statistically significant association with increased Covid-19 vaccine uptake and intention to vaccinate one's child.

The statistical significance of wealth contextualizes the discussion about Covid-19 behavior and intention as a health equity issue. Social determinants of health, notably socioeconomic status, impact health in many ways, including one's capacity and confidence to navigate and access healthcare resources (Lathrop, 2020). Sierra Leone, among the world's poorest countries (Alkire et al., 2015), underscores the gravity of this issue. Despite its low Gini coefficient (Gabani et al., 2023), indicative of a relatively equitable distribution of wealth, noticeable disparities persist in vaccine behavior across socioeconomic strata. While poverty pervades Sierra Leone universally, it is among the most economically marginalized segments of the population where the prominence of these disparities is most evident.

Though Covid-19 vaccines were available free of charge (Buttenheim & Thirumerthy, 2024), indirect costs such as lost wages impact accessibility, and wealth-related inequalities in healthcare utilization have been noted for other free services, including maternal and child health

services provided under the government's Free Healthcare Initiative (Jalloh et al., 2019). The Covid-19 pandemic highlighted how acute health risks exacerbate challenges for vulnerable populations. In our study, we asked people if they received at least dose of the Covid-19 vaccine, recognizing that similar to other vaccines, there is often a drop-off after the initial dose, with many failing to complete the full vaccination series or receive boosters (citation). While interventions that aim to improve self-efficacy may see some eventual increases in vaccine uptake, access and affordability appear to have the most direct impact on vaccine behavior.

Future research should delve deeper into understanding vulnerabilities associated with intersectional identities, such those who are poor and have existing chronic health needs or disabilities. By examining these intersections, researchers can develop targeted interventions to address the specific needs of these marginalized populations and promote more equitable access to healthcare services, including vaccination.

The lessons learned from the COVID-19 pandemic extend beyond the immediate health crisis. Disparities in access to and utilization of healthcare services are likely to arise in future epidemics and pandemics. It is therefore crucial to address these issues proactively and implement strategies that ensure equitable access to healthcare for all individuals, regardless of socioeconomic status or other intersecting factors.

#### Limitations

This study has several limitations. The high vaccination rates in the sample limited the ability to assess the impact of variables such as mental health and trust on routine childhood vaccinations. While this is a positive finding, it complicates the narrative on access, as vaccine availability is generally high. The association between rural residence and adult vaccination in Model 1a may be influenced by confounding factors like health literacy or exposure to misinformation, which were not included in the model.

The small sample sizes in Models 1a, 1b, and 1c, examining adult COVID-19 vaccine uptake, weakened the reliability of findings. A third of respondents (n=237) reported the vaccine was unavailable in their area, affecting sample size. The COVID-19 vaccine for children was not available, so parents were asked about their intention to vaccinate once it became available, resulting in larger sample sizes for Models 2a, 2b, and 2c.

Although the EVD epidemic ended in 2016, survivor status remains relevant, but the study focuses on current and historical drivers of healthcare utilization. Care in Ebola Treatment Units was a significant healthcare interaction for many participants. The healthcare trust scale may lack validity in this sample, and while trust likely influences vaccine intention and uptake, it was not fully addressed here. Future research should explore alternative measures for capturing trust. Lastly, the study relies on self-reported measures (e.g., perceived stress, vaccine uptake, and intention), which may introduce bias. To minimize this, multi-item Likert scales were used, and the team collaborated closely with Sierra Leone-based researchers throughout design and data collection.

### Conclusion

This study demonstrates a consistent pattern of association between wealth and vaccination (particularly when comparing the wealthiest to the poorest). Some association was also identified between self-efficacy and intention to vaccinate one's child. The results of this study suggest that addressing poverty-related access challenges may positively impact both adult and child vaccine uptake for Covid-19, and may have implications for subsequent epidemics and other preventative health needs. Further research should explore the complex interplay between

socioeconomic factors, health beliefs, and vaccine uptake to develop targeted interventions. Findings suggest that public health initiatives and policymakers should prioritize interventions aimed at reducing socioeconomic disparities in healthcare access, beyond removing direct costs, to ensure equitable uptake. Additionally enhancing healthcare infrastructure and implementing strategies to mitigate barriers to vaccination are essential to safeguard public health and build resilience against future health crises.

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#### Chapter 3

Paper 2: Exploring Healthcare Perceptions, Utilization, and Trust: Implications for COVID-19 Vaccine Uptake in Sierra Leone

## Background

There is a growing body of literature exploring trust in healthcare settings in low- and middle-income country (LMIC) contexts, though healthcare trust is a complex and nuanced concept. Much of the existing literature focuses on trust either in the patient-physician clinical relationship (Kwame & Petrucka, 2020) or the healthcare system more broadly (Topp & Chipukuma, 2016). Researchers have utilized a variety of qualitative methods in an attempt to more fully conceptualize trust and patient perceptions of healthcare; in LMICs, these have included semi-structured interviews (Erasmus et al., 2017; Topp & Chipukuma 2016), observations of interactions and general working conditions (Erasmus et al., 2017; Topp & Chipukuma, 2016), and participatory model building workshops (Arakelyen et al., 2021).

Healthcare trust is an important component to healthcare utilization. Increased trust is associated with improved health-seeking behavior, adherence to treatment, effective service delivery, and continuity of care (Green & Tesler, 2023; Gilson, 2006). Trust in one's physician has also been associated with greater compliance to treatment for complex disease treatment such as HIV (Schneider et al., 2004) and diabetes (Halepian et al., 2018). Trust facilitates more effective collaboration, not just between patient and provider but also across the many relationships in the healthcare system, for example between doctors and nurses, between clients and complex care teams, and between medical professionals and social workers, all of which affect health outcomes (Gilson, 2006; Vergara, 2021).

Mistrust has the potential to endanger community members, strain healthcare systems, and make disease containment difficult (Bitanihirwe & Ssewanyana, 2021). During the Ebola Virus Disease (EVD) epidemic in West Africa, mistrust of healthcare providers and formal Ebola Treatment Units (ETUs) was common (Yamanis et al., 2016). This was in part due to an underfunded healthcare system, which was plagued by shortages of beds, staff, and essential resources such as intravenous fluids (Boozary et al., 2014). High death rates in many ETUs contributed to the belief that these facilities were places where people went to die (Richardson et al., 2017; Collier et al., 2024). Public health measures, such as quarantine, were distressing and stigmatizing (Crea et al., 2022), exacerbating these negative perceptions. This mistrust often led individuals to delay seeking formal care, opting instead for traditional healers or avoiding care altogether (Miller et al., 2018; Yamanis et al., 2016). Such delays prolonged illnesses, endangered others, and resulted in more severe conditions upon eventual arrival to ETUs. This, in turn, reinforced the perception that ETUs were ineffective, leading to even greater reluctance to seek timely care. This created a reinforcing cycle, where delayed care increased the likelihood of death in ETUs, further perpetuating the cycle of mistrust and delay (Richardson et al., 2017).

Healthcare mistrust has been connected to rising vaccine hesitancy, which has only worsened since Covid-19 (Huynh et al., 2021; Turhan et al., 2020). Decreased vaccine uptake has been associated not only with supply chain issues and overburdened health systems (Buonsenso et al., 2021), but also with increased overall distrust of health care (Antinyan et al., 2021). As vaccines are highly effective and cost-effective in preventing disease morbidity and mortality, (Nandi & Shet, 2020) it is essential to explore current perceptions and intentions of vaccine uptake, as well as factors impacting current perceptions. The WHO's Strategic Advisory Group of Experts (SAGE) on Immunization defines vaccine hesitancy as occurring along a continuum ranging from complete acceptance and high demand for vaccines to outright refusal of some or all vaccines (World Health Organization, 2014). Vaccine hesitant individuals are heterogeneous and may agree to some vaccines but not others, for a variety of individual and community-level reasons. In addition, lack of immunization is not necessarily an indication of complete vaccine hesitancy, especially when a vaccine is not available or is difficult to receive (World Health Organization, 2014). It may be that on the continuum of hesitation, the risks associated with the vaccine outweigh the benefits, or a person does not yet associate the disease itself with any risks large enough to warrant seeking out and receiving a vaccine.

#### Current Study Context

### Gaps in Research

There are a number of gaps in the literature that this study aims to address through qualitative methodology. Overall, there is much that is not known about the reasons for using or not using healthcare, including vaccines, especially in the context of prior infectious disease outbreaks which impacted healthcare trust and access (Enria et al., 2021). Healthcare trust is a concept not well understood (Ozawa & Sripad, 2013) appearing in largely-quantitative studies as a determinant of a behavioral outcome (such as vaccine uptake) and frequently operationalized as a one-item question asking if the participant trusts healthcare institutions or healthcare providers (Morales-Garcia et al., 2022). Qualitative methods provide an opportunity to delve more into the contextual factors which impact healthcare mistrust and strained already fragile healthcare systems (Collier et al., 2024), it is important to understand the impact that it has on

healthcare utilization today. This study aims to incorporate a variety of perspectives from survivors, affected community members, and healthcare providers to provide a more nuanced understanding of the relationship between prior infectious disease outbreak, healthcare utilization and trust, and vaccine hesitancy and behavior.

### Theoretical Framework

This study is informed by the SAGE Working Group Determinants of Vaccine Hesitancy (See Appendix B), which explores vaccine hesitancy determinants across three categories: vaccine/vaccination specific influences (such as vaccine risks, mode of delivery of vaccine, and reliability of supply), individual and group influences (such as prior healthcare experiences, social perceptions of the vaccine), and contextual influences (which include media portrayal of the vaccine, historical influences, and geographic barriers) (World Health Organization, 2014). The Health Belief Model also informs the study objectives and questions asked. In the Health Belief Model, constructs such as perceived benefits and barriers (tangible and psychological) of health utilization play an important role in healthcare utilization, but specifics vary based on individual and community level factors (Champion & Skinner, 2008).

# Study Objectives

The objective of this study is to explore the influence of healthcare trust in formal healthcare workers on COVID-19 vaccine uptake for caregivers and intention to vaccinate children. While research shows that healthcare trust plays a role in vaccine utilization, and that vaccine utilization is decreasing, there is still much to learn about the current climate of health trust, and how experiences during EVD may or may not play a role in current healthcare perceptions.

The study is guided be a number of research questions: Does the community trust the

healthcare system and providers, and how does this trust influence patient engagement, particularly regarding vaccines like COVID-19? How has the EVD epidemic affected this relationship, specifically in terms of trust in healthcare workers and facilities?

# Methods

#### Setting

This study focuses on families in Sierra Leone, a West African country with a history of infectious disease outbreaks, including the 2014-2016 Ebola virus disease (EVD) epidemic—the largest in history, with over 28,000 infections and 11,000 deaths across Sierra Leone, Liberia, and Guinea (World Vision, 2014). The epidemic disrupted healthcare access and fostered mistrust of healthcare workers, contributing to declines in healthcare utilization, such as routine vaccinations (Enria et al., 2021). Addressing healthcare mistrust and vaccine hesitancy in Sierra Leone requires understanding its high disease burden, driven by systemic challenges like underfunded healthcare systems, limited preventative care, and endemic diseases (Lowes & Montero, 2021).

#### Data collection

Qualitative data was collected in August of 2023 in Freetown, Sierra Leone, as part of a study funded through Boston College Vice Provost Office (PI: Oladoyin Okunoren, MSW, LCSW; Co-PI Thomas M. Crea, PhD). Data was collected over the course of one week with the aid of Sierra Leonean research assistants (RAs) who have received extensive training in interview techniques and group facilitation skills. RAs were also trained in consent procedures.

Ethics approval was received from Boston College, as well as the Sierra Leone Ethics and Scientific Review Committee. See Appendix A for information regarding protection of human subjects throughout the study. Data collection methods included: Focus group discussions (FGDs): Two FGDs were conducted with healthcare workers (n=4 and n=6) to explore group dynamics and shared experiences

Key informant interviews (KIIs): conducted with survivors (n16) and affected individuals (n=4) to ensure confidentiality due to sensitive nature of participants' experiences.

All sessions were conducted in Krio, audio-recorded, transcribed in Krio with identifying information removed, and then back-translated into English following World Health Organization protocol (Toma et al., 2017). Transcriptions were reviewed for accuracy. Participants received a stipend of USD \$7.00 in Leones, transportation reimbursement, and onsite refreshments.

#### Sampling

Participants were purposefully sampled to deepen understanding of healthcare mistrust and vaccine hesitancy. Qualitative approaches were conducted to deepen the understanding of extent and drivers of healthcare mistrust and vaccine hesitancy. Two groups were included:

- Healthcare workers (doctors and nurses): Participated in FGDs to explore shared experiences.
- 2. Caregivers: Participated in KIIs, divided into two subgroups:
  - Survivors of EVD.
  - Caregivers whose children were infected with EVD.

Questions included: What is your opinion about vaccinations? What are the risks and the benefits? How did you come to learn this information? Did trust or mistrust of healthcare workers help you come to this conclusion? Do you look differently at health facilities and healthcare workers after the EVD Crisis? Do you have more or less trust in healthcare workers? Do you have more or less trust in healthcare facilities? (See Appendix D)

# Data Analysis

Analysis was done through a grounded theory approach (Straus & Corbin, 1998; Miles & Huberman, 1994) and a multi-step analytic strategy derived from thematic content analysis (Smith et al., 1992). Grounded theory employs an inductive approach to analysis, and is well-suited for developing an understanding of participants' lived experiences. All data underwent a process of open-coding with themes inductively identified. After reading through transcripts, two team members iteratively developed a coding scheme organized according to key themes and used the qualitative analysis program NVivo (QSR International, 2010) to independently code 10% of transcripts to examine reliability. The codebook was refined and reliability testing was repeated until all coding was above 80% reliability, and team members coded the full qualitative dataset.

# Results

Inductive analysis identified four major themes: trust and mistrust of the healthcare system, trust and mistrust of healthcare workers specifically, reasons (other than trust) that inform healthcare utilization, and the ways in which trust played a role in COVID-19 vaccine decision-making.

### 1. Trust and mistrust in the healthcare system

# 1.1. Trust

Frequently, people expressed their trust in the formal healthcare system directly and without much elaboration, using phrases like "I believe in them 100%" and single word affirmations when asked outright if they had trust. When pressed to elaborate, some people explained their confidence in diagnostic resources available in hospitals which provide legitimacy to healthcare providers. One man, an Ebola survivor, shared,

"I believe that when someone is sick the best you can do is to bring that person to the hospital. The doctor will do the medical checkup and prescribe the right treatment."

A woman, also an Ebola survivor, contrasting formal doctors with traditional healers whom they perceive as lacking legitimacy, shared:

"When you go to the hospital you will be checked and diagnosed [for example] with a cold, but if you believe a native doctor, you will see it as the truth without any test."

People who had been infected by Ebola explained how their experiences had influenced their

trust in healthcare. A few highlighted the successful care they had received during the epidemic

to underscore their trust in healthcare. One man who survived Ebola shared:

"If not for [healthcare workers] I would not be alive. My condition was bad when they cared for me, but they fought for me, and with the power of God, I came back to life."

A female Ebola survivor describes her experience at an Ebola Treatment Unit, saying,

"I trusted them because when I got sick and went to them, I got healed."

For some, the Ebola outbreak, along with the healthcare education efforts carried out by

community healthcare workers, highlighted the shortcomings of alternative healthcare methods

and bolstered trust in doctors and hospitals. One doctor shared, after describing sensitization

efforts in the community during the Ebola outbreak:

"There was a man in Port Loko during the Ebola period who was a well-known herbalist and traditional healer. He was treating people until he died from Ebola...the whole community attended his burial ceremony and all those that went for the burial were infected with Ebola. So, a lot of people died, which convinced people to go against him. So many people started coming to the hospital, so this began to change the mindsets of many people."

## 1.2 Mistrust

Far more infrequently, people also recounted instances of their own mistrust, or that of other community members, towards formal healthcare. This overall mistrust often related to the perceived quality of care received and the ways in which individual behaviors influenced

perceptions of the entire healthcare system. This included complaints about ineffective and delayed treatments, and concerns about inadequately trained healthcare workers exacerbating illnesses. One man who had survived Ebola shared.

"There are times the treatment they give you will not be effective to address your health issues. Sometimes it takes too long, and you have to be taking continuous drugs but will not see improved health."

Another woman, a caregiver who had had children infected with Ebola, added,

"One should not bring their attitude into their profession. When you visit some hospitals or clinics the manner in which some healthcare workers approach a patient is not good and that would make the patient's illness worse."

#### 2. Perceptions towards Healthcare Workers

This perceived inadequacy of care, and the so-called 'attitude problems' of healthcare workers which may impact the quality of care, connect to another major theme that emerged from the interviews and focus groups: people's differing perceptions towards the healthcare system and healthcare workers. Negative perceptions towards individual healthcare workers do not necessarily lead to negative perceptions of the entire healthcare system overall. While many individuals expressed unwavering trust in the healthcare system and hospitals overall, they tended to provide more nuanced considerations when reflecting on individual healthcare providers.

One person affected by Ebola, after voicing trust in the healthcare system, added "Yeah, I don't trust [healthcare workers] one hundred percent." People's trust in the healthcare system, including pharmacies, clinics, and hospitals, varied depending on their interactions with different members at these locations. One man who had survived Ebola expanded on this notion, emphasizing that these considerations extend to various individuals within the healthcare system, including doctors and pharmacists: "When a doctor prescribes medicine for you, you will buy it, but it is not advisable to tell someone to go to the pharmacy because there are some people who own a pharmacy but don't know the usage of drugs, so only follow the doctor's prescriptions."

Some individuals exhibit a preference for hospitals, while others favor community health centers, which are typically run by nurses. One woman who had survived Ebola described her husband's trust in nurses and community health workers, stating,

"He knows a nurse - as soon as he feels sick, he goes to her, he trusts her to treat him. As for me, when I am sick, I will only go to the hospital."

Alternatively, a male caregiver, who had children infected with Ebola, highlights the prevalent

belief in favoring clinic-based care over hospitals, emphasizing the distinct perception of

healthcare workers at clinics compared to those at hospitals, and remarked:

"Some people do trust hospitals, but say it's a waste of time... they believe they should be treated privately rather than to go to the government hospital."

In these interviews, people reflect on perceptions of healthcare workers during Ebola, and the ways in which their experiences during Ebola impact their opinions about healthcare workers today. One female survivor discussed the fear people experienced regarding healthcare workers treating them at Ebola Treatment Units (ETUs), as well as beliefs about malevolent actions by healthcare workers:

"According to some people, there were complaints about the quality of care provided by nurses in certain treatment centers [during Ebola]. Allegations were made that nurses were administering injections to hasten the process [of dying]. The majority expressed negative opinions about the nurses and doctors. However, in my personal experience at the treatment center I attended, no such incidents occurred."

Another man who had been treated at an ETU shared how witnessing the positive efforts of

healthcare workers during the outbreak instilled trust in their ongoing ability to care for people:

"During the Ebola outbreak, their help in saving lives was immense. The sacrifices made by medical personnel as front-runners during the crisis were significant. In the event of a disaster or outbreak, they are the first people we should thank and put our trust in. Ultimately, they were able to deliver and effectively combat the Ebola virus."

### 3. Factors influencing utilization and non-utilization

The third significant theme that emerged from the interviews and focus groups revolves around the factors influencing people's utilization of healthcare, beyond explicit declarations of trust. Even when prompted about trust, individuals frequently expressed practical concerns stemming from past healthcare encounters and access barriers, such as cost, travel distance, and time constraints for healthcare visits. Among these factors, cost emerged as the most prevalent influencer of healthcare utilization decisions, often leading individuals to forgo their preferred healthcare options. Conversely, positive experiences of successful treatment were highlighted as the primary motivator for seeking healthcare. One survivor expressed the impact on prior experiences with individual healthcare workers on future care-seeking decisions:

"Most of the time, people tend to think about the person who has treated them before they consider going to the hospital."

# 3.1 Cost

A recurring topic discussed in interviews pertained to the issue of cost. People were concerned about generally prohibitive costs as well as challenges with accessing promised free services for Ebola survivors. Despite the conclusion of the Ebola epidemic in 2016, individuals continue to face enduring health challenges resulting from the virus, and people expressed confusion and frustration about accessing services that were once free. One man who was a survivor explained,

"The government provided free medical services to Ebola survivors and other individuals with disabilities, and I was fortunate to be included in that program. In each community and hospital, there was a representative available to ensure that the services you needed were delivered. However, currently, that system is not in place. You may go seeking a particular service, but it may not be available or accessible...Not everyone knows how or where to access the free medical care, and that's the problem. It leads to the ineffectiveness of the free healthcare system, especially when it comes to survivors" Apart from concerns about Ebola-related care, people explained that cost persists as a significant

barrier to accessing healthcare generally. One nurse in a focus group elaborated on the

challenges of navigating unpredictable and surprise costs when seeking medical care.

"One of the key challenges that can prevent someone from going to a health center or seeking medical management is financial constraints. Some individuals do not have enough money to visit a hospital, and they are uncertain about the cost of seeing a doctor. They are also unsure about the expenses associated with laboratory tests and where to go for those tests. The prices of lab tests are not fixed; they vary depending on the specific tests ordered by the doctor. For example, the cost of a simple malaria test is different from that of an ultrasound or an X-ray. Therefore, financial constraints pose a significant challenge."

# A doctor echoed this, saying,

"In the community, if somebody knows that you are sick, they will say go to the hospital. But they may not know if you have money or not; they may not know your financial situation, but when you go to the hospital, it is not free. When you go there to register you have to pay money right away. Some people are afraid of going to the hospital because they did not want to hear bad news of their health ... but the main factor is money."

# 3.2 Insufficient resources

Another burden that influenced people's decisions is the persistent perception of limited or insufficient healthcare resources. This included overextended healthcare providers, insufficient space at facilities to accommodate patients, ineffective medications, and a shortage of resources or expertise to effectively treat complex diseases such as tuberculosis or HIV/AIDS. One survivor explained that most hospitals do not have enough medication to treat people and that people must supply their own medications. Another survivor shared that hospitals lack space, and struggle with worker shortages:

"When patients go to hospitals, there is often no place to treat them, no available rooms or beds. They are sometimes redirected to other facilities due to the lack of space. This highlights the need for improved infrastructure in our healthcare system. Additionally, we have a shortage of healthcare workers. Sierra Leone, as a country, has not reached its peak in terms of disaster containment or even providing adequate care for regular illnesses. We do not have enough doctors and nurses to carry out operations, let alone handle emergencies. There is a pressing need to address the shortage of healthcare
workers, improve infrastructure, and ensure that preparedness materials are always in place."

Another concern is that available resources, including medications purchased at pharmacies, may not work properly or as expected. The lack of effective healthcare treatment options in hospitals and pharmacies may prompt people to explore alternative treatment avenues and poor healthcare outcomes. One nurse explained,

"But the other obstacle that some people face is when they look at their family members who are sick and they are given a prescription, which discouraged them because at the end of the day, the only option they will face is to go and buy medicine on the street. Sometimes, this medication has lost its potency and there is no better alternative available in the system. Sometimes they even resort to using traditional medicines, which in the end can lead to liver damage or affect their internal organ systems, resulting in the need for hospitalization. At the end of the day, if you cannot afford your healthcare, it becomes a big problem that will you to death. But the bottom line is that everyone cares about their health"

## 3.3 Pharmacies

Within these conversations, distinctions arose in how individuals utilized pharmacies, clinics, and hospitals, reflecting varied decision-making processes for each. For many individuals, pharmacies served as the initial point of contact for healthcare needs, primarily due to their affordability, shorter waiting times to consult with a pharmacist, and widespread availability, making them more accessible, although the quality of care was noted as not consistent or reliable. One woman, an Ebola survivor, suggested that around 95% of people opt to visit a pharmacy before considering going to a hospital, saying,

"They choose not to go directly to the hospital due to perceiving their illness as minor. Instead, they prefer to first visit the pharmacy."

Another woman, affected by Ebola, highlighted the local familiarity and accessibility of pharmacies within their community and their appeal as a starting place for care:

"When you go to the pharmacy, you will meet with healthcare workers who live in the community. If the pharmacist suspects he cannot handle your case, then he will tell you to go to the hospital, but the community depends a lot on pharmacy treatments."

For many individuals, pharmacies presented the most financially feasible option, despite higher

trust in hospitals. Those unable to afford hospital care often turned to pharmaceutical services, or

clinic care instead. One male survivor elaborated:

"Regarding health centers, I can't say I don't trust them, but right now when you go to facilities, they ask for money. If you don't have the money, it's a problem, so when you are going for treatment make sure you have money. This is a major reason why people don't go to hospital: because of the exorbitant fees. They might not have the money. That is why when some people get a fever, headache or other illness, they will just go and buy medicines at the pharmacy or perhaps they call a nurse whom they know within the community for treatment."

Another survivor, a woman, added,

"Seeking medical attention at a hospital can be challenging, especially during emergencies when immediate attention from doctors or nurses is required. The process often involves being sent back and forth within the hospital, causing significant delays. Unfortunately, these delays can result in critical situations where patients deteriorate before receiving the necessary care. It is due to such delays and time wastage in hospitals that people often prefer going to the pharmacy instead."

3.4 Hospitals

People generally believed that hospitals offered the highest quality of care. This belief was

evident in the interviews, where many participants indicated that hospitals were perceived as the

primary or only viable option for receiving medical care. One man who had been infected by

EVD said directly, "When you are sick, you go to the hospital." Another man, also an EVD

survivor, elaborated:

"We have always believed in consulting hospitals for medical issues. Whenever someone gets sick, we always go to the hospital. There is a strong trust in our community that when someone falls ill, it is best to seek medical care at the hospital. I personally follow this practice as well."

One woman, an EVD survivor, emphasized government-run hospitals as the pinnacle of care.

Addressing the issue of cost, she argued that since all healthcare is expensive, it's logical to opt

for the best option available.

"The government facilities are good. When my children get sick, I will normally take them there. If I felt sick, I also would go there, because it is the same amount of money that you paid in the pharmacy that you would pay there."

One man shared that the hospital was a useful option if symptoms have not been alleviated by

pharmaceutical options.

"If I have a headache, I will go to the pharmacy, where I will buy medicine like ORS (Oral Rehydration Solution) and tetracycline medications. These are the only medicines I buy from pharmacies. But if am experiencing symptoms that are not alleviated by those medications and am still feeling unwell, with no delay I will go to the hospital and seek medical attention. When my joint pain is persistent, the best thing to go is to the hospital."

3.5 Clinics

People often categorized hospitals and clinics under a broader term of "facility" or even just

"hospital," but at times discussed them separately in conversation. Clinics provide an alternative

option for individuals that is both more accessible and more affordable compared to hospitals.

One woman explained this accessibility, noting,

"Some people don't like to queue in the Hospital, some people just want to go [to a clinic], receive treatment and leave."

Another man pointed out that clinics are frequently utilized for specialized care, such as prenatal care, stating,

"If you see somebody going to the clinic, it might be a pregnant woman, but normally when someone is sick, they go to the hospital for treatment."

4. Perceptions and Factors Influencing Uptake of COVID-19 Vaccines

In addition to individuals discussing their overall trust, perceptions, and engagement with

healthcare services, they also shared insights and experiences related to receiving vaccines,

particularly in light of recent events like the COVID-19 pandemic and other endemic diseases. Overall, there was strong trust and acceptance toward routine child vaccines and established vaccinations. One woman, an EVD survivor, shared, "I have vaccinated all my children because I did not see any danger in it." One nurse elaborated in a focus group:

"It is common for both adults and for children to get routine vaccinations but it depends on the type of vaccination... for example if people get tetanus or a dog bite they will directly come to the hospital and ask for vaccine. It is common and it happens in all of the hospitals."<sup>1</sup>

People's trust and acceptance of the Covid-19 vaccine vary, with some expressing hesitation, refusal, and fear of side effects. Their attitudes toward formal healthcare significantly influence their decisions regarding vaccine acceptance. Participants highlighted the crucial role of healthcare workers in promoting health protocols during epidemics, including vaccination, which increased trust in the Covid-19 vaccine. Many recounted how interactions with healthcare services, including door-to-door and radio sensitization efforts, as well as hospital visits, raised awareness and education about vaccines, influencing their decision to get vaccinated.

# 4.1 Trust in healthcare workers

Reasons people voiced for deciding to receive the Covid-19 vaccine included sensitization efforts from trusted healthcare workers. One female EVD survivor, when asked if trust in healthcare workers played a role in decision making, explained:

"Yes, because the nurses told us when we went to the clinic... They said we should be vaccinated, it is good for you and your children."

Another EVD survivor, a woman, shared,

"Nurses that were working at the [Ebola] Treatment Centre were going around sensitizing people every day. [They said] that if we took the vaccine, we will not get Corona, we will not be sick"

<sup>&</sup>lt;sup>1</sup> Note: Based on discussions with local teams, references to "hospitals" often encompass clinics as well.

One man, a father who had had children with EVD, also emphasized the role that healthcare

workers played in educating about the vaccine, sharing,

"Well healthcare workers were on the radio and social media explaining about [the Covid-19 vaccine] ... Even though there was a misconception among people about the vaccine, the healthcare workers advised that the vaccine is good, so I was able to take a dose of it."

One male EVD survivor emphasized that it was not just discussions about vaccines that

convinced him, but rather seeing first hand that healthcare workers trusted and received the

vaccine, which mitigated fears about side effects:

"I saw the medical healthcare care worker are taking the vaccine and I thought it fit that I myself I should protect myself with it the more. [Even though] people were saying when you take it you will collapse, experience diarrhea and [other side effects], I wanted to take it after seeing healthcare workers taking it. It's because they believed in it and have done proper research about it."

4.2 Necessity for travel

An additional consideration, separate from trust, emerged regarding the necessity of the

COVID-19 vaccine for international travel, which notably incentivized certain individuals to

pursue vaccination. This underscored a perception among many that while the vaccine may be

deemed necessary for specific circumstances, the perceived severity of the COVID-19 threat or

risk did not universally justify vaccination. One woman, an EVD survivor, shared:

"Some people are taking it when they want to travel. My elder sister took it when she wanted to travel to Turkey. As for me, I do not believe in Corona, and I have never taken the vaccine"

Another woman, also a survivor, echoed this, saying, "*I didn't take the [Covid] vaccine because I don't have anywhere to go. Some people take it when they want to travel.*"

4.3 Fears about the vaccine

Some reasons for refusing to receive the vaccine indeed reflect mistrust specifically toward the vaccine, although this mistrust does not necessarily extend to the broader healthcare system. This distrust may stem from various sources, including prior negative experiences with other vaccines or from stories on social media or in the community about the Covid-19 vaccine's side effects or rumored ineffectiveness, or from memories of the Ebola outbreak. One nurse described how people's memories of Ebola may impact their current decision-making, sharing:

"Some people still have the idea, like during Ebola, some people said I would not allow them to take me to the healthcare center because they will kill me there. Some people were having the thought that even if you are healthy, as soon as they injected you on the big toe you will die. Some of them are saying that all the vaccines they brought were to kill people and some of them are still having the idea. These are some of the factors that let people refuse to take vaccination even when it is free."

While trust in vaccines frequently stemmed from trust in healthcare workers, mistrust in

vaccines may have been related to community influences and widespread misinformation. One

man who was an Ebola survivor, when asked why he chose not to receive the Covid-19 vaccine,

said, "People were saying a lots of negative things. That was reason I was afraid." Another

man, also an Ebola survivor, shared why he refused to receive the vaccine:

"I was scared about the complaints circulating among people. For instance, there were rumors suggesting that if you consented to receive the vaccine, you would be injected with the actual illness."

A nurse in a focus group elaborated:

"Do you remember the COVID vaccine- a lot of people, because they misunderstand the information and believed that if you take the vaccine, it will cause a lot of bad things. Many people distrusted the vaccine. Therefore, public information and education are crucial to ensure that people understand the correct information about the vaccine and feel confident in taking it. This will encourage more people to get vaccinated."

Anxiety and fear of side effects was another important factor that impacted vaccine decision-

making. One woman, a mother whose children had had EVD, shared:

"Some people refused to take the vaccine because they were afraid. Some said that if they took it, they would become dizzy and unable to do to do anything – that was the reason they were afraid."

Another woman, an EVD survivor, shared a similar perspective:

"Some people reported feeling better after receiving the vaccine. However, there are also complaints from others who claim that their overall health has deteriorated since getting vaccinated. These accounts made me anxious, leading to my decision to decline taking the vaccine."

Another concern, outside of side effects, which deterred people from receiving the vaccination was cost. While most people were aware that the Covid-19 vaccine was available free of charge, a few people expressed confusion about the cost. One woman, who had had EVD, said:

"I heard that they are giving it free but some people say they are paying for it. I have not taken it yet. I am just hearing it from people."

# Discussion

This study presents novel qualitative research conducted in Sierra Leone following the Ebola outbreak, focusing on healthcare trust, utilization patterns, and perceptions of healthcare workers, including their role in Covid-19 vaccine uptake. A central focus of the study was understanding the relationship between trust, mistrust, and decision-making in healthcare. While overall trust in healthcare was high, nuanced perceptions of healthcare workers emerge, with affordability, accessibility, and availability being key drivers of healthcare utilization for infected and affected participants in the study.

Overall, most people in the sample, both infected and affected by Ebola, expressed trust in the healthcare profession. Justifications for this trust were infrequent; a few individuals referenced beliefs in the thoroughness and accuracy of diagnostic methods and treatment plans, indicating an overall faith in the healthcare system's capability to address illnesses effectively. Justifications for any mistrust were similarly brief and often stem from prior experiences, such as residual mistrust during the Ebola outbreak or instances of ineffective treatments and prolonged symptoms despite care.

Unlike the brief responses regarding trust in the healthcare system overall, people exhibited a greater willingness to expand upon their trust or mistrust regarding individual doctors, often connecting it to their personal experiences with healthcare and experiences of community members.

People described an overall increased trust in healthcare workers in the years following the 2014-2016 Ebola outbreak. Initially, reactions during the Ebola crisis were characterized by fear and skepticism towards healthcare. Positive experiences with healthcare workers improved community trust over time, sentiments which are supported by findings in previous studies (Collier et al., 2024; Yamanis et al., 2016). Many credited healthcare workers for their tireless efforts in saving lives. Witnessing successes, contrasted with the failures of traditional healers mentioned in some interviews, played a pivotal role in fostering trust. Community events also played a role in people's trust; the death of a traditional healer and the spread of Ebola at their funeral was described as a pivotal moment in fostering trust in formal healthcare for the larger community.

The Ebola outbreak put additional stress on an already-strained healthcare system (Stone et al., 2024). Despite high levels of trust in healthcare workers stated in interviews, the shadow of Ebola continued to influence people's perceptions of the healthcare system's capabilities and their own abilities to access quality care. Many individuals highlighted persistent challenges, including depleted resources, extended wait times, rising costs, and insufficient care for survivors, which fueled their skepticism about the effectiveness of the healthcare system. Although hesitant to directly link these perceptions to a diminished overall trust in healthcare systems or healthcare workers, individuals noted that these access challenges were reasons for not seeking the healthcare they perceived as the most beneficial. Trust in healthcare systems did not always translate into utilization or Covid-19 vaccine uptake.

Financial constraints emerged as the most prevalent barrier to accessing healthcare, exacerbated by the economic fallout from Ebola due to business closures, loss of family breadwinners, and community exclusion (Crea et al., 2022; McLean, 2020). Interviews revealed that prohibitive costs consistently led individuals to forego pursuing healthcare options despite being deemed trustworthy or optimal. People's decision-making was also impacted by facility resource scarcity, including insufficient rooms and beds, expired medication, and insufficient staffing. For Ebola survivors, these challenges were further exacerbated by persistent health issues and the challenges accessing services that were previously free of charge.

Consequently, many individuals prioritized visiting pharmacies, and resorting to hospitals only after exhausting more affordable alternatives. Pharmacies provided some symptom alleviation, but people shared about the general lack of quality of care and limited effectiveness of treatments they typically received at pharmacies. Their utilization of pharmacies supports other research which underscores the major public health role of pharmacies throughout sub-Saharan Africa (Gebresillassie et al., 2023). Training of pharmacists and quality of care varies widely across the region; some pharmacies offer comprehensive care, including medical screenings and follow-up, while others provide inconsistent care or incorrect information to patients, often with little oversight (Gebresillasie et al., 2023; Gonsalves et al., 2019).

There is limited research exploring the impact of pharmaceutical care on health outcomes in the region (Gebresillasie et al., 2023), although some research links pharmaceutical care to public health concerns, such as over prescription of antibiotics (Otieno et al., 2022; Sulis et al., 2020). Moreover, the role of pharmacies as vaccination sites is also not well-studied (Yemeke et al., 2021). While optimal health outcomes are associated with pharmacist support in hospital settings and in collaboration with doctors (Otieno et al., 2022), findings from these interviews underscore that pharmacies in the region operate independently.

While individuals generally expressed trust in vaccines overall, attitudes towards the Covid-19 vaccine varied, reflecting a lack of urgency towards the disease itself and a general fear about side effects that outweigh the vaccine's benefits. In sub-Saharan Africa, the observed absence of exponential Covid-19 infection growth and low mortality rates (Adams et al., 2021; Bamgboye et al., 2021) may suggest that Covid-19 was not as prevalent as in other parts of the world. Conversely, these patterns may reflect challenges in Covid-19 testing and tracing (Adams et al., 2021; Peeling et al., 2021), leading to underreporting and misattribution of symptoms to endemic diseases such as malaria (Wilairatana et al., 2021) and perceptions of low risk of Covid-19 (Aduh et al., 2021).

In line with other studies on Covid-19 vaccine hesitancy sub-Saharan Africa (Ackah et al., 2022), many participants expressed concern about potential side-effects, shaped by personal experience and community discussions. Misinformation about vaccine costs and availability exacerbated fears, leading some to decide that risks outweighed the benefits of the vaccine.

Those who chose to receive the Covid-19 vaccine attributed their decision to receive the Covid-19 vaccine to guidance from vaccinated healthcare workers. These efforts included sensitization campaigns by healthcare workers during other medical encounters, as well as through door-to-door outreach and media campaigns, conveying the vaccine's safety, effectiveness, and accessibility. While media campaigns and public health announcements influenced some, face-to-face interactions with trusted healthcare providers were pivotal for many in deciding to receive the Covid-19 vaccine, especially with healthcare providers who explained their own vaccination status and current health. This supports prior research in Sierra Leone that showed the effectiveness of face-to-face and community-driven efforts in containing EVD (Collier et al., 2024), and the importance of messaging coming from trusted community members (Patterson, 2018).

This is especially notable considering the previously described barriers to accessing quality healthcare from trusted providers, as well as the siloed nature of pharmaceutical providers who may not provide vaccine information or administer vaccinations. Without these crucial conversations with healthcare providers, concerns about vaccine side effects and a lack of awareness regarding the severity of the disease contributed to hesitancy or reluctance to get vaccinated. Addressing access barriers and integrating vaccination outreach and services within pharmacies could potentially increase confidence in and utilization of vaccines.

### Limitations

This study primarily examined the effects of the EVD epidemic on present healthcare utilization and COVID-19 vaccine uptake. However, it is important to acknowledge that the EVD epidemic concluded in 2016, and risk perception of COVID-19 has decreased in recent years compared to the heightened awareness closer to the onset of the outbreak in 2020 (Lazarus et al., 2023). As a result, the findings may not fully capture the evolving dynamics and perceptions surrounding healthcare utilization and vaccine acceptance in the context of the ongoing pandemic.

Another limitation of the study is the potential for bias. The proposal development was led by U.S.-based researchers, though the team worked closely with Sierra Leone-based researchers throughout the process. Furthermore, FGDs and KIIs were conducted by local researchers, ensuring cultural and contextual relevance during data collection.

Finally, while COVID-19 vaccines were approved and became available in Sierra Leone in 2021, the initial supply and distribution were extremely limited. This scarcity likely affected participants' access to the vaccine and shaped their experiences and perceptions, which may have influenced the findings.

## Conclusion

This study provides an insight into healthcare decision-making, revealing overall high levels of trust in healthcare institutions but persistent and prominent barriers to utilization, including high costs and under-resourced healthcare facilities. While people may have trust for childhood vaccinations, Covid-19 vaccines are not universally accepted, and people's fear of side effects often outweigh any potential benefits to vaccination. Given participants' emphasis on pharmaceutical care and the importance of face-to-face interactions with healthcare workers for vaccine uptake, further research is needed to investigate the accessibility of vaccination services in pharmacies. While the availability of vaccines in hospitals and clinics is well-documented, understanding the utilization of pharmacy-based vaccination services and the factors influencing individuals' decisions to receive vaccines in these settings requires further exploration.

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#### Chapter 4

Paper 3: An exploration of community and healthcare worker perceptions and utilization of traditional healers within healthcare interventions before and after EVD.

# Background

Countries in sub-Saharan Africa face a disproportionate disease burden from infectious diseases, exacerbated by environmental and systemic factors, such as underfunded healthcare systems and a legacy of colonial resource extraction which has left many countries dependent on foreign aid (Drobac et al., 2013). The introduction of Western medical institutions during colonial times often maintained and codified the classification of local communities as disease vectors and favored the health of Europeans at the expense of local communities (Greene et al., 2013; Tilley, 2016). For much of colonial history, healthcare institutions were inaccessible to the local community (Greene et al., 2013; Prince & Marsland, 2014).

As African nations won independence, they were often left with neglected and underfunded government healthcare and sanitation infrastructures (Prince & Marsland, 2014) and extractive power dynamics remained between former colonies and colonizers. Many sub-Saharan countries remained reliant on their former colonizers for basic necessities, including hospital equipment imported at high prices (Cooper 2019; Drobac et al., 2013). International organizations, such as the World Health Organization (WHO), UNICEF, GAVI, and Médecins Sans Frontières (MSF) continue to play a major role in healthcare development and maintenance, and the field of global health today is intrinsically tied to the priorities of numerous stakeholders, including funders and political actors in high-income countries (Greene et al., 2013).

In the context of underfunded and limited healthcare options from hospitals and clinics, traditional healers remain a preferred method of healthcare for many people (Gyasi et al., 2017;

Olson & Sargent, in Stroeken et al., 2017). These traditional healers include herbalists, diviners, and faith healers (Redvers & Blondin, 2020). Traditional healers play a critical role in the treatment of disease, and that healthcare frequently involves an integrated approach of both traditional and biomedical therapies in order to provide complementary services (Asiimwe et al., 2023; Olson & Sargent, in Stroeken et al., 2017). For example, a study in Tanzania explored how diabetes patients often integrated traditional herbal remedies into their diets concurrently with available medications (Kasole et al., 2019). Another study in urban Suriname found that people typically consulted with both doctors and traditional healers for ailments, relying more heavily on traditional herbal remedies for fever, hypertension, headaches, and urinary tract infections despite the availability and affordability of pharmaceutical interventions (Van Andel & Carvalheiro, 2013). In the United States and other high-income countries, traditional and alternative medicines such as probiotics, herbal remedies, and dietary supplements are widely used for health purposes, including digestive health and pain relief (Vanderhoof et al., 2008; Tangkiatkumjai et al., 2020)

Trust influences health-seeking behavior. Research has shown that trust in formal healthcare is associated with increased utilization and better health outcomes (Birkhäuer et al., 2017). When people trust formal healthcare providers, they are more likely to seek treatment, adhere to prescribed medications, and participate in preventative health measures such as vaccinations and screenings (Birkhäuer et al., 2017). In turn, these health behaviors can lead to improved public health outcomes, reduced morbidity and mortality rates, and better management of chronic illnesses (Baker et al., 2020). Conversely, trust in traditional healers can have complex implications for health outcomes and healthcare utilization, particularly in areas where formal healthcare options are limited or inaccessible.

Trusted community leaders, which can include traditional healers, can operate collaboratively with formal healthcare and public health protocols to provide complementary services and address public health crises (Collier et al., 2024). However, when traditional healers operate separately from formal healthcare, this trust may result in delays seeking medical care (Moshabela et al., 2017). Additionally, the practices of traditional healers may not be evidence-based, leading to ineffective or harmful treatments and poor health outcomes.

## Gaps in research

While exploration of traditional healthcare is growing, there is a gap in the literature regarding the overall usage and evolving perceptions of traditional, biomedical, and integrated medicine in sub-Saharan Africa (James et al., 2020a; James et al., 2020b). Most existing studies are focused on middle-income countries such as Nigeria, Ghana, and South Africa, rather than low-income countries like Sierra Leone (Greene & Colucci, 2020). Research on traditional healing practices in Sierra Leone is limited (Bakshi et al., 2013), and much of the available literature relies on brief one- or two-question surveys (Bakshi et al., 2013; James et al., 2020a).

To optimize health outcomes, a more holistic analysis of healthcare trust and utilization in Sierra Leone is crucial, which necessitates a deeper exploration of the role of, and trust in, traditional healers. Currently, there is limited understanding of the drivers behind traditional healing practices, the specific roles of traditional healers, and the extent of trust placed in them. Although existing literature highlights a correlation between mental health and trust in healthcare systems (Klest et al., 2019) and recognizes that poor mental health can impact treatment adherence (Rooks-Peck et al., 2018), much of this research centers on formal healthcare systems, leaving a gap in addressing alternative practices such as traditional healing in sub-Saharan Africa. A historical perspective is also necessary to understand current perceptions of healthcare, particularly in light of how the EVD epidemic may have reshaped community attitudes toward both formal healthcare and traditional healers.

### Study context

This study focused on families in Sierra Leone, a sub-Saharan country in Africa with a history of infectious disease outbreaks resulting in widespread infection and social disruption. Sierra Leone has a complex colonial history; former slaves were brought to the colony after the slave trade was abolished in Britain in 1807 and the area remained under British colonial rule until 1961. In the decades following independence, Sierra Leone experienced authoritarian rule, military coups, and a Civil War from 1991-2002, which resulted in widespread civilian death and displacement, as well as forced recruitment of children into armed forces (Farmer, 2020).

The 2014-2016 Ebola Virus Disease epidemic (EVD) strained an already overburdened healthcare system, resulting in critical resource scarcity, such as limited personal protective equipment for providers, and leading to a disproportionate number of healthcare worker deaths (Cohen & Gex, 2015). Top-down public health efforts to quarantine exacerbated existing fear and mistrust of formal healthcare (Collier et al., 2023; Enria et al., 2020). The outbreak profoundly impacted various facets of people's lives, including widespread unemployment, food insecurity, and scarcities in essential resources, including healthcare personnel (Sellu, 2023). The epidemic also impacted people's mental health, leading to depression and anxiety among affected populations due to experiences during the outbreak and subsequent social stigma (Cénat et al., 2023; Crea et al., 2022; Jalloh et al., 2018).

In Sierra Leone, traditional medicine is commonly used to aid lactation for breastfeeding mothers and to alleviate symptoms of ailments such as malaria, diarrhea, and pneumonia (Diaz et al., 2013; James et al., 2020a; Ranasinghe et al., 2015). Much of the existing literature exploring

traditional healthcare utilization in Sierra Leone focuses on quantitative measures of prevalence, as opposed to reasons for utilization, perceptions of quality of care, or other contextual factors (James et al., 2020a; Ranasinghe et al., 2015). One qualitative study does delve into reasons people may utilize traditional remedies, describing the unavailability of necessary medicine at hospitals and clinics, as well as perceptions that if one were to go to a formal hospital or clinic, necessary therapies would be unavailable or prohibitively expensive (Diaz et al., 2013). During the 2014-2016 EVD outbreak, traditional healers were preferred by many due to affordability and accessibility (Enria et al., 2020) and perceived quality of care (Miller et al., 2018). One study in Sierra Leone found low rates of Covid-19 vaccine uptake, despite availability, with some people turning to herbal remedies as protection and treatment against Covid-19 (Kabakama et al., 2022). *Theoretical framework* 

This study focused on the role of traditional healers in current healthcare practices today in order to understand factors that inform healthcare decision-making. This study's research questions were informed by the Health Belief Model, a public health value-expectancy theory that aims to explain and predict health behaviors (Champion & Skinner, 2008). The Health Belief Model has six constructs: perceived susceptibility to experiencing a risk, perceived severity of the condition, perceived benefits, perceived barriers (both tangible and psychological), cues to action, and health motivation (Patwary et al., 2021). This framework was designed with formal healthcare (such as hospitals and clinics) in mind, but has been used to explore why, how, and when people decide to seek formal health care versus traditional healers for their care (Sahoo & Pradhan, 2021; Ribera, 2007).

Study objectives

The objective of this study was to explore community and healthcare worker perceptions of traditional healers within healthcare interventions and how engagement with traditional healers may have changed since the outbreak of EVD. This study used quantitative and qualitative analysis to address the following research questions:

### 1. What is the level of trust in traditional healers compared to healthcare workers?

- 2. What factors predict trust in healthcare workers and traditional healers?
- 3. What role do traditional healers play in healthcare right now?

How, if at all, has engagement with traditional healers changed since EVD?

The hypotheses of the quantitative component of this study were that lower mental health scores would be associated with lower trust in both traditional healers and formal healthcare workers, and that having survived EVD and having a child who survived EVD, would be associated with higher trust in formal healthcare workers and lower trust in traditional healers. *Methods* 

#### Study design

This study employed a mixed-methods approach with a convergent parallel design, wherein quantitative and qualitative data are collected and analyzed independently but concurrently (Creswell, 2013). Equal weight was given to both types of data, allowing for comparison and contrast of results to look for convergence and divergence (Creswell et al., 2003; O'Cathain et al., 2008). This approach allowed for triangulation of findings, and was used in this study because one single method would not be sufficient to capture the holistic picture of trust and utilization of traditional healers in Sierra Leone. The results of this study were reported in accordance with the Good Reporting of a Mixed Methods Study (GRAMMS) framework (O'Cathain, et al., 2008). Quantitative data came from a longitudinal NICHD-funded study (#R01HD096699; PIs: Thomas M. Crea, PhD and John S. Schieffelin, MD). The existing study included an initial sample of adults (n=663) throughout Sierra Leone, and only participants who completed both waves of data were included for this sample. Wave 1 was completed in May of 2022, and Wave 2, was completed in April 2023. Questions around trust in formal healthcare workers and traditional healers were added for the purpose of this study. All questions were translated into Krio and quantitative data was collected electronically in REDCap.

Qualitative data was collected in August of 2023 in Freetown, Sierra Leone, as part of a study funded through Boston College Vice Provost Office (PI: Oladoyin Okunoren, MSW, LCSW; Co-PI Thomas M. Crea, PhD). Qualitative data consisted of two focus group discussions (FGDs) of healthcare providers (n=6 and n=4), and key informant interviews (KIIs) with caregivers who were EVD survivors (n=16) and affected caregivers (n=4). Affected individuals are caregivers who had children with EVD but were not themselves infected. Each group (healthcare worker, community member) had targeted question guides, exploring perceived extent and drivers of healthcare trust and vaccine hesitancy before, during, and after EVD (see Appendix D). All interviews were conducted in Sierra Leonean Krio, audio-recorded and transcribed into Krio with identifying information removed, and then back translated into English following World Health Organization protocols (Toma et al., 2017). Transcriptions were reviewed by the project manager and research assistants for accuracy.

All data collectors for both data sets were Sierra Leonean with previous experience as research assistants (RAs) and who were trained in data collection and consent procedures. Due to low community literacy rates, participants had the option to read consent forms themselves or have them read to them by RAs.

# Sampling

## Quantitative sampling

The quantitative component of this study included all <u>adult caregivers (n=663)</u> of children aged 10-17 enrolled in the NICHD-funded parent study. Caregivers were sampled on a 1:1 basis. <u>Inclusion criteria for caregivers</u> included (a) being primary caregiver of the child participant; (b) being older than 20 years of age; (c) cohabitating with the child participant; and (d) living with the child as caregiver for the previous year. <u>Exclusion criteria</u> for caregivers were: not being either a biological parent or guardian caregiver of an enrolled child.

## Qualitative sampling

To deepen the understanding of perceptions and utilization of traditional healers, healthcare decision-making, and healthcare trust, focus groups and key informant interviews were collected. Focus group discussions were conducted with healthcare workers (including doctors and nurses) who practiced during the 2014-2016 EVD epidemic. Key Informant interviews were collected with caregivers who were infected with EVD (n=16) as well as caregivers who were not themselves infected but their children were (n=4).

#### *Ethics approval*

Data used in this study was from an ongoing study which has received approval from Boston College and Tulane University IRBs, as well as the Sierra Leone Ethics and Scientific Review Committee. An amendment was submitted to review boards with the additional qualitative interview guide, which was be an addition to the study. See Appendix A for information regarding protection of human subjects throughout the study.

Measures

Quantitative measures

The outcome measure for the quantitative component of this study was the Adapted Wake Forest scale (Hall et al., 2006), collected at Wave 2. This is a measure of self-reported trust, and was asked twice to all participants: once to assess trust in formal HCW and once to assess trust in traditional healers. The Adapted Wake Forest Scale is a 5-item questionnaire (5-point Likert; Cronbach alpha= .72), and healthcare trust was calculated by mean score following variable protocol (Hall et al., 2006). These scales were administered to all participants except those from Kenema, where they were inadvertently omitted from the questionnaire (6% of participants). There were no other instances of missing data from participants from other districts.

Independent measures for this study included self-efficacy, helplessness, anxiety and depression, economic status, type of residence, district, child and adult survivor status, and gender, all collected at Wave 1.

<u>Self-efficacy and helplessness</u> were operationally defined as the two subscales of the Perceived Stress Scale (Cohen et al., 1983): self-efficacy (4 questions, Cronbach's alpha = .85) and helplessness (6 questions, Cronbach's alpha = .81). These subscales are used to assess stress levels in young people and adults aged 12 and above, evaluating the degree to which an individual has perceived life as unpredictable, uncontrollable and overloading over the previous month. Positive items were reverse coded, resulting in values that can range from 0 to 3, with 0 representing the lowest possible self-efficacy or helplessness and 3 representing the highest possible self-efficacy. All 663 participants completed these scales.

<u>Anxiety and depression</u> were operationally defined by two subscales of the Hopkins Symptom Checklist (Derogatis et al., 1974): anxiety (10 questions, Cronbach's alpha = .86) and depression (15 questions, Cronbach's alpha .88), with all questions on a 4-point Likert. Some data was missing from these two scales: two cases (0.3%) for Anxiety and ten cases (1.5%) for Depression. Listwise deletion was used to manage these cases. Positive items were reverse coded, resulting in values that can range from 0 to 3, with 0 representing the lowest possible anxiety or depression and 3 representing the highest possible anxiety or depression.

Economic Status was calculated using a 10-item Wealth Index questionnaire created for the parent study, based off of Demographic Health Surveys wealth index (Fisher & Way, 1988). It involves questions regarding sources of drinking water and cooking fuel, type of toilet facility, availability of household appliances and technology such as cell phones and vehicles, main flooring and roofing material, and ownership of agricultural land. Index for each house was a weighted summation; principal component analysis was run three times, with three indices calculated: once each for all households, rural households, and urban households. The composite wealth index was regressed on the rural and urban indices to develop weights to create a wealth index comparable across rural and urban areas. Upon conducting sensitivity analysis, the composite index was divided into quintiles, with each income quintile containing 20% of the total sample. There were no missing cases for this variable.

<u>Survivor status</u> referred to whether the individual had contracted Ebola during the 2014-2016 outbreak (yes/no). <u>Child survivor status</u> referred to whether the caregiver's child, who was a focal point of the parent study, had been infected with and survived Ebola (yes/no). There were no missing cases for either of these variables

Control variables for this study included type of residence (urban or rural), district, and gender. Place of residence was dichotomous, split between urban (n=419) and rural (n=270) residence. Districts in this study included Western Area Urban, Western Area Rural, Kailahun, Port Loko, and Bombali. Gender is dichotomous, male or female. There were no missing cases for district of gender, but there were 5 cases missing from the type of residence variable (0.7% of all cases). These were accounted for with listwise deletion.

## Data analysis

### Quantitative data analysis

For the quantitative part of this study, there were two outcome variables of interest: the mean scores of (1) trust in formal healthcare and (2) trust in traditional healers. Research assistants from Sierra Leone and the United States checked data for consistency and completeness during data collection in order to identify missing data. Missingness was handled with listwise deletion.

Seemingly unrelated regression (SUR) was used to account for interrelations between trust in traditional healers and trust in formal healthcare. SUR is a generalized linear regression model that emerged from econometrics that consists of multiple regression models, each with a different dependent variable. SUR is particularly useful when dealing with multiple equations that are assumed to be related; by estimating equations jointly, SUR allows for more efficient parameter estimates and corrects for any possible correlation among error terms (Zellner, 1962). I then assessed for multicollinearity using the variance inflation factor (VIF) for each model.

#### Qualitative data analysis

Qualitative analysis followed an approach informed by grounded theory (Creswell & Poth, 2016), which allows for the development of theories grounded in data, and employed a four-step analytic strategy derived from thematic content analysis (Smith et al., 1992). This strategy was designed to ensure that the analysis was systematic, transparent, and reflective of participants' experiences. A coding scheme was developed in collaboration with a research assistant and was structured around key thematic elements identified in the research questions. The coding scheme was iteratively refined throughout the process to ensure it accurately

captured the diversity of participant responses and remained responsive to emerging insights from the data.

To ensure rigor and trustworthiness, the team adopted several strategies. First, multiple researchers were involved in the coding process, with each team member independently coding a portion of the transcripts using Nvivo (QSR International, 2010), a qualitative analysis software. This step was crucial for examining intercoder reliability, and to assess the consistency of coding, a Cohen's kappa coefficient of 0.80 or higher was used as the threshold for achieving acceptable reliability. Once the team achieved this level of agreement, the full set of transcripts was coded collaboratively by the team.

## Integrated interpretation

Taken together, quantitative and qualitative results provided insight as to the current climate of healthcare utilization, decision-making around traditional healer utilization, changes since the EVD epidemic, and areas of current and potential collaboration between formal and traditional healers. Integration took place post-analysis, at the interpretation stage, involving the identification of similarities and differences, merging results, and discussing the implications across both levels of analysis.

### Results

#### *Quantitative findings*

#### **Demographics**

Table 1. Descriptive Statistics for Variables in SUR

Variable	Freq (%)	Mean (SD)	Min	Max
Trust in Formal		2.40 (.50)	1.2	3.2
Healthcare Workers				
Trust in Traditional		1.74 (.68)	.4	3.4
Healers				
Self-Efficacy		1.51 (1.06)	0	4
Helplessness		.94 (.76)	0	3.17
Anxiety		1.54 (.50)	1	3.2

Depression		1.52 (.47)	1	3.47
Type of Residence				
Rural	263 (39.97%)			
Urban	395 (60.03%)			
District				
Western Area	120 (18.10%)			
Urban				
Kailahun	70 (10.56%)			
Port Loko	225 (33.94%)			
Western Area	79 (11.92%)			
Rural				
Bombali	131 (19.76%)			
Wealth Index				
1 <sup>st</sup> quintile	132 (20.06%)			
2 <sup>nd</sup> quintile	132 (20.06%)			
3 <sup>rd</sup> quintile	131 (19.91%)			
4 <sup>th</sup> quintile	132 (20.06%)			
5 <sup>th</sup> quintile	131 (19.91%)			
Carer Infection Status				
No	438 (66.06%)			
Yes	225 (33.94%)			
Child Survivor Status				
No	441 (66.52%)			
Yes	222 (33.48%)			
Gender				
Male	182 (27.45%)			
Female	481 (72.55%)			

Table 1 summarizes the descriptive statistics of each variable in the study. The sample was 72.55% female, and 60.03% urban. Roughly one-third of adults (33.94%) were Ebola survivors.

## Bivariate analyses

Table 2 shows bivariate analyses between the two trust variables (trust in formal healthcare and trust in traditional healers) and the four mental health variables (self-efficacy, helplessness, anxiety, and depression). A negative correlation between all mental health variables and trust in traditional healers was observed, which was statistically significant for self-efficacy (p<0.001), helplessness (p<0.01), and anxiety (p<0.05), but not statistically significant for depression. Conversely, all mental health variables had a positive correlation with trust in formal healthcare, which was statistically significant for self-efficacy (p<0.001) and anxiety (p<0.01). Some correlation was observed between mental health variables in the model, with small

coefficient values between self-efficacy and the other mental health variables, but larger coefficients between anxiety and depression, between helplessness and anxiety, and helpless and depression, which had coefficients greater than 0.5. Correlations between all mental health variables were statistically significant (p<0.001).

Table 2. Correlation matrix between trust variables and mental health variables

	Trust in formal healthcare workers	Trust in traditional healers	Self-efficacy	Helplessness	Anxiety	Depression
Trust in formal	1.00					
healthcare workers						
Trust in traditional healers	-0.54***	1.00				
Self-efficacy	0.16***	-0.27***	1.00			
Helplessness	0.06	-0.12**	0.44***	1.00		
Anxiety	0.13**	-0.10*	0.32***	0.63***	1.00	
Depression	0.04	-0.06	0.30***	0.65***	0.76***	1.00

\* p < .05, \*\* p < .01, \*\*\* p < .001

## Regression analysis

To test for general heteroscedasticity and multicollinearity, regressions were run separately with post-hoc tests before SUR was conducted. Both Breusch-Pagan test and the Cameron-Trivedo decomposition revealed *p*-values that are less than 0.05, leading to rejection of the null and conclusion that there was some evidence of heteroscedasticity with dependent variables. To account for this, robust standard errors were used in the final SUR model to address heteroscedasticity. Multicollinearity was not an issue, as VIF was under 10 (VIF = 1.87).

As a statistical indicator of proportion of variance in the independent variables predictable from the dependent variables, the R<sup>2</sup> showed us that our predictors explained 12.7% of the variation in formal healthcare trust. Our regression model predicting trust in traditional healers explained 14.2% of the variation in trust levels.

#### Mental health dependent variables

Table 3 provides the results of the final SUR model. Across both models, self-efficacy was a significant predictor of trust. As a predictor of formal healthcare trust, higher self-efficacy was associated with slightly increased trust in formal healthcare workers (b= 0.053; p<0.01). Higher self-efficacy was associated with decreased trust in traditional healers (b= -0.158, p< 0.001). Increased anxiety was associated with increased trust in formal healthcare (b=0.164; p< 0.01). Depression and helplessness were not statistically significant predictors in either model.

### Ebola Exposure

Two variables in this model looked at experiences during the 2014-2016 Ebola outbreak: the individual's own infection status, and the infectious status of the individual's child. The individual's own infection status was not a significant predictor of either formal or traditional healers, although one's child's infection status was a significant predictor of trust in traditional healers, such that, on average, having a child who tested positive for Ebola was associated with higher trust in traditional healers (b=0.234; p<0.001).

## **Covariates**

Covariates of interest in the model were gender, type of residence (urban versus rural), district, and wealth index (quintiles). Gender was not a significant predictor in either model. Type of residence was a significant predictor of trust in formal healthcare, such that living in an urban environment was associated with lower trust in formal healthcare (b= -0.240, p<0.001).

Western Area Urban was the control district in this study. Living in Port Loko and living in Bombali were significant predictors of lower trust in formal healthcare and higher trust in traditional healers. Living in Port Loko was associated with lower trust in formal healthcare (b= -0.270; p< 0.001) and higher trust in traditional healers (b= 0.239; p<0.01). Similarly, living in Bombali was also associated with lower trust in formal healthcare (b= -0.2581 p<0.001) and higher trust in traditional healers (b= 0.242; p<0.01). Living in Western Area Rural was significantly associated with lower trust in formal healthcare (b= -0.232 p<0.01), but was not a significant predictor of trust in traditional healers.

Respondents in the second lowest quintile (as compared with those in the lowest quintile) had lower trust in formal healthcare (b= -0.181, p<0.01); there was no other statistical significance within the wealth index quintiles.

	Trust in Formal	Trust in Traditional
	Healthcare $(n=584)$	Healers (n=584)
	b(SE)	b(SE)
Self-Efficacy	0.053(0.020) **	-0.158(0.027) ***
Helplessness	-0.023(0.037)	-0.020(0.051)
Anxiety	0.164(0.061) **	-0.076(0.084)
Depression	-0.111(0.064)	0.084 (0.083)
Type of Residence		
Urban	-0.240(0.050) ***	0.080(0.063)
District (Western Area Urban as reference)		
Kailahun	-0.129(0.087)	0.089(0.119)
Port Loko	-0.270(0.065) ***	0.239(0.087) **
Western Area Rural	-0.232(0.079) **	0.096(0.100)
Bombali	-0.258(0.064) ***	0.242(0.084) **
Wealth index (first quintile as reference)		
Second quintile	-0.181(0.062) **	0.047(0.083)
Third quintile	-0.009(0.065)	-0.163(0.089)
Fourth quintile	-0.079(0.072)	-0.068(0.098)
Fifth quintile	-0.078(0.074)	-0.127(0.093)
Gender		
Females compared to male	-0.005(0.043)	-0.055(0.058)
Caregiver's infection status	0.033(0.041)	-0.005(0.059)
Child's infection status	-0.058(0.041)	0.234(0.058) ***
Constant	2.650(0.110) ***	1.820(0.143) ***
Log variance	-1.550(0.041) ***	-0.950(0.054) ***

Table 3. Seemingly Unrelated Regressions for Trust in Formal Healthcare and Traditional Healers

\* *p* < .05, \*\* *p* < .01, \*\*\* *p* < .001

# Qualitative findings

An inductive analysis revealed three primary themes related to our qualitative research question: people's trust and overall perceptions of traditional healers, their utilization of traditional healing methods for reasons other than perceptions of trust, and third, the integration of formal and traditional healthcare systems. One pattern of note within all three themes was that while people may say little about their own perceptions or utilization of traditional medicine (or may assert distrust and avoidance), they often described the trust of "the people who live in the provinces," as one man said, or spoke generally about other people. One man, an EVD survivor, shared:

"Naturally, some of us hold the perception that not all ailments can be cured solely by Western medicine, and without alternative approaches, many lives would be lost. Personally, I may not believe in it, but we've heard stories about such cases."

Another man, also an EVD survivor, echoed this, saying,

"People will tell you that when you are sick go to that [traditional healer], because he can prepare medicine for you. He is an herbalist, he is this, he is that, he will tell you what to do, but as for me I don't have time for traditional healers. I always go to the hospital or take tablets or get advice from a nurse."

## Trust and perceptions of traditional healers

Participants briefly described their trust, mistrust and overall perceptions of traditional healers, as well as the trust and mistrust that people in their communities felt. Most people discussed their own mistrust, but also made some mention of others in their community who may have more positive views of traditional healers. Reasons for mistrust included beliefs that traditional healers lied or purposely provided false information to patients to make a profit, that their practices actively harm people, and beliefs that they do not follow proper health protocols.

#### <u>Mistrust</u>

One man, an EVD survivor, expressed his mistrust, expressing a belief that traditional healers

were focused on making a profit, rather than on healing:

"Native doctors [traditional healers] are not good people. They will eat your money and tell you lies about what has happened to you, which is not true...Some people will only be sick with a cold but because of the paleness of their body the native doctor will tell them that it is a sign of witchcraft." Another man, who had not had EVD, shared a belief that traditional healer remedies caused more

harm than good:

"When you go [to traditional healers] they give you leaves which sometimes can be harmful to your life. So that is why I said they are scammers. It is just for the money they receive from people."

Trust

More rarely, people mentioned trust towards traditional healers. One man, sharing positive

experiences with traditional healers that people he knew experienced, shared,

"These remedies have become widespread, even being promoted by agents who market their businesses. Unlike in the past when you had to search in the bushes to find a traditional healer, nowadays people testify that their herbal medicines are effective. Through experiences like these, we develop trust in traditional healers."

One woman spoke generally about trends in the community which were trustworthy of both formal healthcare as well as traditional healers:

"Some people as soon as they are sick - they will not go to the hospital. They prefer to run first to the traditional healers because they trust them more."

Utilization of traditional medicine

Generally, throughout the interviews, people most commonly focused on herbal medicine. One

man, an EVD survivor, shared:

"Traditional healers often rely on leaves and herbs for their treatments. We can witness this when we visit our local markets, where you'll find various herbal remedies available for ailments like malaria."

Less frequently, people described other types of traditional medicine. Spiritualism was the

second most common type of traditional medicine described. One woman explained:

"They have diverse roles in addressing various illnesses. For instance, if someone believes they have been afflicted by a spiritual weapon like a "voodoo gun" (spiritual witch gun), they might consult a traditional healer to remove the supposed affliction. These healers possess a wide range of techniques and remedies to address different conditions and provide healing."

Effectiveness of treatment

Past experiences influenced people's decision-making process; for instance, the resolution of symptoms may have encouraged continued usage, while adverse effects or prolonged symptoms may have deterred individuals from seeking further traditional healthcare. One woman, an EVD survivor, shared that people in the community saw traditional healthcare as effective:

"When I get sick, I don't visit [traditional healers]. But other people visit them and I hear people saying, 'When I went to that traditional healer I got healed by the grace of God.' They believe them because they saw improvements after going to traditional healers."

One man shared a negative experience with traditional medicine that impacted his decision to

cease a certain traditional remedy:

"At times they will boil [herbs] in a pot without any prescription or measurement and ask you to drink it. Sometimes the outcome is dangerous to your health ...I used to buy this traditional medicine on the street. I can remember one time I drank a big cup of it and it affected my heart. I was not able to breathe fully for a very long time."

# Appropriateness for specific illnesses

People shared that traditional healer utilization may be more appropriate than hospitals for

certain needs, including, as one nurse explained, "mental health issues or drug addiction with

spiritual issues." One man, an EVD survivor, elaborated on this commonly held belief in his

community:

[Some people] have the perspective that certain illnesses do not require hospital treatment or injections. Instead, they believe in traditional healing methods. There are individuals in the community who hold this perspective, advocating for the use of traditional treatments for certain illnesses."

Another man, an EVD survivor, spoke of diseases that may not be responsive to formal

healthcare interventions:

"There are certain illnesses only the herbalist can treat, like devilish or evil spirits. They are able to attack those things and drive them from somebody or out of your way. There are some certain illnesses where you may be in hospital for a long time with no cure until you go to the herbalist."
#### Ebola and traditional healing

Some contrasting perspectives emerged as to the role of traditional healers during the Ebola outbreak and in treating Ebola. Many believed that Ebola wasn't a condition suitable for traditional remedies. Some people recalled this distinction being clear at the time. One woman, an EVD survivor, said:

"They knew that [Ebola] was not a traditional sickness. It was not an illness for them to cure."

However, some expressed frustration with traditional healers during Ebola, noting negative perceptions and disregard for regulations. Despite strict containment laws which banned traditional practices and gatherings which might spread Ebola (Lee-Kwan et al., 2017), people continued to seek traditional healers out. One woman, also an EVD survivor, said:

"These laws state that they should not have allowed strangers or anyone seeking their services without informing the authorities or the public. However, some traditional healers did not abide by these regulations. They would still encourage people to come and pay for their services, even if they couldn't heal the sickness. For instance, they wouldn't disclose that someone had Ebola as long as they were paid. This disregard for the law and the encouragement of improper practices should have been stopped. Traditional healers should have guided people to the right places, informed them about the government's directives, and declined their offerings, stating that it was not within their area of expertise. Unfortunately, none of these actions were taking place, and people were even dying secretly under their care."

#### Accessibility

Though participants were asked about trust, people generally focused on practical considerations which impact utilization, including accessibility challenges. The most common access challenge people mentioned was cost. A nurse in a focus group described the expenses involved with visiting hospitals and pharmacies, and why people may decide to visit traditional healers:

"Some areas result in people seeking the help of traditional healers due to financial challenges that prevent them from going to the hospital and paying for medical services...They may offer local food gifts like sheep, goats, or fowl as a form of payment.

The traditional healer would accept these gifts. However, hospitals do not tolerate such practices."

Traditional healers often charged steep fees, yet people may have perceived these costs as onetime expenses which provided immediate symptom relief, compared to the ongoing and costly visits to hospitals. The fear of receiving diagnoses like tuberculosis or HIV/AIDS, which necessitated prolonged and expensive treatments, further influenced individuals' decisions to explore alternative healthcare options either as substitutes for formal healthcare or after exhausting resources without improvement. In a focus group discussion, a nurse highlighted the frustrations with hospital processes, citing delays and length time frames for receiving attention. Traditional healers, she said, were often more convenient for people:

"The time frame for receiving immediate attention [from doctors] may seem lengthy, whereas traditional healers are often readily available. You can bring whatever resources you have to the traditional healer, and they will immediately provide you with a solution, such as cutting a leaf or preparing an herbal remedy"

Others described how, with limited resources, turning to traditional healers may be seen as the only feasible option. One woman shared:

"Some people express sentiments such as, "Rather than spending money at the hospital without seeing any improvement, I would prefer to visit a traditional healer."

The Ebola outbreak exacerbated existing difficulties by further depleting already limited resources. People were told that clinics were not treating people for non-Ebola related ailments, leading to people "reluctantly visiting" traditional healers.

Integration of traditional and formal healthcare

Interviews and focus groups consistently revealed a common pattern: formal and

traditional healthcare systems were typically depicted as separate and distinct entities, which

were siloed from each other. Yet, traditional healers, hospitals, clinics, and pharmacies were all

seen as healthcare options, and people would generally pick one path first, based on

convenience, accessibility, or confidence in its success. People may start by visiting an herbalist and if that does not work, may then choose to visit a pharmacy or a hospital. The opposite may also happen; a person may visit a traditional healer after exhausting formal healthcare options. One man shared,

"Some people do go to herbalists to try the traditional methods until they tired of it, before going to the hospital to be treated by nurses and doctors."

Formal healthcare workers also considered their work siloed from that of traditional healers. Healthcare workers and traditional healers did not communicate with each other to design healthcare plans for patients. In focus group discussions, formal healthcare workers described their perspective of traditional healthcare in Sierra Leone. Though traditional healers were not interviewed, formal healthcare workers describe mistrust and tension between the two groups, limiting collaboration. One nurse said:

"There is no trust, because of issues related to confidentiality. The local healer wants to maintain their business and position as the boss... There is a struggle between the two sides. [At the hospital] when you come, they will say I cannot do anything without laboratory tests but [traditional healers] will quickly intervene and diagnose. Everyone starts believing [traditional healers] without evidence and when they can't deliver, they will start to say "Well, I have tried my best, but the gods could not find a solution for it." They don't tell you that they are unable to help, but rather that the gods won't allow it. So, then, the patient will return to the hospital. The hospital will give medical treatment and they will get well, which then the patient may start doubting the situation."

A doctor shared an example of the consequences of the existing siloed nature of traditional and

formal healthcare systems, which have led to confusion and misinformation among patients:

"He was supposed to come two or three times a week ... He said he did not have money for the treatment. I did not know that he had been going to a traditional healer and was drinking herbs.... [the traditional healers] say that he did not have a kidney problem and the doctors want to kill him. Eventually, he died. We had thought he stopped coming because of cost but later we found out that he was a wealthy man and was misled."

Though many community members and HCWs in interviews say that the best, and only, course

of action ought to be visiting a hospital, traditional healers persist as a preferred healthcare

option for many people throughout the community. People – including formal healthcare workers - describe their hope for integrated, or streamlined care and communication between providers, which could improve health outcomes in the community. When asked about the role, or potential role, of traditional healers during an outbreak like Ebola, one man who was an Ebola survivor said,

The only way the government could have potentially involved traditional healers in the fight against Ebola by engaging them in collaborative efforts within the hospital setting."

When asked about any potential for integrated healthcare, healthcare workers in focus groups explained that currently, traditional healers weren't treated by the government as part of the healthcare system. In other places, including Ghana, traditional and formal healthcare workers collaborated and communicated in a formalized way. One nurse said:

"In Ghana, they have trained some [traditional healers] and that training has allowed the health workers and traditional healers to come together and discuss patients, because there are some conditions even in Sierra Leone when you use modern medicine it cannot work or be effective like traditional medicine... Traditional medicine can work in some ways but we do not have a system here to discuss together, or any training on effective traditional practices."

Participants echoed a belief that integrated care in some form would be useful. Referrals and a

more formal transition for patients would be one place to start. One man, an EVD survivor, said,

"What role do I think traditional healers should play? If there is a sickness you know you can't cure, send them to the hospital."

Another man, also an EVD survivor, shared,

"I have the understanding that [traditional healers] are employed at government hospitals [in other countries]. There are some illnesses when you go to the hospital, they won't see anything, even though you are sick and need help. If they work together, it will be nice"

Discussion

This study explored how people in Sierra Leone perceive and utilize traditional healers, focusing on trust and other factors that influenced decision-making, including the availability of other healthcare options available. Through mixed-methods analysis, several themes emerged. These included the overlaps in people's behaviors and perceptions of traditional healers and formal healthcare, the impacts of the 2014-2016 Ebola outbreak, economic and regional factors, and self-efficacy.

Though this study was driven by an interest in understanding the possible role of healthcare trust in decision-making, qualitative observations revealed significant skepticism regarding the efficacy of traditional healthcare options despite their high prevalence and availability. People expressed hesitancy in using traditional healthcare methods, although healthcare workers and other respondents describe some level of community utilization. Some research suggests people may underreport, or deny, their own utilization of traditional remedies (James et al., 2019); regardless, people's descriptions of their peers' utilization shed light on community-level patterns.

#### Overlaps between formal and traditional healers

Both quantitative and qualitative data highlighted the complex relationship between traditional medicine and formal healthcare systems, where individuals may trust or mistrust both systems, utilize each for different purposes, or make pragmatic decisions based on accessibility, regardless of trust or perceptions.

Quantitative data showed an overlapped distribution of trust scores for traditional healing and formal healthcare. Although the mean trust score for traditional healers was lower than that for formal healthcare providers, there was a larger distribution of scores for trust in traditional healers, revealing a greater range of trust and mistrust. Furthermore, the presence of a significant relationship between a variable in the model and trust in one form of healthcare (e.g., the positive correlation between a child's survivor status and trust in traditional medicine) did not consistently correspond to an inverse significant relationship between the same variable and trust in formal healthcare. This observation implies that trust in traditional healthcare and trust in formal healthcare is not inherently diametrically opposed; people may trust both, or neither, to varying extents.

In qualitative interviews and focus groups, participants outlined various reasons for mistrusting traditional healers, yet many still utilized their services. Some individuals sought traditional healers for specific ailments perceived as more suitable for traditional treatment while others chose to visit traditional healers due to their affordability and accessibility compared to formal healthcare options. These findings underscored the complex dynamics at play in healthcare decision-making, where individuals may mistrust traditional healers, or be hesitant to voice trust, while still relying on them for certain health needs, often driven by cultural beliefs, perceived effectiveness, and accessibility.

The insights from both data sets underscored the complexity of the healthcare landscape. During focus group discussions, healthcare workers advocated for integrating traditional medicine and formal healthcare systems, citing Ghana's model as an example. Despite challenges, such as the distrust many doctors and nurses held towards traditional medicine (Krah et al., 2017), policies like the establishment of a traditional medicine council in 2010 aimed to regulate and integrate these systems (Kwame, 2021).

To improve patient navigation in Sierra Leone's diverse healthcare systems, healthcare workers and community members recommended measures such as fostering trust between traditional and formal healthcare providers, standardizing practices related to confidentiality, diagnosis, and patient communication, as well as establishing effective referral systems among different practitioners. These initiatives hold promise for enhancing healthcare accessibility, clarity, and affordability for patients.

#### Impacts of the 2014-2016 Ebola outbreak

The EVD outbreak affected every aspect of people's lives, from job losses and food insecurity to resource scarcity and loss of healthcare workers (Sellu, 2023). Understanding the current perceptions of traditional healthcare requires examining the impacts of the EVD outbreak. The study aims to explore the interplay between the outbreak and contemporary perceptions on traditional healers.

Survival status, either one's own or one's child, did not have a significant impact on trust in formal healthcare. However, participants with a child who survived Ebola tended to demonstrate slightly higher trust in traditional healthcare. While these findings indicate a potential relationship, the underlying reasons remain unclear. It may be that parents attribute their children's recovery to traditional healing practices. Alternatively, confounding factors not in the model, such as concerns about community stigmatization, as suggested in some literature (James et al., 2020b), may influence parental preferences for traditional healers. Further research is warranted to understand the mechanisms underlying these associations.

Complementing these quantitative findings, qualitative insights provided some insights as to how participants connected prior healthcare experiences to today's context. While many did not consider Ebola suitable for treatment by traditional healers, some learned from the epidemic experience that traditional healers, despite presenting themselves as experts, often lack the expertise required to effectively manage such diseases. Some speak to the need for traditional healers to be collaborators, not competitors, with formal healthcare particularly during a national health crisis. Research suggests that this did eventually happen, that some traditional healers did become part of community-driven responses to combat mistrust and educate the community about important viral mitigation strategies (Collier et al., 2024; Barker et al., 2020).

Additionally, participants highlighted how the Ebola epidemic strained resources in formal healthcare centers, affecting their abilities to care for non-Ebola-related illnesses. Consequently, individuals increasingly turned to traditional healers for care due to a belief that the care they would receive at hospitals would be sub-par or inaccessible.

#### Economic and regional factors

Both quantitative and qualitative data provide insights as to the role of accessibility, particularly cost, which may lead to individuals opting for traditional healers as their preferred health treatment. Quantitative data suggested that in some cases increased wealth was significantly associated with slightly lower trust in both formal and traditional healthcare providers. One possible explanation for this was that individuals with more financial means may also have more access to healthcare information and more opportunity to compare and evaluate providers. However, there was no statistically significant difference between the wealthiest quintiles and the least wealthy quintiles.

Qualitative data highlighted the nuanced interplay between wealth and healthcare decisions. Financial considerations, including healthcare affordability, emerged as a predominant theme in qualitative findings for infected participants, affected participants, and healthcare providers. This indicated that that cost played a crucial role in healthcare decision-making irrespective of individuals' professed trust levels.

Moreover, the siloed nature of healthcare people described often forced individuals to exhaust one option before seeking assistance from another provider type, particularly impacting those with limited income. Limited financial resources may leave individuals with a single opportunity to alleviate their symptoms. As a result, some opt for assistance from pharmacies or traditional healers, seen as more financially accessible and streamlined pathways to symptom relief, albeit without guarantees of the highest quality of care.

One notable distinction between the quantitative and qualitative data is their geographical scope. The quantitative data spanned five districts, encompassing both urban and rural areas, while the qualitative data was confined to Freetown. Interestingly, individuals in rural areas demonstrated slightly higher trust in formal healthcare providers compared to their urban counterparts, with no significant difference observed for trust in traditional healers. District-level variations were also observed, with lower average trust in formal healthcare reported in Port Loko, Western Area Rural, and Bombali. Conversely, slightly higher trust in traditional healers was noted in Port Loko and Bombali.

These differences may be influenced by district-level factors, including access to healthcare services, quality of care, cultural differences, and variations in policy implementation. For instance, delayed or disparate healthcare service rollouts in some distracts could impact healthcare trust in those areas (Caviglia et al., 2021). Additionally, existing research suggests a connection between elevated traditional healthcare usage and specific cultural and religious groups, who may be concentrated in certain districts (Jambai & MacCormack, 1996). Though qualitative accounts from Freetown highlight the prevalence of traditional healthcare practices outside of Western Area Urban, further research is needed to fully understand these nuances, particularly through qualitative investigations conducted beyond Freetown.

#### Self-efficacy

Integrating quantitative and qualitative data can offer a nuanced understanding of the role of self-efficacy in healthcare trust and utilization. Self-efficacy, a concept introduced by Albert Bandura in the 1970s within his social cognitive theory, and a key component of the Health Belief Model, referred to an individuals' confidence in their own ability to accomplish tasks and achieve goals (Bandura, 1977; Champion & Skinner, 2008).

While quantitative analysis found a possible link between anxiety and trust in formal healthcare, no such relationship was observed for trust in traditional healers, except for self-efficacy. Self-efficacy was significantly associated with higher trust in formal healthcare as well as lower trust in traditional healthcare. This may have stemmed from a confidence in understanding complex medical information, making informed decisions, and effectively communicating with doctors and nurses. The negative relationship between self-efficacy and trust in traditional medicine may indicate concern about treatment reliability.

Prior studies have underscored that higher self-efficacy correlates with increased adherence to and uptake of formal healthcare (Nafradi et al., 2017; Adamu et al., 2020). Although the relationship between self-efficacy and traditional healthcare is less explored, selfefficacy may offer some resilience when navigating complex and potentially-overwhelming care systems (Okuboyejo et al., 2018).

Qualitative data revealed a clear connection between access barriers and individuals' self-efficacy in accessing healthcare services. Participants noted that despite expressing minimal trust in traditional healthcare, the prohibitive costs and complex treatment plans associated with formal healthcare profoundly shape individuals' decisions to seek more affordable and accessible traditional healthcare services. The economic barriers described by many participants not only shape healthcare choices but also reflect the broader socioeconomic context, intensified in the

years after Ebola, impacting healthcare access and utilization. This financial strain imposed by formal healthcare costs not only reinforces reliance on traditional healthcare but also undermines individuals' confidence in managing their healthcare needs effectively.

Though findings reveal some interplay between self-efficacy, trust, and healthcare utilization, the precise pathways remain complex and warrant further investigation.

## Limitations

A major limitation of this study is the absence of traditional healers' perspectives in the data. This gap is due to the parent study's focus on survivor and formal healthcare workers. Time and funding constraints restricted our ability to conduct interviews with other stakeholders, including traditional healers. While future studies may capture traditional healer perspectives of their work, current data for this study will provide insight as to perspectives regarding traditional healthcare as well as patient decision-making around their own healthcare.

Another study limitation is the potential for bias. To mitigate bias, the US-based researchers coordinated closely with Sierra Leone-based researchers at every step of the process. Social desirability bias may impact how participants respond to questions about healthcare trust and vaccine uptake and intention. Attempts to mitigate that potential bias included multi-question measures with Likert-scale responses, and the incorporation of a qualitative aim that may have allowed more open discussion. In addition, US-based researchers were not present during data collection in order to further mitigate risk of bias.

The relatively low R-squared values for the SUR models in the quantitative component of this study suggested that there are significant factors influencing the outcome variables that have not been accounted for in these models. Exploring other factors, including others related to access, may add more clarity to people's decision making around healthcare.

#### Conclusions

This study presents valuable insights into the contemporary healthcare landscape in Sierra Leone. By employing both quantitative and qualitative methodologies, it offers a nuanced understanding of various factors influencing individuals' perceptions and utilization of traditional healers within the context of the country, including access challenges, self-efficacy considerations, and experiences during the Ebola outbreak.

It is essential to underscore the critical role of trust and effectiveness in public health service delivery. While traditional healthcare in Sierra Leone may operate outside conventional scientific frameworks and lacks formal oversight, it remains deeply embedded as a healthcare option for communities, necessitating a nuanced approach to its integration within broader healthcare system.

Future research should explore specific case studies, such as Ghana's experience in formalizing traditional healthcare, to glean insights into standardization's potential benefits in enhancing accessibility and affordability. By leveraging academic research and practical experiences, stakeholders can work towards sustainable solutions that prioritize community needs and promote equitable access to quality healthcare services.

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### Conclusion

This dissertation contributes to the existing literature by examining the intricate interplay among mental health, healthcare trust, and vaccine decision-making within low- and middleincome countries (LMICs). Focusing on Sierra Leone, the study investigates how contextual factors such as traditional healing practices, prior experiences with infectious diseases, and mental health conditions influence healthcare utilization, particularly concerning vaccination among caregivers and their children. In the years following the Covid-19 pandemic, and given the likelihood of future infectious disease outbreaks, understanding the determinants of healthcare engagement is crucial for community-level health outcomes. By identifying potential drivers of increased trust and increased vaccine uptake, this research lays the groundwork for evidence-based interventions aimed at enhancing healthcare trust and vaccine acceptability. Ultimately, these efforts can contribute to addressing health disparities among children and families in LMICs.

#### Appendix A: Protection of Human Subjects

#### Recruitment and Informed Consent

The assent/consent process was conducted in English, Krio, Mende, or Temne, depending on the preferred language of the participant. Child assent and parental consent forms were written in English and provided to participants if they are able to read. If they were not able to read, or if they preferred, assent and consent forms were read to participants in their own language. Questionnaires, interviews, and focus groups were also provided in participants' desired language. During the assent/consent process, study personnel went over in detail with all participant the content of the consent form, including the nature of the study, a description of each assessment, and risks and benefits. Participants were specifically told that participation in the study is voluntary and that declining to participate in the study no way affected any services they received via Caritas referrals. This information was also written in the assent/consent forms. Participants were given an opportunity to have any questions they have about the study answered by study personnel if requested. Participants were given a copy of the assent/consent forms, and they were asked to participate in the study. If they agreed participate, they were asked to sign or make a mark on the assent or consent form. The original assent/consent forms were placed in a locked cabinet separate from the research data at the Caritas-Freetown office.

#### Protection Against Risk

Participants were informed that the information gathered in the study was confidential and would not adversely affect any service that they may receive via Caritas referrals. All computerized data files were maintained on a password-protected computer system and is only be accessible by approved study personnel. All participants were assigned a unique study ID. A file containing links between participant identity and study ID is maintained in a passwordprotected folder behind the Boston College firewall and is accessible by study personnel who must know the participants' identities to contact participants for enrollment or to maintain the integrity of the database.

All questionnaire and interview data has been entered into REDCap, a system that allows for customized methods for data entry validation and assignment of different levels of data access for each member of the research team so that data are only accessible to study personnel as needed and confidentiality is maintained. REDCap was designed in a manner that is consistent with all federal and local regulatory policies and procedures. REDCap allows study staff to define REDCap data security policies, data backup schedules, data retention plans, and involvement of necessary departments (e.g., IRB) in the REDCap project creation process. Boston College has web-based methods for securely delivering electronic files, documents, and other sensitive information, which allows for sharing of data among collaborators as needed.

All study personnel received training in human subjects' protection prior to any involvement with participants or study data and were continuously supervised by the investigators, all in order to minimize risk to participants.

#### Potential Benefits to Research Participants and Others

While there are no immediate benefits to participants at the time the study, understanding the current climate of vaccine perceptions and health care climate may have potential benefits to the larger populations of vaccine hesitant communities in Sierra Leone and LMIC as COVID-19 vaccine rollout expands across the country and is made more accessible for youth.

## Importance of Knowledge to be Gained

The risks to participants are minimal and the potential knowledge to be gained is large. This study has the potential to add to the limited research that explores the relationship of prior experience with healthcare and infectious disease upon one's vaccine hesitancy, especially in low-resource settings. Understanding extent and drivers of medical mistrust and vaccine hesitancy increased opportunities for targeted and culturally specific interventions to address mistrust in areas with compounding health vulnerabilities, address disparities, and improve overall community health.

# Appendix B: Conceptual Models

Model 1: SAGE Working Group Determinants of Vaccine Hesitancy

## CONTEXTUAL INFLUENCES

Influences arising due to historic, socio-cultural, environmental, health system/institutional, economic or political factors

#### INDIVIDUAL AND GROUP INFLUENCES

Influences arising from personal perception of the vaccine or influences of the social/peer environment

#### VACCINE/ VACCINATION-SPECIFIC ISSUES Directly related to vaccine or

vaccination

- a. Communication and media environment
- **b.** Influential leaders, immunization program gatekeepers and anti- or pro-vaccination lobbies.
- c. Historical influences
- d. Religion/culture/ gender/socio-economic
- e. Politics/policies
- f. Geographic barriers
- g. Perception of the pharmaceutical industry
- Personal, family and/or community members' experience with vaccination, including pain
- b. Beliefs, attitudes about health and prevention
- c. Knowledge/awareness
- d. Health system and providers-trust and personal experience.
- e. Risk/benefit (perceived, heuristic)
- f. Immunisation as a social norm vs. not needed/harmful
- a. Risk/ Benefit (epidemiological and scientific evidence)
- b. Introduction of a new vaccine or new formulation or a new recommendation for an existing vaccine
- c. Mode of administration
- d. Design of vaccination program/Mode of delivery (e.g., routine program or mass vaccination campaign)
- Reliability and/or source of supply of vaccine and/or vaccination equipment
- f. Vaccination schedule
- g. Costs
- h. The strength of the recommendation and/or knowledge base and/or attitude of healthcare professionals

Model 2: Figure 2. Health Belief Model Components and Linkages (Champion & Skinner, 2008).



Question	Formal Healthcare Worker	Traditional Healer
	Strongly Agree	Strongly Agree
	Agree	Agree
Sometimes providers care more about	Neutral	Neutral
what is convenient for them than about	Disagree	Disagree
their patients' health needs.	Strongly Disagree	Strongly Disagree
	Strongly Agree	Strongly Agree
	Agree	Agree
	Neutral	Neutral
Providers are extremely thorough and	Disagree	Disagree
careful.	Strongly Disagree	Strongly Disagree
	Strongly Agree	Strongly Agree
	Agree	Agree
You completely trust providers'	Neutral	Neutral
decisions about which medical	Disagree	Disagree
treatments are best for you.	Strongly Disagree	Strongly Disagree
	Strongly Agree	Strongly Agree
	Agree	Agree
	Neutral	Neutral
A provider would not mislead you	Disagree	Disagree
about anything.	Strongly Disagree	Strongly Disagree
	Strongly Agree	Strongly Agree
	Agree	Agree
	Neutral	Neutral
All in all, you trust providers	Disagree	Disagree
completely.	Strongly Disagree	Strongly Disagree

Table 1:	Wake Forest	t Trust Measure	es

## **EVD Survivors Key Informant Interview**

We've been talking about your previous experiences. Now we want to take some time and talk about your perceptions about healthcare and healthcare workers today.

1. When someone gets sick, where do you think they go first to get treatment? Do they go to different kinds of healthcare workers or healers for different illnesses?

## PROMPTS

- a. Friends and family
- b. Clinic
- c. Traditional healer
- d. Hospital
- e. Community health worker
- 2. Do you look differently at health facilities and healthcare workers after the Ebola Crisis?
  - a. Do you have more or less trust in healthcare workers? Do you have more or less trust in healthcare facilities?
  - b. Follow up: How, if at all, did receiving treatment for Ebola affect how you perceive receiving healthcare today?
- 3. What role do you believe traditional healers play in healthcare right now?
  - a. How do traditional healers treat illnesses?
  - b. How, if at all, has people's engagement with traditional healers changed since Ebola?
  - c. What role do you think traditional healers could/should play?
- 4. What is your opinion about vaccinations? What are the risks and the benefits?
  - a. How did you come to learn this information? Did trust or mistrust of healthcare workers help you come to this conclusion? What about traditional healers?

## PROMPT

- a. Accessibility
- b. Vaccination for children
- c. Cost
- d. Covid-19/flu

5. What are the main things we need to know about healthcare today in Sierra Leone that we haven't discussed?

6. I thank you for your time. Is there anything I did not ask you that you would like to share with me?

## **Doctors, Nurses Focus Group Interview**

Can we go around and everyone introduce themselves? Tell me about yourself and your professional background.

- 1. How, if at all, has Ebola changed people's perceptions and behaviors around healthcare facilities and healthcare workers?
  - a. How, if at all, has Ebola increased or decreased trust in healthcare workers and healthcare facilities?
  - b. How, if at all, has Ebola changed your perceptions and behaviors around providing healthcare or interacting with patients and families?
  - c. What changes do you see in how healthcare workers provide services for patients?
- 2. What are the main barriers that patients have in engaging with the healthcare system?
  - a. Beyond financial barriers?
  - b. What is the role of trust in the healthcare system and in healthcare workers in patient engagement?
- 3. How common is it for people to get routine vaccinations? For adults? For children?
  - a. What are the barriers?
  - b. What do you do now to encourage patients to vaccinate?
  - c. What can be done to improve vaccination rates?
- 4. In what circumstances do you think a person goes to a traditional healer rather than a healthcare provider?
  - a. How, if at all, has this changed since Ebola?
  - b. How would you describe traditional healers treating illnesses?
  - c. What is the level of people's trust in traditional healers compared to healthcare workers? Always or only for certain illnesses?
- 5. How common is it for traditional healers and health care workers to communicate about a patient?
  - a. In what circumstances?
  - b. Is there trust between healthcare workers and traditional healers? If so, does this improve patient care?
- 6. What are the main things we need to know about healthcare today in Sierra Leone that we haven't discussed?
- 7. I thank you for your time. Is there anything I did not ask you that you would like to share with me?

Appendix E: Stata do file for paper 1

use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta" \*\* Task: create child vaccine variable \*\*\*\*\*\*

label define probably 0 "definitely get it" 1 "probably get it" 2 "probably not get it" 3 "definitely not get it" 4 "don't know / not sure" label values covid vax intent child probably

recode covid vax intent child (0=1)(1=1)(2=0)(3=0)(4=.), gen (covid child)

```
******
** task: create composite parent vaccine variable
```

//removed all people for whom covid 19 vaccine was not available in the area (this is why n is small)

gen adultvaccine=. replace adultvaccine=1 if covid vax receive==1 & covid vax availablity==1

replace adultvaccine =0 if covid\_vax\_receive==0 & covid\_vax\_availablity==1

```
******
** task: Wealth index into quintiles
```

xtile quintile wi=composite wi, n(5)recode quintile wi (1=0) (2=1) (3=2) (4=3) (5=4), gen (quin wi)

```
******
** Task: descriptive statistics
```

summarize Formal\_trust Traditional\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins depression av1 urban district n composite wi carer infection infected status1 carer sex1

tab covid child tab adultvaccine tab cvq1 w2 tab cvq3 w2 \*\*\*\*\*\*\* \*\* Task: mixed effects logistic regression clustered by district, with odds ratios added 

melogit adultvaccine Formal trust pss self efficacy av1 pss helpless av1 Hopkins anxiety av1 Hopkins depression av1 urban i.quin wi carer sex1 carer infection infected status1 || district n:

melogit, or

melogit covid child Formal trust pss self efficacy av1 pss helpless av1 Hopkins anxiety av1 Hopkins depression av1 urban i.quin wi carer sex1 carer infection infected status1 || district n: melogit, or

\*\*\*\*\*\*\*\*

\*\* Task: mixed effects logistic regression clustered by district, with odds ratios added -- start without Formal Trust, and then adding it in

melogit adultvaccine pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1 || district\_n:

melogit adultvaccine Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1 || district\_n:

melogit covid\_child pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1 || district\_n:

melogit adultvaccine Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1 || district\_n:

use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta"

\*covid\_child Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.district\_n i.quin\_wi carer\_sex1 carer\_infection infected\_status1 //

tab covid\_child district, chi2 tab adultvaccine district, chi2

tab adultvaccine urban2, chi2 tab covid\_child urban2, chi2

tab adultvaccine carer\_infection, chi2 tab covid child carer infection, chi2

tab covid\_child infected\_status1, chi2 tab adultvaccine infected\_status1, chi2

ttest Formal\_trust, by(covid\_child)
ttest Formal\_trust, by(adultvaccine)

ttest pss\_self\_efficacy\_av1, by(covid\_child) ttest pss\_self\_efficacy\_av1, by(adultvaccine)

ttest pss\_helpless\_av1, by(covid\_child) ttest pss\_helpless\_av1, by(adultvaccine)

ttest Hopkins\_anxiety\_av1, by(adultvaccine)

ttest Hopkins\_anxiety\_av1, by(covid\_child)

ttest Hopkins\_depression\_av1, by(covid\_child) ttest Hopkins\_depression\_av1, by(adultvaccine)

\*\* Task: Adult Covid Vaccine Modeling

\* Model 1: Mental health

\*\* Model 1 part 1: keep Kenema, mixed effect model, clustered by district

- \*\* Model 1 part 2: robustness check (district as a fixed effect)
  - \*\* Model 1 part 3: robustness check (drop Kenema)

//\\/\\ MODEL 1.1 //\\//\

melogit adultvaccine pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n:

estat ic

//\//\ MODEL 1.2 //\//\

melogit adultvaccine pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1 i.district\_n, or

estat ic

//\//\ MODEL 1.3 //\//\

drop if district n=2

melogit adultvaccine pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n:

estat ic

clear use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta"

\* Model 2: Healthcare Trust
\*\* Model 2 part 1: mixed effects model, clustered by district\_n
\*\* Model 2 part 2: robustness check (district as a fixed effect)

//\\//\ MODEL 2.1 //\\//\

melogit adultvaccine Formal\_trust urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n:

//\//\ MODEL 2.2 //\//\

melogit adultvaccine Formal\_trust urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1 i.district\_n, or

\* Model 3: Trust plus Mental Health

\*\* Model 3 part 1: keep Kenema, mixed effects model, clustered by district

\*\* Model 3 part 2: robustness check (drop district as a fixed effect)

\*\* Model 3 part 3: robustness check (drop Kenema)

////// MODEL 3.1 //////

melogit adultvaccine Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n:

//\//\ MODEL 3.2 //\//\

melogit adultvaccine Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1 i.district\_n, or

tab adultvaccine district, chi2 tab covid\_child urban2, chi2 tab adultvaccine carer\_infection, chi2 tab covid\_child carer\_infection, chi2 tab covid\_child infected\_status1, chi2

\* Model 1: Mental health

\*\* Model 1 part 1: keep Kenema, mixed effect model, clustered by district

\*\* Model 1 part 2: robustness check (district as a fixed effect) \*\* Model 1 part 3: robustness check (drop Kenema)

//\//\ MODEL 1.1 //\//\

melogit covid\_child pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n:

//\//\ MODEL 1.2 //\//\

melogit covid\_child pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1 i.district\_n, or

////// MODEL 1.3 //////

use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta"

drop if district\_n== 2

melogit covid\_child pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n:

clear

use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta"

\* Model 2: Healthcare Trust

\*\* Model 2 part 1: mixed effects model, clustered by district\_n

\*\* Model 2 part 2: robustness check (district as a fixed effect)

//\//\ MODEL 2.1 //\//\

melogit covid\_child Formal\_trust urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n:

//\\//\ MODEL 2.2 //\\//\

melogit covid\_child Formal\_trust urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1 i.district\_n, or

\* Model 3: Trust plus Mental Health

- \*\* Model 3 part 1: keep Kenema, mixed effects model, clustered by district
- \*\* Model 3 part 2: robustness check (drop district as a fixed effect)

//\//\ MODEL 3.1 //\//\

melogit covid\_child Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n:

//\//\ MODEL 3.2 //\//\

melogit covid\_child Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1 i.district\_n, or

#### \*

melogit adultvaccine pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n: estat ic

melogit adultvaccine Formal\_trust urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n: estat ic

melogit adultvaccine Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n: estat ic

\* FINAL ANALYSIS (before reverse coding): Child

 $\label{eq:logicond} melogit covid\_child pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n:$ 

estat ic

melogit covid\_child Formal\_trust urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n:

estat ic

melogit covid\_child Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.quin\_wi carer\_sex1 carer\_infection infected\_status1, or || district\_n:

estat ic

\*\*\*\*\*

\*\* reverse code gender \*\* \*

gen sex = . replace sex = 0 if carer\_sex1 ==1 replace sex=1 if carer\_sex1==0 label define sex 0 "Female" 1 "Male" label values sex sex tab sex

\*\*\*\*\*\*

\* FINAL ANALYSIS with reverse code: ADULT

melogit adultvaccine pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban2 i.quin\_wi sex carer\_infection infected\_status1, or || district\_n:

melogit adultvaccine Formal\_trust urban2 i.quin\_wi sex carer\_infection infected\_status1, or || district\_n:

melogit adultvaccine Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins depression av1 urban2 i.quin wi sex carer infection infected status1, or || district n:

\*\*\*\*\*\*\*

\* FINAL ANALYSIS with reverse code: Child

melogit covid\_child pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban2 i.quin\_wi sex carer\_infection infected\_status1, or || district\_n:

melogit covid\_child Formal\_trust urban2 i.quin\_wi sex carer\_infection infected\_status1, or || district\_n:

melogit covid\_child Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban2 i.quin\_wi sex carer\_infection infected\_status1, or || district\_n:

Appendix F: Stata do file for paper 3

\*\*\*\*\*\*

\*\* Dissertation

\*\* PAPER THREE

\*\*\*\*\*\*\*

use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta"use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta"

\*\*\*\*\*\*\*\*\*\*\*\*

\*\* Task: Exploring models for Paper 3

use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta"

pwcorr Formal\_trust Traditional\_trust, sig regress Formal\_trust Traditional\_trust

pwcorr Formal\_trust Traditional\_trust pss\_helpless\_av1 pss\_self\_efficacy\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban composite\_wi carer\_age1 carer\_sex1 carer\_education1 district\_n carer\_infection, sig

use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta"

regress Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.district\_n composite\_wi carer\_infection infected\_status1 est sto model1

regress Traditional\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.district\_n composite\_wi carer\_infection infected\_status1 est sto model2

suest model1 model2,robust

clear

\*\*\*\*\*\*\* MODEL 2: Two constructs use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta"

regress Formal\_trust pss\_self\_efficacy\_av1 Hopkins\_anxiety\_av1 urban i.district\_n composite\_wi carer\_infection infected\_status1 est sto model1

regress Traditional\_trust pss\_self\_efficacy\_av1 Hopkins\_anxiety\_av1 urban i.district\_n composite\_wi carer\_infection infected\_status1 est sto model2

suest model1 model2,robust

clear

***************************************
***************************************
*task: PAPER 3 seemingly unrelated regressions // final models ************************************
***************************************
*********************
*task: correlations ************************************

use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta"

// Formal\_trust, Traditional\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.district\_n i.quin\_wi carer\_sex1 carer\_infection infected\_status1

pwcorr Formal\_trust Traditional\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1, sig

use "/Users/elizabethneiman/Desktop/Boston College/Research Projects/Dissertation/Data/Final data set/1.29EVDAnalysesData.dta"

drop n\_district

summarize Formal\_trust Traditional\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban district\_n composite\_wi carer\_infection infected\_status1 carer\_sex1

xtile quintile\_wi=composite\_wi, n(5) recode quintile\_wi (1=0) (2=1) (3=2) (4=3) (5=4), gen (quin\_wi)

\*\*getting r-squared:

sureg (Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.district\_n i.quin\_wi carer\_sex1 carer\_infection infected\_status1) (Traditional\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.district\_n i.quin\_wi carer\_sex1 carer\_infection infected\_status1), corr

\*\*checking individual models/post-hoc tests

regress Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.district\_n i.quin\_wi\_carer\_sex1 carer\_infection infected\_status1 carer\_sex1

imtest vif estat ic

regress Traditional\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.district\_n i.quin\_wi carer\_sex1 carer\_infection infected\_status1 carer\_sex1

imtest vif estat ic

\*\*final SUR model

regress Formal\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.district\_n i.quin\_wi carer\_sex1 carer\_infection infected\_status1 est sto model1

regress Traditional\_trust pss\_self\_efficacy\_av1 pss\_helpless\_av1 Hopkins\_anxiety\_av1 Hopkins\_depression\_av1 urban i.district\_n i.quin\_wi carer\_sex1 carer\_infection infected\_status1 est sto model2

suest model1 model2,robust clear