
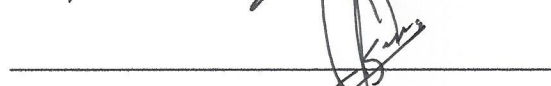
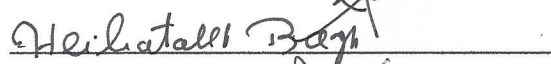



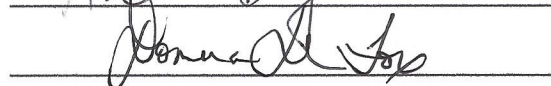
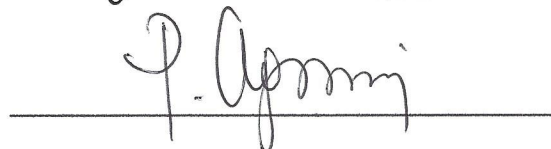


AN EPIDEMIOLOGICAL AND GEOGRAPHIC ANALYSIS OF HEALTHCARE  
PROVIDER CHOICE IN URBAN BO, SIERRA LEONE

by

Lila C. Fleming  
A Dissertation  
Submitted to the  
Graduate Faculty  
of  
George Mason University  
in Partial Fulfillment of  
The Requirements for the Degree  
of  
Doctor of Philosophy  
Environmental Science and Public Policy

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Spring Semester 2015  
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## **DEDICATION**

This work is dedicated to my best friend, my husband Jeremy Fleming, without your help, support, encouragement, and patience I would not have made it this far. Thank you!

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## LIST OF ABBREVIATIONS

Bo Government Hospital .....	BGH
Environment, Provider, Individual, Cost .....	EPIC
Geographic Information Systems .....	GIS
Global Positioning System.....	GPS
High Income Countries .....	HICs
Longitude and Latitude .....	XY
Low Income Countries.....	LICs
Low and Middle Income Countries .....	LMICs
Medical Subject Heading.....	MeSH
Médecins Sans Frontières.....	MSF
Mercy Hospital Research Laboratory .....	MHRL
Naval Research Laboratory.....	NRL
Nongovernmental Organizations .....	NGOs
Population .....	POP
Universal Transverse Mercator.....	UTM
Univariate Analysis of Variance.....	ANOVA
United States .....	U.S.
World Health Organization.....	WHO

## **ABSTRACT**

### **AN EPIDEMIOLOGICAL AND GEOGRAPHIC ANALYSIS OF HEALTHCARE PROVIDER CHOICE IN URBAN BO, SIERRA LEONE**

Lila C. Fleming, M.S.

George Mason University, 2015

Dissertation Director: Dr. Kathryn H. Jacobsen

The built environment plays a critical role in people's ability to access healthcare services. The goal of this study was to explore the factors that affect women's selection of acute (short-term) and inpatient (long-term) healthcare providers in an urban area of a low-income country. Geographic and epidemiologic methods were used to analyze data collected from more than two thousand women from across the city of Bo, Sierra Leone, in West Africa, in 2010 and 2011. The insights gained from this analysis, along with a comprehensive examination of the literature on maternal and child healthcare access, were applied to a consideration of the policy implications for Bo and to a broader analysis of the factors influencing healthcare provider selection.

A dynamic healthcare marketplace exists in urban Bo. The participating women identified 26 pharmacies, clinics, and hospitals as the facilities they prefer when seeking acute care. Nine of these facilities provide inpatient services and are preferred by

mothers when in need of overnight care for themselves or their children. Although residences in Bo are on average only about 0.3 km from a healthcare facility providing outpatient services and 0.9 km from an inpatient facility, women travel on average 3.0 km to access care for themselves or their children. Bypassing of facilities near to the home is very common, and the majority of women bypass private (usually nonprofit) facilities so that care can be received from the city's only large government hospital, which is located in the central part of the city. The strong preference for the government referral hospital is likely related to this hospital offering the most advanced diagnostic and therapeutic options within Bo city limits and to a national policy implemented in April 2010 that made most maternal and child health care free at government healthcare facilities.

These observations and others identified from a systematic review and synthesis of the literature inspired a new framework for categorizing the factors that affect healthcare provider selection: the EPIC model. The four components of the EPIC model include (1) Environmental factors such as travel distance and road availability, (2) Provider factors such as staffing and equipment availability, (3) Individual factors such as sociodemographic characteristics, and (4) Cost factors such as the price of healthcare services. In Bo, individuals and families must consider the built environment, represented by the *E* in the EPIC model, as part of the decision about healthcare provider selection because private transportation has to be purchased out-of-pocket when traveling beyond easy walking distance for care. Improving access to healthcare services in Bo will require expanding the diagnostic and treatment services available in the city,

especially for chronic disease management, and ensuring that road networks and a public transportation system are available to facilitate access to these services.

## CHAPTER 1. INTRODUCTION

Access to healthcare services is highly dependent on a well-designed built environment and public policies that facilitate the access to appropriate, affordable, and quality healthcare services. The goal of this dissertation is to explore the factors that influence the choice of healthcare provider for short-term (acute) and long-term (inpatient) care once the decision to seek healthcare has been established.

### **Background**

Accessing healthcare services requires a series of decisions related to recognizing the need to seek care, selecting a particular provider, visiting that provider to receive a diagnosis, and following through on the prescribed course of therapy (Figure 1).

Although Figure 1 is a simple figure, it demonstrates the series of decision a person will make to access healthcare. This model will be further developed in Chapter 4. The decision to seek care is not synonymous with provider choice. First, a person must decide whether there is a need for healthcare advice or treatment from a healthcare provider. Once this decision to seek care has been made, a person must then decide which type of provider to visit and which specific caregiver to consult. This second step in accessing healthcare is the least studied of the four steps shown in Figure 1. How do people make the decision of where to go for care? What are the factors that influence a person's choice of one provider over another?

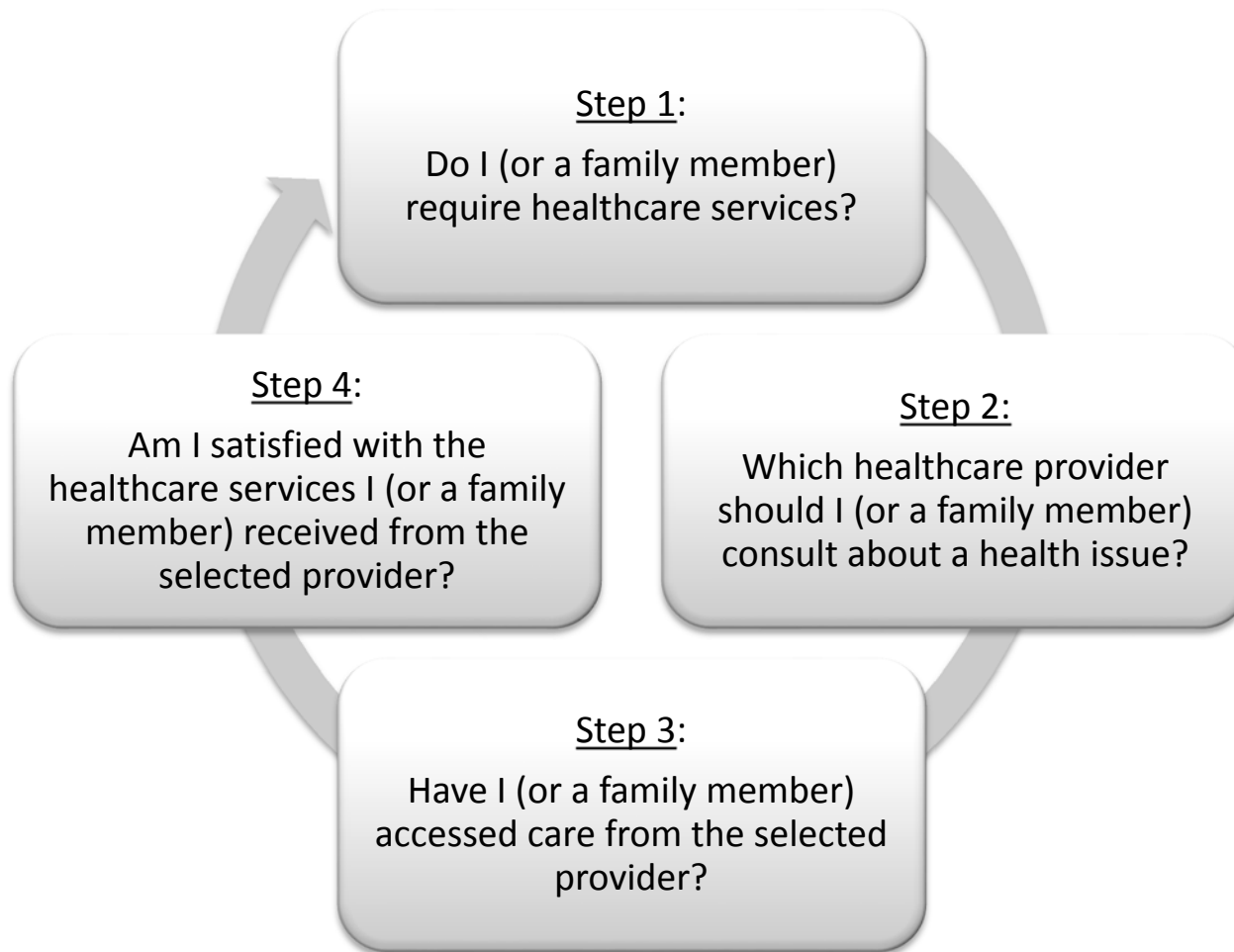


Figure 1. Steps in accessing health care

Few published studies have examined the factors that influence healthcare provider selection in low- and middle-income countries (LMICs), but these studies have demonstrated that even in low-resource areas, both urban and rural, people still have a choice of the type of facility (such as a clinic, pharmacy, or traditional healer) and which specific provider to visit. How a person makes the choice of which provider to visit is not yet well understood and therefore could vary from population to population. Hence the factors that influence provider selection for a person residing in a high income country (HIC) maybe somewhat different from one residing in a LMIC. Most studies in LMICs focus on rural areas, with only a couple of studies exploring this in urban settings of LMICs. This dissertation explores issues of healthcare access, specifically healthcare provider selection, in an urban area of a LMIC, then applies this environmental analysis to broader policy considerations that apply to more diverse populations. Hence, this dissertation seeks to fill the gap in the literature on the factors that affect healthcare provider choice in urban areas of LMICs.

A review of the literature points to a variety of factors that influence the selection of a provider once a need for care has been established, including socioeconomic and demographic factors,<sup>1,2</sup> as well as those pertaining to the cost, reputation and location of the healthcare facility.<sup>3</sup> In this dissertation, the roles of environmental factors, such as the distance to the provider of choice, together with socioeconomic and demographic factors, are evaluated as they relate to provider selection.

In general, environment in the context of health is defined to include physical, biological, social, cultural, as well as other external factors that impact human health.<sup>4</sup>



For healthcare access, these environmental factors consist of healthcare delivery system characteristics such as the availability and acceptability of medical services; health system policies and organizational structures; external environmental factors such as politics, societal norms, and the economic climate; and community characteristics such as physician availability within the community.<sup>5</sup> Few studies have examined all these issues in field studies. However, reviews of the literature have identified these and other factors as components of healthcare access. These components are further developed and explored in Chapter 4.

Other environment-related factors that could potentially influence healthcare access, health service utilization, and the choice of provider are linked to the “built environment.” The built environment relates to the natural spaces that have been deliberately altered by humans, such as buildings and road networks.<sup>6</sup> The built environment provides the physical aspects that facilitate healthcare access. Without physical access to a healthcare provider, and without the availability of physical facilities that enable the provision of health care, a person would be unable to access medical services. Therefore, the availability and location of healthcare facilities, road and path networks, and other aspects of the built environment need to be considered when studying what motivates a person to choose one health care facility or provider over another. Some studies from LMICs suggest that distance to a facility can be a key determining factor when health care is sought for preventive services, such as vaccinations and prenatal care,<sup>7</sup> or when acute medical issues such as malaria require urgent treatment.<sup>8,9</sup> The influence of distance to the nearest healthcare facility on

population health outcomes needs to be expanded from looking at how living farther from a healthcare provider inhibits use of the formal healthcare system to examining how distance to various facilities influences the selection of a provider.<sup>10, 11, 12, 13, 14</sup>

Many studies on distance in relation to healthcare access apply a circular buffer method that measures geographical distance using a straight-line path of travel. This measuring method ignores the environmental and geographical factors affecting travel distance and time, such as road availability and topology of the area. To better evaluate the influence of distance in provider selection decisions, this study utilizes road-network analysis, a more accurate measure of the distance travelled by a person to reach a particular provider of choice, and determines how this travel distance may influence where a person goes to receive care.

Cost also plays a role in the choice of healthcare provider when someone is in need of care.<sup>1, 2, 15</sup> This cost not only includes direct costs such as the monetary cost of services at various facilities<sup>8, 15</sup> and transportation costs to reach the facility,<sup>16</sup> but also indirect costs such as travel time and lost work hours.<sup>7</sup> Reputational factors such as perceived staff-patient relationships,<sup>17</sup> patient care levels,<sup>17</sup> mortality rates,<sup>18</sup> and infrastructure<sup>17</sup> seem to play a role in the choice of healthcare provider as well. Other possible influencing factors in the selection of a healthcare facility include socioeconomic and demographic factors such as education, age, sex, marital status, insurance status, and satisfaction with the local hospital.<sup>1, 2, 19</sup>

This dissertation is structured as a three-paper series. Its purpose is to present the study conducted in a publishable format. The following pages provide brief summaries

of each paper: a paper exploring how distance to a healthcare facility affects the choice of provider, a paper on inpatient healthcare facility bypassing (travelling farther than the closest facility), and a paper that presents a new framework for the understanding of how the decision about which provider to consult is made. This dissertation seeks to add to the body of literature on the factors that influence a woman's choice of healthcare provider—that is, the type of facility she visits and the specific facility that she chooses to go to—after her need to seek care has been established.

Although papers 1 and 2 in this dissertation use the same data source, these papers focus on two different areas related to the factors that affect healthcare provider choice. Paper 1 explores data related to a *woman's choice* of healthcare facility or provider and examines provider location and distance as potential environmental factors influencing the choice of healthcare provider for *acute febrile illnesses*. Paper 2 analyzes data related to *mothers and their children* (15 years of age or younger), and examines the factors influencing healthcare provider *bypassing* for mothers and their children focusing on *inpatient healthcare facility* choice. These papers merit separate explorations to gain a deeper understanding on how decisions related to healthcare provider selection are made in urban areas of low-income countries, especially in West Africa.

### **Paper 1 - Distance travelled for healthcare services for acute febrile illnesses in urban Bo, Sierra Leone**

As previously mentioned, several studies identify distance as an influencing factor on provider selection for both women and children. This first paper seeks to explore the influence of travel distance on choice of acute health services provider by women in urban Bo, Sierra Leone, a low-income country located in West Africa (Figure 2).

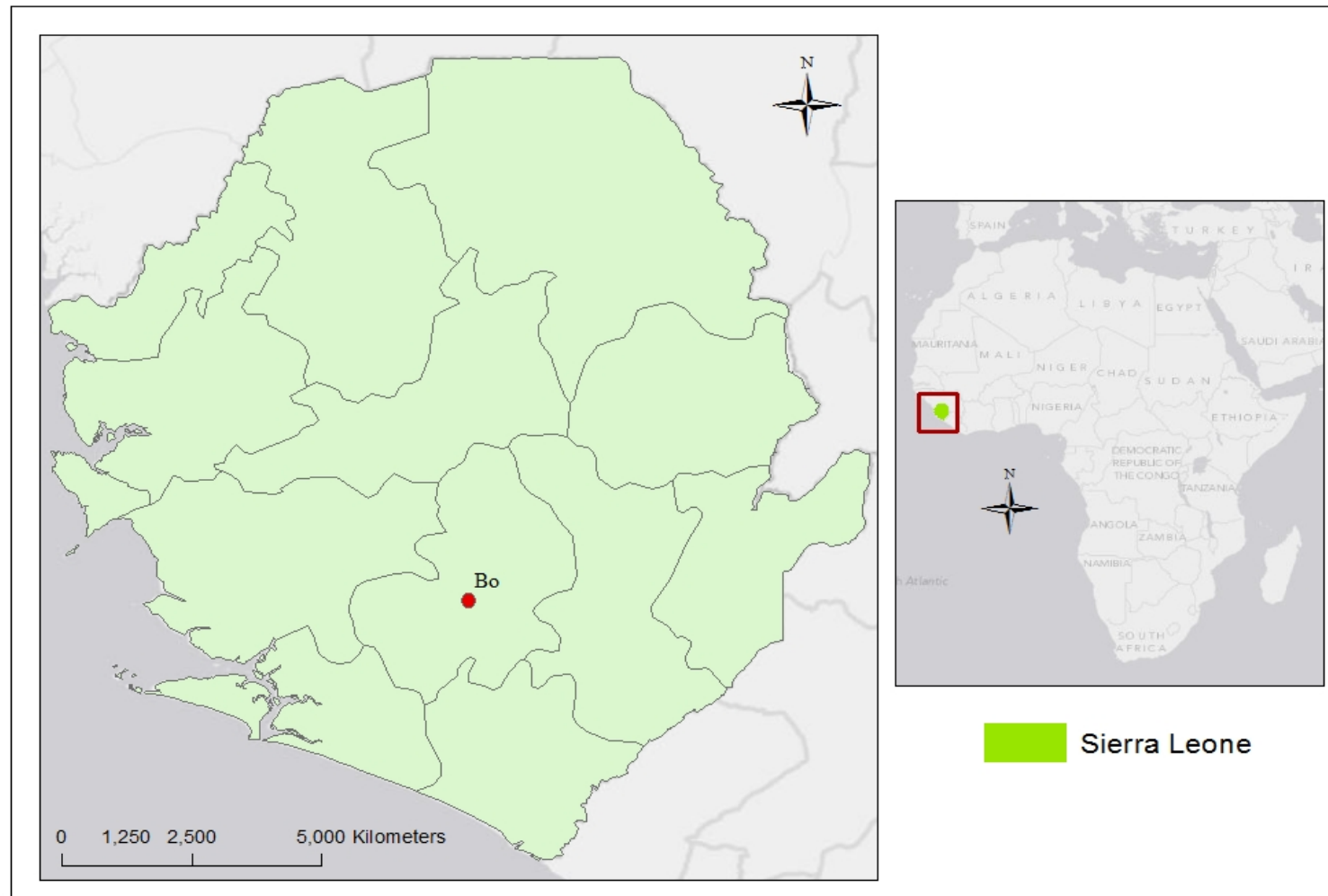


Figure 2. Bo, Sierra Leone, West Africa

***Study goals***

The goals of this paper are to identify the types of healthcare providers available in Bo while exploring which providers women in the city are most likely to visit when in need of malaria care; as well as to determine the distances a woman travels by road to reach her provider of choice.

***Methods***

Bo city, located in the low-income country of Sierra Leone, West Africa,<sup>20</sup> has an estimated population of 150,000 and is the second largest urban center in Sierra Leone covering an area 30.1 sq km.<sup>21</sup> The city is comprised of 68 administrative sections (neighborhoods) that were mapped by the Mercy Hospital Research Laboratory (MHRL) in 2009 using a Participatory Geographic Information System (PGIS) approach that drew on the knowledge of long-term local residents and municipal authorities.<sup>21</sup> Two sections near the MHRL facility were chosen for a pilot study.<sup>21</sup> Then in 18 of the remaining 66 sections in Bo, a health census was conducted in private residences by MHRL between November 2010 and February 2011 using a random sampling method (

Figure 3). Geographic data for Bo, including road networks, water bodies, and administrative boundaries, and the location of each household in the 18 selected sections and of health care providers, were collected by the MHRL team. A total of 3554 women participated in the door-to-door survey in the 18 sections of Bo.

A two-stage interview process was used for survey data collection. A consenting adult representative of the dwelling provided general information about the residence and each household (family) residing in the structure. Other data collected included the

number of individuals in each family, the number of women who are or had ever been pregnant in the household, and the home environment (such as the roof type, proximity to a drinking water source, and number of rooms within each dwelling among others).

Women 18 years or older that had been pregnant at least once and were willing to participate in a short interview, were asked to answer questions related to their health and the health of their youngest child, as well as healthcare access decisions for themselves or their child.

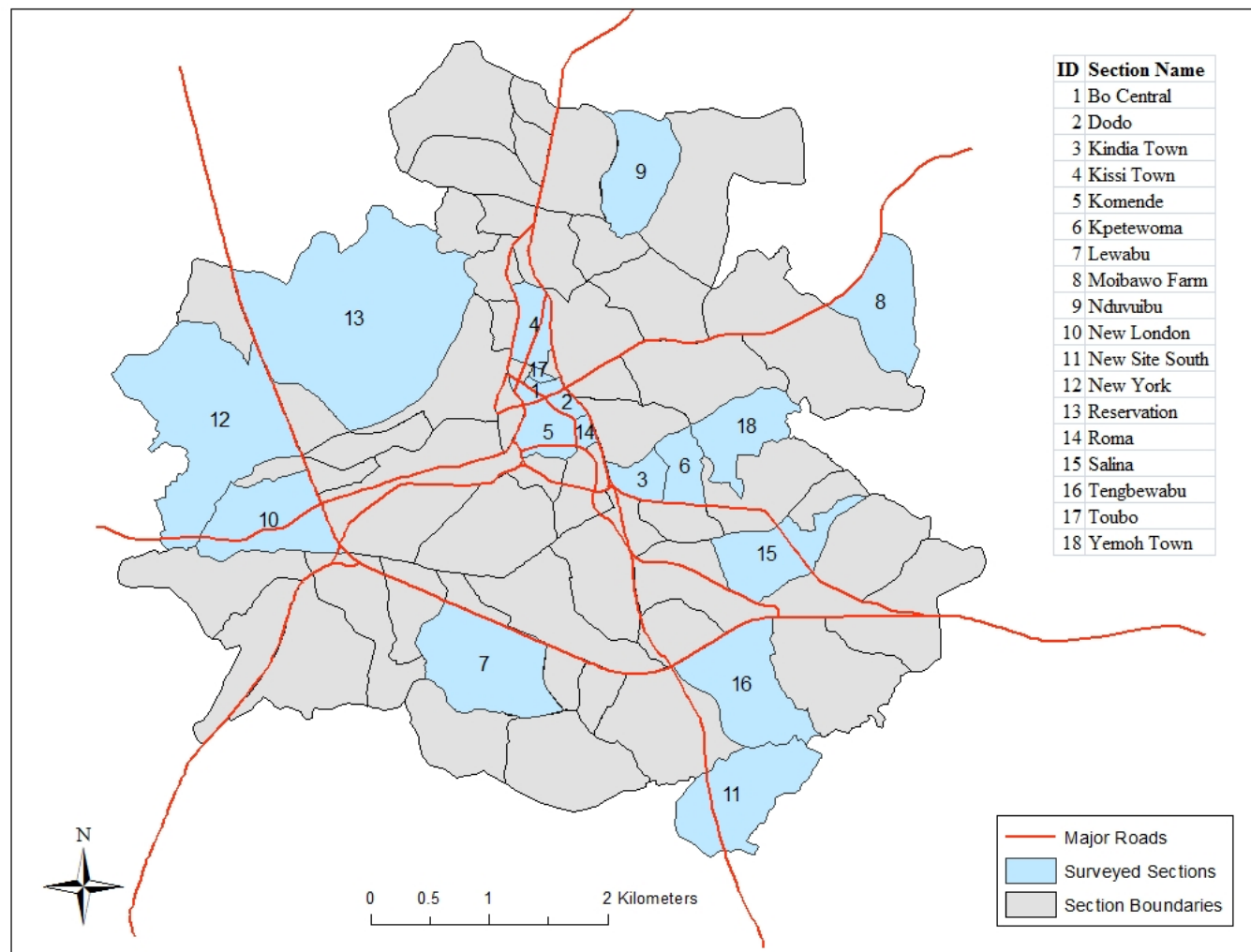


Figure 3. Eighteen surveyed administrative sections (neighborhoods) in Bo City, Sierra Leone

Two key questions related to provider choice were asked in the survey. The first inquired about the type of facility or provider a woman visits for a particular type of care (hospital, clinic, doctor, nurse, pharmacy, or traditional healer) and the second asked each woman for the name of her preferred provider. This allowed the research team to identify specific providers a woman chooses to access and then acquire the geographic coordinates for each healthcare provider. To measure the distances between a residence location and a preferred provider, road network analysis is conducted.

### ***Key findings***

West African cities like Bo have a diverse healthcare marketplace that provides a variety of options for women. Many women in Bo travel farther than walking distance to reach their preferred provider for malaria care. Although distance can be a determining factor for provider selection according to previous studies, in Bo, other factors such as the provider's reputation may be more indicative of how a woman makes a choice of where to go to receive acute care. However, road distance to a healthcare provider can be a burden for women who are ill and have to walk a median distance of 4.0 km by road to reach her preferred provider. In a place like urban Bo, focus on policies that address public transportation access could be key in reducing the problem that long distance travel can have on women who are ill.

### **Paper 2 - Inpatient healthcare provider bypassing by mothers and their children in urban Bo, Sierra Leone**

An emerging body of literature explores healthcare bypassing, seeking to understand when and why people choose to visit healthcare facilities that are located farther from their homes rather than neighboring facilities.<sup>19,22</sup> Previous studies indicate



that patients seeking medical services “bypass” local facilities based on the perceived severity of their illness,<sup>22, 23, 24</sup> the size of the healthcare facility closest to their homes,<sup>19, 25, 26</sup> the range of services provided at the healthcare facility,<sup>14, 27</sup> satisfaction (or dissatisfaction) with the local facility,<sup>19, 28</sup> and individual characteristics such as age,<sup>19, 28</sup> education,<sup>19, 25</sup> marital status,<sup>19</sup> income,<sup>28, 29</sup> and insurance status.<sup>23, 24, 29</sup> The factors that predict bypassing have been examined almost exclusively in rural areas<sup>19, 30</sup> and mostly in developed countries such as the United States (Chapter 2 provides a lengthier background of this topic).<sup>23, 24, 26</sup> This is likely because the limited number of healthcare facilities available, and the fewer available facilities to choose from in rural areas, makes it easier to explore and identify bypassing behavior in these areas. This dissertation study, examines bypassing in a complex urban environment in Bo, Sierra Leone.

### ***Study goals***

The aims for the second paper are to explore the healthcare bypassing phenomenon in urban Bo for inpatient (long-term) healthcare services and to investigate the possible factors that influence this decision to bypass.

### ***Methods***

Details on the geographic and survey data collection methods for the Bo health census are provided in the summary methods section for Paper 1. This paper explores data related to the health of mothers and children, with a focus on the choice of inpatient care services. Data related to the geographic location of each residential structure and hospital and clinic providing inpatient care are used to measure the distance mothers and/or their children travel when the mother chooses to bypass their closest inpatient care

facility. A total of 1980 mothers with children 15 years of age and younger that participated in the survey are part of this analysis.

Mothers who completed the survey answered questions related to which facility they visit for long-term care for themselves and their children if the need arises, and which specific provider they choose to visit. To assess the factors that influence the stated preference for healthcare provider, mothers were asked whether reputation, cost, or location are influencing factors when choosing a provider, and whether they would choose a different provider if cost was not a barrier. The analysis for this paper uses socioeconomic and demographic information collected about each mother and her household to identify the factors that affect inpatient care provider selection. Distance measurements from a mother's home to the closest provider, and to hers and her child's preferred provider, are conducted using the Network Analyst tool available in ArcGIS.

### ***Key findings***

In urban Bo, a vast majority of mothers choose to bypass their local private healthcare facilities in search for Bo's government-run hospital that offers advanced and specialty care, as well as low-cost, sometimes free, healthcare services to the local community. This is especially true for households located farther from the city center and those located more than 2.0 km from the nearest healthcare provider, which tend to be of low socioeconomic status (SES). The limited availability of chronic disease management services in the Bo region, points to a gap in the availability of healthcare services. Therefore, private inpatient facilities, which are closest to most households in Bo, should focus on reducing healthcare costs for individuals, as well as offering unique

services including chronic disease management and treatment to fill this gap in the healthcare marketplace.

### **Paper 3 - EPIC: a framework for the factors that influence the selection of healthcare providers**

Some researchers have studied the factors that affect healthcare provider selection once the decision to seek care has been made.<sup>2, 3, 15, 17, 18, 31</sup> However, the different approaches used to conduct these studies (i.e. study design, rural vs. urban population), and the specific factors evaluated in these studies, limit their comparability and the possibility to form definitive conclusions about the factors that affect provider selection. To increase this comparability of study results, and to gain a deeper understanding on what influences the decision of which healthcare provider to visit, a framework for the study of provider choice is needed.

#### ***Study goals***

The aim for this final paper is to conduct a review of the current literature on healthcare provider selection and synthesize the available data to create a new and integrative framework for the study of the factors that influence healthcare provider choice in various populations.

#### ***Methods***

A systematic review of the literature was conducted based on a search strategy aiming to identify all the primary studies indexed in PubMed that report data on factors affecting healthcare decision-making for mothers and children worldwide. Each full-text article that met the inclusion criteria—articles that reported primary research results, addressed healthcare provider selection in the formal sector, examined the factors

influencing choice of formal provider, and focused on maternal and child health are closely reviewed and the factors that evaluate how provider selection is made in each individual study are extracted. Using a qualitative thematic synthesis approach, the extracted data were organized into themes that provide the basis for a comprehensive model for the study of healthcare provider choice. This is the first model ever developed for the study of healthcare provider selection.

### ***Key findings***

The *Environment, Provider, Individual, and Cost (EPIC) model*, which summarizes the factors identified through the systematic review and qualitative thematic synthesis process, includes four major components. Environmental factors such as travel distance and transportation access and modes of transport; Provider factors such as reputation, staffing, and facility ownership; Individual factors such as age, marital status, and education; and Cost factors both monetary and time (Chapter 4 provides an in-depth discussion of the development of the *EPIC model* and its components). The *EPIC model*, the first model developed that focuses on healthcare provider selection, offers an innovative and versatile avenue to study the factors that influence the decision of where a person prefers to go to receive healthcare. This model also provides the basis to create location-specific policies to improve the effectiveness, quality, and provision of healthcare services.

### **Overview of future chapters**

The next three chapters present the papers that compose this three-paper dissertation. The final chapter provides closing remarks about the healthcare

environment in Bo, Sierra Leone, applications of the *EPIC model*, and the policy implications of the dissertation.

## CHAPTER 2. PAPER 1 - DISTANCE TRAVELLED FOR HEALTHCARE SERVICES FOR ACUTE FEBRILE ILLNESSES IN URBAN BO, SIERRA LEONE<sup>1, 2</sup>

### **Abstract**

*Background.* To examine the diversity of the healthcare market in urban Bo; identify the types of healthcare facilities preferred by women; and analyze the distance travelled by road to receive malaria care.

*Methods.* We used a population-based random sampling method to recruit 2419 women from urban Bo, Sierra Leone, for a health study. A geographic information system (GIS) of Bo was used to measure the road distance a woman would travel to her preferred malaria care provider.

*Results.* Preferred providers of malaria care were inpatient hospitals (62.3%), outpatient clinics (12.6%), and pharmacies (12.4%). Participants lived an average of 0.6 km from the nearest preferred provider, but women seeking malaria care from one of these providers travelled an average of 3.2 km one-way for care. Women living farther from the city center travelled significantly longer distances for care than women living downtown.

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<sup>1</sup> A version of this paper has been submitted to a peer-reviewed journal. This paper is co-authored by: Lila C. Fleming, Rashid Ansumana, Alfred S. Bockarie, Joel Alejandre, Karen K. Owen, Umaru Bangura, David H. Jimmy, Kevin M. Curtin, David A. Stenger, and Kathryn H. Jacobsen.

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*Conclusions.* The diverse healthcare marketplace in Bo allows women to choose from providers based on cost and reputation rather than location. Most women opt to travel farther than walking distance for malaria care.

**Keywords:** Health Services Accessibility; Choice Behavior; Urban Population; Sierra Leone; West Africa

## **Introduction**

Studies of access to healthcare in low- and middle-income countries (LMICs) have suggested that the distance from homes to healthcare facilities is a critical factor for accessing preventive, diagnostic, and therapeutic health services. However, most of these previous studies on distance to healthcare provider have been conducted in rural settings of LMICs.<sup>7, 8, 9, 15, 32</sup> The dynamics of health care access are much different in urban environments in LMICs, where a diverse marketplace of clinical and other health services allows most residents a choice of which type of formal or informal provider to visit and which particular clinician or other care provider to consult about health concerns.

Bo, Sierra Leone's second largest city, has an estimated population of about 150,000 and an area of 30.1 km<sup>2</sup> in 2004.<sup>21</sup> The healthcare facilities in Bo include public hospitals and clinics; mission hospitals sponsored by religious organizations; and nonprofit hospitals and clinics, such as those run by international charities or other nongovernmental organizations (NGOs) that offer affordable care, sometimes at no cost to the patient.<sup>3</sup> There are also an assortment of private clinics and hospitals, which may be expensive by local standards. Additionally, private doctors and nurses provide

services from their homes and through house calls, and residents can also seek care from private pharmacists and from traditional healers.<sup>3</sup>

Healthcare delivery across West Africa, as described by previous studies in Burkina Faso,<sup>33</sup> Ghana,<sup>34, 35</sup> Liberia,<sup>36</sup> and Nigeria,<sup>37, 38</sup> is similar to Bo's healthcare delivery system where a variety of traditional healers and pharmacies, as well as public and private clinics and hospitals, provide an assortment of services to their population. Based on the commonalities within West African healthcare delivery systems, the analysis in Sierra Leone can reasonably be generalized to other countries in the region.

Previous studies in Bo have found that residents prioritize the reputation of the provider when selecting a healthcare facility or provider, that cost is an important secondary consideration, and that the distance to a facility is a primary consideration for only a small proportion of residents.<sup>3</sup> However, this does not mean that distance may not factor into decisions about where to access health services. For example, the cost of transportation to a facility may exceed the cost of clinical services for those who must hire a private taxi or "okada" because they live too far from the facility to walk to it. There may be distance thresholds beyond which the cost of transportation exceeds the perceived benefits of travel to a provider having a high reputation or offering low-cost services. Also, the location of the residence in reference to the city center, where there may be a higher concentration of healthcare providers, could potentially influence the distance a woman would travel to her provider of choice. While it is understood that rural residents may have to travel to more populated areas for care, this assumption may not necessarily apply in urban areas, and therefore requires further examination.



Some studies of distance to a healthcare facility rely on participants' self-reports of how many minutes it takes for them to travel to a clinician or how far they must travel; others use geographic information systems (GIS) to estimate Euclidean distance, which is the “as the crow flies” shortest straight-line distance between two points.<sup>9, 13, 15, 39</sup> A more accurate way to estimate travel distance is to use road network analysis.<sup>13</sup> The aims of this study are to use road network analysis (1) to examine the diversity of the healthcare marketplace in urban Bo, (2) to identify the types of healthcare facilities preferred by women in Bo when they require care for malaria, and (3) to analyze the distance women in Bo travel by road to receive malaria care.

## **Methods**

### ***Sampling methods***

In 2009, Mercy Hospital Research Laboratory (MHRL) created a GIS-based representation of the city of Bo. Administrative boundaries, roads and trails, water bodies, and other features were collected using a community-participatory process, as described elsewhere,<sup>21</sup> and have been updated to remain current. We have made this geographic data publically-available at OpenStreetMap.org. The city of Bo is divided into 68 administrative neighborhoods called “sections”.<sup>21</sup> After a pilot survey in two sections near the MHRL facility on the north side of Bo, we randomly sampled 18 of the 66 remaining sections for a household health census conducted between November 2010 and February 2011 (Figure 4). All households within these 18 sampled sections were targeted for recruitment into the study. The study protocol was approved by the institutional review boards of Njala University (Bo, Sierra Leone), George Mason

University (Fairfax, Virginia, USA), and the U.S. Naval Research Laboratory (Washington, DC, USA).

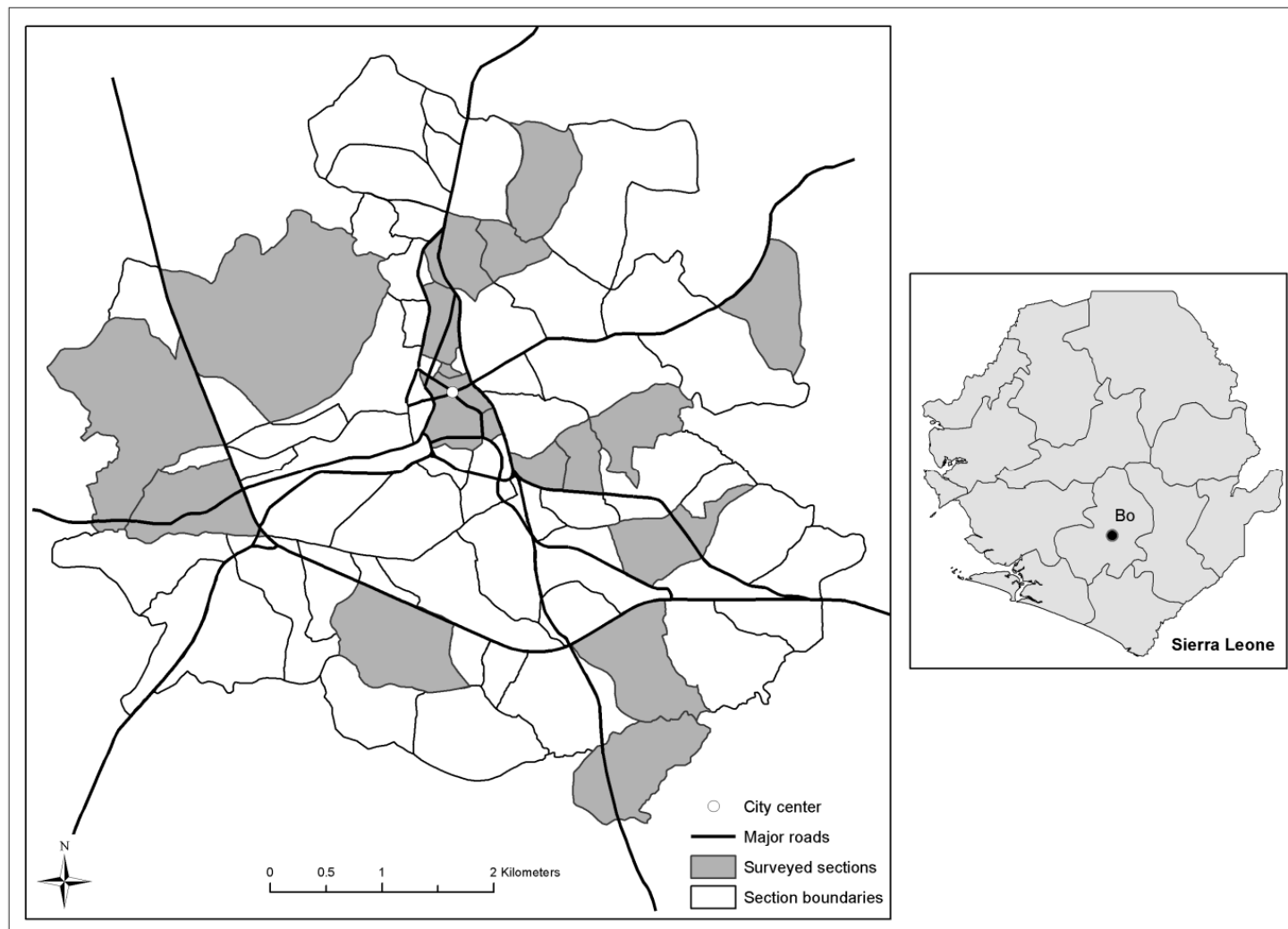


Figure 4. Bo City, Sierra Leone, and sections (neighborhoods) sampled for participation in maternal health surveys in 2010-2011

**Data collection**

The rooftops of all buildings in each of these sections were outlined through digitization of satellite imagery, and the 1659 single-family or multi-family residential structures were identified and marked on maps during walkthroughs and consultations with local residents.<sup>21</sup> We used a two-stage interview process for data collection. First, a consenting adult representative from 3286 of the 3295 (99.7%) households in the 18 sections provided basic information about the household, including a count of the number of individuals in the household and the number of household members who were or had ever been pregnant. Second, each of the 3564 of 3975 (89.7%) consenting women from these households who were age 18 or older and had ever been pregnant was asked to complete a brief interview about her reproductive health, the health of her children, and her priorities when making decisions about accessing healthcare for herself or her children.

**Key variables**

Each woman was asked “*If you thought you needed treatment for malaria, what type of healthcare provider would you go to?*” In Bo, the term “malaria” is often used to refer to any febrile illness, so this question about malaria can be considered a question about acute undifferentiated febrile illnesses more generally. The majority of febrile illnesses in this community are self-diagnosed and treated at home,<sup>40</sup> often with herbal remedies, so this question specifically asked about where women would go for care once the need for external assistance had been determined. Answers to this question included hospital, clinic, doctor (private practice), nurse (private practice), pharmacy, and

traditional healer. All types of healthcare providers were valid answers to this question. The distinction between hospitals and clinics in Bo is very blurry because some large “clinics” offer more services than most small “hospitals”.<sup>41</sup> For this study, we classified facilities that provide inpatient care as hospitals and classified those that provide only outpatient services as clinics. As a follow-up question, we asked each woman to state her preference for the specific healthcare provider she would go to. We also obtained information about the ownership of each healthcare facility in Bo. Government-run facilities were classified as public and all non-governmental facilities (both nonprofit and for profit) were classified as private. Although most nonprofit providers offer low-cost services, most do charge a fee to users. The fee might be higher at for-profit facilities, but both nonprofit and for-profit private providers usually charge higher fees for services than public facilities.

### ***Geographic methods***

Many streets in the city of Bo have no formal names, and there are almost no numbered houses or other structures in existence. Although some streets now have formal names, the vast majority do not have a formal numbering system for the structures located on these streets. This meant that there were no pre-existing addresses available for the surveyed residences or even a way in which to ask for the exact location of each residence. Therefore, with each household’s consent, the MHRL team acquired the longitude and latitude (XY) coordinates for each participating household’s front door with a handheld global positioning system (GPS) unit. We also obtained GPS locations for all of the fixed-location healthcare providers—including public and private hospitals,

clinics, and pharmacies—listed by participants as their preferred facility for malaria care (Figure 5 and Figure 6). The GPS approach to obtain the locations for both households<sup>42</sup> and healthcare facilities<sup>43</sup> has been used in other low-income countries where accurate maps are scarce. This approach was approved by all participating research ethics committees as extreme care was taken to assure the protection of this information. Both survey and geographic data were stored in password protected computers. These computers were stored in a building where security guards were available around-the-clock. These guards were hired to protect the lab workers and patients, and to secure the physical premises. Geographic data were projected to Universal Transverse Mercator (UTM) coordinate system Zone 29N. When building the network for road distance analysis, the residence and healthcare facility locations were automatically snapped to the closest road located within 5 meters of the structure. A tolerance distance of 3 meters was set to correct road segment errors.

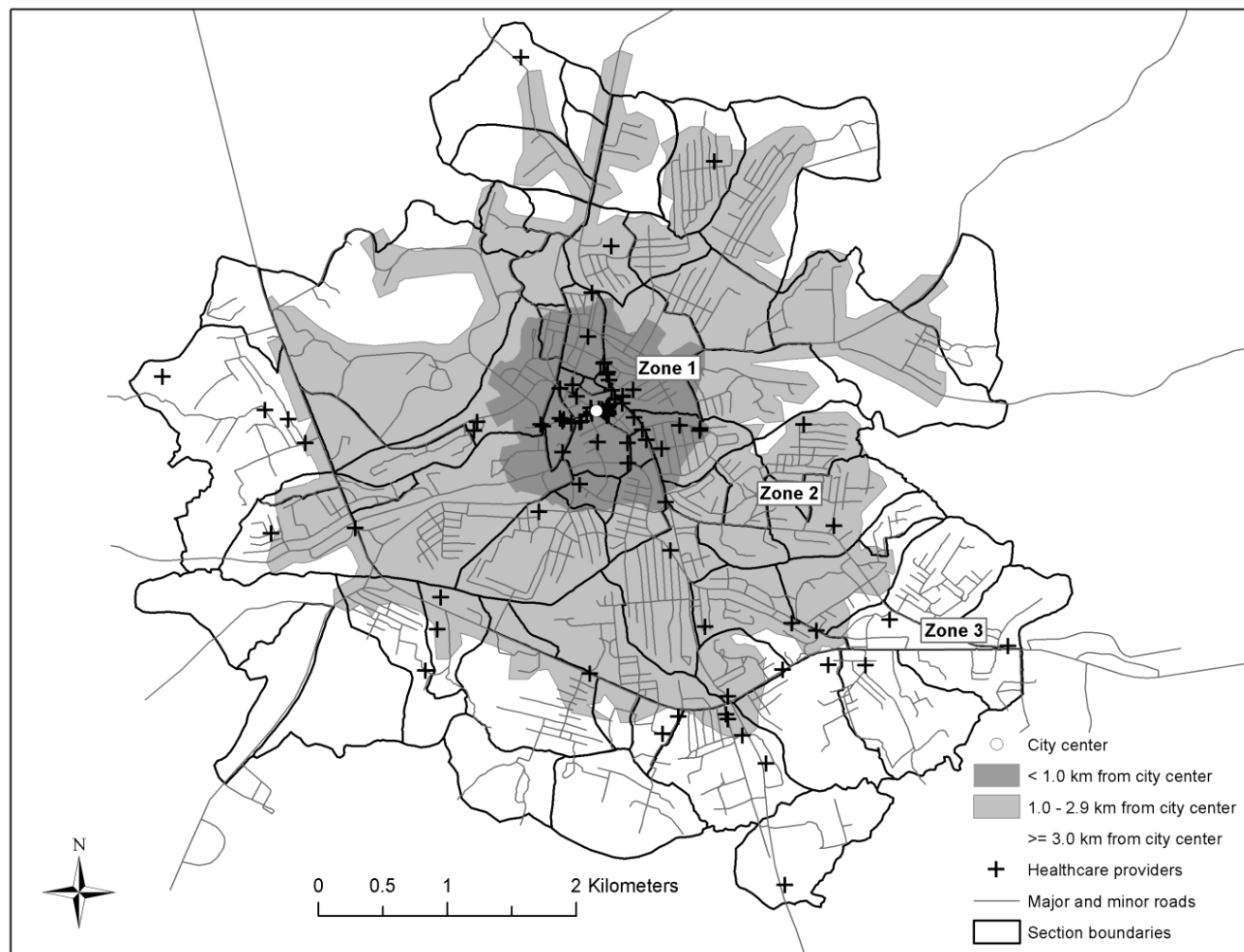


Figure 5. Road travel distance zones from the city center and location of all healthcare providers in Bo

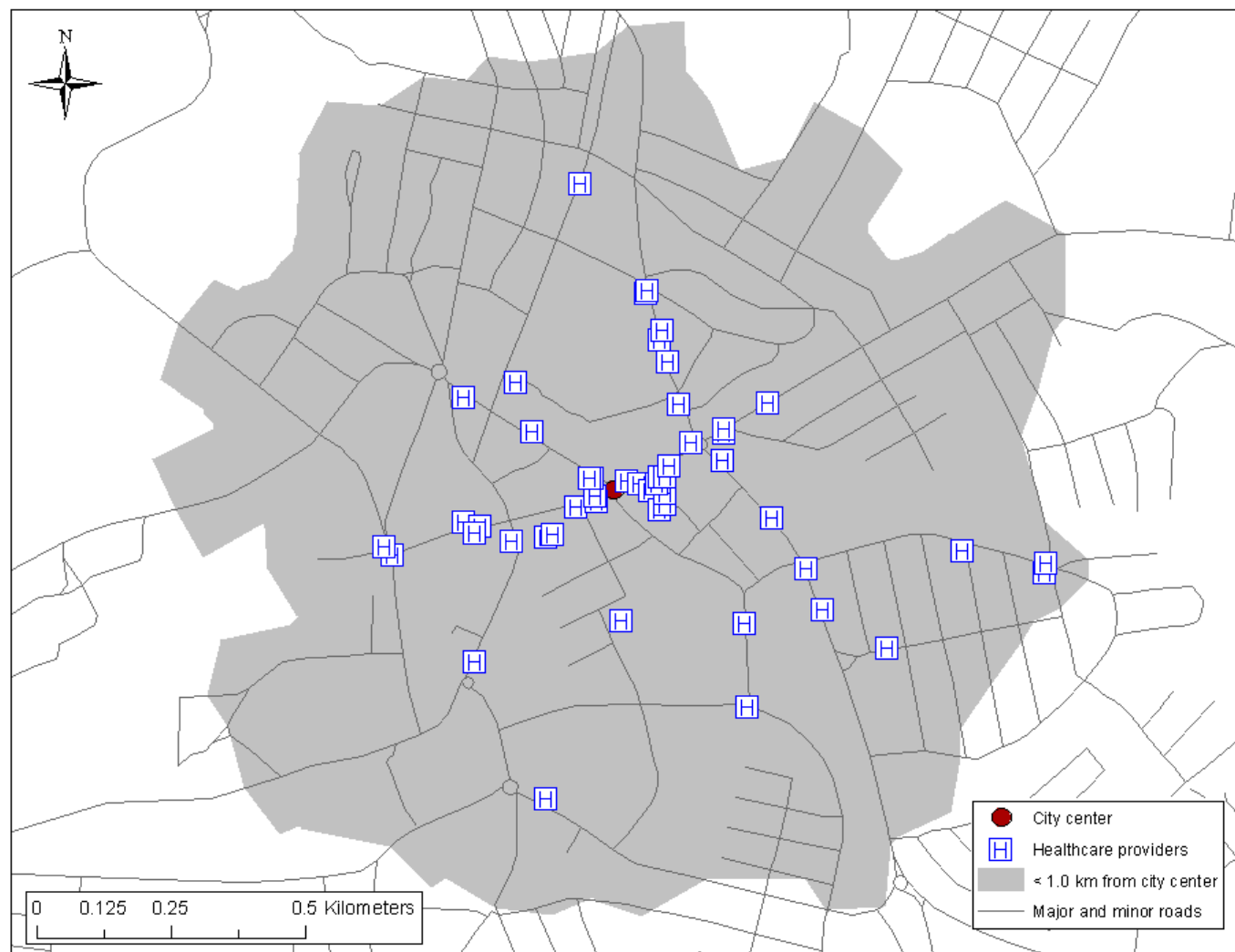


Figure 6. Distribution of healthcare providers in Zone 1



### ***Spatial analysis***

To determine the distance by road from each woman's home to her preferred healthcare provider, we measured the shortest route using the Network Analyst tool available in ArcGIS (version 10.1). This approach assumes that a woman will take the shortest route to her preferred provider. Yet women may not always take the shortest route, perhaps because some other route is faster. Or simply because she will need to make other stops along the way before reaching her preferred provider. However, the shortest-route distance is still a reasonable assumption to make in relation to the distance from a woman's home to her provider of choice. We also used Network Analyst to measure the road distance from each woman's home to the city center and to create three "zones" of road distance from the city center. Zone 1 includes all areas located less than 1 kilometer of road travel from the city center, Zone 2 represents 1 to 2.9 km of road distance, and Zone 3 indicates places 3 km or more from the center of the city (Figure 5). We defined the center of Bo as the place where three main roads (Old Gerihun Road, Fenton Road, and Bojon Street) in the city of Bo intersect. The city's main market is located in this intersection, so this is the locally-defined downtown area.

### ***Statistical analysis***

Socio-demographic data for the 18 sections of Bo were analyzed using SPSS (version 19) with a significance level of  $\alpha=0.05$ . We used a univariate analysis of variance (ANOVA) to evaluate differences in the mean distances women with different characteristics travel to their providers of choice. Data were screened to meet ANOVA assumptions of normality and linearity distribution of the measures of distance (in

kilometers) from women's home to their preferred healthcare provider.<sup>44</sup> Chi-square ( $\chi^2$ ) tests were also conducted to identify differences in socio-demographic characteristics among sections of Bo.

## **Results**

Bo has a diverse healthcare marketplace. Of the 3542 (99.4%) women who reported the type of healthcare provider they would visit if they thought they had malaria and needed treatment, 2207 (62.3%) said they would choose to visit a hospital (that is, a facility offering inpatient care), 448 (12.6%) a clinic (that is, an outpatient-only facility), 441 (12.4%) a pharmacy, 306 (8.6%) a private nurse, 130 (3.7%) a private doctor, and 10 (0.3%) a traditional healer. Nurses and doctors in private practice and traditional healers often provide care in clients' homes, even if they also provide services at clinics or in their own homes, so it is not possible to calculate a distance to these service providers. For a particular nurse or doctor it was not possible to know whether the typical visit would be in a patient's home or the clinician's home or private office, so no location for these providers could be mapped. Thus, only the 2419 (68.3%) women who identified a specific hospital, clinic, or pharmacy as their provider of choice were able to be included in the distance analysis.

The community-participatory mapping process<sup>21</sup> conducted alongside the community survey identified a total of 84 hospitals, clinics, and pharmacies within Bo city limits (Figure 2), of which 57.1% were located in Zone 1 (<1 km from city center), 25.0% were located in Zone 2 (1.0-2.9 km from city center), and 17.9% were located in Zone 3 ( $\geq 3$  km from city center). Two facilities located outside of Bo city are also

commonly used by Bo residents for serious illnesses: Connaught Hospital, a government-run facility located in the capital city Freetown, approximately 230 km northwest of Bo, which is the main referral hospital in Sierra Leone, and the Médecins Sans Frontières (MSF) clinic in Gondama, located approximately 12 km south of Bo's city center, which is a privately-run nonprofit facility providing inpatient and outpatient care free of cost to those who can make arrangements to travel to the facility. As a result, a total of 86 facilities were identified as serving the study population (Table 1). The most commonly available providers in all zones were pharmacies (73.3% of all providers). All of the pharmacies and most of the hospitals were private, while most clinics were public facilities.

Table 1. Characteristics of healthcare providers in Bo, Sierra Leone, by type, distance from city center, and ownership

<i>Facility type</i>	All providers (n=86)						Preferred Providers only (n=26)					
<i>Distance from city center</i>	Zone 1 < 1.0 km		Zone 2 1.0 – 2.9 km		Zone 3 ≥ 3.0 km		Zone 1 < 1.0 km		Zone 2 1.0 – 2.9 km		Zone 3 ≥ 3.0 km	
<i>Ownership</i>	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private
Hospital (inpatient care offered)	1	1	0	1	1	2	1	1	0	1	1	2
Clinic (outpatient care only)	1	2	6	2	5	1	1	2	4	1	4	0
Pharmacy	0	43	0	12	0	8	0	7	0	0	0	1
<i>Total</i>	2	46	6	15	6	11	2	10	4	2	5	3

A total of 26 facilities were identified as preferred providers by the women who listed a fixed-location provider as their preference for malaria care. Hospitals were preferred by 2009 (83.1%) women, clinics were preferred by 383 (15.8%), and pharmacies were preferred by 27 (1.1%) women. Public facilities accounted for 38.5% of the preferred providers (Table 1), and were chosen by 1885 (77.9%) of women. In particular, Bo Government Hospital (BGH), the city's main public hospital, provides a variety of free primary care services as well as low-cost advanced care options. The plurality (12 of 26) of the preferred providers, including BGH, were located in Zone 1, and these facilities near the city center were selected as preferred by 1678 (69.4%) women (Table 2). Zone 2 providers were preferred by 479 (19.8%) women, and Zone 3 providers, including Connaught Hospital and MSF clinic, both of which are located outside Bo city limits, were preferred by 272 (10.8%) women.

Table 2. Measurements of distance from the preferred provider (km) to the city center, by residential zone

		<i>Mean (standard deviation) from preferred provider to city center</i>			<i>n (%) of women with a preferred provider in a particular zone, all preferred providers</i>			<i>n (%) of women with a preferred provider in a particular zone, non-BGH within-Bo providers only</i>		
		All providers	Bo providers only	Non-BGH* Bo providers only	Zone 1 < 1.0 km	Zone 2 1.0 - 2.9 km	Zone 3 ≥ 3.0 km	Zone 1 < 1.0 km	Zone 2 1.0 - 2.9 km	Zone 3 ≥ 3.0 km
Household distance from city center (km)	Zone 1 < 1.0	1.9 (14.7)	0.6 (0.5)	1.1 (0.8)	<b>391 (79.5)</b>	77 (15.7)	24 (4.9)	46 (36.5)	<b>77 (61.1)</b>	3 (2.4)
	Zone 2 1.0 - 2.9	1.8 (9.6)	0.9 (0.8)	2.0 (0.7)	<b>827 (69.1)</b>	291 (24.3)	79 (6.6)	41 (11.7)	<b>291 (82.9)</b>	19 (5.4)
	Zone 3 ≥ 3.0	2.9 (12.4)	0.9 (0.9)	2.1 (0.9)	<b>460 (63.0)</b>	111 (15.2)	159 (21.8)	29 (14.3)	<b>111 (54.7)</b>	63 (31.0)
	All zones	2.2 (11.7)	0.8 (0.8)	1.8 (0.8)	1678 (100)	479 (100)	262 (100)	116 (17.1)	479 (70.4)	75 (12.5)

\*Bo Government Hospital. Values in bold indicate the highest percentage within each column

Participants lived a median distance of 0.6 km (with an Interquartile Range (IQR) of 0.3 - 0.9 km) from the nearest preferred provider (Table 3; Figure 7), but more than 70% of women travelled more than 1 km one-way from their homes to their own preferred healthcare provider (Table 4). Including the two facilities located outside of Bo city, the median distance travelled one-way by women to their preferred provider was 2.2 km (IQR = 1.0 - 3.2 km) (Figure 7). Women who visited a private provider rather than a public (governmental) facility travelled a median distance of 3.8 km (IQR = 1.1 - 7.9 km) to their preferred provider while those preferring a public provider travelled only 2.0 km (IQR = 0.9 - 2.9 km), which is 1.6 km less distance one-way. Women with a preferred provider within Bo city limits travelled a median distance of 0.6 km one-way (IQR = 0.3 - 0.8 km) from their residences.

Table 3. Mean distances from home to the preferred provider (km), by residential zone

		<i>Mean (S.D.) distance to nearest provider</i>	<i>Mean (standard deviation) from home to a woman's preferred provider</i>							
			All providers	Hospitals (inpatient care offered)	Clinics (outpatient care only)	Public providers	BGH*	Private providers	Within Bo providers	Non- BGH* Bo providers
Household distance from city center (km)	Zone 1 < 1.0	0.1 (0.1)	2.2 (15.2)	2.0 (15.2)	0.9 (0.6)	2.1 (17.9)	0.8 (0.2)	2.4 (3.8)	0.8 (0.4)	0.9 (0.8)
	Zone 2 1.0 - 2.9	0.3 (0.1)	2.8 (10.0)	1.7 (10.9)	2.3 (0.5)	2.4 (6.1)	2.2 (0.6)	5.4 (4.7)	1.9 (0.9)	1.2 (1.0)
	Zone 3 ≥ 3.0	0.3 (0.2)	4.6 (12.4)	3.0 (13.5)	2.5 (0.9)	4.1 (14.7)	3.4 (0.6)	5.9 (3.3)	3.2 (1.0)	2.7 (1.5)
	All zones	0.3 (0.7)	3.2 (12.0)	2.2 (12.8)	2.1 (0.8)	2.8 (13.5)	2.2 (1.1)	4.8 (4.2)	2.0 (1.2)	1.6 (1.3)

\*Standard deviation. \*\*Bo Government Hospital



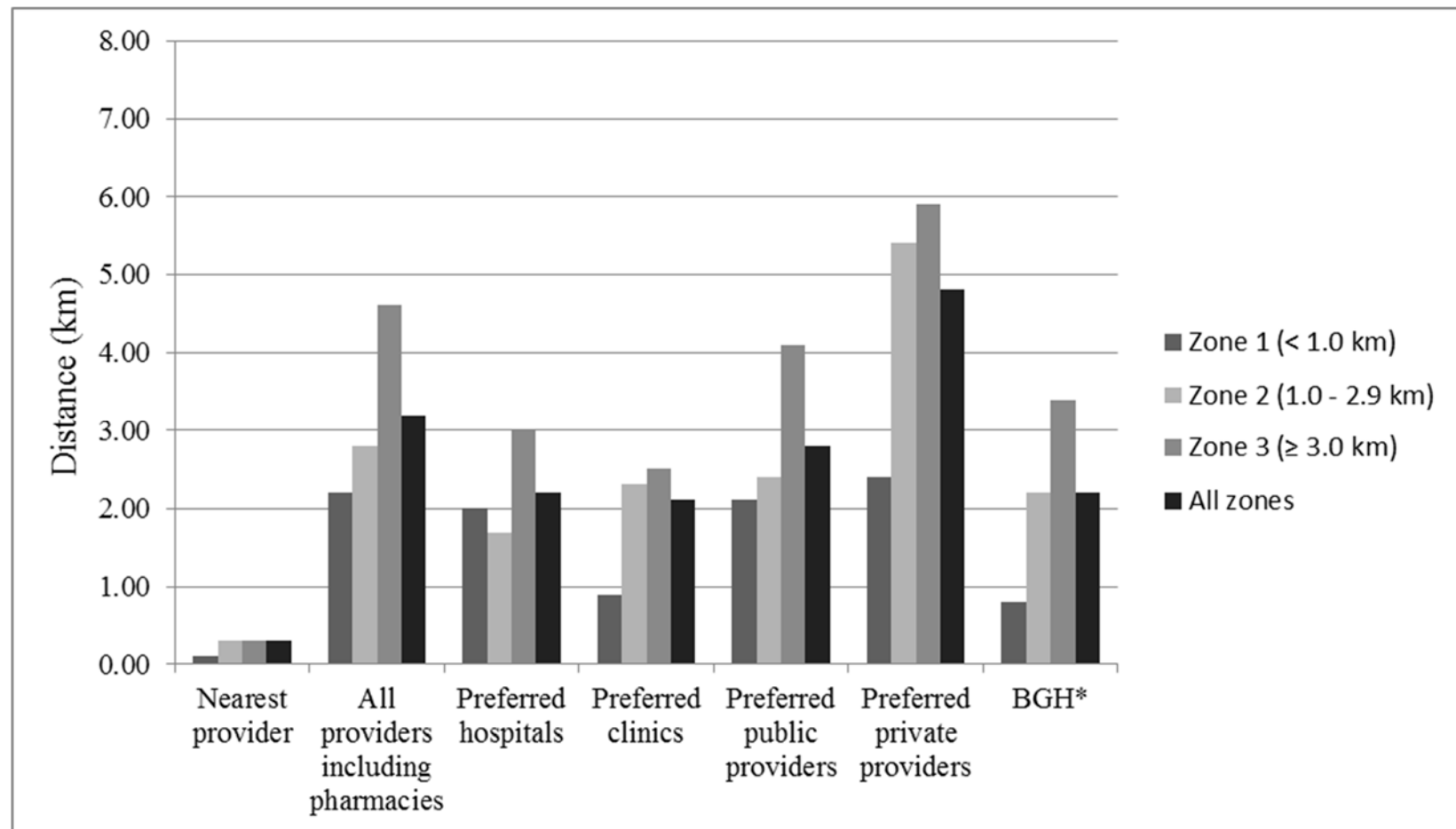


Figure 7. Mean distances from women's home by Zone of residence to nearest and preferred providers

\*Bo Government Hospital

Table 4. Distribution of distances from home to the preferred provider (km), by residential zone

		<i>n (%)</i> , all providers			<i>n (%)</i> , non-BGH* Bo providers only		
		< 1.0 km	1.0 - 2.9 km	≥ 3.0 km	< 1.0 km	1.0 - 2.9 km	≥ 3.0 km
Household distance from city center (km)	Zone 1 < 1.0	<b>368</b> <b>(74.8)</b>	99 (20.1)	25 (5.1)	<b>82</b> <b>(65.1)</b>	40 (31.7)	4 (3.2)
	Zone 2 1.0 - 2.9	184 (15.4)	<b>823</b> <b>(68.8)</b>	190 (15.9)	<b>182</b> <b>(53.1)</b>	132 (38.5)	29 (8.5)
	Zone 3 ≥ 3.0	47 (6.4)	156 (21.4)	<b>527</b> <b>(72.2)</b>	47 (24.6)	34 (17.8)	<b>110</b> <b>(57.6)</b>
	All zones	599 (100)	1078 (100)	742 (100)	311 (47.1)	206 (31.2)	143 (21.7)

\*Bo Government Hospital. Values in bold indicate the highest percentage within each column

Although women living in Zone 3, farther from the city center (Table 3; Figure 7), had similar sociodemographic characteristics to women living in Zones 1 and 2, they had lower socioeconomic status, such as less access to electricity, concrete floors, and a drinking water source near the home (Table 5). ANOVA results did not show significant differences in the mean distances travelled from home to a preferred provider by sociodemographic variables or the residential zone. However, Chi-square tests indicated that women living in Zone 3 travelled significantly longer distances compared to women in other Zones, even though most lived within easy walking distance of a healthcare provider (Table 5). Most women living in Zone 1 preferred a provider within 1 km of home, while most women living in Zone 3 preferred a provider more than 3 km from home (Table 4). These findings demonstrate that the hypothesis that women living far from the city center would prefer local neighborhood-based services was proved incorrect, since so many women living at the outskirts of the city preferred to go to BGH.

Table 5. Socioeconomic and demographic characteristics of study participants by distance from home to Bo city center and road distance traveled to preferred provider.

		Distance from home to city center (km)					Distance from home to preferred provider (km)					
		All	Zone 1 < 1.0	Zone 2 1.0 - 2.9	Zone 3 ≥ 3.0	X <sup>2</sup> p-value	All providers	Bo providers only	< 1.0	1.0 - 2.9	≥ 3.0	X <sup>2</sup> p-value
		Mean (SD)	n (%)	n (%)	n (%)		Mean (SD)	Mean (SD)	n (%)	n (%)	n (%)	
All		2.2 (1.1)	492 (20.3)	1197 (49.5)	730 (30.2)	--	3.2 (12.0)	2.0 (1.2)	599 (24.8)	1078 (44.6)	742 (30.7)	--
Age (years)	18-24	2.2 (1.1)	90 (18.3)	241 (20.1)	146 (20.0)	0.220	2.8 (2.8)	2.0 (1.1)	119 (19.9)	209 (19.4)	149 (20.1)	<b>0.006</b>
	25-34	2.1 (1.2)	193 (39.2)	377 (31.5)	240 (32.9)		3.4 (14.5)	1.9 (1.2)	235 (39.2)	348 (32.3)	226 (30.5)	
	35-44	2.2 (1.2)	113 (23.0)	293 (24.5)	181 (24.8)		3.1 (10.0)	2.1 (1.2)	143 (23.9)	254 (23.5)	190 (25.6)	
	45-54	2.2 (1.1)	47 (9.6)	132 (11.0)	78 (10.7)		4.7 (21.0)	2.2 (1.2)	48 (8.0)	122 (11.3)	88 (11.9)	
	≥55	2.2 (1.1)	49 (10.0)	154 (12.9)	85 (11.6)		2.5 (2.1)	2.2 (1.2)	54 (9.0)	146 (13.5)	88 (11.9)	
Marital status	Never Married	2.0 (1.1)	85 (17.3)	186 (16.1)	101 (14.2)	0.161	3.2 (12.5)	1.8 (1.1)	99 (17.1)	180 (17.1)	94 (13.0)	<b>0.021</b>
	Married	2.2 (1.1)	349 (70.9)	812 (70.2)	532 (75.0)		3.5 (13.0)	2.1 (1.2)	417 (71.9)	728 (69.0)	547 (75.8)	
	Widowed or Divorced	2.1 (1.1)	58 (11.8)	158 (11.7)	76 (10.7)		2.3 (1.7)	2.1 (1.2)	64 (11.0)	147 (13.9)	81 (11.2)	
Electricity in residence	Yes	1.7 (1.1)	424 (86.2)	533 (44.5)	213 (29.2)	<b>&lt;0.001</b>	2.8 (12.1)	1.7 (1.1)	392 (65.4)	557 (51.6)	222 (30.0)	<b>&lt;0.001</b>
	No	2.6 (0.9)	66 (13.4)	620 (51.8)	492 (67.4)		3.8 (12.2)	2.4 (1.2)	187 (31.2)	495 (45.9)	495 (66.8)	
Type of floor in dwelling	Concrete	2.1 (1.1)	443 (90.0)	937 (78.3)	548 (75.1)	<b>&lt;0.001</b>	3.1 (12.2)	2.0 (1.2)	496 (82.8)	911 (84.4)	521 (70.3)	<b>&lt;0.001</b>
	Other	2.6 (1.0)	49 (10.0)	260 (21.7)	181 (24.8)		3.6 (11.0)	2.3 (1.3)	103 (17.2)	168 (15.6)	219 (29.6)	
Approximate distance from home to drinking water source (meters)	<50	2.3 (1.1)	243 (49.8)	552 (47.8)	392 (55.1)	<b>&lt;0.001</b>	3.5 (13.9)	2.1 (1.2)	298 (51.3)	472 (44.8)	417 (57.8)	<b>&lt;0.001</b>
	50-150	2.1 (1.1)	172 (35.2)	550 (47.6)	261 (36.7)		2.9 (7.9)	2.0 (1.1)	212 (36.5)	514 (48.8)	257 (35.6)	
	>151	1.8 (1.4)	73 (15.0)	54 (4.7)	59 (8.3)		3.4 (17.8)	1.8 (1.4)	71 (12.2)	68 (6.5)	47 (6.5)	

*p*-values in bold are significant at  $\alpha \leq 0.05$

## **Discussion**

This study demonstrates the dynamic nature of the healthcare marketplace in urban Africa. Once women in the city of Bo, Sierra Leone, determine that they require professional rather than home-based malaria care, they select a healthcare provider from a diversity of options. Most women prefer to consult at a health facility offering both outpatient care and advanced services, including inpatient care, and most women prefer public facilities that offer free primary healthcare services. Although, on average, women in Bo live only 0.6 km from one of the healthcare facilities listed as a preferred provider by study participants, most women do not seek malaria care from the facility nearest to their homes. Instead, they travel a median distance of more than 4 km roundtrip to seek treatment from their own preferred providers, which is a distance beyond what could reasonably be walked by an adult with malaria or another acute febrile illness that has not responded to home-based care.

The diversity of healthcare providers available in Bo city is similar to what is found in other urban areas of Ghana<sup>35</sup> and Nigeria,<sup>45, 46</sup> where a variety of public and private hospitals, primary care centers, and pharmacies provide options for infection diagnosis and treatment. The preference for hospital-based care in our study is congruent with previous studies in urban Nigeria<sup>45</sup> and Senegal.<sup>47</sup> However, the preference of our participants to consult with malaria care providers that are not within easy walking distance from home is not something that has been previously explored in an urban West African setting.

The decision to bypass nearer facilities<sup>22</sup> suggests that factors such as the severity

of the illness,<sup>48</sup> the cost of care,<sup>49</sup> and the perceived quality of care<sup>50, 49</sup> may be more important in the selection of a healthcare provider in Bo than a convenient location. Previous studies have suggested that most bypassing in rural areas of low-income countries occurs when patients bypass a public facility to seek care at a private facility that is perceived to offer higher-quality and more responsive care.<sup>51, 52, 53, 54</sup> In Bo, the opposite seems to be happening, with many residents bypassing private facilities with potentially high fees to seek free care from public facilities. The perceived quality of care at healthcare facilities, including public facilities, in Bo and other low-income urban areas may be enhanced by the need for providers to “compete” for patients in a crowded healthcare marketplace.<sup>49, 55</sup> Access to transportation, at least as seen in rural Tanzania, may enable healthcare consumers to opt for a preferred provider not within walking distance of their homes rather than being reliant on facilities in close proximity to their places of residence.<sup>30</sup>

A significant limitation of this study was that the question posed to the women about where they would go for malaria care was hypothetical and indicative of their stated preference for healthcare provider. In practice, women may not always visit their preferred providers when febrile, and they may be especially likely to use facilities closer to home when they are seriously ill. This may mean that our calculations of average distance travelled have overestimated the distances from home to usual providers, even if they are accurate measures of the distances from home to preferred providers.

This study did not ask women to explain the reasons behind their stated preference for healthcare provider. This, in turn, limits the interpretation of our findings.

The study also did not determine whether a woman's choice would change if the question was asked at a different point in time or under different circumstances, a limitation carried by a stated preference study such as this one. Even so, this analysis provides new insights into the dynamics of the healthcare marketplace in urban areas of low-income countries—a market that includes public and private facilities; hospitals, clinics, pharmacies, and other types of healthcare providers; and a plethora of healthcare options from in-home care to specialty services offered hundreds of kilometers away.

This study demonstrates the diversity of the healthcare marketplace that exists in urban Bo that provide a variety of service options to the local population. Despite the availability of providers within a short distance of most homes in the city of Bo, most women choose to travel farther than walking distance for malaria care. Based on previous studies, the desire to seek affordable care<sup>37, 56</sup> and to be treated by a provider with a reputation for good quality care<sup>49, 50, 56, 57</sup> may be the driving forces behind women's willingness to bypass facilities close to home when seeking care for acute febrile illnesses. This aligns with participants' stated preferences for prioritizing cost and provider reputation over a convenient location when choosing a provider for themselves or family members.<sup>3</sup>

In urban settings, where a variety of providers are accessible to the population, the geographic placement of new healthcare facilities might not be as important for improving access to health services as the cost of those services and the perception that the facility offers high quality preventive, diagnostic, and therapeutic services. Measures of spatial access to healthcare alone do not capture the human factors that influence

provider selection. Public health officials and health system planners must account for environmental factors such as location as well as provider characteristics, individual preferences, and costs when seeking to expand access to health services.



### CHAPTER 3. PAPER 2 - INPATIENT HEALTHCARE PROVIDER BYPASSING BY WOMEN AND THEIR CHILDREN IN BO, SIERRA LEONE<sup>3,4</sup>

#### **Abstract**

*Objective.* Bypassing refers to a person's choice to seek care at a healthcare facility that is not the nearest one of its type to the home. This study examined inpatient care facility bypassing in urban Bo, Sierra Leone.

*Methods.* Data about use of health services were collected from a population-based sample of 1980 mothers of children less than 15 years old from across Bo. A geographic information system (GIS) of Bo was used to identify the location of healthcare facilities and residential structures, and to measure the road distance from each participating household to the nearest and preferred providers.

*Results.* Most mothers in Bo reported preferring to seek inpatient care for themselves and their children at the city's only public hospital, which offers free or low cost care as well as access to advanced diagnostic and therapeutic services not available elsewhere in the city. The preference for care from this facility was consistent across household socioeconomic strata. Women frequently bypass private facilities near to their homes to seek care at the governmental referral hospital, which is located in the central part of the

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<sup>3</sup> A version of this paper will be submitted to a peer-reviewed journal. Co-authorship include: Lila C. Fleming, Rashid Ansumana, Alfred S. Bockarie, Joel Alejandro, Umaru Bangura, David H. Jimmy, Kevin M. Curtin, Nigel M. Waters, Heibatollah Baghi, David A. Stenger, and Kathryn H. Jacobsen.

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city. Households located farther from the city center and farther from healthcare providers had the highest bypassing rates.

*Conclusion.* Although Bo has a diverse healthcare marketplace, it offers limited inpatient care options. Cancer care and other advanced and rehabilitative services are not available in the city, and private hospitals may need to fill this gap in services if the public hospital does not expand its offerings.

**Keywords:** Healthcare bypassing; Choice Behavior; Hospitalization; Urban Health Services; Maternal Behavior; Inpatients

## **Introduction**

Healthcare bypassing refers to a person's choice to visit healthcare facilities that are located farther from their homes rather than nearby facilities.<sup>19, 22</sup> The healthcare facility bypassing literature seeks to understand the reasons behind this choice and identifies the perceived severity of illness,<sup>22, 23, 24</sup> the number of beds at the healthcare facility nearest to a person's home,<sup>19, 25, 26</sup> the range of services provided at the facility,<sup>14, 27</sup> satisfaction with the care provided by the facility,<sup>19, 28</sup> as well as individual characteristics such as age,<sup>19, 28</sup> education,<sup>19, 25</sup> marital status,<sup>19</sup> income,<sup>28, 29, 29</sup> and insurance status<sup>23, 24, 29</sup> as potential influencing factors in bypassing behavior.

Studies examining the factors associated with bypassing have been conducted almost exclusively in rural areas and in developed countries, with only a few studies examining bypassing in rural areas in low- and middle- income countries (LMICs).<sup>30</sup> A very limited number of studies have focused on bypassing behaviors in urban areas where a wide choice of healthcare providers may be available,<sup>35, 45</sup> and only two studies have

examined the bypassing phenomenon in urban areas of LMICs. One study, from Chad, found significant differences in bypassing of primary care services in rural versus urban areas.<sup>29</sup> In urban areas, the search for high quality services was a key factor in bypassing, and individuals with high socioeconomic status were most likely to bypass.<sup>29</sup> The other study, from Sri Lanka, examined the bypassing phenomenon in both rural and urban areas, but only reported results at the aggregate level.<sup>22</sup> Bypassing was common among those who perceived their illness to be severe and were searching for a higher quality of care for their condition.<sup>22</sup> The potential dynamic nature of the formal healthcare marketplace in urban areas of LMICs presents an opportunity to further explore the phenomenon of bypassing.

Bo, the second largest urban center in Sierra Leone, has a diverse healthcare marketplace that serves an estimated population of about 150,000 spread across area of about 30 km<sup>2</sup>.<sup>21</sup> An assortment of services from basic medical care for acute illnesses to advanced inpatient medical services are available within the city. Government (public) hospitals offer care at low or no cost to the patient. Private nonprofit hospitals run by religious organizations (mission hospitals) and non-governmental organizations (NGOs) may offer affordable care, and private for-profit hospitals are also available but may be expensive.<sup>3</sup> Hence, Bo provides an ideal location to further the study of bypassing behavior in urban areas of LMICs.

This paper adds to the healthcare bypassing literature by focusing on bypassing behavior in an urban area of Sierra Leone. The purposes of this study are (1) to determine the preference of inpatient care facility by mothers of children less than 15

years old for themselves and their children in urban Bo, (2) to examine the rate of inpatient care facility bypassing by mothers for themselves and their children, and (3) to identify the factors that may contribute to a mother's choice to bypass the nearest inpatient healthcare facility from her home for herself or her child when the need for inpatient care arises.

## **Methods**

This paper uses the same data that were used for the previous chapter of the dissertation. A Geographic Information System (GIS)-based representation of the city of Bo was created in ArcGIS (v. 10.1), which was originally produced in 2009 by the Mercy Hospital Research Laboratory (MHRL) team utilizing a participatory GIS (PGIS) approach.<sup>58, 59</sup> Input from municipal authorities and long-term residents of the city allowed for the accurate mapping of geographic features including administrative boundaries, roads and trails, and water bodies by the MHRL team.<sup>21</sup> These geographic data are publicly available at OpenStreetMap.org and have been updated to remain current (last update: January, 2015).

Bo is divided into 68 administrative sections (neighborhoods). Two sections closest to MHRL for convenience were selected for a pilot study.<sup>3</sup> Then, the remaining 66 sections were randomly sampled. This random sample captured a total of 18 sections. These sections were located near the city center as well as at the outskirts of the city. The selected 18 sections were then used for a door-to-door health census conducted by the MHRL team,<sup>21</sup> and these data were used for the present study. After digitization of satellite imagery of the rooftops of all the buildings in the selected 18 sections, a total of

1659 single-family or multi-family residential structures were identified using the PGIS approach and, with each household's consent, the longitude and latitude (XY) coordinates of the front door of each structure were recorded using global positioning system (GPS) units (accuracy of <10 meters).<sup>21</sup> The XY coordinates of available health care providers in Bo were also collected. The institutional review boards of Njala University (Bo, Sierra Leone), George Mason University (Fairfax, Virginia, USA), and the U.S. Naval Research Laboratory (Washington, DC, USA) approved the study protocol.

Health survey data were collected between November 2010 and February 2011 using a two-stage interview process. In stage one, a consenting adult from 3286 of the 3295 (99.7%) households provided information about the residence, including the number of households (families) in the dwelling, socio-economic information related to the dwelling, and the age and sex of all household residents. In stage two, 3564 of 3975 (89.7%) of the consenting adult women (age 18 or older) in each household who indicated that they had ever been pregnant completed a short interview about their reproductive health, the health of their youngest child 15 years of age or younger, and the factors that influenced their provider selection when accessing healthcare for themselves and their children. To ensure the protection of participant data, a trained interviewer recorded all responses on a password protected tablet computer then each day the data from the tablets were downloaded to a secure computer and the stored files were removed from the tablet.

To evaluate the need for inpatient care for mothers and their children, two questions were asked. The first question was *“If you were very sick and needed to be*

*treated for several days and nights away from home, where would you go for care?”*

This same question was also asked about each woman's youngest living child. A follow-up question was then used to determine the specific healthcare facility or provider a mother would choose to visit for herself or her child. Of the 2735 (76.7%) women who had children 15 years of age or younger, 1980 (72.4%) answered the questions related to inpatient healthcare needs for both herself and her child and could be included in the analysis. Women whose youngest child was older than 15 years of age, those who did not answer questions related to inpatient care needs, and those who named a particular doctor or nurse rather than a hospital or clinic were excluded from the analysis. Facilities that were named as a preferred provider a combined total of less than twenty times across women and children were also excluded, as most of the infrequently named clinics do not routinely offer inpatient care services.

For this study, a mother or child was classified as having bypassed a healthcare facility if the inpatient healthcare facility nearest in road distance to the home was different from her listed preferred facility. Identification of the nearest inpatient care provider, and road distance measurements from each woman's home to this facility and to her preferred provider for herself and for her youngest child, were conducted using the Network Analyst tool available in ArcGIS (version 10.1). This tool was also used to measure the road distance of a residence to the city center, which was defined as the place where three main roads in Bo (Old Gerihun Road, Fenton Road, and Bojon Street) intersect (Figure 8). Geographic data were projected to Universal Transverse Mercator (UTM) coordinate system Zone 29N. Road segment errors in the geographic data were

corrected using a tolerance distance of 3 meters to facilitate network analysis. When preparing the network for analysis, residences and facility locations were automatically snapped to the nearest road within 5 meters of the structure.

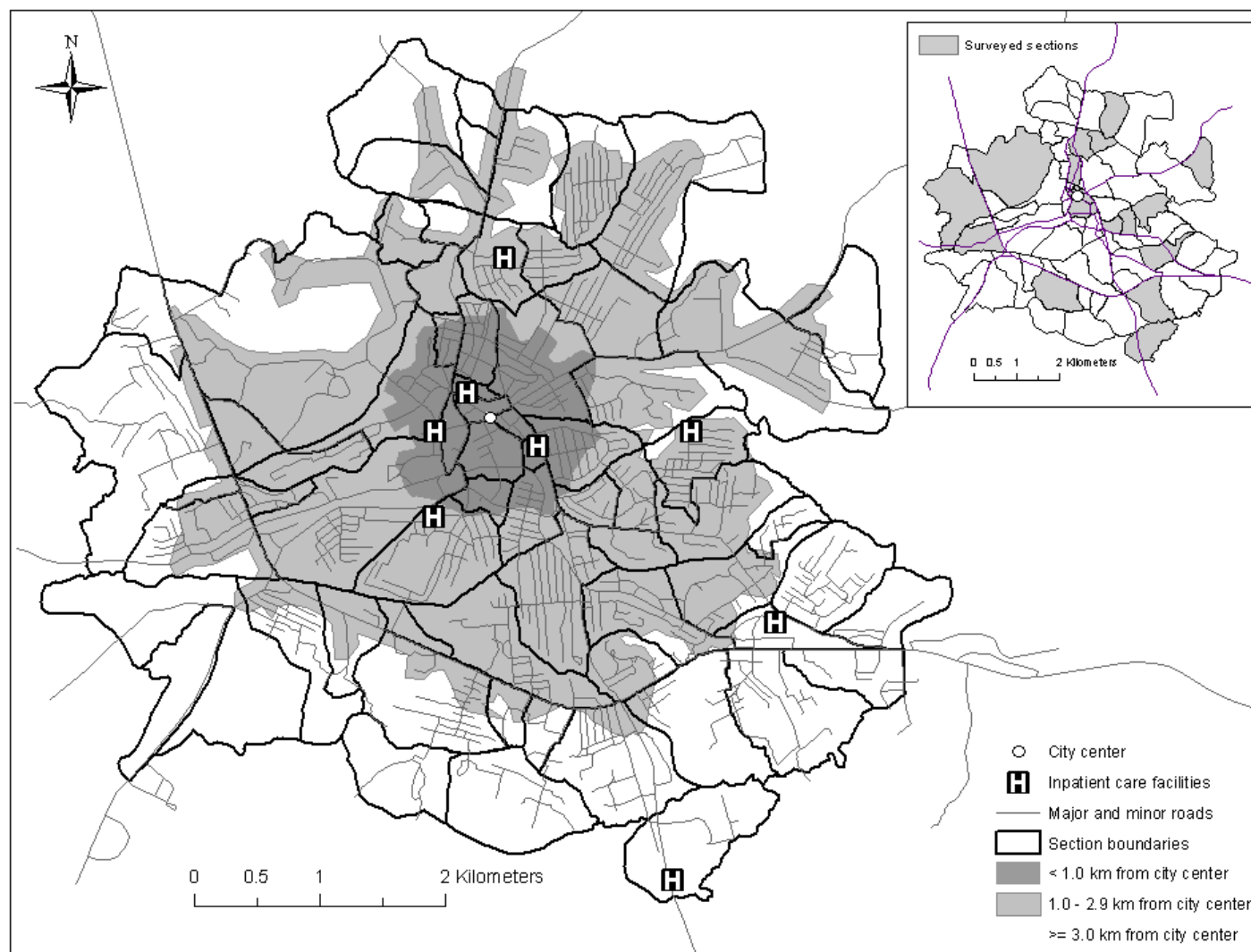


Figure 8. Bo City, Sierra Leone, inpatient healthcare facility locations, road travel distance to a hospital, and sections (neighborhoods) sampled for participation in maternal health surveys.



To assess the factors that may influence bypassing of the nearest inpatient healthcare facility, two questions were asked about the mother and her child: “*If cost was not a barrier, would you prefer to go to a different healthcare provider than the one you usually go to when you are sick?*” and a three-part question about “*When you are choosing where to go for medical care, which is a more important factor?*” Using a circular triad method<sup>60</sup> for this question, women were presented with three paired-comparison questions: cost versus location, cost versus reputation, and location versus reputation. These three questions allowed the highest priority factor to be identified. For example, if a woman chose location, location, reputation in the three paired-comparison questions as her priority, location was her most influential factor. Paired-comparison questions are commonly used for public health research. Based on previous research, this procedure is considered to be unbiased, as well as easily used and a powerful tool to learn about a person’s preferences for goods, services, and policies among others.<sup>61</sup>

Socio-demographic variables were also considered in relation to bypassing behavior. To assess a household socioeconomic status (SES), a socioeconomic index was developed for the purpose of categorizing households into SES terciles<sup>62</sup> to compare differences between bypassing status and the factors that may influence bypassing behavior between groups of low and high SES.<sup>63</sup> Factor analysis was used to determine which household-related variables would be included in the index as this type of analysis allows for the exploration of underlying structures within a set of variables.<sup>44</sup> Seven household-level variables related to the characteristics of the residence such as the house and floor material, availability of electricity, availability of toilet facilities (flush latrine,

pit latrine, bucket), the source of drinking water (well or piped), and the number of individuals and families living in each residence—variables typically included in an SES index—<sup>63, 64</sup> were included in the factor analysis. Prior to analysis all question responses were categorized<sup>63</sup> using a point scale of 0 (indicating low SES), 1 (indicating middle SES), and 2 (indicating high SES). Variables were selected if the correlation between the variable and the factor (factor loading) had a value of 0.6 or greater.<sup>62</sup> Five questions met this criteria (Table 6): (1) “*What is the primary material used for the construction of the house?*” (concrete block = 2; mud block = 1; mud and sticks or other = 0). (2) “*What is the main floor material used in the house?*” (Covered with floor tile = 2, concrete floor = 1, muddy floor = 0, other = 0); “*Does the house have electricity?*” (yes = 2, no = 0); “*How many separate households (families) currently live in this building?*” (1 family = 2; 2 to 3 = 1; 4 or more = 0); as well as “*How many people currently live in this household?*” (1 to 5 individuals = 2; 6 to 9 = 1; 10 or more = 0). The sum of the values for these five variables (0-10) was used to assign a socioeconomic index value. The variables that made up the two retained components were used to create the SES index in view that SES is a complex concept and should contain variables reflecting its multi-dimensional nature.<sup>63</sup> To create SES terciles, scores of 0 to 4 were classified as low socioeconomic status (SES), scores from 5 to 6 were classified as middle SES, and scores from 7 to 10 were classified as high SES. The two excluded variables were the source of drinking water (piped or from a well), and the type of toilet used in the household. A total of 656 (33.1%) households were classified as having a low SES index, 766 (38.7%)

were classified as middle SES index, and 558 (28.2%) were classified as high SES index households.

Statistical analysis was conducted using SPSS (version 21) with a significance level of  $\alpha=0.05$ . Chi-square tests ( $\chi^2$ ) were used to identify differences in socio-demographic characteristics, SES index, and proximity to the nearest healthcare provider between women who would bypass the nearest inpatient healthcare facility for herself and her children and those who would not bypass.

Table 6. Factor analysis component loadings

	<i>Component 1</i>	<i>Component 2</i>
	<i>Loadings</i>	<i>Loadings</i>
<i>House material</i>	0.714	0.093
<i>Floor material</i>	0.656	0.161
<i>Electricity availability</i>	0.725	-0.207
<i>Number of families in the residence</i>	-0.095	0.821
<i>Number of individuals the in household</i>	-0.068	0.667
<i>Toilet type</i>	0.480	0.348
<i>Water source</i>	0.238	-0.127

## Results

Mothers identified eight inpatient healthcare facilities within the city of Bo as preferred providers when inpatient care was required (Figure 8). The three government-run facilities named by the women included one hospital—Bo Government Hospital (BGH), located in the city’s center—and two community health clinics. Four nonprofit facilities were named (three clinics and one hospital) along with one for-profit private hospital. Additionally, the Médecins Sans Frontières (MSF) clinic in Gondama (12 km south of Bo), which provides inpatient care at low or free cost to patients from Bo, was listed as a preferred provider for both women and children. (In Bo, the terms “clinic” and “hospital” are not consistently applied to particular types of facilities. Some clinics offer inpatient care, and some hospitals do not. All eight of the listed providers offer inpatient care services.)

The majority of participants listed BGH, the city’s only public referral hospital, as the preferred inpatient provider for themselves (73.9%) and their children (72.8%). Of the remaining women, 6.8% listed a government facility, 18.6% listed a nonprofit, and 0.7% named the for-profit facility as preferred for themselves. For children, these percentages were 6.5% public, 20.0% nonprofit, and 0.8% for-profit. Bo residents would travel, on average, 3.0 km (standard deviation  $\pm$  2.8 km) one-way by road to reach their preferred inpatient care provider.

The nearest inpatient facility to the home was located an average of 0.9 km ( $\pm$  0.8 km), and for most women the nearest inpatient provider to their homes was a nonprofit facility. Residences were, on average, 1.1 km ( $\pm$ 0.8 km) from the nearest nonprofit

provider but 1.3 km ( $\pm 1.1$  km) from the nearest public provider and, more specifically, 1.9 km ( $\pm 1.2$  km) from BGH (Figure 9). Thus, most bypassing for inpatient care in Bo occurs when an individual living near to a nonprofit provider passes by that facility to access care at BGH. The results demonstrate that the hypothesis that women would prefer to visit their closest inpatient care provider from the home was proven to be incorrect since women would prefer to bypass their closest facility to reach their preferred provider.

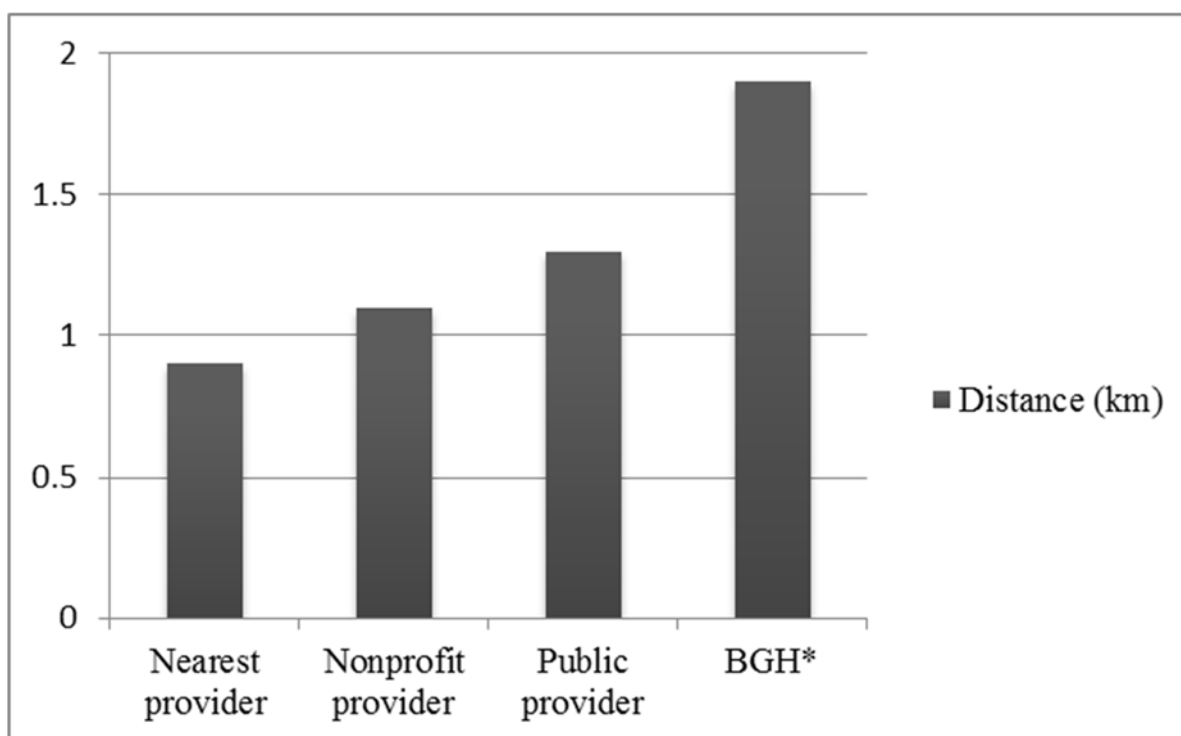


Figure 9. Nearest provider distance from home by provider type

\*Bo Government Hospital

Indeed, because of the strong preference for seeking inpatient care at BGH, the majority of mothers would chose to bypass their nearest inpatient healthcare facility to seek inpatient care for themselves (87.0%) and their children (87.6%). Most of the non-bypassers lived in the downtown Bo city, near BGH, which meant that they did not need to bypass other types of facilities to get to the city's public hospital. In contrast, women who lived farther from the city center, who were not particularly close to an inpatient care facility, were more likely to bypass the facility close to their homes to seek care at BGH (Table 7). Bypassing behavior did not significantly vary by SES or demographic characteristics (Table 7).



Table 7. Inpatient provider selection factors for mothers with pediatric offspring stratified by bypassing behavior, SES index, and the distances from the home to the nearest inpatient provider.

		<i>Bypass</i>			<i>SES index</i>			<i>Proximity to nearest provider</i>		
		<i>Yes</i>	<i>No</i>	$\chi^2$ <i>p-value</i>	<i>High</i>	<i>Low</i>	$\chi^2$ <i>p-value</i>	$\leq 1.0$ km	$\geq 2.0$ km	$\chi^2$ <i>p-value</i>
		<i>n=1723</i>	<i>n=257</i>		<i>n=558</i>	<i>n=656</i>		<i>n=1127</i>	<i>n=444</i>	
		<i>n(%)</i>	<i>n(%)</i>		<i>n(%)</i>	<i>n(%)</i>		<i>n(%)</i>	<i>n(%)</i>	
<i>Nearest provider</i>	<i>Public (Government)</i>	343 (19.9)	193 (75.1)	<0.001*	136 (24.4)	178 (27.1)	0.003*	375 (33.3)	7 (1.6)	<0.001*
	<i>Private nonprofit</i>	1253 (72.7)	57 (22.2)		391 (70.1)	415 (63.3)		643 (57.1)	436 (98.2)	
	<i>Private for-profit</i>	127 (7.4)	7 (2.7)		31 (5.6)	63 (9.6)		109 (9.7)	1 (0.2)	
<i>Preferred provider</i>	<i>Public (Government)</i>	1405 (81.5)	193 (75.1)	<0.001*	451 (80.8)	529 (80.6)	0.595	884 (78.4)	388 (87.4)	0.001*
	<i>Private nonprofit</i>	311 (18.0)	57 (22.2)		101 (18.1)	125 (19.1)		232 (20.6)	54 (12.2)	
	<i>Private for-profit</i>	7 (0.4)	7 (2.7)		6 (1.1)	2 (0.3)		11 (1.0)	2 (0.5)	
<i>Provider selection factor</i>	<i>Reputation</i>	880 (54.9)	161 (69.4)	<0.001*	331 (62.3)	348 (58.7)	0.162	651 (65.1)	265 (63.5)	0.008*
	<i>Cost</i>	718 (44.8)	51 (22.0)		196 (36.9)	234 (39.5)		384 (36.3)	152 (36.5)	
	<i>Location</i>	4 (0.2)	20 (8.6)		4 (0.8)	11 (1.9)		24 (2.3)	0 (0.0)	
<i>Different provider selected if cost not a barrier</i>	<i>Yes</i>	1409 (83.6)	169 (66.3)	<0.001*	456 (82.6)	516 (81.3)	0.547	891 (80.3)	395 (90.4)	<0.001*
	<i>No</i>	276 (16.4)	86 (33.7)		96 (17.4)	119 (18.7)		219 (19.7)	42 (9.6)	
<i>Mother's age (years)</i>	<i>18-24</i>	403 (23.4)	66 (25.7)	0.328	128 (22.9)	154 (23.5)	0.941	278 (24.7)	110 (24.8)	0.164
	<i>25-34</i>	735 (42.7)	97 (37.7)		240 (43.0)	271 (41.3)		475 (42.1)	188 (42.3)	
	$\geq 35$	585 (34.0)	94 (36.6)		190 (34.1)	231 (35.2)		374 (33.2)	146 (32.9)	
<i>Age of youngest child (years)</i>	<i>&lt;1</i>	247 (14.3)	47 (18.3)	0.232	80 (14.3)	108 (16.5)	0.691	169 (15.0)	68 (15.3)	0.931
	<i>1-4</i>	844 (49.0)	117 (45.5)		270 (48.4)	311 (47.4)		549 (48.7)	217 (48.9)	
	<i>5-15</i>	632 (36.7)	93 (36.2)		208 (37.3)	237 (36.1)		409 (36.3)	159 (35.8)	
<i>Mother's marital status</i>	<i>Married</i>	1397 (81.5)	214 (84.3)	0.281	454 (81.8)	529 (81.4)	0.925	901 (80.5)	359 (81.0)	0.815
	<i>Not married</i>	318 (18.5)	40 (15.7)		101 (18.2)	121 (18.6)		218 (19.5)	84 (19.0)	
<i>Residence distance from city center (km)</i>	<i>&lt;1.0 km</i>	304 (22.7)	52 (22.9)	<0.001*	133 (29.6)	57 (11.5)	<0.001*	351 (38.4)	0 (0.0)	<0.001*
	<i>1.0-2.9 km</i>	600 (44.7)	144 (63.4)		204 (45.3)	287 (58.0)		409 (44.7)	143 (41.0)	
	$\geq 3$ km	437 (32.6)	31 (13.7)		113 (25.1)	151 (30.5)		154 (16.8)	206 (59.0)	
<i>Bypass</i>	<i>Yes</i>	--	--	--	487 (87.3)	564 (86.0)	0.605	930 (82.5)	437 (98.4)	<0.001*
	<i>No</i>	--	--		71 (12.7)	92 (14.0)		197 (17.5)	7 (1.6)	

\*Significant at  $\alpha=0.05$

Women who said that they would choose a different provider if cost was not a barrier were more likely than other women to bypass (Table 7 and Table 8). This suggests that the preference for BGH may be related to cost as well as reputation (Table 7). Two additional items are of note. First, women from households with a high SES index were more likely than women from low SES households to say that they would choose a different provider if cost was not a barrier, particularly for their child (Table 8).

Table 8. Inpatient provider selection factors for youngest children (ages birth to 15 years) stratified by bypassing behavior, SES index, and the distances from the home to the nearest inpatient provider.

		<i>Bypass</i>			<i>SES index</i>			<i>Proximity to nearest provider</i>		
		<i>Yes</i>	<i>No</i>	$\chi^2$ <i>p-value</i>	<i>High</i>	<i>Low</i>	$\chi^2$ <i>p-value</i>	$\leq 1.0$ km	$\geq 2.0$ km	$\chi^2$ <i>p-value</i>
		<i>n=1735</i>	<i>n=245</i>		<i>n=558</i>	<i>n=656</i>		<i>n=1127</i>	<i>n=444</i>	
		<i>n (%)</i>	<i>n (%)</i>		<i>n (%)</i>	<i>n (%)</i>		<i>n (%)</i>	<i>n (%)</i>	
<i>Nearest provider</i>	<i>Public (Government)</i>	347 (20.0)	189 (77.1)	<b>&lt;0.001*</b>	136 (24.4)	178 (27.1)	<b>0.003*</b>	375 (33.3)	7 (1.6)	<b>&lt;0.001*</b>
	<i>Private nonprofit</i>	1263 (72.8)	47 (19.2)		391 (70.1)	415 (63.3)		643 (57.1)	436 (98.2)	
	<i>Private for-profit</i>	125 (7.2)	9 (3.7)		31 (5.6)	63 (9.6)		109 (9.7)	1 (0.2)	
<i>Preferred provider</i>	<i>Public (Government)</i>	1382 (79.7)	189 (77.1)	<b>&lt;0.001*</b>	442 (79.2)	519 (79.1)	0.555	870 (77.2)	375 (84.5)	<b>0.013</b>
	<i>Private nonprofit</i>	347 (20.0)	47 (19.2)		110 (19.7)	135 (20.6)		245 (21.7)	67 (15.1)	
	<i>Private for-profit</i>	6 (0.3)	9 (3.7)		6 (1.1)	2 (0.3)		12 (1.1)	2 (0.5)	
<i>Provider selection factor</i>	<i>Reputation</i>	840 (53.4)	171 (75.6)	<b>&lt;0.001*</b>	317 (60.5)	351 (60.9)	0.392	636 (61.4)	252 (61.8)	0.167
	<i>Cost</i>	727 (46.2)	51 (22.6)		207 (39.5)	223 (38.7)		390 (37.7)	156 (38.2)	
	<i>Location</i>	5 (0.3)	4 (1.8)		0 (0.0)	2 (0.3)		9 (0.9)	0 (0.0)	
<i>Different provider selected if cost not a barrier</i>	<i>Yes</i>	1386 (82.5)	174 (73.7)	<b>&lt;0.001*</b>	449 (82.1)	483 (77.2)	<b>0.037*</b>	808 (74.1)	390 (88.8)	<b>&lt;0.001*</b>
	<i>No</i>	295 (17.5)	62 (26.3)		98 (17.9)	143 (22.8)		282 (25.9)	49 (11.2)	
<i>Bypass</i>	<i>Yes</i>	--	--	--	484 (86.7)	569 (86.7)	0.319	942 (83.6)	437 (98.4)	<b>&lt;0.001*</b>
	<i>No</i>	--	--		74 (13.3)	87 (13.3)		185 (16.4)	7 (1.6)	

\*Significant at  $\alpha=0.05$

Second, the paired-comparison questions indicated that reputation was a higher priority for healthcare provider selection than cost or provider location, especially among women who lived within 1 km of an inpatient provider (that is, those who lived in the city center near BGH) (Table 9). Together, these observations suggest that Bo residents with higher SES, many of whom live in downtown Bo rather than at the outskirts of the city, choose to go to BGH rather than traveling to Freetown, the capital city, when they need advanced care (Table 9). By comparison, many lower-SES women living farther from the city center choose to bypass local private providers to seek care at BGH, where they know that the costs will be limited (Table 9). While some private providers offer free or low-cost care, health consumers may not be able to access advanced diagnostics and therapeutics at those facilities, and they may have to negotiate on prices rather than trusting that prices will be disclosed ahead of time like they are at BGH.

Table 9. Comparison of women preferring Bo Government Hospital (BGH) for themselves and their children rather than another inpatient care provider.

		<i>Mothers</i>			<i>Children</i>		
		<i>BGH*</i>	<i>All other inpatient providers</i>	$\chi^2$ <i>p-value</i>	<i>BGH*</i>	<i>All other inpatient providers</i>	$\chi^2$ <i>p-value</i>
		<i>n=1464</i>	<i>n=516</i>		<i>n= 1442</i>	<i>n=538</i>	
		<i>n (%)</i>	<i>n (%)</i>		<i>n (%)</i>	<i>n (%)</i>	
<i>Bypass</i>	<i>Yes</i>	1382 (94.4)	341 (66.1)	<b>&lt;0.001**</b>	1359 (94.2)	376 (69.9)	<b>&lt;0.001**</b>
	<i>No</i>	82 (5.6)	175 (33.9)		83 (5.8)	162 (30.1)	
<i>Proximity to nearest provider</i>	$\leq 1.0$ km	772 (66.6)	355 (86.2)	<b>&lt;0.001**</b>	764 (67.1)	363 (84.0)	<b>&lt;0.001**</b>
	$\geq 2.0$ km	387 (33.4)	57 (13.8)		375 (32.9)	69 (16.0)	
<i>Provider selection factor</i>	<i>Reputation</i>	740 (54.3)	301 (63.8)	<b>&lt;0.001**</b>	694 (53.1)	317 (64.6)	<b>&lt;0.001**</b>
	<i>Cost</i>	619 (45.4)	150 (31.8)		311 (46.7)	167 (34.0)	
	<i>Location</i>	3 (0.3)	1 21 (4.4)		2 (0.2)	7 (1.4)	
<i>Different provider selected if cost not a barrier</i>	<i>Yes</i>	1175 (81.8)	403 (80.1)	0.462	1140 (81.4)	420 (81.2)	0.533
	<i>No</i>	262 (18.2)	100 (19.9)		260 (18.6)	97 (18.8)	
<i>Residence distance from city center (km)</i>	$<1.0$ km	268 (23.6)	88 (20.3)	0.348	268 (23.7)	88 (20.2)	0.328
	$1.0-2.9$ km	529 (46.6)	215 (49.7)		532 (47.0)	212 (48.6)	
	$\geq 3$ km	338 (29.8)	130 (30.0)		332 (29.3)	136 (31.2)	
<i>SES Index</i>	<i>High</i>	426 (47.7)	132 (41.2)	<b>0.048**</b>	421 (48.1)	137 (40.5)	<b>0.018**</b>
	<i>Low</i>	468 (52.3)	188 (58.8)		455 (51.9)	201 (59.5)	

\* Bo Government Hospital. \*\*Significant at  $\alpha=0.05$

## **Discussion**

Bypassing inpatient care facilities is a common occurrence in urban Bo. The preference for BGH, despite the proximity of many households to other providers, usually private nonprofit facilities, suggests that access to advanced services, such as diagnostic and specialty care, as well as to free or low-cost inpatient care, is a key factor in household-level decision-making about where to access health care.

Previous studies have observed that the decision about where to receive health care services is influenced by the facility's quality and reputation and by whether facilities are government or privately run.<sup>3, 34</sup> Most studies suggest that public providers have a poorer reputation than private providers.<sup>37, 52, 54, 65</sup> However, in Bo, the main public hospital was strongly preferred by women for themselves and their children.

Although we did not directly inquire about the reasons behind a woman's choice of provider for herself or her child, the results may indicate that BGH is providing exceptional care. It could also be a simple reflection of the fact that BGH is the only hospital in Bo that offers advanced diagnostics and advanced therapies such as surgery. However, we could not ask for this information in follow-up studies with focus groups due to the Ebola outbreak in 2014, which limited our ability to conduct this follow-up study.

A lack of competition in the inpatient care market makes BGH the only viable option for many types of inpatient care services. If other providers in Bo city were offering similar treatment options at a reasonable cost, then BGH's reputation and status as the most preferred provider might quickly dissipate.

Bypassing practices may vary based on the type of care being sought. A study of primary healthcare facilities in Chad reported a bypassing rate of 54% in an urban area.<sup>29</sup> The rate of bypassing for inpatient care in Bo was much higher, at nearly 90%. Bypassing behavior in Bo might be very different for primary care services, since a greater diversity of public and private clinics are available across the city. For primary care, Bo residents also have access to a diversity of clinicians who make home visits, herbalists who dispense traditional remedies, and other options for home-based care. Inpatient care requires a particular type of medical provider at a particular type of facility, and for most residents of Bo in 2010-2011 BGH was perceived to be the best option for serious illnesses.

This perception may have been related to an innovative healthcare policy implemented nationally in Sierra Leone in April 2010. Under that plan, a variety of free healthcare services were offered to pregnant and breastfeeding women and to children under 5 years of age who sought care at government-run facilities.<sup>66</sup> The initiative is financed through funds from external donors as well as the national government.<sup>66</sup> Hence this initiative is justified as it reduces the burden of healthcare expenditures imposed on the national government, and allows for cost sharing.

Sierra Leone's government initiative may have increased the appeal of BGH for maternal and child health services. Under this new national policy, private inpatient healthcare providers may need to increase the type and number of services they offer (such as offering rehabilitative services or other unique care plans not available at BGH),

examine their cost structures, and consider how to appeal to a larger demographic within Bo if they want to maintain and grown their client base.

A household's distance to a healthcare facility is usually considered to be an important factor in the choice of provider.<sup>30, 34, 51</sup> This may be true in rural areas, especially in low-income countries. In urban Bo, however, road distance does not seem to be a major factor for healthcare facility selection. Bypassing behavior in Bo also does not seem to be heavily influenced by travel distance.

Bypassing may also be a reflection of the number of opportunities available in an area. In the case of Bo, opportunities refer to the number of healthcare facilities that are available in Bo's city center. The results show that the majority of mothers would travel closer to the city center for inpatient healthcare where a higher concentration of providers exist. These results resemble the theory of intervening opportunities. This theory indicates that as the number of opportunities available increases in an area, the higher number of people would travel to that area.<sup>67, 68</sup> Therefore, in Bo, the higher number of facilities available closer to the city center would indicate that more women would go to this area for care.

Mothers who live farther from the city center and those who live more than 2.0 km from the nearest providers are more likely than other women to bypass. Even though these women tend to be from lower SES index households, they are not merely seeking care at the nearest facility. This is especially interesting given that Bo does not have a public transportation system so private, and sometimes costly, transportation arrangements must be made when a provider is not within easy walking distance of a



home. Access to affordable and reliable transportation or alternatively distributed healthcare<sup>69</sup> may be important for alleviating the burden of travel on severely ill adults and children.

The decision to bypass in an urban area also appears in other studies to be influenced by a household's high SES status, which increases their ability to pay for care and opens up a wider choice of providers with increased preference for private ones.<sup>29</sup> However, in Bo, SES was not a major factor in care seeking, since BGH was a preferred inpatient provider for nearly all demographic and socioeconomic groups. This finding has not been observed by other studies conducted solely in an urban area of a LMIC. Replication studies in urban centers with only one major referral hospital might help to determine whether this is a common finding in places where the inpatient care marketplace is limited.

It is also important to acknowledge that the questions about the stated preference for healthcare providers were hypothetical ones about plans for future care. In practice, mothers may not bypass their nearest facility when the need for inpatient care arises even if they would prefer to go elsewhere. And their actual selections of providers might not change even if money was not a barrier. Even with this limitation, the use of road network analysis to examine bypassing in an urban area of an LMIC provides new insights into the factors influencing inpatient bypassing in West Africa.

A variety of choices of inpatient care providers exist for urban Bo residents, yet the overwhelming preference for BGH, the large government-run facility in the center of the city, indicates a high demand for advanced care services that are at present not being

provided at other facilities within the city. This preference may also support the success of the national policy making many types of maternal and child health care free at public hospitals in Sierra Leone. Women in Bo appear willing to bypass nearer facilities and pay for transportation to BGH in order to access inpatient care there.

Private facilities, both nonprofit and for-profit, looking to recruit new patients and fill a gap in the healthcare marketplace in Bo may want to consider greater transparency about their fees, marketing to improve their reputation and desirability, and offering unique long-term care services, such as post-surgery rehabilitation or chronic disease management.

The rising burden of chronic diseases in LMICs as well as in high income countries (HICs), which requires extensive treatment for several years, calls for low cost and cost-effective approaches to chronic disease diagnosis, management, and treatment as well as the improved training of healthcare personnel.<sup>70, 71</sup> The need for expanded programs in low-income countries is specially critical. At present, there is almost no access to anti-hypertensive medications (despite a hypertension rate of about 25% in adults).<sup>72</sup> Therefore in Bo, the lack of access to cancer diagnosis and treatment, and to state-of-the-art care for other chronic diseases, points to a gap in the healthcare marketplace that needs to be filled by BGH or by other inpatient facilities in the Bo area.

## CHAPTER 4. PAPER 3 - EPIC: A FRAMEWORK FOR THE FACTORS THAT INFLUENCE THE SELECTION OF HEALTHCARE PROVIDERS<sup>5</sup>

### **Abstract**

*Introduction.* The decision about where to seek healthcare services once the need for care has been established is an important step in healthcare access.

*Methods.* We conducted a systematic review of the maternal and child health literature using Medline/PubMed. We then used a thematic synthesis approach to integrate themes from the eligible articles as a foundation for a comprehensive model of the factors that affect healthcare provider selection once the decision to seek formal medical care has been made.

*Results.* The *EPIC model* captures four main provider selection factors from the included articles: Environment (such as travel distance and transportation access), Provider (level of care, services, ownership, staffing, equipment and supplies, and reputation), Individual (socioeconomic and health status), and Cost (price and time).

*Conclusion.* All aspects of the *EPIC model* should be considered when studying and developing location-specific strategies to improve access to and choice of healthcare providers.

**Keywords:** Health Services; Health Services Accessibility; Health Care Quality, Access, and Evaluation; Maternal Health Services; Patient Acceptance of Health Care; Patient Participation.

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<sup>5</sup>A version of this paper will be submitted to a peer-reviewed journal. Co-authorship include: Lila C. Fleming and Kathryn H. Jacobsen.

## **Introduction**

Healthcare access can be considered to be a 4-step cycle of (1) deciding to seek care from a clinician after determining that professional clinical assistance is required, (2) selecting a particular healthcare provider to consult from among the many types of providers and specific clinicians available, (3) following through on the identified need for clinical services by visiting the selected provider for diagnostic and therapeutic care, and then (4) evaluating the level of satisfaction with the healthcare services received from the provider and the willingness to seek healthcare services from that provider again in the future (Figure 10). Health seeking behavior (Step 1) and patient satisfaction (Step 4) are generally well studied. The decision about where to seek services (Step 2) has been less explored but is of critical importance for health services research and policy. How do individuals and families decide what type of healthcare provider to visit—a clinic or hospital, a generalist or specialist, the nearest clinician or one whose office is on the other side of town? What are the factors that influence the selection of one provider over another provider offering the same types of services?

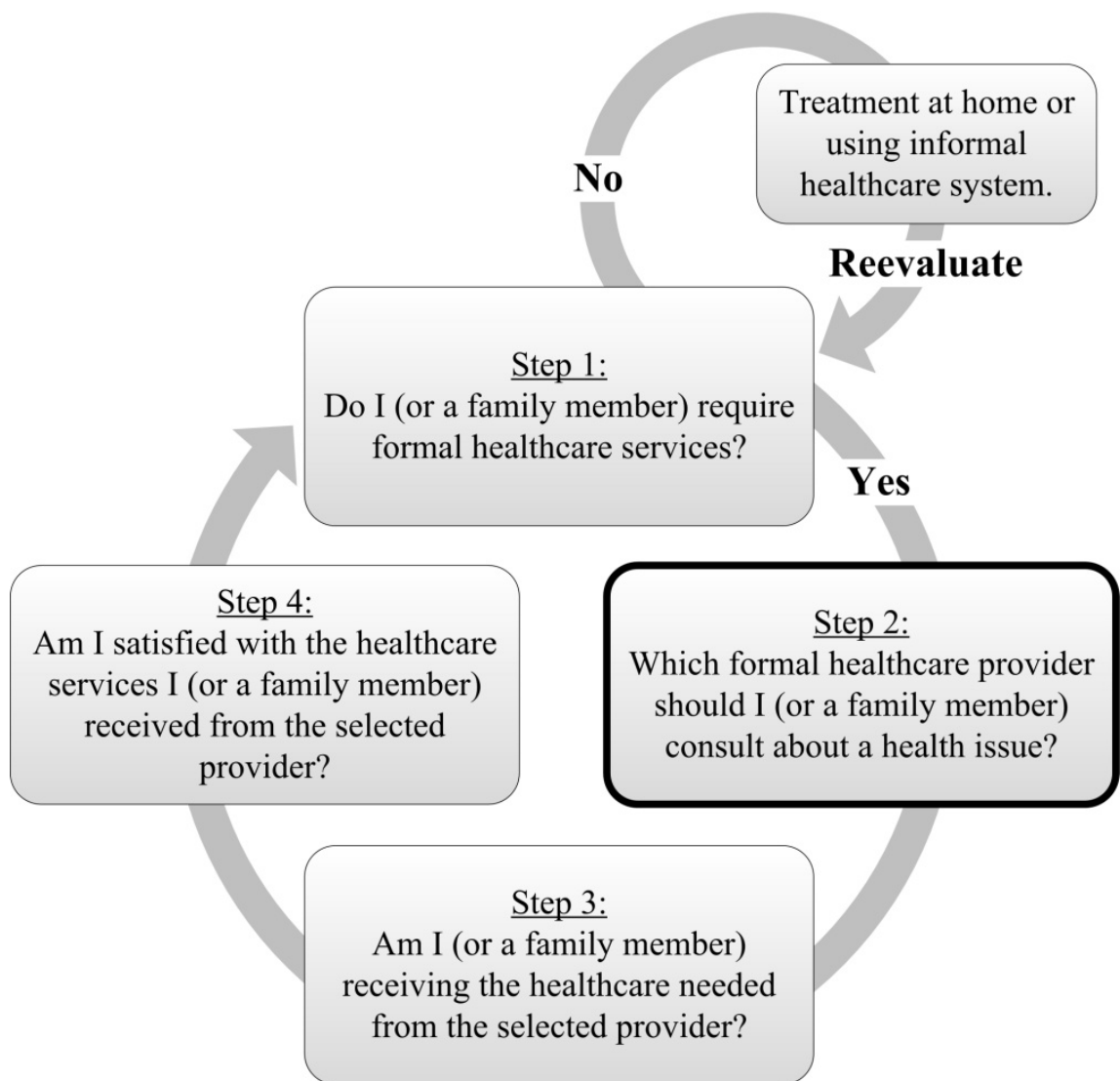


Figure 10. Steps in accessing formal healthcare services

In this paper, we use a review of the literature on healthcare provider selection within the field of maternal and child health (MCH) to formulate a model of healthcare provider selection. The goals of our analysis were to use a systematic review approach to identify a diverse set of published maternal and child health articles about healthcare provider selection (that is, studies focusing on Step 2 in Figure 10), to extract themes from each eligible paper, and to group these themes into a comprehensive model of the factors that affect formal healthcare provider selection. In this paper, we present the new “EPIC model” and describe its use for health services administrators, urban planners, healthcare practitioners, and policymakers.

## **Methods**

We searched the PubMed database using the MeSH (Medical Subject Heading) terms [(“Health Services/Utilization” OR “Health Services Accessibility”) AND (“Patient Acceptance of Health Care” OR “Decision Making”)]. PubMed is a service of the U.S. National Library of Medicine, and it includes abstracts from more than 24 million articles published in peer-reviewed life science journals from across the globe, including journals published in languages other than English. PubMed is the largest medical research database, and has extensive coverage of a diversity of health topics, including health services research, maternal and child health, epidemiology, community health, and health policy. We validated the search string by ensuring that the terms used captured several articles on provider selection in different populations that we had identified as relevant prior to the search. Although the search was conducted in English, articles in all languages were eligible for inclusion. No restrictions were placed on publication year.

The quantity and variety of articles from all over the world that are indexed in PubMed allowed for a thorough review of the literature on the subject of provider selection (Step 2, Figure 10).

In order to be eligible for inclusion in our analysis, an article had to (1) report on a primary research study, (2) address the selection of a formal healthcare provider (such as a nurse, doctor, clinic, or hospital) after the decision to seek care had been established, (3) examine the factors that influenced the selection of a particular healthcare provider from among two or more formal providers, and (4) focus on mothers and/or children. Both quantitative and qualitative articles were eligible for inclusion. Studies that presented secondary research or were review articles or meta-analyses; those that examined the decision to seek formal healthcare (Step 1, Figure 10) or evaluated satisfaction with health services (Steps 3 and 4); those that presented reasons for selection of one provider without considering other formal healthcare providers (such as another hospital, clinic, or primary care physician); and those that did not focus on women and/or children were excluded from our analysis.

The PRISMA checklist for systematic review reporting guided the search and screening process for this analysis.<sup>73</sup> The search yielded a total of 12,105 abstracts when run in December 2013. In total, 272 abstracts met the preliminary screening criteria. When the full texts of all of these articles were reviewed, 248 were found to be ineligible (Figure 11). Therefore, 24 articles met the inclusion criteria. The majority of the excluded articles focused on healthcare utilization rather than provider selection. For example, articles that examined how pregnant women decided whether to give birth at

home rather than at a formal healthcare facility were not eligible because those articles focused on healthcare-seeking behavior (Step 1 in Figure 10) rather than on how women planning to give birth at a healthcare facility selected from among the various clinics and/or hospitals in their region (Step 2 in Figure 10). Other articles were excluded because they examined reasons for selecting a particular facility or being satisfied with the care received at that facility (Step 4 in Figure 10) without offering a comparative perspective.



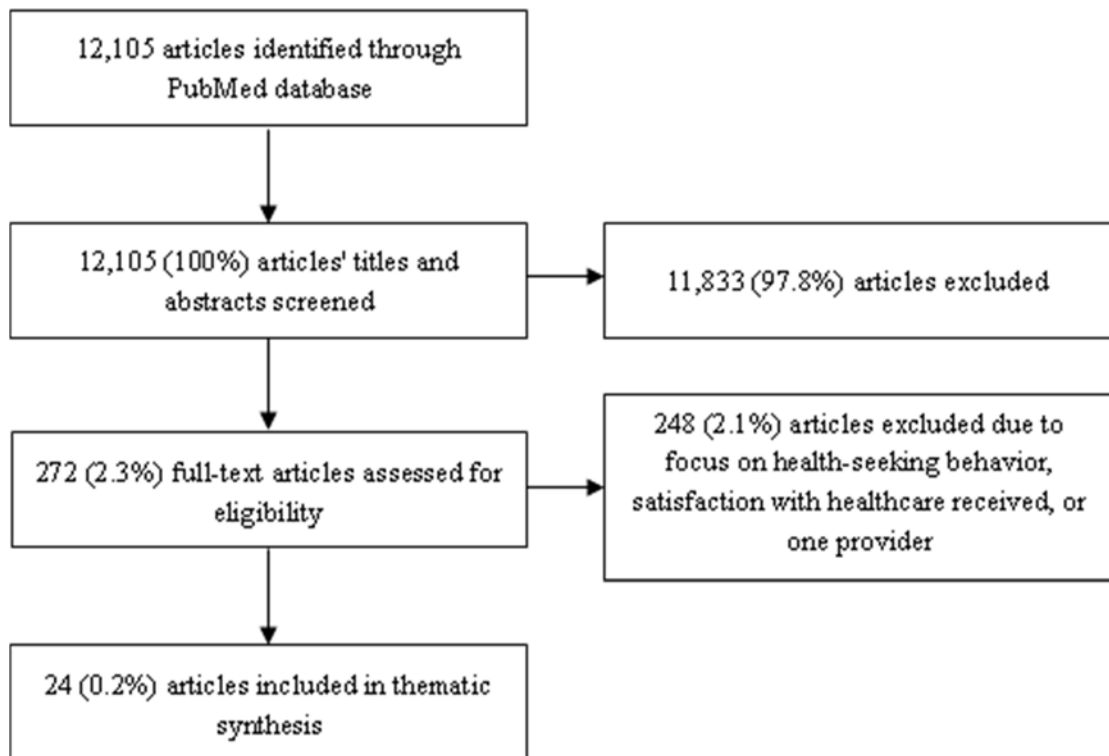


Figure 11. Flow-chart of ineligible and eligible articles reviewed

The 24 eligible articles identified from the PubMed search included a diverse set of studies of the factors that affect provider selection in rural and urban areas of both HICs and LMICs around the world (Table 10). We extracted key information from each article, including the study country, year(s) of data collection, population examined (mothers, children, or both), and study design, the types of providers considered in the analysis, and the factors that were reported to influence the decision of where to seek healthcare services, then examined the articles for conceptual themes.

Table 10. Factors that affect the decision of where to seek healthcare in accordance with the *EPIC* model

Country	Study Year(s)	Pop. <sup>a</sup>	Study Design <sup>b</sup>	Ref.	<u>Environment</u>				<u>Provider</u>						<u>Individual</u>														<u>Cost</u>			
					Population density	Travel distance/time	Road networks	Transportation access	Level of care	Ownership	Services	Staffing	Equipment / supplies	Reputation	Age	Race / ethnicity	Religion	Marital status	Offspring	Education / literacy	Media exposure	Employment status	Occupation	Income	Wealth	Ability to pay	Preventive care	Medical history	Illness severity	Price	Time	
Australia	--	M	NL	Hoang & Le, 2012		•			•	•	•	•	•		•	•			•	•												
Cambodia	--	M	L	Ith et al. 2013					•	•				•											•						•	
United Kingdom	1989	M	NL	Robinson et al., 1993		•			•					•	•				•													
France	2001	M	N	Combier et al., 2004	•	•						•	•	•	•			•	•	•			•				•					
France	2003	M	L	Pilkington et al., 2012	•	•									•				•				•									
Ghana	--	M	L	Aboagye & Agyemang, 2013		•					•	•	•		•				•	•				•							•	
India	1998-1999	M	L	Thind et al., 2008	•					•					•	•			•	•	•				•		•					
Nigeria	--	M	NL	Nwosu et al., 2012		•			•	•	•	•	•	•	•				•												•	
Nigeria	1999	M	NL	Osubor et al., 2006					•	•	•			•	•			•		•								•	•		•	
Nigeria	2005-2008	M	N	Olusanya et al., 2010					•	•		•			•	•	•	•		•			•									
Palestine	2004	M	N	Giacaman et al., 2007	•		•		•	•					•	•				•							•				•	
Philippines	1983-1984	M	N	Hotchkiss, 1998	•	•		•	•	•	•	•	•	•	•			•	•	•						•	•				•	•
South Africa	--	C	N	London & Bachmann, 1997		•			•	•				•	•					•		•					•				•	
Tanzania	1999-2001	C	NL	de Savigny et al., 2004					•	•															•				•			
Tanzania	2007	M	L	Kruk et al., 2009b		•		•	•	•			•	•		•	•	•	•				•		•	•					•	
Tanzania	2007	M	NL	Kruk et al., 2009a		•	•	•	•	•		•	•	•	•			•	•	•			•				•				•	
Tanzania	2009-2010	C	NL	Kahabuka et al., 2011		•			•	•	•	•	•		•					•										•		
Thailand	2000	C	N	Pandey, 2002		•			•	•					•					•							•				•	
United States	--	C	N	Chang et al., 2004		•									•	•								•		•					•	
United States	1983	M	N	LeFevre et al., 1987		•			•			•		•						•				•		•					•	
United States	1983, 1988	M	N	Bronstein & Morrissey, 1990		•			•		•		•		•	•															•	
United States	1996	M	N	Brown, 2001		•			•	•	•				•									•		•					•	
United States	2000-2003	M	N	Roh et al., 2008		•			•	•	•				•	•										•						
United States	2005	C	L	Berry et al., 2008					•			•	•	•						•												

<sup>a</sup>Population: M = Mothers, C = Children; <sup>b</sup> Study Design: N = Quantitative, L = Qualitative, NL = Both

In this systematic review, we applied a qualitative thematic synthesis approach, a method for synthesizing a diversity of perspectives, to the analysis and integration of both qualitative and quantitative studies.<sup>74, 75</sup> To begin the synthesis process, we listed all of the provider selection factors reported in each of the eligible articles. Then these factors were organized to identify groups of information that were common to several articles reviewed. The qualitative synthesis approach allowed us to group the extracted information into descriptive themes and scrutinized the included articles again to look for examples of how these themes were expressed. As a final step, we integrated the examined factors and analytical themes into a new, never before developed, comprehensive framework of the factors that affect the selection of a provider in the formal healthcare sector.

## **Results**

We identified four major themes within the included articles, and these form the basis for the *EPIC model* (Figure 12): Environment-, Provider-, Individual-, and Cost-related factors that affect the selection of a healthcare provider once the decision to seek services from the formal healthcare sector has been made. Figure 12 provides a list of the factors that encompass each component of the *EPIC model*. Prioritization of each factor will be dependent on the priorities set by the researcher using the model. However, this model provides a newly developed framework that allows its user to consider all aspects that may influence provider selection in their specific population to better understand how the decision of which provider a person would like to visit is made.

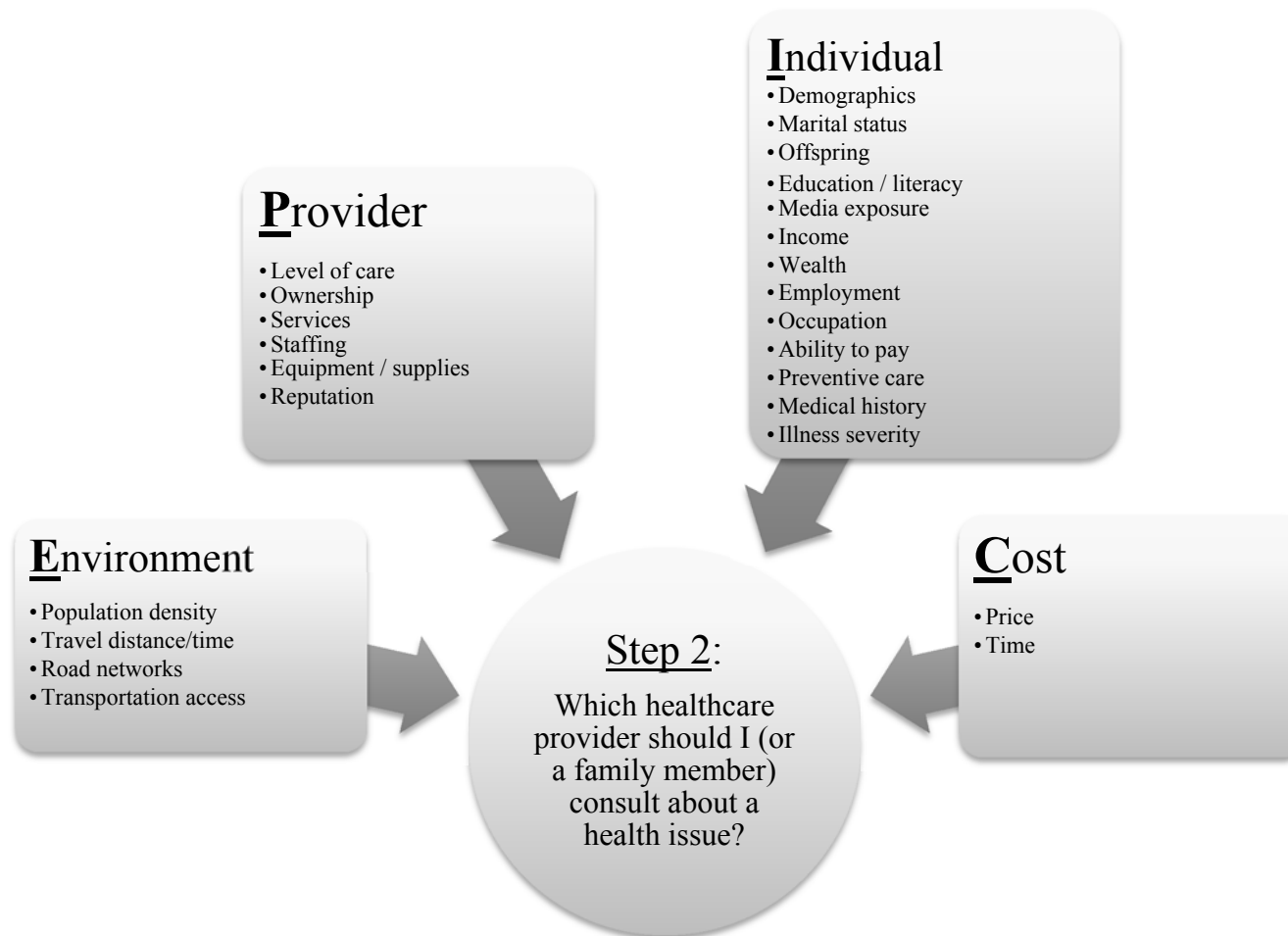


Figure 12. *EPIC model* for the study of healthcare provider selection

Table 11 provides the definition of each of the components in the *EPIC model*.  
Table 10 shows the components of the *EPIC model* that were present in each of the 24 included studies that informed the development of the model.

Table 11. Definitions for the components of the *EPIC model*

	<i>Factor</i>	<i>Definition</i>
<u><b>E</b></u> <i>nvironment</i>	<i>Population density</i>	Number of people per square kilometer or square mile where the home or healthcare facility is located. Can be described using terms such as rural, peri-urban, or urban
	<i>Travel distance / time</i>	Distance (measured in meters, kilometers, feet, or miles) or travel time (measured in hours or minutes) from home to a healthcare facility
	<i>Road networks</i>	Availability and quality of roads connecting homes to healthcare facilities (including during rainy or snowy seasons)
	<i>Transportation access</i>	Availability of public (buses, trains, taxis, or other) or private (bicycles, motorcycles, cars, or other) transportation from home (or near home) to a healthcare facility
<u><b>P</b></u> <i>rovider</i>	<i>Level of care</i>	Use of primary health services (such as those provided by nurses and at community health centers) or secondary or tertiary care providers (such as specialty clinicians and hospitals)
	<i>Ownership</i>	Use of a private or public healthcare facility
	<i>Services</i>	Use of a small facility offering only basic preventive, diagnostic, and therapeutic care or a larger hospital offering advanced medical, surgical, and laboratory services
	<i>Staffing</i>	Availability of an adequate number of trained staff, including an adequate number of nurses and doctors
	<i>Equipment / supplies</i>	Availability of necessary drugs, equipment, and other supplies
	<i>Reputation</i>	Patient or community perceptions about the quality of care provided by staff
<u><b>I</b></u> <i>ndividual</i>	<i>Demographics</i>	Age, race / ethnicity, religion, and other personal characteristics
	<i>Marital status</i>	Relationship status, such as being single, married, divorced, or widowed
	<i>Offspring</i>	Number of children residing in the household or a woman's gravidity, fertility, or parity
	<i>Education / literacy</i>	Years of school attendance / the ability to read
	<i>Media exposure</i>	Access to health information from the internet, newspapers or magazines, radio, and/or television
	<i>Employment</i>	Participation in paid or unpaid work inside or outside the home
	<i>Occupation</i>	Primary type of unskilled, skilled, or professional work done by an individual
	<i>Income</i>	Individual or household income
	<i>Wealth</i>	Material wealth indicated by ownership of household goods or livestock and/or access to utilities
	<i>Ability to pay</i>	Ability to pay for healthcare services out-of-pocket or with insurance
	<i>Preventive care</i>	Use of routine and preventive healthcare services, such as wellness check-ups or vaccination
	<i>Medical history</i>	Past health events and complications that might increase the perceived need for healthcare services
	<i>Illness severity</i>	Urgency of care required for an acute or chronic health condition
<u><b>C</b></u> <i>ost</i>	<i>Price</i>	The price of various healthcare goods and services at a particular facility
	<i>Time</i>	Time required to travel to and from a healthcare facility and to wait for and receive services at that facility

The *environment* factors that affect selection of a provider include population density, travel distance and time, road networks, and transportation access. Eligible articles from places as diverse as rural Africa, rural and urban Europe, and urban North America reported that women often prefer to give birth in the nearest healthcare facility,<sup>51, 34, 76, 77</sup> especially women who reside in rural areas.<sup>57, 76, 77</sup> However, a study from rural Australia found that some women are willing to travel farther distances in order to give birth in a hospital that is able to provide emergency obstetric care if needed.<sup>78</sup> Other investigations, such as a quantitative study of mothers in the Middle East, reported that road closures make some providers inaccessible during some times of the year.<sup>37</sup> Quantitative studies of mothers in Europe and Southeast Asia found that access to personal or public transportation can be an important consideration when deciding which provider to visit.<sup>56, 57</sup> Together, these studies highlight the common environmental factors influencing the decision of choice of provider.

The *provider* characteristics that influence the selection of a healthcare consultant include the level of care offered at facility, ownership, the facility's services, staffing, equipment and supplies, and the provider's reputation. Quantitative and qualitative studies from rural areas in Africa and in North America found that women may prefer hospitals that offer specialty care.<sup>14, 52, 79</sup> Studies from Africa, the Middle East, and North America indicated that pregnant women often express a preference for giving birth at a private rather than a public facility.<sup>37, 54, 80</sup> The availability and number of trained staff was also a significant consideration for some women in studies from urban Africa and rural Australia,<sup>53, 78</sup> and the availability of drugs and medical equipment were noted



as priorities in rural Africa and in Australia.<sup>34, 78</sup> Additionally, studies from rural Africa and from rural and urban Southeast Asia found that a reputation for quality in terms of short wait times and friendly and trustworthy staff may be important for women's selection of a provider.<sup>52, 56</sup> Thus, many desired provider characteristics were similar across diverse study populations.

There are many *individual* patient characteristics that are associated with preferences for certain providers, including demographics, marital status, offspring and reproductive history, education and literacy, media exposure, employment and occupation, income and wealth, ability to pay, attendance to preventive care, medical history, and illness severity. For example, a stronger preference for private healthcare facilities among older women than younger women was found in a quantitative study from India;<sup>81</sup> a study from urban Africa found a higher preference for private care among women of higher socioeconomic status and those who had not previously had a Cesarean section, which would be an expensive procedure at a private facility;<sup>53</sup> and a study in rural and urban Southeast Asia found that those with frequent exposure to media also preferred private providers.<sup>81</sup> Other qualitative and quantitative studies from rural Africa and rural and urban Europe have found that women with fewer children,<sup>34, 57</sup> those engaged in professional or managerial level employment,<sup>77</sup> and those who have more years of education,<sup>34</sup> are more likely to choose advanced-level care facilities rather than basic ones. In general, individuals with higher socioeconomic status, no matter where in the world they live, have the ability to select from a wider range of providers.

Besides personal preferences for care, the selection of a particular provider may also involve consideration of *costs*, both in terms of price differentials for goods and services at various facilities as well as the time it takes to access care at these places. For example, a study from the Middle East found that women are more likely to choose basic care for themselves and their children if the cost of services is deemed too high in advanced level facilities<sup>37</sup> and a study from Southeast Asia indicated that some pregnant women selected maternal care providers based on how long patients have to wait to receive clinical services.<sup>56</sup> Individual factors influence the ability of a care-seeker to navigate complex healthcare marketplaces and to identify and compare provider options, but cost factors may be the final determinant of which provider is actually selected for consultation.

## **Discussion**

This systematic review of the literature allowed for the identification of several key groups of factors that influence healthcare provider selection in the formal healthcare sector and for the integration of these themes into one innovative and comprehensive framework: the *EPIC model* (Figure 12). The *EPIC model* addresses the diversity of considerations that drive the selection of a particular healthcare provider by an individual or family once the decision to seek care has been made. Although some of the factors that influence provider selection (as described by the *EPIC model*) may not be obvious to the person choosing a particular healthcare provider, they continue to play a role in how the decision of healthcare provider is made. The model emphasizes links between the built environment—the places deliberately altered by humans, such as the addition of

buildings and road networks<sup>6</sup>—and the individual social, economic, and demographic considerations more commonly examined in field studies of provider selection. Without the built environment, a person’s availability to access healthcare services is greatly diminished.

Although the specific components that fall under each of the *EPIC model* categories may vary between populations, the relevance of these categories across diverse settings was demonstrated in our analysis. For example, while transportation access might be a consideration for a higher proportion of residents of low-income countries than high-income countries, studies from both LMICs and HICs reported “environmental” concerns. Similar trends emerged across the other components of the *EPIC model*, which suggests that the *EPIC model* can be adapted for use in a wide range of study populations. The variations in significance of the factors that affect provider choice from study to study reflect the variations on how various populations make the decision of which provider to visit. However, by utilizing all the categories that make up the *EPIC model* researchers will be able to gain a deeper understanding on how the decision of which provider to visit is made based on their population.

Very few conceptual models exist for the study of healthcare access. One commonly used model focuses on health seeking behavior and healthcare service utilization (Step 1 of Figure 10), emphasizing individual-level predisposing, enabling, and need factors rather than community and environmental determinants of healthcare use.<sup>82</sup> Other constructs have attempted to include the entire process of accessing healthcare (all of the steps in Figure 10), but these frameworks generally place limited

attention on the provider selection (Step 2) decisions that are the focus of the *EPIC model*.<sup>83, 84</sup> Although economic choice models focused on healthcare supply and demand have incorporated considerations of provider selection, these analyses usually assume that the selection is made based on utility factors such as cost and quality<sup>80</sup> rather than a more complex set of individual, community, and environmental characteristics. The *EPIC model* provides a more comprehensive and adaptable framework for understanding the various factors that affect this critical decision, and as such this new and innovative model may help to strengthen future geographic, environmental, economic, urban and regional planning, and health and social policy studies that explore this topic.

The *EPIC model* is was created to be a comprehensive framework of provider selection, but its utility will need to be validated with additional field research as no other model on provider selection is currently available. The primary limitation of the *EPIC model* is that we developed it by examining the factors that affect formal healthcare provider selection in the maternal and child health literature and therefore cannot provide evidence at this time that the model applies to other populations. While we consider it reasonable to assume that the framework will be generalizable to other study populations because common themes emerged across maternal and child health studies conducted in diverse settings, this conjecture will need to be confirmed by larger meta-analyses that include studies of men and other populations. Similarly, although the *EPIC model* focuses on accessing formal healthcare providers, a congruent set of decisions may apply to care offered by the informal healthcare sector. The relevance of the *EPIC model* to the informal sector will need to be validated.

An additional limitation was our inclusion of a variety of study designs—both various types of quantitative studies as well as qualitative studies—in our analysis, which restricted our ability to make direct comparisons between the studies. Also, because the included studies used different definitions for their provider selection variables, and used a variety of direct and indirect ways of evaluating provider selection, the language used in our taxonomy may not exactly match the papers from which we gleaned information about the factors that influence provider selection. Despite these limitations and possible sources of bias, our hope is that the *EPIC model* provides a useful and broadly-applicable framework for understanding the environmental and other factors that affect the selection of a healthcare provider.

The *EPIC model* points to a variety of policies and interventions that might help to increase access to healthcare services and provider choice for currently underserved populations. The extent to which a population can physically access a preferred provider is highly dependent on environmental factors, including the built environment. Increasing *environmental* access, and therefore spatial accessibility,<sup>85</sup> to healthcare facilities through improved road infrastructure and affordable transportation<sup>76, 86</sup> may help community members to gain access to a wider assortment of providers, including clinical specialists, as well as allow for the reduction of travel time and travel distance required by those accessing healthcare services.

Environmental access improvement can be supported with Geographic Information Systems (GIS) that can identify areas with healthcare provider shortages.<sup>85</sup> A GIS quadratic programming approach—that is, the use of tools that examine the equity

of geographical distributions of various services—may be applied to inform the redistribution of available resources to enhance healthcare access.<sup>87</sup> It should be noted that the use of a GIS quadratic programming approach has its limitations due to the complexities that affect the equal geographic distribution of healthcare facilities and services.<sup>87</sup> However, this type of informed geographic redistribution of healthcare services could be useful if supplemented by the consideration of other factors in the *EPIC model* when seeking to make informed decisions about the optimal locations for new, expanded or redistributed healthcare facilities.

Supporting continuing education for diverse *providers* and promoting quality care may allow existing healthcare facilities to better meet the needs of the populations they serve. Increased access to accessible health information by *individuals* may allow healthcare consumers to make better decisions about where to seek various types of preventive, diagnostic, and therapeutic health services. The *costs* of selecting preferred providers can be addressed, in part, through health system reforms such as regulation of user fees,<sup>49</sup> and the development of health equity funds<sup>88, 89</sup> to mitigate the cost of healthcare access and increase users' ability to access affordable care from a wider range of providers. Also, using the lessons learned from high income countries, the development of universal healthcare access could be part of these healthcare system reforms.

The identified studies that provide the basis for the *EPIC model* demonstrate its versatility based on the similarity of the factors that influence provider selection in each of the reviewed studies regardless of where the studies were conducted (HICs versus

LMICs, rural versus urban), the type of study designed used (qualitative versus quantitative), and the population observed (mother versus child). However, healthcare access goals and policies that could be informed by the *EPIC model* will need to be tailored to particular communities and will need to be developed at the local and national government level.

In rural areas where the ‘*E*’ of the *EPIC model* is the primary consideration because so few healthcare facilities are within a reasonable travel distance or travel time from homes, the goal of health planners and regional planners might be to address road infrastructure and transportation issues so that residents have an improved ability to access advanced care from specialists. In some urban communities where a diverse and competitive healthcare market makes the selection of one provider from among many options challenging, the focus of urban planners and health access policies might be on ‘*E*’ factors related to pedestrian and motor vehicle transportation or on the spatial distribution of healthcare facilities in suburban as well as high-density areas of cities. Other health access policies may focus on ‘*P*’ factors like increasing the quality of care and levels of care available or on ‘*T*’ factors that help consumers make informed decisions about where to seek care for their various health concerns.

The *EPIC model* could also help guide improvements in government health policies. For example, consider the recent series of policies adopted by the National Health Service (NHS) in England that aim to increase patient choice and therefore increase access to care.<sup>90, 91</sup> The primary focus of these initiatives has been on *provider* and *cost* characteristics. Based on the *EPIC model*, further consideration of the

*environment* and *individual* factors affecting provider choice may provide additional insights into how to improve the effectiveness of the healthcare system.

In rural, urban, and suburban settings—whether high-income or low-income—the *EPIC model* may help health service administrators, practitioners, planners, and policymakers to more completely understand how members of the communities they serve make decisions about where to obtain healthcare services, what environmental and other barriers their potential clients encounter when making these important decisions, and what strategies might increase access to high-quality, affordable, and timely health services.



## **CHAPTER 5. DISCUSSION**

As living organisms, human beings belong to an ecosystem where interactions with the environment occur. Part of this environment is the built environment, which encompasses everything from the location and structure of our cities and neighborhoods, to the physical structures we build such as homes and office buildings.

The built environment in the context of health plays an important role on our ability to access healthcare services. This access is greatly dependent on whether or not medical facilities exist and are accessible for us to use through the availability of road networks and transportation services that allow us to get to and from these facilities. Also, the role policy plays in providing the physical availability and accessibility to healthcare services must be taken in to account, as various public policies will have an impact on our built environment and our interactions with it.

This dissertation highlights the importance of the environment in the context of healthcare access, specifically provider selection, by providing connections between the built environment and its impact on healthcare provider choice for mothers and their children in a low-income country, and possibly for other populations around the world. Without physical access to healthcare facilities it would not be possible for an individual in need of care to reach a facility. Therefore, without the built environment, there will be no access to healthcare services, no matter the quality of the healthcare services offered at a particular facility.

### **Applying the EPIC model to Bo**

The *EPIC model* was created for the purpose of allowing researchers to better understand how women select a healthcare provider once the decision to seek formal medical care has been made. Applying this model to Bo requires a special focus on the environmental factors affecting provider selection, such as distance to facilities and transportation availability; provider factors such as reputation that prove to be central to the decision of where to seek healthcare; individual factors such as health insurance provision; and cost-related factors such as the availability of low cost or free medical services.

Environment-related factors specifically tied to health care delivery, the “*E*” in the *EPIC model*, involve the built environment, especially the availability of healthcare facilities and the structure of the road networks that facilitate physical access to healthcare providers. This type of examination of the environment factors influencing healthcare facility selection provides an innovative and key contribution to advancing the way we think about healthcare access in urban areas of low- and middle-income countries (LMICs). These factors must be considered when implementing policies to improve access to healthcare services, such as increased access to public transportation, which would be useful in places like Bo. Also, the geospatial analysis conducted in urban Bo in relation to provider choice provides clues on how the location of healthcare facilities in relation to residential areas of different socioeconomic levels might influence healthcare accessibility.

Although it is often assumed that cost is the most important factor in the decision about where to go for healthcare services, especially in low-income areas, in urban Bo the

reputation of the provider is an even higher priority. In Bo, women from lower socioeconomic status (SES) living at the edges of the city chose to visit a healthcare facility farther from their home, in many cases a government facility, when in need of care. These study results disproved the hypothesis that women would visit to their neighborhood providers for care and the idea that women would choose a nonprofit provider over a government one. Consequently, there is evidence to suggest that the low cost of Bo Government Hospital (BGH), and its reputation for offering a diversity of subsidized services not available elsewhere in the city, are higher priorities for healthcare provider choice than the location of providers.

To increase access to health services, health policies need to encourage improvements in the quality of individual healthcare facilities and the services provided, focusing on the “*P*” factors delineated by the *EPIC model*. For example, a provider’s reputation may improve when personnel have more advanced training and when the facility stocks more medications and offers more access to preventive, diagnostic, and therapeutic technologies.<sup>7, 14, 32, 92</sup>

The “*T*” in the *EPIC model* describes how the ability to access a preferred healthcare provider can also be dependent on individual factors such as the availability of health insurance or a household’s socioeconomic status (SES). As observed in Bo, mothers belonging to households with a low SES index tend to travel farther to reach their low-cost provider of choice while bypassing private providers located closer to their homes, which offer higher-priced services. Policies aimed at making health insurance available for individuals to use at private facilities could help increase the ability of

lower-income households to access healthcare services closer to their homes, which might be a critical factor in patient outcomes and even patient survival when urgent care is required.

In most low-income countries, the burden of paying for health care falls on the family of the individual seeking care,<sup>93</sup> and therefore health care user fees may become a barrier to access preventative and, in some cases, curative healthcare services in these LMICs.<sup>94</sup> For example, in Sierra Leone, more than 80% of health spending is paid out-of-pocket by consumers (while, in comparison, only about 10% of health spending is out-of-pocket in the United States).<sup>95</sup> When health expenses must be paid in cash at the time of service—and when seeking care requires direct costs like transportation as well as indirect costs such as lost work hours—the choice of a healthcare provider may be limited even in a city with a diverse healthcare marketplace. Although the “reputation” of a provider was reported by women in Bo to be a more important factor for provider selection than cost or location, the cost of care was a primary consideration for low-income women living farther from the city center. Many families in Bo make presumptive diagnoses of illnesses and treat them at home before reaching out to informal providers (such as herbalists); consultations with a formal healthcare provider are often delayed until late in the course of a serious illness, when treatment is more difficult and expensive.<sup>40</sup> These patterns were also seen during the Ebola outbreak of 2014, when many families chose to keep critically ill members at home rather than sending them to Ebola treatment centers for care.<sup>96</sup> Expanding access to trained healthcare workers for acute and chronic medical conditions may require changes in

policies about healthcare and transportation costs, which relate to the “C” factors that make up the last component of the *EPIC model*. This sort of policy change has already been shown to be successful in Sierra Leone, where free care for pregnant women and young children at government facilities, together with an increase availability of government health workers at these facilities, has significantly expanded the use of the formal healthcare system for particular types of conditions.<sup>41, 66</sup> The preference for seeking care at government-owned facilities rather than private ones in Bo is likely a direct result of these health system improvements and the low-cost and subsidized services available at government facilities under these relatively new policies.

### **Future research**

Additional research is required to understand the complexities behind a person’s decision of where to go to when in need of healthcare. Distance to a healthcare provider and a person’s bypassing behavior also calls for additional exploration in an effort to further understand the role of these factors in provider selection. Also, validation of the *EPIC model* will prove to be an integral part of our understanding of how the decisions about which healthcare provider to visit are made.

To fully recognize the role of travel distance in choosing a healthcare provider as studied in paper 1, additional research looking at both physical road distance to the facility and a person’s perceptions on which facility is closer to their homes, or easier to access, could be key. These perceptions are directly linked with the use of mental maps, which represent the knowledge a person has about the world around them.<sup>97</sup> By adding an individual’s viewpoint and then comparing this to an objective measure of travel

distance, we will be able to further examine how travel distance influences which facility a person may or may not choose to visit when in need of healthcare. Mental maps can also provide clues as to the specific route a person will likely take to a healthcare facility, and therefore provide a better measure of time and distance travelled compared to using the standard "shortest-distance" travelled measurements to indicate how far a person would go to receive care.

Transportation factors such as the availability and cost of public and private transportation, which are seldom studied, need to be investigated in conjunction with travel distance. Researchers must consider the possibility that transportation may be available to a facility further away from a person's home but on a main road, but not to a nearer facility that is not near a market or other destination for public transport. Also, the type of transportation that will be used by individuals to access healthcare services may influence the decision of which healthcare provider to visit<sup>30</sup> and therefore it must be considered. Modal split models used in transportation geography, which differentiate the mode of travel used (such as the use of a car versus a bicycle versus public transportation) and how this could impact behavior,<sup>98</sup> as well as the access to emergency healthcare services,<sup>99</sup> will be useful in the study of environmental factors affecting healthcare provider choice.

The bypassing phenomenon in urban areas of LMICs, as examined in paper 2, as well as in other settings (such as high income countries) also needs to be further studied. The large number of healthcare providers in urban areas presents a more interesting and complex platform for observing bypassing behavior than the rural settings selected for

most previous studies of bypassing. These studies will require direct inquiry of individuals about the specific facilities that are preferred as well as the ones people actually visit when in need of care. Geographic information systems (GIS) provides a powerful tool for this analysis, especially when integrated with examinations of human behaviors and decision-making, such as the logic behind decisions to choose one facility from a wide selection of provider options. It should be noted that some individuals may not be aware of the existence of some facilities near their homes and may therefore bypass without knowing they had a choice of facility. This might have happened in Bo, where outpatient clinics frequently open unceremoniously and often close just a few months later, leaving little time for change in preferred providers for local residents. Combining objective and subjective measures of perceived distance will allow researcher to gain a deeper understanding of bypassing behavior, especially in urban areas.

A dramatic example of the changes in the availability of healthcare facilities in Bo comes from the 2014 Ebola outbreak in Sierra Leone. This outbreak has had a significant impact on health workers<sup>100</sup> and healthcare facilities alike. Unfortunately, the limited availability of health workers in Sierra Leone<sup>100</sup> and the understandable fear of the healthcare workers to treat the ill and risk getting sick<sup>101, 102</sup> has greatly reduced the ability of hospitals and clinics to treat their patients. This situation has forced many healthcare facilities to close their doors as they may be unable to deal with the increased patient volume due to the outbreak.

Besides limiting routine clinical care activities, the Ebola outbreak also restricted research activities. Neighborhood quarantines, hospital closures, travel restrictions, and

repeated government-mandated shut-downs of the MHRL research facilities meant that the usual research activities could not be conducted in 2014.<sup>102</sup> MHRL had hoped to lead focus groups with local stakeholders—healthcare workers, government officials, randomly-selected groups of local women, and others—to provide additional insights into the observations made in these quantitative evaluations. These plans were unable to be implemented due to the Ebola crisis. MHRL hopes to be able to resume normal research activities later in 2015, and to move forward with qualitative studies in 2016.

Further examination of bypassing behavior also requires the differentiation between the types of healthcare a person is looking to access. A person looking for acute medical services for a minor injury or an uncomplicated case of malaria may not be too particular about choosing a provider, but cost and reputational factors may be very important when surgical services or extended inpatient care may be required. The decision may be more complicated during an emergency, when a decision must be made quickly and timely access to urgent care is key.<sup>103</sup> The risk of extended travel time to a government facility or nonprofit hospital must be balanced with the possibility of being unable to pay for necessary tests or treatments at a private hospital that is closer to home. Examinations of the different factors involved in specific decisions about care-seeking, beyond the “acute malaria” and “inpatient care” scenarios examined in this dissertation, will be necessary extensions of this work if the goal is to acquire a more complete understanding of bypassing behavior as it relates to provider choice.

The ever-changing economic, social, and political environments of LMICs can serve as an opportunity to study the evolution of healthcare policies and practices in



urban and rural populations. Many changes could impact individual decisions pertaining to provider choice. A country's economic development may translate to more job availability for individuals and an increase in the purchasing power of households. This could in turn signify a change in healthcare access needs and practices as people may now have the ability to afford healthcare services, including private providers that are considered expensive for residents of LMICs or higher quality care that may have been out of their reach in the past. This individual's increased ability to afford healthcare services can also put pressure on the healthcare system as a whole. This may be directly correlated to a higher demand for advanced healthcare services, including the demand for specialty care, which may not yet be available or may have a limited availability in the current healthcare system. Studies of provider choice must also consider the social and political climate, the effects emergent situations may have on the healthcare system as a whole, and the potential effects on individual and family selections of healthcare providers for various conditions.

As part of future research on provider selection, validation of the *EPIC model* (paper 3) in diverse populations will be key. Studies that focus on the formal healthcare system, which includes hospitals, clinics, and private medical doctors and nurses, among others, and the factors that affect provider selection, will need to be part of this validation process. It will also be important to apply the *EPIC model* in the context of the informal health sector, which includes home health care approaches, faith-based treatments, and the use of traditional healers. By examining the factors that influence the selection of informal providers, we can gain clues on how the journey towards accessing formal

healthcare services begins. This will also shed light on the similarities and differences between healthcare provider decisions made by individuals using both the formal and informal healthcare systems. A validated *EPIC model* will allow the research community to conduct comparative research on provider selection, while allowing for the model to be tailored to specific populations.

### **Policy Implications**

The World Health Organization (WHO) has identified six areas that constitute the overall quality and performance of a health system in a country: (1) provision of effective healthcare services both for the individual and the population; (2) trained healthcare providers with the ability to give quality care; (3) medications and health-related technology accessibility; (4) system performance data gathering and analysis; (5) access to affordable healthcare services; and (6) effective system-wide oversight.<sup>104</sup> These WHO criteria are aspirational. Not every country, even those in high income areas, have achieved these goals. However, by understanding the factors that affect provider choice, we are, in turn learning, about the current quality of a healthcare system. Therefore, studies of access to healthcare may have significant policy implications.

As described earlier, the environment in the context of health encompasses all of the natural and built, social and economic, political and legal, policy, and other environments that influence the health status of a population.<sup>4</sup> The built environment plays a particularly important role in provider choice, with the location of and distance to healthcare facilities, road network availability, and transportation accessibility all directly influencing how members of a population interact with (or do not interact with)

healthcare services. Distance to healthcare services, decision-making behaviors such as those related to bypassing, and all of the factors in the *EPIC model*—especially the “E” part that represents the physical environment—are critical components of understanding access to health services and evaluating health-related policies.

**Closing remarks**

Understanding the motivations behind how people choose where to go to for acute and long-term care will allow healthcare providers, public health agencies, and local and national governments to pinpoint the needs and expectations of potential users of the healthcare system, to improve the quality of care offered by individual healthcare providers, and to identify under-served populations and the best spatial placement of new healthcare facilities. This, in turn, will help increase the overall quality, effectiveness, and efficiency of their healthcare systems, and therefore improve the health status of the populations they serve.

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Lila C. Fleming is a global health epidemiologist and certified health education specialist. Her current research and professional interests include access to health care issues in developing countries. Mrs. Fleming has twelve years of experience as a health educator and has worked and interned in a variety of public health and community health settings including Nueva Vida, Inc., Pan-American Health Organization, and the Navajo Area Indian Health Service, among others. Mrs. Fleming teaches courses on personal and community health, global health, and epidemiology at the undergraduate level. She is a full time faculty member at Montgomery College in Rockville, Maryland, and an adjunct faculty member for the Department of Global and Community Health at George Mason University in Fairfax, Virginia. In 2013, Mrs. Fleming won the College of Health and Human Services (CHHS) Adjunct Master Teacher of the Year award. In 2015, Mrs. Fleming was recognized as one of three Adjunct Teaching Excellence Award winners from across George Mason University. This prestigious award recognizes the contribution that adjunct faculty provide to the university's teaching mission.