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Health-care availability, preference, and distance for women in urban Bo, Sierra Leone

Lila C. Fleming · Rashid Ansumana · Alfred S. Bockarie · Joel D. Alejandre ·
Karen K. Owen · Umaru Bangura · David H. Jimmy · Kevin M. Curtin ·
David A. Stenger · Kathryn H. Jacobsen

Abstract

Objectives To examine the diversity of the health-care providers in urban Bo, Sierra Leone, identify the types of health-care facilities preferred by women for fevers, and analyze the road network distances from homes to preferred health-care providers.

Methods A population-based random sampling method was used to recruit 2419 women from Bo. A geographic information system was used to measure the road distance from each woman's home to her preferred provider.

Results Preferred health-care providers for acute febrile illnesses (commonly referred to as "malaria" in the study communities) were hospitals (62.3 %), clinics (12.6 %), and pharmacies (12.4 %). Participants lived a median distance of 0.6 km from the nearest provider, but on average each woman lived 2.2 km one-way from her preferred provider. Women living farther from the city center had preferred providers significantly farther from home than women living downtown.

Conclusions The diverse health-care marketplace in Bo allows women to select clinical facilities from across the city. Most women prefer a malaria care provider farther from home than they could comfortably walk when ill.

Keywords Health services accessibility ·
Choice behavior · Urban population · Sierra Leone ·
West Africa

Introduction

Studies of access to health care in low- and middle-income countries (LMICs) have suggested that the distance from homes to health-care facilities is a critical factor for accessing preventive, diagnostic, and therapeutic health services. However, most of these previous studies on distance to health-care providers in LMICs were conducted in rural settings (Acharya and Cleland 2000; Akin and Rous 1997; Amaghionyeodiwe 2008; Amuge et al. 2004; Bigogo

L. C. Fleming (✉)
Department of Environmental Science and Public Policy, George Mason University, 4400 University Drive 5B7, Fairfax, VA 22030, USA
e-mail: lflemin1@gmu.edu

R. Ansumana · A. S. Bockarie · U. Bangura · D. H. Jimmy
Mercy Hospital Research Laboratory, Kulanda Town, Bo, Sierra Leone

R. Ansumana
Njala University, Bo, Sierra Leone

J. D. Alejandre
Information Technology Division, U.S. Naval Research Laboratory, 4555 Overlook Avenue, SW Washington, DC 20375, USA

K. K. Owen · K. M. Curtin
Department of Geography and Geoinformation Science, George Mason University, 4400 University Drive, Fairfax, VA 22030, USA

D. A. Stenger
Center for Bio/Molecular Science and Engineering, U.S. Naval Research Laboratory, 4555 Overlook Avenue, SW Washington, DC 20375, USA

K. H. Jacobsen
Department of Global and Community Health, George Mason University, 4400 University Drive 5B7, Fairfax, VA 22030, USA

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et al. 2010). The dynamics of health-care access are considerably different in urban environments, where even in LMICs 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 people and an area of about 30 km^2 (Ansumana et al. 2010). The health-care facilities in Bo include public hospitals and clinics as well as a diversity of private providers, including nonprofit hospitals and clinics run by international charities, religious organizations, and other non-governmental organizations as well as some for-profit clinics and hospitals (Jacobsen et al. 2012b). Additionally, some physicians and nurses provide private services from their homes and through house calls. Residents can also seek care from private pharmacists and traditional healers.

Previous studies in Bo have found that residents prioritize the reputation of the provider when selecting a health-care facility or a caregiver, that cost is an important secondary consideration, and that the distance to a facility is the primary consideration in provider selection for only a small proportion of residents (Jacobsen et al. 2012b). However, this does not mean that distance does 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 is a higher concentration of health-care providers, could potentially influence the distance a woman would be willing to travel to access 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 within urban areas and therefore requires further examination.

Some studies of distance to a health-care 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 to access health-care services. Some studies have used geographic information systems (GIS) to estimate Euclidean distance, which is the "as the crow flies" shortest straight-line distance between two points (Amaghionyeodiwe 2008; Bigogo et al. 2010; Perry and Gesler 2000). A newer, more accurate way to estimate travel distance is to use road network analysis, which allows the lengths of actual pathways between two locations to be measured (Owen

et al. 2010). The aims of this study are (1) to examine the diversity of the health-care marketplace in urban Bo, Sierra Leone, West Africa; (2) to identify the types of health-care facilities preferred by women in Bo when they require care for acute febrile illnesses like malaria; and (3) to use road network analysis to analyze the distance from the homes of women living in Bo City to the nearest health-care providers and to their preferred acute care providers.

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 (Ansumana et al. 2010), and have been updated to remain current. These geographic data are publicly available at OpenStreetMap.org. As of 2010, the city of Bo was divided into 68 administrative neighborhoods called "sections" (Ansumana et al. 2010). After a pilot survey in two sections near the MHRL facility on the north side of Bo, 18 of the 66 remaining sections were randomly sampled for a household health census conducted between November 2010 and February 2011 (Fig. 1). 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, VA, USA), and the U.S. Naval Research Laboratory (Washington, DC, USA).

Data collection

The rooftops of all buildings in each of these sections were outlined through digitization of satellite imagery, and all of the 1659 single-family or multi-family residential structures were identified and marked on maps during walkthroughs and consultations with local residents (Ansumana et al. 2010). A two-stage interview process was used for data collection. First, a consenting adult representative from 3286 of the 3295 households identified across Bo (a 99.7 % participation rate) 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 %) women from these households, who consented to participate in the study, was age 18 or older, and had ever been pregnant was asked to complete a brief interview about her
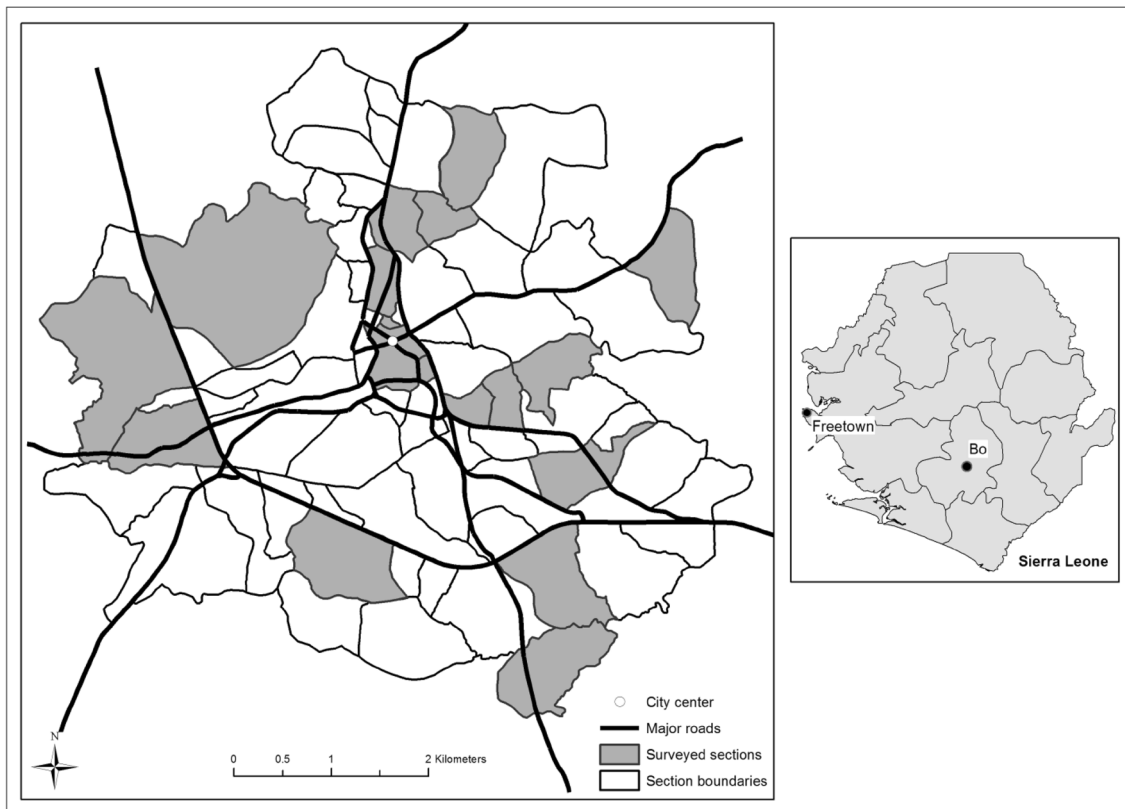
Fig. 1 Bo City, Sierra Leone, West Africa, and sections (neighborhoods) sampled for participation in maternal health surveys in 2010–2011

reproductive health, the health of her children, and her priorities when making decisions about accessing health care for herself or her children.

Key variables

Each woman was asked "If you thought you needed treatment for malaria, what type of health-care 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 (Ansumana et al. 2013), 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 health-care providers were considered to be valid answers to this question. The distinction between hospitals and clinics in Bo is very blurry, because some large "clinics" offer more services than some small "hospitals" (Jacobsen et al. 2012a). For this study, we classified facilities that provide both inpatient and outpatient care as

hospitals and classified those providing only outpatient services as clinics. As a follow-up question, each woman was asked to state her preference for the specific health-care provider she would go to.

Information about the location and ownership of every health-care facility in Bo was subsequently obtained by members of the research team. Government-run facilities were classified as public. All non-governmental facilities, including nonprofit and for-profit providers, were classified as private. Public facilities offer basic care at no cost to the patient, but charge some fees for advanced services. Most nonprofit providers charge a nominal fee to users. For-profit facilities charge fees that are often considered expensive by local standards.

Geographic methods

Many streets in the city of Bo have no formal names, and even streets with established names rarely utilize 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. In other low-income countries where accurate maps are unavailable, global positioning system (GPS) units have been used to acquire the geolocation of residences and health-care

facilities (Noor et al. 2004; Stothard et al. 2011). Thus, with each household's consent and the approval of all participating research ethics committees, members of the MRHL research team used handheld GPS units to acquire the longitude and latitude (XY) coordinates of each participating household's front door. Great care was taken to assure the protection of these data. GPS locations were also obtained for all of the fixed-location health-care providers—including public and private hospitals, clinics, and pharmacies—that were listed by participants as their preferred facilities for malaria care (Fig. 2). Geographic data were projected to Universal Transverse Mercator (UTM) coordinate system Zone 29 N. When building the network for road distance analysis, the residential and health-care facility locations were automatically snapped to the closest road located within 5 m of the structure. A tolerance distance of 3 m was set to correct road segment errors.

Spatial analysis

To determine the distance by road from each woman's home to her preferred health-care provider, the shortest route was measured using the Network Analyst tool available in ArcGIS (version 10.1). Because women may not always take the shortest route to a provider—perhaps because some other route yields a faster travel time or because of plans to make other stops along the way to or from the preferred provider—this approach may underestimate the actual travel distance. However, the shortest-route distance is still a reasonable, yet conservative, distance estimate. Network Analyst was also used 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. The center of Bo was defined 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. Zone 1 includes all areas located less than 1.0 km of road travel from the city center, Zone 2 represents 1.0 to 2.9 km of road distance, and Zone 3 indicates places 3.0 km or more from the center of the city (Fig. 2).

Statistical analysis

All data were analyzed using SPSS (version 19) with a significance level of $\alpha = 0.05$. The Mann–Whitney U test for comparison of variables across two population
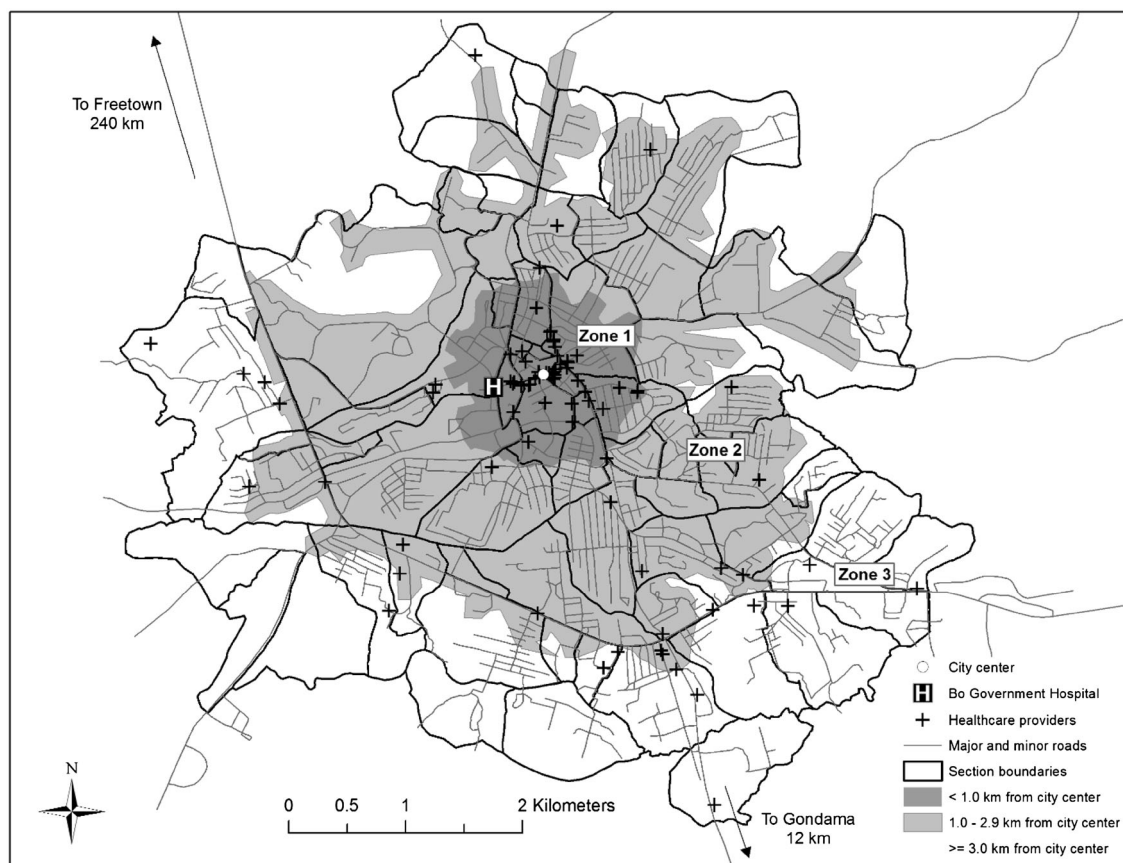

Fig. 2 Road travel distance zones from the city center and location of all health-care providers in Bo (Sierra Leone, 2010–2011)

subgroups and Kruskal–Wallis test for comparison across three or more population subgroups were used to evaluate differences in the median distance from women's homes to their preferred health-care providers. Chi square (χ^2) tests were used to identify differences in socio-demographic characteristics between the geographic zones of Bo.

Results

Bo has a diverse health-care marketplace. Of the 3542 (99.4 %) women who reported the type of health-care 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 while also offering services at clinics or in their own homes, so no location for these providers could be mapped and no distances to these providers could be calculated. 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 (Ansumana et al. 2010) conducted alongside the community survey identified a total of 84 hospitals, clinics, and pharmacies within Bo City limits (Fig. 2), of which 57.1 % were located in Zone 1 (<1 km from the city center), 25.0 % were located in Zone 2 (1.0–2.9 km from the city center), and 17.9 % were located in Zone 3 (≥3 km from the city center) (Table 1). 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 Médicins 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. The most commonly available providers in all zones were pharmacies (73.0 % of all providers). All of the pharmacies and most of the hospitals were private, while most clinics were public facilities.

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 %). Public facilities accounted for 42.3 % of the preferred providers (Table 1) and they were preferred by 1885 (77.9 %) women. 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. BGH was the most commonly identified preferred provider and was named by 1562 (64.6 %) women. Twelve of the 26 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 262 (10.8 %). Of the residents whose preferred provider was located in Zone 3, 85 (32.4 %) named preferred providers within Bo City limits and the remaining 177 (67.6 %) named one of the two facilities located outside city limits.

Participants lived a median distance of 0.6 km (interquartile range (IQR): 0.3, 0.9) from the nearest of the 26 preferred providers (Table 3), but most women did not name their nearest facility as their preferred facility for acute health-care services. More than 70 % of women named a preferred provider located more than 1 km one-way from their homes. Including the two facilities located outside of Bo City, the median distance one-way from women's homes to their preferred providers was 2.2 km

Table 1 Characteristics of health-care providers in Bo by type, distance from the city center, and ownership (Sierra Leone, 2010–2011)

Facility type	All providers ($n = 86$)						Preferred providers only ($n = 26$)					
Distance from the city center	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	
Ownership	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
Total	2	46	6	15	6	11	2	10	4	2	5	3

Table 2 Measurements of distance from the preferred provider (km) to Bo City center, by residential zone (Sierra Leone, 2010–2011)

Household distance from the city center (km)	Median (interquartile range) from preferred provider to city center			n (%) of women with a preferred provider in a particular zone, all preferred providers			n (%) of women with a preferred provider in a particular zone, non-BGH within-Bo providers only		
	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
Zone 1									
<1.0	0.4 (0.4–0.4)	0.4 (0.4–0.4)	1.5 (0.4–1.5)	391 (79.5)	77 (15.7)	24 (4.9)	46 (36.5)	77 (61.1)	3 (2.4)
Zone 2									
1.0–2.9	0.4 (0.4–2.3)	0.4 (0.4–1.5)	2.3 (1.5–2.3)	827 (69.1)	291 (24.3)	79 (6.6)	41 (11.7)	291 (82.9)	19 (5.4)
Zone 3									
≥3.0	0.4 (0.4–2.3)	0.4 (0.4–1.5)	2.3 (1.5–3.1)	460 (63.0)	111 (15.2)	159 (21.8)	29 (14.3)	111 (54.7)	63 (31.0)
All zones	0.4 (0.4–1.5)	0.4 (0.4–1.5)	2.3 (1.5–2.3)	1678 (100)	479 (100)	262 (100)	116 (17.1)	479 (70.4)	75 (12.5)

BGH Bo Government Hospital

Table 3 Median distances from home to the preferred provider (km), by residential zone (Bo, Sierra Leone, 2010–2011)

Household distance from the city center (km)	Median (IQR) distance to the nearest provider	Median (IQR) distance from home to a woman's preferred provider							
		All providers	Hospitals (inpatient care offered)	Clinics (outpatient care only)	Public providers	Private providers	BGH	Within Bo providers	Non-BGH Bo providers
Zone 1									
<1.0	0.3 (0.2–0.5)	0.8 (0.6–1.0)	0.8 (0.6–0.9)	0.9 (0.3–1.0)	0.8 (0.6–0.8)	0.8 (0.5–1.6)	0.8 (0.6–0.9)	0.8 (0.6–0.9)	0.8 (0.5–1.4)
Zone 2									
1.0–2.9	0.7 (0.6–1.0)	1.9 (1.2–2.7)	0.9 (0.5–1.1)	0.9 (0.5–1.1)	1.9 (1.1–2.5)	3.1 (1.5–10.9)	2.2 (1.8–2.6)	1.9 (1.2–2.5)	0.9 (0.6–1.5)
Zone 3									
≥3.0	0.6 (0.3–0.9)	3.5 (2.9–4.4)	3.5 (3.0–4.5)	2.0 (0.6–3.3)	3.3 (2.8–3.6)	4.7 (3.8–7.9)	3.4 (2.9–3.6)	3.4 (2.8–3.8)	3.3 (1.7–4.3)
All zones	0.6 (0.3–0.5)	2.2 (1.0–3.2)	2.4 (1.2–3.4)	0.9 (0.6–1.7)	2.0 (0.9–2.9)	3.8 (1.1–7.9)	2.3 (1.1–3.0)	1.9 (0.9–3.0)	1.1 (0.6–2.8)

IQR Interquartile range, BGH Bo Government Hospital

Table 4 Socioeconomic and demographic characteristics of study participants by distance from home to Bo City center and road distance travelled to the preferred provider (Sierra Leone, 2010–2011)

	Distance from home to the city center (km)					Distance from home to the preferred provider (km)					
	All	Zone 1 <1.0	Zone 2 1.0–2.9	Zone 3 ≥3.0	χ^2 p value	All providers	Bo providers only	<1.0	1.0–2.9	≥3.0	χ^2 p value
	Median (IQR)	n (%)	n (%)	n (%)		Median (IQR)	Median (IQR)	n (%)	n (%)	n (%)	
All	2.4 (1.1–3.1)	492 (20.3)	1197 (49.5)	730 (30.2)	–	2.2 (1.0–3.2)	1.9 (0.9–3.0)	599 (24.8)	1078 (44.6)	742 (30.7)	–
Age (years)					0.220						**0.006**
18–24	2.4 (1.2–3.1)	90 (18.3)	241 (20.1)	146 (20.0)		2.2 (1.0–3.2)	1.8 (0.9–2.9)	119 (19.9)	209 (19.4)	149 (20.1)	
25–34	2.4 (1.0–3.0)	193 (39.2)	377 (31.5)	240 (32.9)		2.0 (0.9–3.1)	1.8 (0.8–2.8)	235 (39.2)	348 (32.3)	226 (30.5)	
35–44	2.4 (1.2–3.1)	113 (23.0)	293 (24.5)	181 (24.8)		2.2 (1.0–3.3)	2.0 (0.9–3.1)	143 (23.9)	254 (23.5)	190 (25.6)	
45–54	2.5 (1.3–3.1)	47 (9.6)	132 (11.0)	78 (10.7)		2.2 (1.1–3.3)	2.3 (1.1–3.2)	48 (8.0)	122 (11.3)	88 (11.9)	
≥55	2.4 (1.2–3.0)	49 (10.0)	154 (12.9)	85 (11.6)		2.5 (1.3–3.4)	2.0 (1.1–3.1)	54 (9.0)	146 (13.5)	88 (11.9)	
Marital status					0.161						**0.021**
Never married	2.2 (1.0–3.0)	85 (17.3)	186 (16.1)	101 (14.2)		1.8 (0.9–3.0)	1.7 (0.9–2.7)	99 (17.1)	180 (17.1)	94 (13.0)	
Married	2.4 (1.1–3.1)	349 (70.9)	812 (70.2)	532 (75.0)		2.3 (1.0–3.3)	2.0 (0.9–3.0)	417 (71.9)	728 (69.0)	547 (75.8)	
Widowed or divorced	2.3 (1.1–3.0)	58 (11.8)	158 (11.7)	76 (10.7)		2.0 (1.0–3.1)	1.9 (1.0–3.0)	64 (11.0)	147 (13.9)	81 (11.2)	
Electricity in residence					**<0.001**						**<0.001**
Yes	1.3 (0.7–2.7)	424 (86.2)	533 (44.5)	213 (29.2)		1.6 (0.8–2.7)	1.4 (0.8–2.4)	392 (65.4)	557 (51.6)	222 (30.0)	
No	2.8 (2.2–3.2)	66 (13.4)	620 (51.8)	492 (67.4)		2.8 (1.7–3.5)	2.6 (1.6–3.3)	187 (31.2)	495 (45.9)	495 (66.8)	
Type of floor in dwelling					**<0.001**						**<0.001**
Concrete	2.3 (1.1–3.0)	443 (90.0)	937 (78.3)	548 (75.1)		1.9 (0.9–3.1)	1.8 (0.9–2.8)	496 (82.8)	911 (84.4)	521 (70.3)	
Other	2.7 (2.1–3.1)	49 (10.0)	260 (21.7)	181 (24.8)		2.8 (1.1–3.5)	2.6 (1.0–3.3)	103 (17.2)	168 (15.6)	219 (29.6)	
Approximate distance from home to drinking water source (m)					**<0.001**						**<0.001**
<50	2.5 (1.3–3.1)	243 (49.8)	552 (47.8)	392 (55.1)		2.3 (0.9–3.3)	2.2 (0.9–3.1)	298 (51.3)	472 (44.8)	417 (57.8)	
50–150	2.2 (1.1–3.0)	172 (35.2)	550 (47.6)	261 (36.7)		1.8 (1.0–3.0)	1.8 (1.0–2.8)	212 (36.5)	514 (48.8)	257 (35.6)	
>151	1.2 (0.4–3.2)	73 (15.0)	54 (4.7)	59 (8.3)		1.7 (0.6–3.1)	1.7 (0.6–2.9)	71 (12.2)	68 (6.5)	47 (6.5)	

IQR interquartile range

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

Table 5 Distribution of distances from home to the preferred provider (km), by residential zone (Bo, Sierra Leone, 2010–2011)

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

BGH Bo Government Hospital

(IQR: 1.0, 3.2). Women with a preferred provider within Bo City limits named a facility at a median distance of 1.9 km (IQR: 0.9, 3.0) one-way from their residences. Women who preferred to visit a private provider rather than a public (governmental) facility named preferred facilities at a median distance of 3.8 km (IQR: 1.1, 7.9) from their homes, while those preferring a public provider named facilities that were on average 2.0 km (IQR: 0.9, 2.9) from home.

Women living in Zone 3, at the outskirts of Bo City, had similar demographic characteristics to women living in Zones 1 and 2, but they had lower socioeconomic status as indicated by being less likely to have electricity in the home and less likely to have a concrete floor rather than a dirt one (Table 4). Women living in Zone 3 named preferred providers significantly farther from their homes than women in other zones, even though most women residing in Zone 3 lived less than 1 km from one of the 26 preferred providers. 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 5). The typical woman living at the outskirts of Bo City did not report a preference for local neighborhood-based malaria care services, and instead reported a preference for seeking care for acute febrile illnesses from BGH, the public hospital located in the city center.

Discussion

This study demonstrates the dynamic nature of the health-care 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 health-care 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 health-care services. Although women in Bo live only a median distance of 0.6 km from one of the health-care 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 named preferred providers at a median distance of more than 4 km roundtrip from home, 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 health-care providers available in Bo City is similar to that found in other urban areas of West Africa, as described by previous studies in Burkina Faso (Nikièma et al. 2008), Ghana (Aboagye and Agyemang 2013; Dodoo et al. 2009), Liberia (Kruk et al. 2010), and Nigeria (Giacaman et al. 2007; Onah et al. 2006), where a variety of public and private hospitals, primary care centers, and pharmacies provide options for infection diagnosis and treatment (Dodoo et al. 2009; Onwujekwe et al. 2010; Uzochukwu et al. 2008). The preference for hospital-based care in the Bo study is congruent with previous studies in urban Nigeria (Onwujekwe et al. 2010) and Senegal (Diallo et al. 2012). However, the stated preference for malaria care providers that are too far from home to be considered easily accessible by pedestrians with febrile illnesses is not something that has been previously reported for an urban West African setting.

In Bo, most women named a preferred malaria care provider located farther from home than they could comfortably walk when ill. The desire to seek affordable care (Giacaman et al. 2007; Hotchkiss 1998) and to be treated by a provider with a reputation for good quality care (Combier et al. 2004; Elul 2011; Hotchkiss 1998; Onah et al. 2006) may be the driving forces behind

women's possible 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 (Jacobsen et al. 2012b). A study from rural Tanzania suggested that access to transportation may enable health-care 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 (Kruk et al. 2009). However, the relationships between access to transportation, distances to various providers, and provider selection may be significantly influenced by the costs of health-care services as well as transportation. The full costs of health care, both direct and indirect, need to be further studied in Bo—a place where few households own a motorcycle, car, or other motor vehicle—and in future studies of provider selection at other study sites.

The decision to bypass nearer facilities (Akin and Hutchinson 1999) suggests that factors such as the severity of the illness (Scott et al. 2014), the cost of care (Onah et al. 2006), and the perceived quality of care (Elul 2011; Onah et al. 2006) may be more important in the selection of a health-care provider than a convenient location, and this may be what is occurring in Bo. Other 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 (Brown 2001; Nwosu et al. 2012; Olusanya et al. 2010; Osubor et al. 2006). However, the opposite seems to be happening in Bo, with many residents traveling further away from their homes and possibly bypassing private facilities with potentially high fees to seek free care from public facilities. The perceived quality of care at public and private health facilities in Bo and other low-income urban areas may be enhanced by the need for providers to "compete" for patients in a crowded health-care marketplace (Onah et al. 2006; Thaddeus and Maine 1994). This requires further study.

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 only indicative of their stated preference for health-care provider. In practice, women may not always visit their preferred providers when febrile and may be especially likely to use facilities closer to home when they suddenly become seriously ill. This may mean that the average distance from homes to preferred providers is longer than the actual average distance traveled from homes to usual providers. The stated preference questionnaire items did not ask women to explain the reasons behind their provider selections, and they did

not seek to ascertain whether a woman's preferred provider would change under different circumstances. Even so, this analysis provides new insights into the dynamics of the health-care marketplace in urban areas of low-income countries—a market that includes public and private facilities; hospitals, clinics, pharmacies, and other types of health-care providers; and a plethora of health-care options from in-home care to specialty services offered hundreds of kilometers away.

In urban settings where a variety of providers are accessible to the population, the geographic placement of new health-care 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. Standalone measures of spatial access to health-care facilities 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.

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