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Research Article

Keywords:

Posted Date: August 13th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10540353/v1

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Additional Declarations: No competing interests reported.

Inter-facility referrals for childbirth care in Lubumbashi city, DRC: results from a healthcare facility census in 2023

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Abstract

Background

Ensuring continuity of care around the time of childbirth is essential to maternal and perinatal survival and wellbeing. In many health systems, health facilities (HFs) are mandated to refer women needing more advanced care within a designated structure. However, inter-facility referral practices remain under-documented, especially in complex urban settings with diverse and fragmented care provision. This study describes the characteristics, capacity, and spatial relations of inter-facility referrals for childbirth care in Lubumbashi, Democratic Republic of the Congo.

Methods

A facility census was conducted in November 2023, recording geographic coordinates for all HFs. Representatives of HFs without childbirth care capacity cited the HFs to which they refer women needing childbirth care; representatives of HFs providing childbirth care cited destination HFs to which they referred women needing higher-level care. Sending-destination HF pairs were characterized by sector (public vs. private) and childbirth care capacity (none, non-caesarean section (CS), or CS-offering). We assessed the extent to which HFs referred to their designated hospital under national referral policies (lower-level HF should send patients to the referral hospital within the same health zone) and calculated straight-line distances to it.

Results

We enumerated 1,254 primary and secondary HFs in Lubumbashi. Overall, 20% cited no destination HF (14% of 296 facilities without childbirth care capacity, 15% of 658 non-CS facilities, and 38% of 300 CS-offering facilities). The two public tertiary hospitals were the most frequently cited destinations regardless of sending facility capacity and location. Although 80% of HFs cited at least one destination HF, 58% cited a public CS-offering facility. Overall, 43% cited their designated referral hospital and 11% cited the equivalent hospital in a different health zone. Among facilities citing their designated hospital, the median distance to it was 2.6km; among facilities citing an alternative, the median distance to their own designated hospital was 3.3km.

Conclusion

Referral patterns in Lubumbashi deviate somewhat from the designated structure, at times bypassing designated hospitals in favour of facilities closer by and public tertiary facilities. Strategies to strengthen inter-facility referral policies and practices should account for the importance of proximity, to improve the efficiency, continuity, and timeliness of childbirth care.

Background

Maternal mortality remains a global health concern, with the highest burden in low- and middle-income countries (LMICs). Democratic Republic of the Congo (DRC) in sub-Saharan Africa (SSA) has one of the highest maternal mortality ratios in the world, with an estimated 427 deaths per 100,000 births in 2023 [1] . Much more effort is needed to accelerate progress toward achieving the SDG target of less than 70 deaths per 100,000 live births by 2030. The leading causes of maternal deaths in DRC and other high-burden countries are bleeding after childbirth, hypertensive disorders, and infections related to pregnancy and childbirth [2]. Similarly, the country is unlikely to meet the stillbirth target of ≤ 10 stillbirths per 1,000 total births by 2035 [3, 4]. Most of these deaths are preventable if the danger signs were identified, and the appropriate interventions provided in a timely manner. The package of evidence-based medical interventions to address the leading causes of maternal and perinatal mortality are collectively referred to as emergency obstetric care (EmONC) [5]. International guidance consistently underscores that all women should deliver in facilities that are adequately equipped, staffed with skilled birth attendants, and capable of providing comprehensive EmONC [6]. The revised set of 25 EmONC signal functions includes a new referral function for emergency referral to higher-level facilities when complications arise [7] [6].

A high proportion of births in many high-burden countries now occur in health facilities, especially in urban areas. In DRC, the 2023–2024 Demographic and Health Survey (DHS) reported that 83% of births occurred in a health facility nationally, reaching 95% in urban areas [8]. Yet improvements in pregnancy outcomes have not kept pace with this increase, in part because giving birth in a health facility does not guarantee that women receive high quality intrapartum care their clinical situation requires. Rapid urban growth has led to increasingly complex health systems characterised by high population density, significant social and economic inequalities, heavy patient caseloads, and diversity of public and private providers [9]. In urban settings, women may live within reasonable proximity to multiple health facilities operating across different levels and sectors of the health system, and thus seek care at one of these nearby facilities as their first point of contact [10]. When the facility of first contact lacks the capacity to provide the level of care required to care for the presenting woman, an inter-facility referral, defined as “a process in which a health worker at a level of the health system (initiating facility), having insufficient resources (drugs, equipment, skills) to manage a clinical condition, seeks the assistance of a better or differently resourced facility at the same or higher level (receiving or destination facility) to assist in, or take over the management of, the client's case”, is needed [11]. Given the narrow time window to effectively intervene in obstetric emergencies, a well-functioning inter-facility referral system is critical to ensuring the safety of both women and newborns [12].

In the DRC, the delivery of public health services follows a tiered referral structure. Primary-level health centres serve as the first point of contact, managing routine care. Cases beyond their capacity go to secondary-level, offering more complex medical and surgical services. Highly specialized cases are referred further to tertiary level. The successful of this model depends strongly on effective coordination between levels of care. In practice, however, insecurity, political instability, epidemics, prolonged armed conflict, and chronic underfunding have limited the Congolese public health system's ability to respond to health demands and facilitate efficient inter-facility referrals. In fast-growing urban areas, especially, persistent gaps have emerged in access to and quality of public-sector care [13-15], accompanied, and partly driving, a corresponding rise in private-sector healthcare provision [16-18]. Many private hospitals, while comparatively better equipped and staffed by more specialised and better-remunerated personnel than their public-sector counterparts [19], often lack an official classification within the tiered health system, a clearly defined service package or formal designation as referral facilities, and are expensive. This fragmentation poses a particular problem for childbirth, where the absence of clear referral pathways between facilities can delay access to lifesaving care when complications arise, placing both women and babies at heightened risk.

There is limited empirical evidence on inter-facility childbirth care referrals practices in the DRC. Little is known about actual referral linkages, which facilities act as de facto referral centres, or the extent to which practices align with existing policy frameworks. The role of spatial factors (e.g., geographic accessibility and proximity) on referral decisions remains largely undocumented. The objective of this study is to describe the characteristics, capacity, and spatial relations between health facilities with specific focus on referrals for childbirth care in Lubumbashi. We assess three main types of inter-facility childbirth care referrals: 1) from facilities that do not provide childbirth services, 2) from facilities that provide childbirth services but no caesarean section, and 3) from facilities that provide childbirth services and caesarean section.

Methods

Study settings

The study was conducted in Lubumbashi. Lubumbashi is the second largest city in the DRC and the economic and social capital of the Haut Katanga province. Based on the 2023-2024 Demographic and Health Survey in the DRC, 92% of births in Haut Katanga province occurred in health facilities [20].

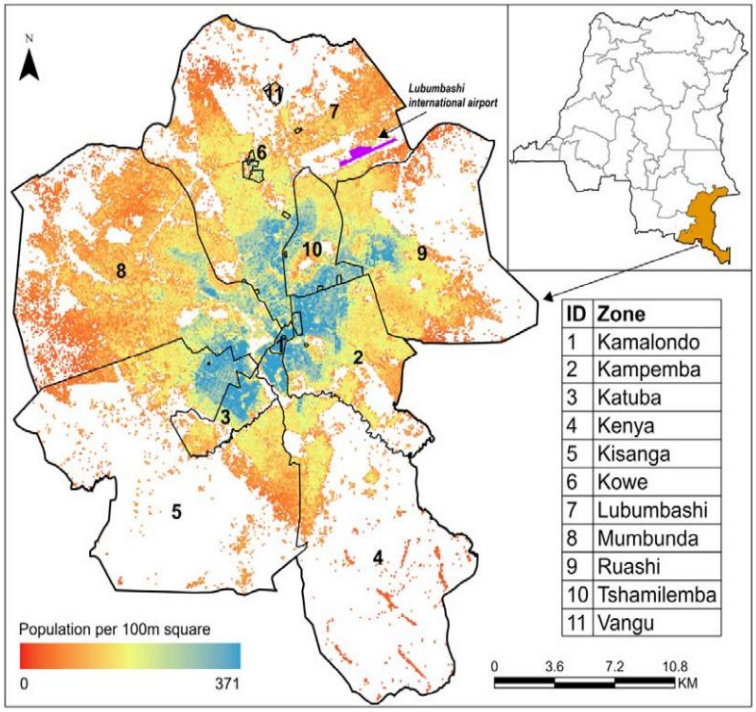


Figure 1: Map of Lubumbashi showing the 11 health Zones [16] [21] with population counts per 100 square meters

Lubumbashi is divided into 11 health zones (HZs), including two special-purpose and geographically small zones, Vangu (army) and Kowe (police) (**Figure 1**). The HZ constitutes the primary organizational unit for healthcare delivery, with most HZ served by one public secondary hospital (General Referral Hospital, or Hôpital Général de Référence - HGR) that servers as the designated referrals hospital to HFs within the same HZ [22]. In HZs lacking an HGR, referrals are designated to at least one equivalent, authorized facility. The HFs designated or used as HGRs in all 11 HZs at the time of this study are listed in **Supplementary Material I**. These referral facilities are public-sector secondary HFs required to include departments of internal medicine, gynecology-obstetrics, paediatrics and surgery, as well as a laboratory, a pharmacy and a medical imaging department, all staffed by specialists [23]. Additionally, the provincial referral hospital (Sendwe Hôpital de Référence) and the University Clinics of Lubumbashi (administered by the University of Lubumbashi) are both located in the city, in Lubumbashi HZ. Both facilities provide highly specialised tertiary medical care across a wide range of disciplines. The detailed map of health facility locations is published elsewhere [21] .

National policies for childbirth care referral in the DRC

In the DRC, maternal and perinatal care is embedded in a district health system framework that assigns basic and comprehensive EmONC functions in a tiered structure. The first tier comprises all primary HFs and secondary HFs (except for the HGRs), which are mandated to provide basic EmONC. In the second tier, HGRs

provide comprehensive EmONC, including caesarean sections and blood transfusions, to manage complicated childbirth deliveries. National policy stipulates that when referral is indicated at the first tier, women should be referred to the designated HGR or an equivalent HF (**Supplementary Material I**). Onward referrals to tertiary facilities (provincial hospital and university clinic offering specialised services) must go through the HGRs [25-27].

Capturing inter-facility referral for childbirth care

Data on inter-facility childbirth care referrals have been captured in various ways in the literature. In some population surveys, women recall the care-seeking journeys for their last births, with stops along the way categorised as, for example, home, another facility, or a pharmacy. Radovich and colleagues found that, in Nigeria, the majority (58%) of referred cases came from a lower-level public facility [28]. Researchers have also collected data from postpartum women, asking them to describe where their journey began, any intermediate stops, and how they reached their final facility [29]. Data from patient records may additionally be extracted [30-32]. Using this approach, Birabwa et al. [30-32]. Using this approach, Birabwa et al. analysed EmONC care-seeking pathways in 433 women in Kampala, Uganda, and found that journeys to the final HF for childbirth delivery frequently involved at least two facilities along the way, suggesting potential referral inefficiencies [32]. A third approach relies on facility staff reporting referral practices in health facility assessment studies. In Tanzania, Schmitz and colleagues linked facilities into pairs based on information provided by staff at the receiving facilities. The authors found that one third of inter-facility transfers exceeded two hours, with women frequently not referred to facilities with higher EmONC provision [33]. Other studies using ambulance programme data and modelled referral networks linking non-CEmONC to CEmONC facilities by their GPS coordinates and estimated travel time have similarly identified prolonged inter-facility travels and potential pressure points in the highest level of care within obstetric referral systems [34, 35]. [34, 35].

Data

This study analysed data from a comprehensive health facility census conducted in Lubumbashi in November 2023. Detailed information about the census is available elsewhere [16, 21]. Briefly, health facility listings provided by the health zone offices and snowballing techniques were employed to identify all HFs in the city. The census questionnaire was administered to a knowledgeable respondent from the HF, typically the nurse in-charge, the manager, or the person in charge of the reception. The census identified approximately 1,300 primary, secondary, and tertiary HFs across the public, private, and semi-public, or parastatal sectors. Parastatal HFs are institutions established, recognized, or substantially supported by the state that operate with a degree of autonomy. These facilities contribute to public health services

implementation and are linked to the state, but are often governed semi-autonomously, such as by university administrations or private management entities. Their financing often derives from a combination of public funds, contributions from financial partners, and internally generated revenue.

Global positioning system (GPS) coordinates from every HF were taken during data collection. HF respondents were asked to provide basic facility information, including level of care (primary, secondary, tertiary), and whether childbirth care was available at their facility. Those at HFs not providing childbirth care were asked to name two to five HFs to which they refer women needing childbirth care. The original question was “À quelle autre FOSA referez-vous les femmes qui viennent ici pour accoucher ? SVP nommez 2-5 FOSA”, where FOSA was the abbreviation for Formation Sanitaire (health facility). Those at HFs that declared providing childbirth care were asked to name between two to five destination HFs to which they referred pregnant women, women in labour, women about to give birth, or postpartum women the most ("Votre FOSA réfère-t-elle les femmes enceintes, en travail, pour accoucher, ou en post-partum vers d'autres FOSA ? Si oui, SVP nommer 2-5 FOSA vers lesquelles vous référez le plus de femmes").

The free-text facility names provided by respondents were manually cleaned and matched to those existing in the census database with a unique identifier (numeric code) for information on their capacity to provide childbirth care, the capacity to provide caesarean section (CS) birth, and other facility characteristics (e.g., HZ, ownership, and facility level). It is common that facilities have identical or similar names, especially as many private facilities operate in chains in different locations of the city. For these cases, the facility was matched to that existing in the same health zone. Seventy-six HFs cited at least one destination facility with names that could not be matched, either because of data entry errors or because the respondents were referring to the facilities using aliases that are common in the community but different from the formal facility name noted in the database. For these cases, the facilities were categorised as “unidentified”. Further information on the questionnaire and variable is presented in the protocol [36].

We defined all primary and secondary facilities as potential sending facilities. Destination facilities were identified from HF names responses cited by HF respondents. Three types of referral linkages were examined. First, referrals from sending HFs that did not provide any childbirth services (the expected type of referral would be for uncomplicated childbirth). Second, referrals from sending HFs that declared providing childbirth services (e.g., referrals for care not available at the sending HF, most likely for a complication). The second group was further stratified by their capacity to provide CS, based on the responses.

Analysis

Descriptive statistics of HFs' health zone, sector (public, private, and parastatal), levels (primary, secondary, and tertiary) and the provision of any level of childbirth services and CS were reported descriptively. We identified the number of unique HFs citied as destinations of referrals, and the HFs that were most frequently cited. Then, we assessed the sector and level of the destination facilities, by category of the sending facilities (whether they provided childbirth care or not). Attention was paid to sending facilities that exclusively cited private primary-level facilities or exclusively cited public tertiary-level facilities as referral destinations. This distinction is important in Lubumbashi's health system, which is dominated by a large number of private primary facilities [16], potentially leading to lateral referrals that may be inappropriate in case of complications and introduce delays in accessing higher-level care. Conversely, citing only distant tertiary facilities may bypass closer, appropriately equipped secondary-level facilities, thereby contributing to unnecessary delays.

We constructed indicators of appropriateness of referral linkages, operationalised as facilities referred with greater clinical capacity than the sending HF, specifically the provision of CS. Four indicators were constructed: 1. the proportion of sending HFs that cited at least one destination facility, 2. the proportion of sending HFs that cited at least one destination facility that declared providing childbirth care, 3. the proportion of sending HFs that cited at least one destination facility that declared providing CS, and 4. the proportion of sending HFs that cited at least one destination facility in the public sector that declared providing CS. These proportions were calculated separately by referral type: referrals from HFs providing no childbirth services, and referrals from HFs declared providing childbirth services, the latter further stratified by CS capacity.

Adherence to referral policies and geographic proximity

Under DRC national policies, primary and secondary HFs, regardless of their own capacity to provide childbirth care, should refer women to their designated HGR when such a need arises (**Supplementary Material I**) [25-27].[25-27]. To assess adherence to this policy and explore geographic explanations of the observed referral patterns, we examined whether sending facilities cited their designated HGR, an alternative HGR in another zone, or no HGR at all. We calculated the straight-line distance from each sending facility to their designated HGR or equivalent HF. In addition, we identified the shortest distance from each sending facility to a HGR in another HZ. Straight-line distance was used as a proxy for geographic accessibility due to the relatively short distances to HGRs (typically ≤10km) [37]. Median distances and interquartile (IQR) were compared between facilities that cited their designated HGR and those that did not.

Results

The census identified 1,267 health facilities. For this analysis, the 12 HGRs and the provincial referral hospital were excluded because of their role at the top of the referral hierarchy and were not expected to refer upward. Thus, we considered 1,254 eligible primary and secondary HFs, 96% of which operated in the private sector, with nearly 90% at primary level (**Table 1**). Among all 1,254 eligible HFs, 296 did not provide childbirth care, 658 declared providing childbirth care but not CS, and 300 declared providing CS.

Table 1. Characteristics of all primary and secondary health facilities (HFs) in Lubumbashi city in 2023, n=1,254

	All HFs		**HFs not providing childbirth care**		**HFs declared providing childbirth care**					
					All		**Did not declare providing caesarean section**		**Declared providing caesarean section**	
	N=1,254	(%)	n=296	(%)	n=958	(%)	n=658	(%)	n = 300	(%)
Sector										
Public	33	2.6	12	4.1	21	2.2	9	1.4	12	4.0
Private	1213	96.7	282	95.3	931	97.2	648	98.5	283	94.3
Parastatal	8	0.6	2	0.7	6	0.6	1	0.2	5	1.7
Level										
Primary	1,127	89.9	275	92.9	852	88.9	631	95.9	221	73.7
Secondary	127	10.1	21	7.1	106	11.1	27	4.1	79	26.3
Health Zone										
Kampemba	242	19.3	53	17.9	189	19.7	143	21.7	46	15.3
Lubumbashi	223	17.8	53	17.9	170	17.7	78	11.9	92	30.7
Ruashi	221	17.6	41	13.9	180	18.8	150	22.8	30	10.0
Mumbunda	156	12.4	27	9.1	129	13.5	79	12.0	50	16.7
Kisanga	127	10.1	34	11.5	93	9.7	74	11.2	19	6.3
Kenya	125	10.0	48	16.2	77	8.0	64	9.7	13	4.3
Tshamilemba	87	6.9	17	5.7	70	7.3	36	5.5	34	11.3
Katuba	49	3.9	14	4.7	35	3.7	25	3.8	10	3.3
Kamalondo	16	1.3	7	2.4	9	0.9	6	0.9	3	1.0
Kowe	5	0.4	1	0.3	4	0.4	2	0.3	2	0.7
Vangu	3	0.2	1	0.3	2	0.2	1	0.2	1	0.3
Did not cite any destination facilities	251	20.0	41	13.9	210	21.9	97	14.7	113	37.6
Median number of facilities cited	2		2		2		2		1	
Interquartile range of facilities cited	1-2		1-2		1-2		1-2		0-2	
Number of unique facilities cited	239		165		141		131		37	

Among 296 HFs that did not provide childbirth care, 41 (13.9%) did not cite any destination facilities to whom they sent women. Among the 958 HFs providing childbirth care, 210 (21.9%) did not cite any destination HFs. A higher proportion of HFs that declared providing CS did not cite any destination HFs (37.6%), compared to <15% among HFs providing childbirth care but not CS. The median number of destination HFs cited was 2 (interquartile range=1-2). Overall, 239 unique destination facilities were cited. The five most cited destination facilities by childbirth care capacity of the sending HFs are shown in **Table 2** and **Figure 2**.

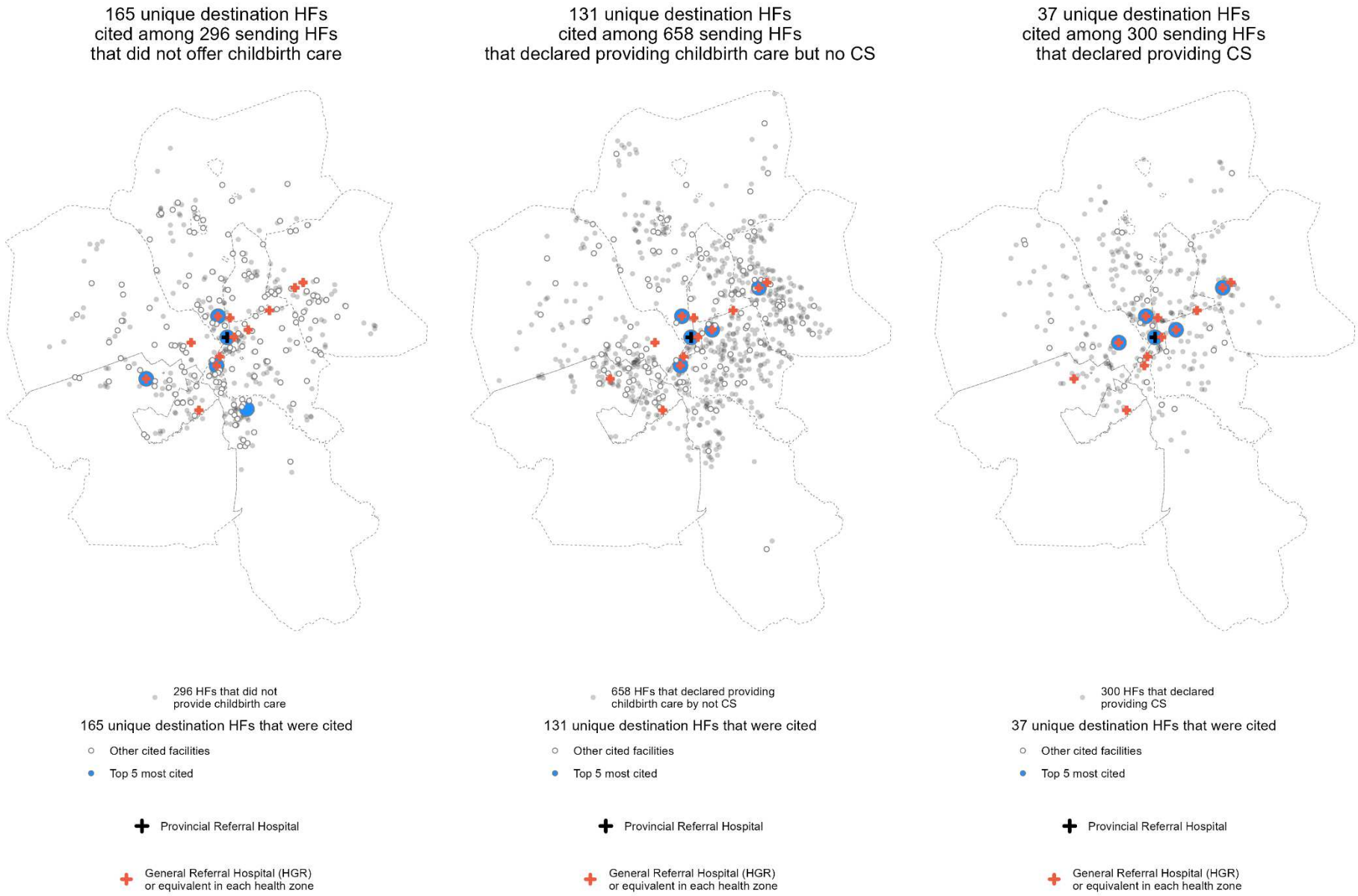
Both tertiary public hospitals (Sendwe Hôpital de Référence and Lubumbashi Cliniques Universitaires) were among the most frequently cited, regardless of the capacity and health zone of the sending HFs (**Table 2**). Sendwe Hôpital de Référence, for instance, was cited by 13% of HFs that did not provide any childbirth care, 36% of HFs that declared providing childbirth care but not CS, and 72% of HFs that declared providing CS. Despite the strong presence of private healthcare providers in the city, the list of most cited destination HF consisted exclusively of public and parastatal HFs.

Table 2. Top 5 most cited destination health facilities for childbirth care referral

	Number of times cited	Health Zone	Sector	Level	Designated HGR?
By HFs that did not provide childbirth care and cited at least one destination facility (n=255)					
Sendwe Hôpital de Référence	33 (13%)	Lubumbashi	Public	Tertiary	No
Kenya HGR	24 (9%)	Kenya	Public	Secondary	Yes
Kalebuka CSR	23 (9%)	Kenya	Public	Primary	No
La Foi CS	22 (9%)	Kisanga	Private	Secondary	Yes[1]
Lubumbashi Cliniques Universitaires	17 (7%)	Lubumbashi	Parastatal	Tertiary	No
By HFs that declared childbirth care but not CS and cited at least one destination facility (n=561)					
Sendwe Hôpital de Référence	204 (36%)	Lubumbashi	Public	Tertiary	No
Hakika HGR	105 (19%)	Ruashi	Public	Secondary	Yes
HGR Kampemba	80 (14%)	Kampemba	Public	Secondary	Yes
Lubumbashi Cliniques Universitaires	62 (11%)	Lubumbashi	Parastatal	Tertiary	Yes
Kenya HGR	54 (10%)	Kenya	Public	Secondary	Yes
By HFs that declared providing CS and cited at least one destination facility (n=187)					
Sendwe Hôpital de Référence	134 (72%)	Lubumbashi	Public	Tertiary	No
Lubumbashi Cliniques Universitaires	81 (43%)	Lubumbashi	Parastatal	Tertiary	Yes
Hôpital Gecamines SUD	28 (15%)	Mumbunda	Parastatal	Secondary	Yes
HGR Kampemba	15 (8%)	Kampemba	Public	Secondary	Yes
Hakika HGR	14 (7%)	Ruashi	Public	Secondary	Yes

[1] La Foi CS has been temporarily designated as the HGR in Kisanga Health Zone under a public-private agreement, following a fire that damaged the original designed HGR in the zone in 2016.

Figure 2. Maps of the health facilities cited as destinations for childbirth care referrals



Sector, level, and capacity of destination facilities

Among the 296 facilities that did not provide childbirth care, 40% cited exclusively private sector HFs as destinations of referrals, and 23% cited only private primary HFs. Another 18% referred women exclusively to public HFs (**Table 3**). In contrast, a higher proportion of facilities that reported providing childbirth care cited destination HFs only in the public sector (32%). Overall, 3% of HFs reported referring exclusively to public tertiary HFs.

Capacity-based analysis showed that 83% of facilities which did not provide childbirth care reported referring to at least one HF that declared providing childbirth care. The same percentage (83%) of facilities providing childbirth care but not CS reported referring to at least one HF that provided CS. HFs that declared providing childbirth care but not CS reported the highest percentage of referrals to a public HF with CS capacity (68%).

Table 3. Sector and level of destination facilities cited by sending primary and secondary HFs, Lubumbashi DRC

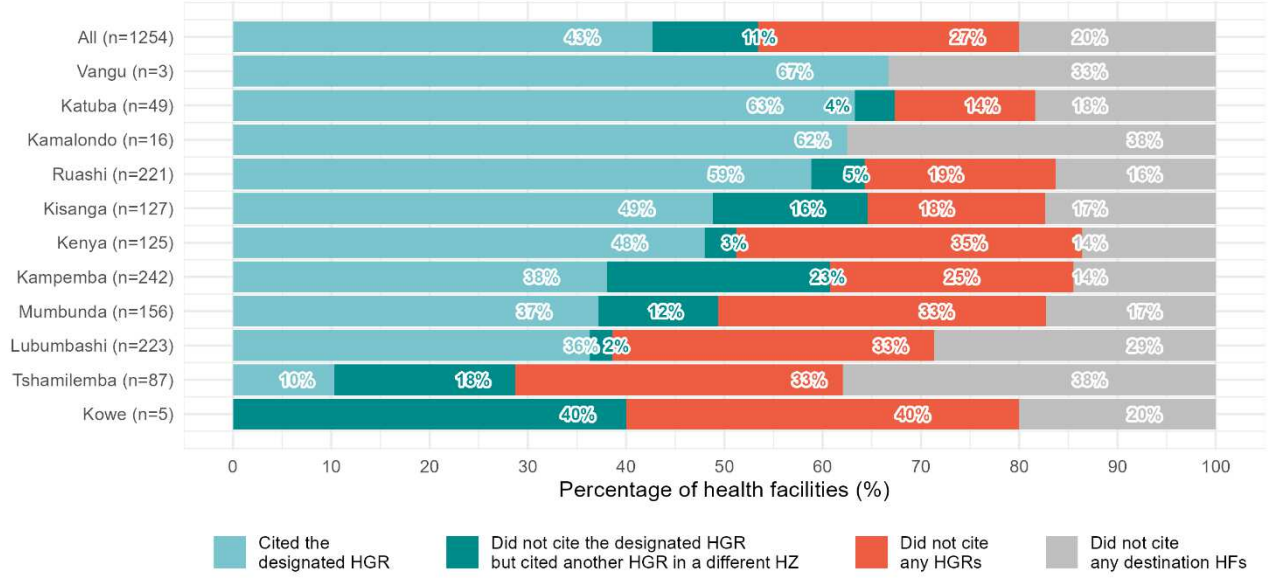
	Referrals from all HFs	**Referrals from HFs that did not provide childbirth care**	**Referrals from HFs that declared providing childbirth care**		
	All (n=1254)	All (n=296)	All (n=958)	Did not declare providing caesarean section (n=658)	Declared providing c-section (n=300)
Sector of the cited destination HFs[+]					
1. Did not cite any	251 (20%)	41 (14%)	210 (22%)	97 (15%)	113 (38%)
2. Only private	201 (16%)	117 (40%)	84 (9%)	75 (11%)	9 (3%)
3. Only public	393 (29%)	53 (18%)	310 (32%)	250 (38%)	60 (20%)
4. HFs in both public and private (mixed) sectors	439 (35%)	85 (29%)	354 (37%)	236 (36%)	118 (39%)
Specific sector and level of the cited destination HFs					
Only private primary HFs	105 (8%)	68 (23%)	37 (4%)	37 (6%)	0 (0%)
Only private primary HFs and/or polyclinics	120 (10%)	79 (27%)	47 (5%)	46 (7%)	1 (<1%)
Only public tertiary HFs	41 (3%)	3 (1%)	38 (4%)	19 (3%)	16 (5%)
Capacity of the cited destination HFs					
At least 1 HF that declared providing childbirth care	986 (79%)	246 (83%)	740 (77%)	554 (84%)	186 (62%)
At least 1 HF that declared providing CS	948 (76%)	217 (73%)	731 (76%)	545 (83%)	186 (62%)
At least 1 public HF that declared providing CS	730 (58%)	120 (41%)	610 (64%)	446 (68%)	164 (55%)

[+] *Rows 1, 2, 3 and 4 sum to 100%.*

Adherence to childbirth care referral policies

In the DRC, the policies for childbirth care referrals differ by the level (primary or secondary) of the sending facilities. Primary and secondary facilities (other than the HGRs or equivalent) are to refer to their respective designated HGR or an equivalent facility in the same HZ (**Supplementary Material I**) [25-27]. Among the 1,254 eligible primary and secondary HFs, 43% cited their officially designated HGR, while another 11% cited a HGR located in another HZ (**Figure 3**). In four HZs (Vangu, Katuba, Kamalondo, and Ruashi), at 50% or more of primary and secondary HFs cited their designated HGR. The percentage of HFs that cited HGR in a different HZ reached 16% in Kisanga, 18% in Tshamilemba, 23% in Kampemba, and 40% in Kowe. Overall, 27% of HFs did not cite any HGRs, and this percentage was the highest in Kowe (40%, 2 of 5 HFs) and Kenya (35%, 44 of 125 HFs).

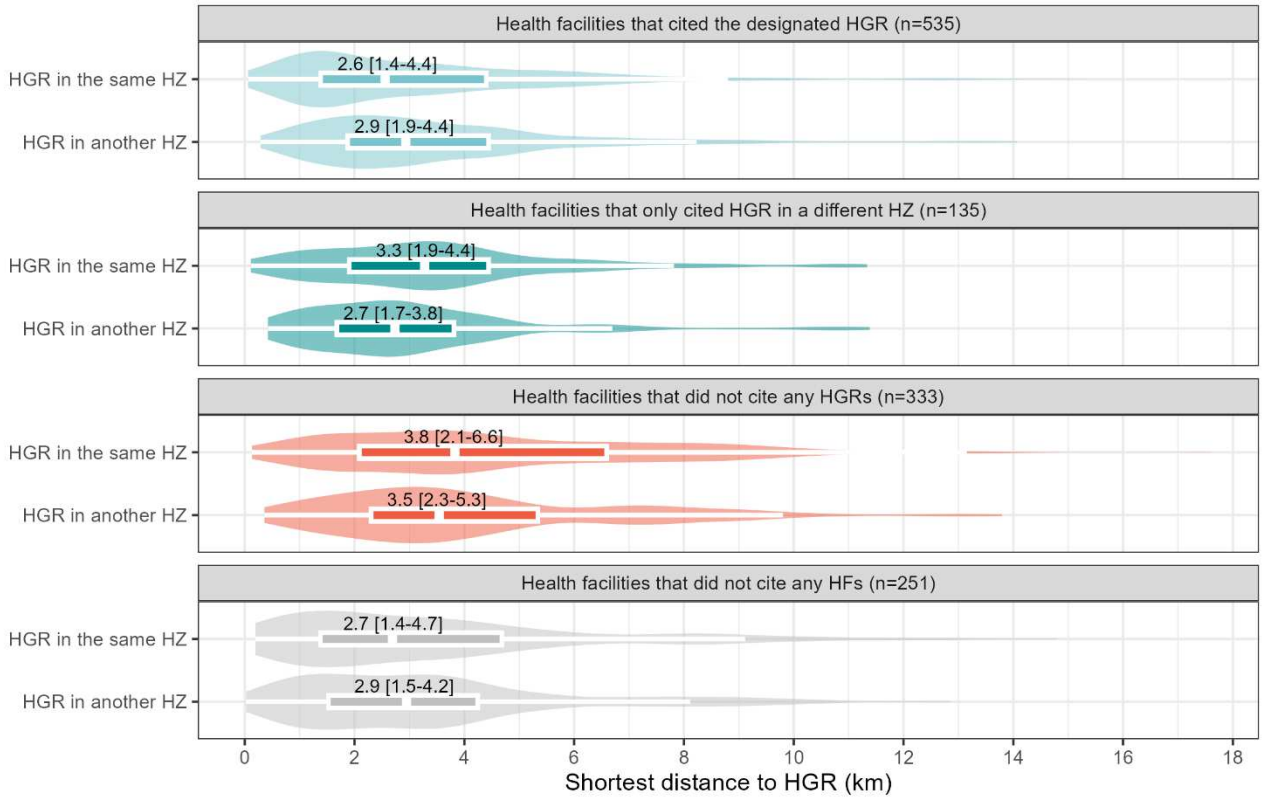
Figure 3. Childbirth care referrals to HGRs among eligible primary and secondary facilities by Lubumbashi, by health zone



Geographic justification of childbirth care referral policies

Straight-line distance to the designated HGR or an equivalent HF in the same HZ was measured for all eligible sending facilities. On average, the distance to the designated HGR or an equivalent HF in the same HZ from HFs that cited the designated HGR was 2.6km (IQR=1.4-4.4), compared to 3.3km (IQR=1.9-4.4) among HFs that only cited HGRs in other HZs, and 3.8km (IQR=2.1-6.6) among HFs that did not cite any HGRs (but cited at least one destination HF) (**Figure 4**). Among HFs that only cited a HGR in a different HZ, the average distance to the HGR in another HZ was shorter than the average distance to the HGR in their own HZ (2.7 km vs. 3.3 km).

Figure 4. Violin plot and boxplot of the shortest straight-line distances (km) from the 1,254 primary and secondary HF, to the designated HGR in the same health zone and the closest alternative HGR in another health zone (HZ)



Discussion

This study examined inter-facility childbirth care referral practices by healthcare providers in Lubumbashi. Overall, 80% of HFs cited at least one destination facility. Lubumbashi's health system is dominated by private providers, however, facilities more commonly cited public sector destinations, and most cited a mix of both sectors. Sendwe Hôpital de Référence, the city's sole public tertiary hospital, was the most frequently cited destination overall (named by nearly 400 of the 1,254 facilities). Most facilities cited some facilities to which they sent women and 58% cited a public secondary HF with caesarean capacity. However, only 43% adhered to the policy by referring women to their designated HGR for comprehensive EmONC. Geographic proximity appeared to be a factor in referral linkages – facilities which did not cite any HGR were generally located farther from their nearest HGR than those which mentioned an HGR. Additionally, facilities which cited an HGR in a different HZ were average closer to that out-of-zone HGR compared to the designated HGR in the same zone. Both patterns suggest that proximity, rather than zonal designation alone, partially influences whether referral linkage is practices according to the policy.

In this study, we observed that the most commonly reported childbirth care referral linkage was a combination of public and private-sector facilities. This pattern reflects continued reliance on the public sector for referral care (presumably particularly so among women who cannot afford more advanced care in the private sector) and the *de facto* integration of private providers into referral networks. This dynamic is increasingly recognised in urban low- and middle-income settings, where the private sector is a significant provider of maternal and child health services. Private facilities fill gaps left by public services, contributing substantially to overall service provision in mixed systems [38]. Our results speak to the need for clearer policy guidance on the role of private facilities within the referral system – both as origins and destinations of referrals, closer monitoring and supervision to regulate the private sector in their capacity and skill-level to adequately care for women, as well as to ensure women and families are able to afford the care they are being advised to seek.

The high proportion of facilities citing the provincial hospital as one of the destination HFs, including among HFs that did not provide childbirth care (and are not expected to be referring complications), raises concerns about potential over-reliance on specialised tertiary-level care in the public sector. Inappropriate referrals to tertiary hospitals introduce delays, overcrowding, and inefficiencies. This pattern may exist due to financial limitations, where the provincial referral hospital cannot reject patients due to inability to pay. However, it underscores the importance of reinforcing the gatekeeping role of public secondary-level facilities to prevent unnecessary bypassing and congestion at public tertiary hospitals. A study from Uganda found majority of cases referred to a national referral hospital suffered from complications should have been manageable in the district hospitals [32, 39]. Adherence to the policy of referring to the designated HGRs

varied considerably across the HZs. Studies from sub-Saharan African countries identify several common reasons for non-adherence to official referral policies, many of which are likely relevant in this setting. Providers and patients may bypass local HGRs due to a perception of better quality of care, which could be reflected as more trust in higher-level facilities [40, 41]. Other common reasons to incompliance with referral policies include insufficient knowledge about the referral system, misconceptions about the problem and work responsibilities, weak enforcement of referral policies, and poor connection and coordination among different levels of the referral system [42, 43].

Travel time and distance to facilities have strong implications on referral linkages for childbirth care, particularly in the context of obstetric emergencies where delays can quickly become life-threatening [44]. Under current policies, HFs are required to refer women to the HGR in the same zone regardless of distance [25-27].. In some cases, however, an alternative HGR located in neighbouring zones may be geographically closer and more accessible. Our findings indicate that some childbirth care referral linkages outside of health zone boundaries might be explained by geographic proximity. This points to the need of referral policies that better account for spatial accessibility and functional service capacity, as well as coordination across health zones to minimise delays and avert the maternal and perinatal morbidity and mortality that untimely or misdirected referrals can cause.

Policy recommendations

Strengthening referral governance should be a central policy priority. Clearer guidance is needed on the roles of public and private facilities within the referral system, particularly given the widespread practice of citing mixed-sector destinations. Formalizing the integration of private providers through accreditation, service mapping, and inclusion in referral protocols could improve coordination, accountability, and continuity of care. At the same time, enforcement of existing regulations regarding referral to designated HGRs should be reinforced, while ensuring that these facilities are adequately equipped and staffed to fulfil their gatekeeping role.

Efforts are also needed to reduce unnecessary bypassing of secondary-level facilities and over-reliance on tertiary hospitals such as Sendwe Hôpital de Référence. This could include training/retraining of care providers as empowering strategies to ensure competency in managing referral needs, implementation of a communication system, and strengthening the technical and infrastructural capacity of HGRs, particularly for comprehensive emergency obstetric and newborn care. Regular supervision, quality audits, and transparent performance monitoring may help address perceptions of poor hygiene, unreliable electricity, or inadequate equipment that discourage appropriate referrals.

Finally, referral policies should better reflect the realities of urban geography and service accessibility. Rather than relying solely on rigid zone-based rules, policymakers could incorporate spatial analysis, travel-time considerations, and facility capacity into referral planning, especially for time-sensitive obstetric emergencies. Investments in transport systems, ambulance networks, and communication between facilities would further enhance timely transfers. Together, these measures could support a more functional, equitable, and responsive referral system for childbirth care in Lubumbashi.

Future research recommendations

This study captured intended referral behaviour by asking sending facilities where they refer women, reflecting what facilities routinely do, rather than what actually occurs. An alternative approach, used by Schmitz et al. in Tanzania, captures observed referral behaviour by asking receiving facilities to report which facilities sent patients to them, but would miss women who were referred but never arrived [33]. Simultaneously examining data from both ends of the referral chain would enable identification of the gap between intended and realised referrals. Women who were referred but did not reach their destination represent a particularly vulnerable group, and understanding why referrals fail to materialise is essential for system improvement – whether due to demand-side barriers (e.g., households' financial constraints and decision-making processes, women's preferences and freedom to provider-of-choice) or and supply-side failures (e.g., inter-facility communication, inadequate ambulance service, and facility capacity at the point of reception). Linking facility-reported referral data with individual patient-level outcome data would further allow assessment of whether the referral system is effective in averting negative pregnancy outcomes.

Study strengths and limitations

A key strength of our analysis is the stratification by the capacity of the sending facilities: not providing childbirth care, declared providing childbirth care but not CS, and declared providing CS. This approach is more informative than relying on facilities' designated level (e.g., primary), because formal classification often reflects an administrative or planned level of service rather than what a facility is actually equipped and staffed to deliver at a given time. For example, while an average of one in five HFs did not cite any destination facilities, HFs that declared providing CS were less likely to report a referral option, possibly because of their own capabilities. However, these HFs remain subject to the same referral policies facilities and should still report referral pathways accordingly. By using HFs' reported capacity instead, we captured a more accurate picture of the care environment women were referred from, allowing referral patterns to be interpreted in light of what each sending facility could offer rather than what it was nominally designated to offer. Furthermore, in addition to assessing adherence to referral policies, we also examined whether facilities referred to an HGR outside their own zone, and explored whether distance might be a driver of this pattern. This is an important consideration because a referral could be technically policy-concordant

(directed to the designated HGR in the same HZ) yet that facility might be farther away than an alternative HGR outside the zone, which would be less justifiable in the context of an obstetric emergency, where minimizing time to definitive care is critical. Despite these strengths, several limitations should be considered when interpreting the results. First, the question regarding referral destinations specifically asked where “women who come here to give birth” would be referred. As a result, facilities that did not cite any destination HF might not have any cases to refer, instead of not having a destination HF to which to refer women. Second, a referral is technically considered as due to insufficient resources to manage a clinical condition, thus seeking the assistance of another facility to assist in or take over. The way the data were collected in this study, a referral could be needed due to other reasons (e.g., the HF is about to close for the day when the woman arrives, or the woman cannot afford the facility fees). Third, all data were self-reported by HF personnel, and the status of CS provision relied on staff recall of events over the past 12 months, which may introduce recall bias. Fourth, particularly in smaller private facilities, service availability may be highly dynamic and the provision of CS during part of the reference period may change, for instance, if a qualified physician left. This can lead to misclassification of facility capacity. Fifth, the study measured distances between health facilities using straight-line calculations, which may not accurately reflect actual travel distances or times. Existing road network and travel time estimation approaches developed for home-to-facility accessibility could be adapted to the inter-facility context, representing a promising direction for future research [45].

Conclusion

Current childbirth referral practices in Lubumbashi show deviation from designated pathways, at times bypassing assigned hospitals in favour of closer facilities or public tertiary facilities. Facilities’ referral choices, in this urban setting, appear to be influenced by official policies, geographic accessibility, infrastructure constraints, and the mixed public–private nature of the health system. These patterns have direct consequences for women and newborns as fragmented care pathways and the bypassing of capable lower-level facilities increase the risk of unnecessary referrals when timely life-saving services are needed. In cities such as Lubumbashi, strengthening referral governance, better aligning referral policies with actual facility capacity and geographic accessibility, and more systematically integrating the private sector, which dominates Lubumbashi's health landscape, into broader health system oversight and planning are essential steps toward ensuring that women can access timely and appropriate, childbirth care.

Ethics approval and consent to participate

This study was conducted in accordance with the guidelines of the Declaration of Helsinki, and approved by the Institute of Tropical Medicine's Institutional Review Board, ITM (1715/23) and the medical Ethics Committee of the University of Lubumbashi (UNILU/CEM/028/2023).

Data collectors and researchers received written permission from health zone officials to visit the healthcare facilities. informed consent to participant in this study was obtained from all facility-based respondents. Participants who had agreed to participate in the study were asked to put a digital signature on the tablet to attest to their written informed consent.

Consent for publication

Not applicable. No individual patient data are included in this manuscript.

Competing interests

The authors declare no competing interests.

Funding

This work was completed with the support of the Belgian Federal Directorate-General for Development Cooperation and Humanitarian Aid (DGD) and the Fonds voor Wetenschappelijk Onderzoek (FWO; grant ID G074724N). PMM is supported by the FWO through a Senior Postdoctoral Fellowship (grant ID 1201925N). The funders had no role in study design, data collection and analysis, decision to publish or preparation of the manuscript.

Availability of data and materials

This analysis was based on secondary data The dataset supporting the conclusions of this article is available upon reasonable request. Please contact the corresponding author.

Acknowledgements

We acknowledge the essential support of the data collectors. We also thank respondents in health facilities, who gave their time to answer our questions, and health zone representatives who granted permission to conduct the fieldwork and provided lists of health facilities. We are grateful to Dr. Rachel Cassidy and Prof. Josefien van Olmen, PhD supervisors of RKO, for their comments on this manuscript and for providing a supportive environment for RKO to work on this study during her PhD. We also acknowledge conversations with Marie Alice Mosuse within the project which collected these data.

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KLMW, RKO, AMN and LB conceptualised the study. AS performed the data processing and data cleaning. KLMW and RKO conducted the statistical analysis and led the drafting of the manuscript. PMM provided methodological support. AMN, AS, PMM, JDMK, NL, AM, TIM, MS, JKB, NMK, WNM, TM, ANM, and LB assisted in data interpretation and contextualisation. LB provided overall supervision to the study. All authors read and approved of the final manuscript.

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