

# Availability, Coverage and Geographical Distribution of Emergency Obstetric and Neonatal Care Services in Tanzania Mainland

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**Abstract:** In order to assess the availability of Emergency Obstetric and Neonatal Care (EmONC) services in Tanzania Mainland, a Cross-sectional survey of a National sample of obstetric care facilities was conducted in 2015. We adapted the Averting Maternal Deaths and Disabilities (AMDD) tool and did spatial mapping using a calibrated Global Positioning System (GPS) Essential Software for Android and Arc Geographical Information System (GIS) software. Data were analysed using STATA, SPSS and Excel computer programs. Ethical approval was granted by the National Institute for Medical Research and the Ministry of Health, Community Development, Gender, Elderly and Children. We identified 5207 obstetric care facilities which is equivalent to 59.7 facilities per 500,000 population. We surveyed 2405 (46.2%) facilities of which 251 (10.4%) had provided all the 7 Basic Emergency Obstetric and Neonatal Care (BEmONC) in past 3 months. Among these, 130 had provided Comprehensive Emergency Obstetric and Neonatal Care (CEmONC). The UN benchmarks for BEmONC and CEmONC facility densities were attained or exceeded by 40% and 76% in all 25 regions respectively. EmONC facilities were dominated by hospitals and were clustered in cities and townships. In conclusions, the distribution of EmONC facilities in Tanzania Mainland is suboptimal in more than half of regions with clustering around cities and townships.

**Keywords:** Emergency Obstetric Care, Emergency Neonatal Care, Geographical Distribution, Health Services Availability, Tanzania

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## 1. Introduction

Availability and utilization of Emergency Obstetrics and Neonatal care (EmONC) services are key in attainment of Global and National targets for reduction of maternal and neonatal morbidity and mortality [1]. Tanzania with the maternal mortality ratio of 398 per 100,000 live births has strived to avert the situation by implementing several policies and strategies including the Millennium Development Goals

(MDGs) and now Tanzania's One plan II strategy (2016-2020) with the aim to focus actions and resources where interventions would be most effective [2]. Nevertheless, small scale studies have consistently shown implementation gaps of these strategies including inadequacy and unavailability of EmONC facilities [3, 4]. The Primary Health Services Development Program (PHSDP) was introduced in 2007 with the aim to establish and staff additional 5162 dispensaries, 2074 health centres and 8 district hospitals by 2017. A successful PHSDP would lead to

having a dispensary for each village, a Health Centre per ward and a District Hospital at every District [5]. This study aimed at establishing availability, utilization and quality of Emergency Obstetric and Neonatal Care (EmONC) services in Tanzania Mainland in the background of PHSDP and more than two decades of investment and implementation of the various health policies and strategies. The focus of this paper will be on geographical distribution and availability status of EmONC facilities in Tanzania Mainland.

## 2. Materials and Methods

This Cross-sectional survey was conducted in all the 25 regions of Tanzania Mainland from June to August, 2015. The regions of Tanzania Mainland are grouped into 7 geographical zones namely; Lake zone (Kagera, Geita, Mwanza, Mara, Shinyanga, and Simiyu), Western (Tabora and Kigoma), Central (Singida, and Dodoma), Eastern (Dar es Salaam, Pwani, and Morogoro), Southern (Lindi, Mtwara, and Ruvuma), Southern Highlands (Iringa, Njombe, Mbeya, Rukwa, Katavi) and Northern zones (Tanga, Kilimanjaro, Arusha, and Manyara). Each region is administratively subdivided into district councils which were 110 in total at the time of this study. An exhaustive list of all hospitals, health centres and dispensaries known to provide obstetric care services was obtained from the Ministry of Health Community Development, Gender, Elderly and Children (MOHCDGEC). This list was updated based on recent research data from the regions and finally appraised by the local District Health Management Teams. The final and exhaustive list included all Obstetric Care facilities among public, private for profit, Faith based and other forms of private health facilities. From this exhaustive list it was agreed a priori to survey all hospitals, all health centres and ten dispensaries from each district council. In case the district council had fewer than 10 dispensaries, all of them were surveyed. In order to select the dispensaries a district was arbitrarily divided into quadrants from which a proportionate number of dispensaries were determined and the selection achieved using a ballot technique. Overall in 25 regions 35% (range 23-64%) of dispensaries were surveyed.

Sources of information were multiple including interviews with health facility managers and unit in-charges, review of routinely stored data including MTUHA (*Mfumo wa Taarifa za Huduma za Afya*) and Health Management Information System (HIMS), review of patient/client documents and direct observation of the services. Each district council was visited by a team of three data collectors. The team comprised of one member from a different region, one from the surveyed district and a District Reproductive Health Coordinator whose main role was to guide the team. In total, 280 data collectors were directly involved in collecting data from all the 110 district councils. The data collection tool was based on the United Nations standard EmONC indicators as published in a handbook for *Monitoring of Emergency Obstetric Care* [6]. The tool was adapted from Averting Maternal Deaths and Disabilities (AMDD) Program

assessment tool [7]. Data collectors were trained on how to fill both a hard copy and electronic forms of the tool and had sufficient hands on practice with the assistance of Geographical Information System (GIS) experts. Geographic coordinates for each visited health facility were captured using calibrated Global Positioning System (GPS) essential software for Android machine. Spatial data analysis was done using ArcGIS software 10.1 (Esri, Redlands, CA, USA). For the purpose of quality check, facility coordinates were promptly sent to our central database along with the rest of facility data and the feedback promptly sent to specific region and district if an error was discovered. The entire process of tool development, data collection and data analysis were done by the team of researchers from the Muhimbili University of Health and Allied Sciences (MUHAS) and the National Institute for Medical Research (NIMR) in close supervision of the Reproductive and Child Health Technical Committee of the MOHCDGEC. Throughout the survey access to the data was restricted to the research team. The protocol for this survey was reviewed and ethical approval granted by the NIMR Institutional Research Board and permission to conduct the survey was given by the MOHCDGEC and facility authorities.

Analysis of the survey data was done using STATA 14 (stataCorp, USA), SPSS version 20 (IBM, Armonk, New York, United States) statistics version 20.0 and EXCEL computer programs. In the current analysis a region was taken as the area of study. The criteria for adequate distribution of EmONC facility were defined as presence of at least five fully functional EmONC facilities in a 500,000 population with at least one of them providing Caesarean section and blood transfusion services. EmONC was defined as encompassing Basic (BEmONC) and Comprehensive (CEmONC) services. A BEmONC facility was defined as one capable of providing injectable antibiotics, uterotonics, anticonvulsants; conducting manual removal of placenta, evacuation of uterus; performance of assisted vaginal delivery and basic neonatal resuscitation. A facility that had provided all the 7 functions in last three months was categorized as BEmONC. A CEmONC facility was defined as one that had provided Caesarean section and Blood transfusion plus 7 BEmONC functions. In addition to the standard criteria, we also determined the number of obstetric care facilities per 500,000 population. Where it was necessary to use, National and population data were provided by the National Bureau of Statistics (NBS) based on Tanzania Demographic and Health Survey (TDHS, 2010) and the 2012 National Population and Housing Census.

## 3. Results

Overall, 5207 health facilities provided obstetric care services in Tanzania Mainland in 2015. In total 2416 obstetric care facilities were selected for the study of which data were obtained for 2405 (99.5%) facilities with more than 98% response rate.

The 5207 obstetric care facilities were equivalent to 59.7

obstetric care facilities per 500,000 population of which 4,321(83%) were dispensaries. Western zone (46.6/500,000 population) and Lake Zone (50.6/500,000 population) had the lowest obstetric care facility densities. Southern (86.1/500,000 population) and Southern Highlands

(80.3/500,000 population) zones had the highest densities. At the regional level, Njombe (149.6/500,000 population), Lindi (121.4/500,000 population) and Pwani (108.8/500,000 population) had the highest facility densities (Table 1).

**Table 1.** Distribution of Obstetrics care facilities in Tanzania Mainland.

<b>Characteristics Types of Health facilities</b>					
	<b>Hospitals</b>	<b>Health Centres</b>	<b>Dispensaries</b>	<b>Total</b>	<b>Health facilities/500,000 population</b>
<i>Zone</i>					
Central	16	53	428	497	71.9
Eastern	49	85	518	652	42.4
Lake	53	149	995	1197	50.6
Northern	44	139	710	893	65.6
S. Highlands	41	110	800	951	80.3
Southern	25	63	517	605	86.1
Western	16	43	353	412	46.6
<i>Region</i>					
Arusha	11	44	140	195	57.5
Dar es Salaam	29	25	81	135	15.5
Dodoma	7	36	260	303	72.7
Geita	4	17	92	113	32.5
Iringa	7	24	81	112	59.5
Kagera	15	28	218	261	53.1
Katavi	1	11	50	62	54.9
Kigoma	6	24	127	157	36.9
Kilimanjaro	15	35	200	250	76.2
Lindi	9	18	183	210	121.4
Manyara	9	22	113	144	50.5
Mara	12	37	220	269	77.1
Mbeya	20	35	321	376	69.4
Morogoro	13	38	227	278	62.7
Mtwara	5	18	168	191	75.1
Mwanza	13	35	196	244	44.0
Njombe	11	21	178	210	149.6
Pwani	7	22	210	239	108.8
Rukwa	2	19	170	191	95.1
Ruvuma	11	27	166	204	74.1
Shinyanga	4	18	137	159	51.8
Simiyu	5	14	132	151	47.7
Singida	9	17	168	194	70.8
Tabora	10	19	226	255	55.6
Tanga	9	38	257	304	74.3
All regions	244	642	4321	5207	59.7

In total 251(10.4%) of the studied obstetric care facilities were reported to provide a full set of 7 BEmONC functions in the last 3 months. This number included 130 facilities, which had provided Caesarean section and blood transfusion functions in addition to the 7 BEmONC functions. These 130 facilities were thus, classified as CEmONC facilities. Geographical distribution of EmONC (i.e., BEmONC and CEmONC) facilities is shown in Figures 1 and 2.

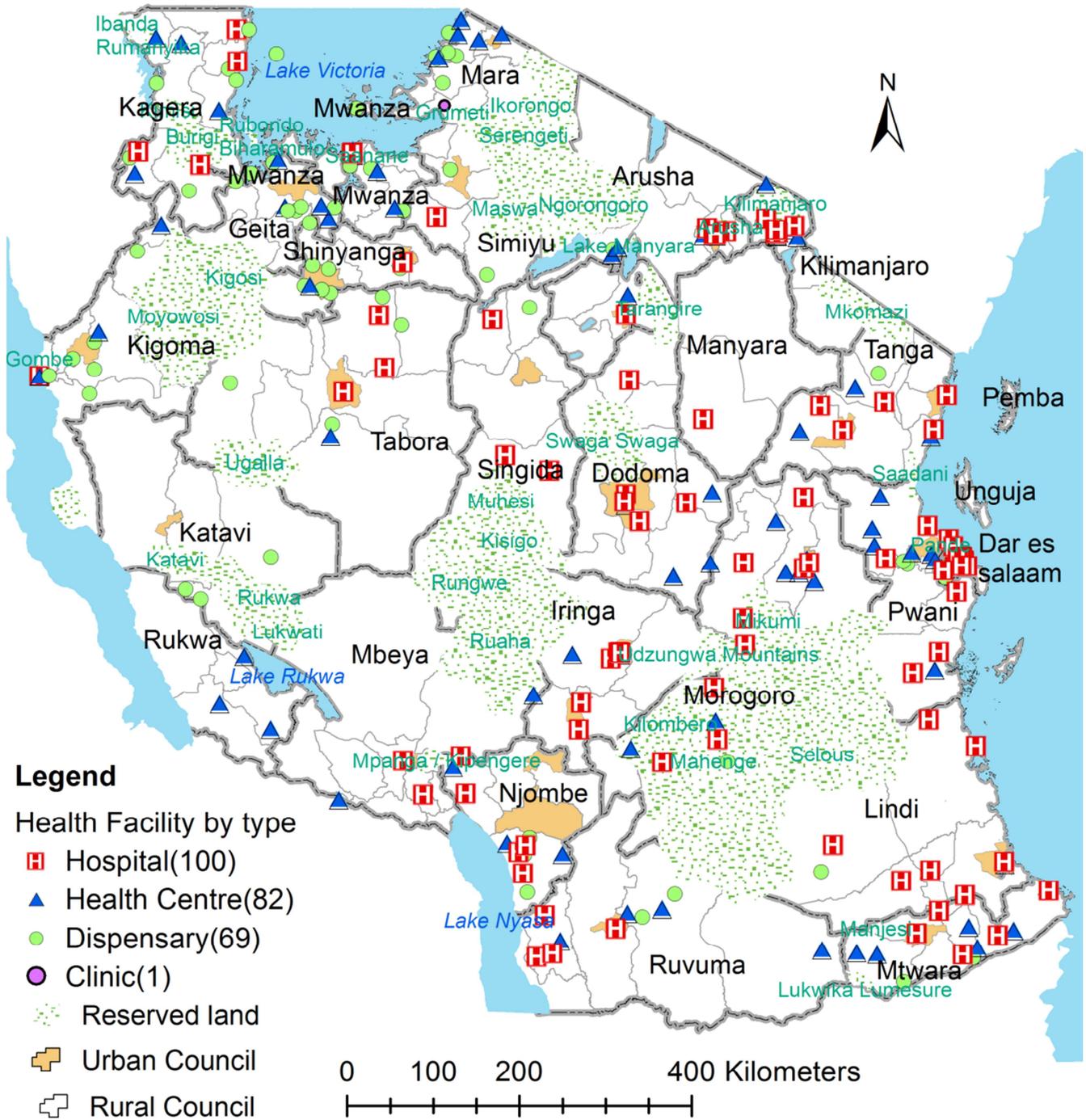


Figure 1. Geographical distribution of EmONC facilities in Tanzania Mainland.

Figure 1 shows that EmONC facilities were dominated by hospitals and clustered in or around cities and townships. Overall 10 (40%) of all the 25 regions had attained or exceeded the recommended minimum number of 5 BEmONC facilities per 500,000 population. As seen in Figure 2, a total of 19 regions (76%) had at least one CEmONC facilities per 500,000 population.

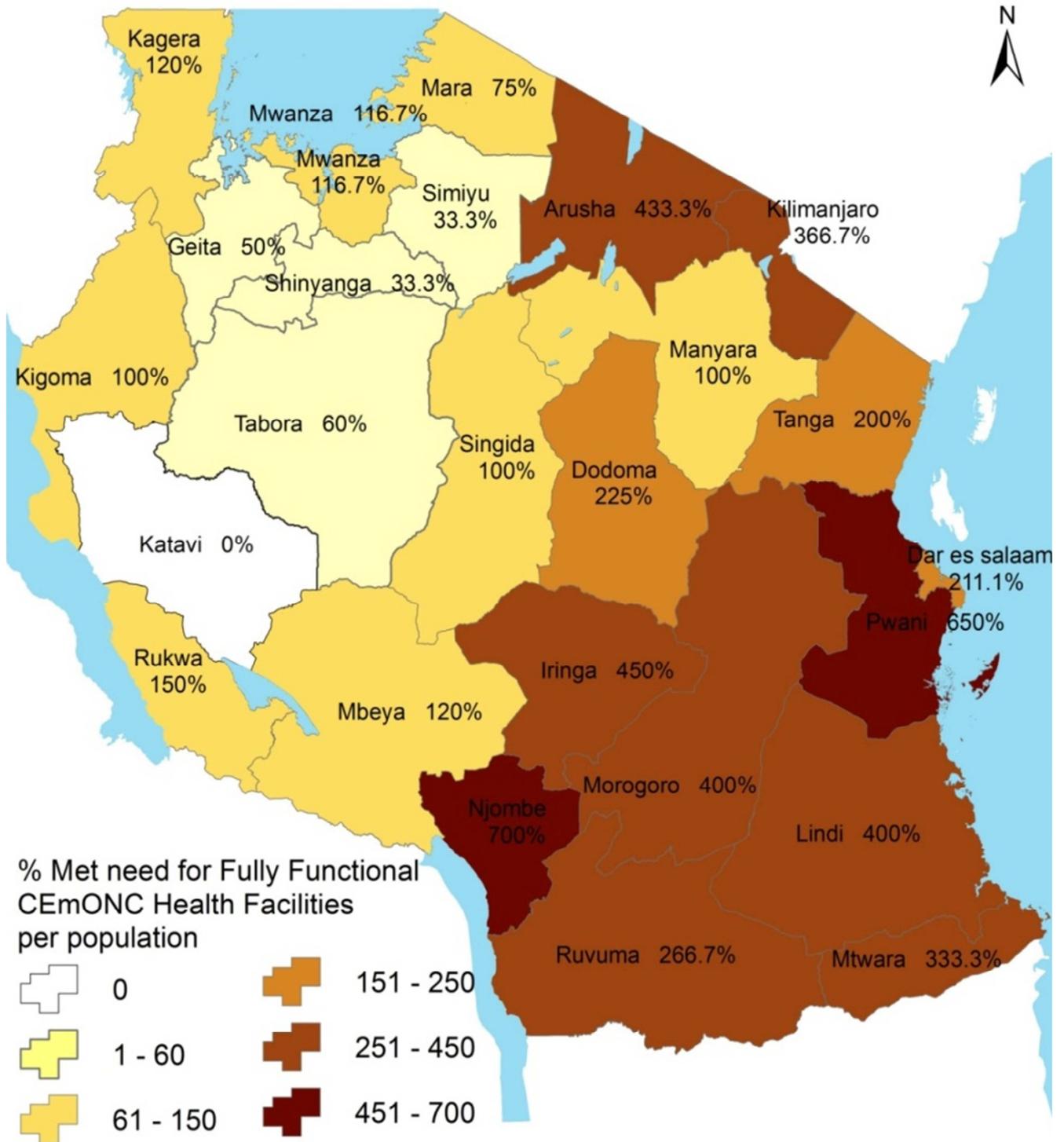


Figure 2. Distribution of CEmONC as percentage of the ideal number as per UN benchmark of 1 facility per 500,000 population.

Six regions, namely Katavi, Tabora, Shinyanga, Simiyu, Mara and Geita that did not reach 100% of the UN benchmark for CEmONC distribution were almost all located in the Lake and Western zones and half of them were newly promoted to region status.

This study observed a challenge of infrastructure support

to referral system as shown by only 16 (64%) of regions that had an average transport time to a referral point of less than 2 hours during dry season (Figure 3). The longest transport distances to a referral point during dry season were encountered in the Lake and Western zone regions.

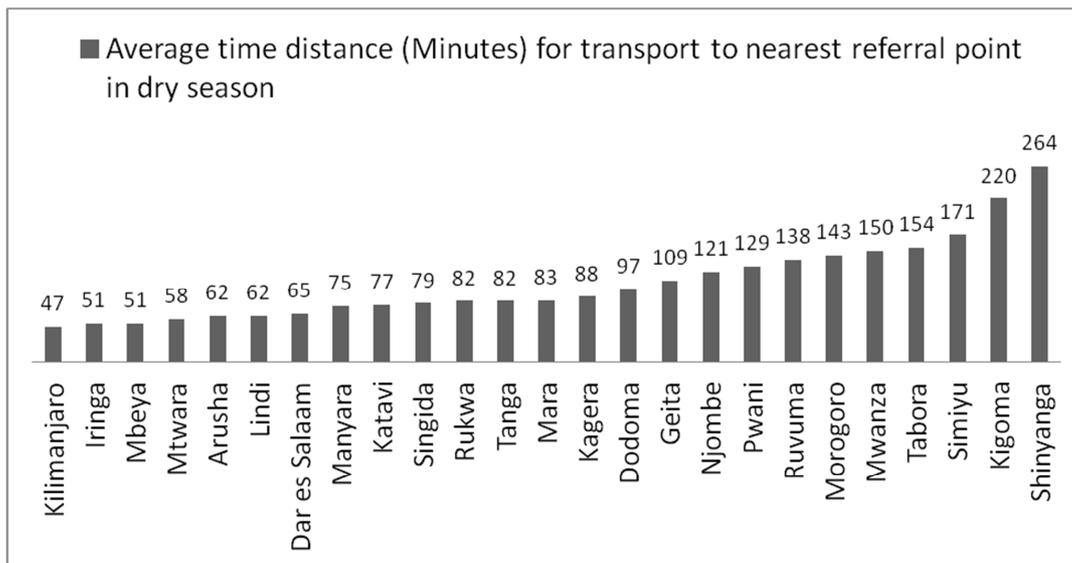


Figure 3. Average Time-Distance to referral point by Region.

Of all the surveyed 2405 obstetric care facilities, only a third (29.9%) had a functional means of communication in terms of landline, facility mobile phone or radio wave. Only Rukwa (65%), Dar es Salaam (62.5%), Mwanza (55.2%) and Dodoma (51.3%) had more than half of its facilities in possession of a functional means of communication.

Regarding ambulance system, overall the commonest source of transport to referral points was hiring of a private transport (51.4%). An ambulance service from a nearby health facility, district or other referral hospital was available for 43% of obstetric care facilities. When dispensaries are excluded 42.1% of obstetric care facilities had own ambulances including 52.1% of hospitals and 38.7% of health centres.

#### 4. Discussion

This study provides the first mapping of emergency obstetric and neonatal care (EmONC) service availability in Tanzania Mainland. In the current analysis our focus was on general obstetric care services coverage per population, EmONC facility coverage per population and geographical distribution (mapping) of the facilities. Obstetric care facility population coverage, although not considered as one of EmONC standard indicators, it is a relatively stable indicator, informs how close to people are general obstetric services and informs on the potential of an area to achieve EmONC standard indicators [6]. Accordingly, our results have demonstrated an impressive density of obstetric care facilities of 60 per 500,000 population. This coverage is higher than the 8.6-13/500,000 population that has been previously reported in other developing countries such as Bangladesh, Malawi and Ghana [8-10]. Moreover, in two thirds of the regions, obstetric care facilities were located within the two-hour threshold to a referral point which can allow timely access to advanced EmONC services using the most accessible means of transport during a dry season. This can be interpreted as good progress

towards the targets of the Primary Health Services Development Program (PHSDP) that include having a dispensary at every village, a Health Centre at every ward and a District Hospital at every District [5].

The observed impressive general population coverage of obstetric care services in Tanzania Mainland, however, was in sharp contrast with EmONC population coverage. Among all the surveyed facilities only 10% of them had provided the full set of BEmONC or CEmONC functions in past three months. Being an EmONC facility reassures the readiness of the facility to effectively manage women with direct obstetric complications that claim majority of maternal deaths. The current results are comparable or better than the results reported in other African countries including Ghana (7.7%), Zanzibar (7.6%), Nigeria, South Africa and Zambia [8, 11-14]. In contrast to most these studies, the 90% obstetric care facilities that could not provide the full set of EmONC functions renders a huge potential for promotion into EmONC facilities. The National strategy should therefore put more emphasis on improving quality care of the available obstetric care facilities to make them fully functional as EmONC through staffing skilled health care providers, mentoring and sustained availability of key equipment and supplies needed for effective provision of EmONC signal functions. As was earlier reported by Adegoke *et al* [15] in relation to the situation of maternal mortality in 9 countries, including Tanzania in order to attain improve maternal and neonatal quality of care requires equitable coverage of Basic EmONC signal functions by the entire spectrum of recognized skilled birth attendants which has direct correlation with the reduction of maternal and neonatal deaths.

The use of thematic maps is known to provide better insight into inequities in geographical EmONC service distribution [8]. In the current study spatial maps have revealed that the availability of EmONC (BEmONC/CEmONC) services in Tanzania Mainland were

more inclined towards hospitals than lower level facilities and were clustered in cities and around townships. Even in areas that seem to have attained the minimum EmONC standards, poor distribution of the services could still lead to persistence of high maternal and neonatal morbidities and mortality especially when considering that only a third of facilities have functional means of communication and ambulance services are not readily available. Similar distributional inequities have been previously reported in the Northern zone of Tanzania [16] in East African countries of Uganda, Kenya, Rwanda, and South-Sudan [17] and elsewhere in the developing countries [18, 19] indicating a chronic pattern of inequity in EmONC service distribution in favour of urban than the rural dwellers.

In addition to the general inequity pattern observed across developing countries, the current study also indicates a substantially wide variation in service distribution of CEmONC facilities among geographical zones with the Lake and Western zones being the most disadvantaged. Noting these inequities is very important to guide National policy strategies and can be interpreted in the background of other available evidence for Tanzania. The Ministry of Health and Social Welfare in 2013 had reported gross mal-distribution of Human Resource for Health particularly in lower level health facilities with all regions in the two zones (Lake and Western) listed among the ten regions with lowest numbers of health workers per 10,000 population [5, 20]. These findings call for special and focused investment in these two zones in order to improve EmONC services and averting maternal and neonatal morbidities and deaths.

This study has provided a detailed analysis of EmONC service distribution covering all the 25 regions and 110 districts of Tanzania Mainland. This National coverage of a large representative sample of obstetric care facilities gave power for data analysis at regional, zonal and National levels. The use of Geographical point System locations has added value to the interpretation of our data beyond absolute numbers. The use of GPS also helped as a quality check system during data collection to ensure physical presence of enumerators at the facility. Nevertheless, this study encountered some limitations that need to be discussed here. Some facilities (n=148) could not be physically accessed in quarantined areas because these areas had impassable roads due to floods at the time of data collection. Nevertheless, some of the desired information from such facilities was obtained through mobile phone communication and the GPS coordinates for all of them were sought from other databases at national and district level. The strength of this study is the National coverage with adequate sample and based on international standards. The findings will permit fair comparisons with similar studies elsewhere thus informing national and international policy makers and health planners.

## 5. Conclusion

EmONC facility distribution does not meet the minimum required per population in more than half of the regions in

Tanzania, Mainland. This failure to meet UN-standards is mainly attributed to the failure to provide BEmONC functions. The distribution of EmONC facilities is uneven, being mainly hospitals and clustered around townships and cities. Nevertheless, there is a huge potential to promote the existing obstetric care facilities to attain UN benchmarks in all the regions.

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