

Health Facility Reachability Index: Geospatial Analysis of Demographic Health Vulnerability and Marginalization¹

Abstract. The availability of health facilities is a factor for modern family planning uptake and fertility rates. In most countries, the number of health facilities in an area is determined by the population size in that region. Such an approach of resource allocation and infrastructure development is usually in favor of densely populated areas and against people in sparsely populated areas. This approach thereby produces marginalization based on population density. In this paper, we determine the geographical area served by a health facility and establish a Health Facility Reachability Index (HFRI). We then conducted two regression models: 1). Based on HFRI and 2). The conventional approach - based on the number of health facilities. We regressed these two independent variables separately against the access to modern family planning and the total fertility rates in two counties in Kenya. These counties are characterized by least human development index in the country and among those officially classified by the government of Kenya as marginalized. The results were geospatially presented for better visualization. The findings indicate that the use of the number of health facilities in a region alone does not explain the low uptake of family planning and high fertility rates in the two regions under study. Also, the failure to consider the distance to reach a health facility hides marginalization of people in health care access in sparsely populated areas.

Background

Access to reproductive and maternal health has been analyzed in diverse approaches. The commonly used analysis involves access as 1). Financial cost 2). The reachability to health facilities and 3). The availability of family planning methods in health facilities. Most governments' efforts revolve around reducing the costs of these three elements in order to increase the access. When we talk about Universal Healthcare, much focus goes to the poor, vulnerable, and marginalized. Studies show that access to, and high quality of, contraceptives are the major factor in family planning. Worldwide, Sub-Saharan Africa has lagged behind the rest of the world in reproductive and maternal health. As well, the region performed the least in the achievement of Millenium Development Goals, especially goal number four and five on child and maternal health. In Sub-Saharan Africa, minority communities in terms of population are characterized by higher vulnerability and marginalization (Finlay, Mejía-Guevara, Akachi, 2018). In relation to healthcare access, this paper is concerned with how reachability to the

¹ This work is part of the authors' series papers in contribution to understand the root causes of irregular migration in Sub-Saharan Africa

health facilities is analyzed and presented in context to most vulnerable and marginalized people?

The analysis of the total fertility rate between continents and between countries is necessary. Say, for instance, in East Africa. The total fertility rate in Kenya 3.8, Uganda 5.5; Tanzania 5.0; Somalia 6.2; Rwanda 3.8, Burundi 5.6. (World Bank, 2019). The data is essential in comparing the fertility rate of East African countries with the rest of Africa in especially in the examination of the effectiveness of a country's policies and strategies of health promotion. For instance, although Kenya has relatively low fertility rates, the range is extensive. In some regions, the total fertility rate is 2.3, while in others is as high as 7.8 (DHS Kenya, 2014). With such wide gap in regional total fertility rates, it is not clear where would be the starting point to analyze the national population using the concept of demographic dividend, or indeed, it is at in any case the concept applicable. However, such high-level national-based average data does not bring out the comparability of health vulnerability and marginalization within these countries and their impact. This paper, therefore, brings a reenergized focus micro-level analysis of healthcare reachability. We define healthcare reachability as 'the unit distance covered to reach a health facility.'

In the study of healthcare access, the most comprehensive data sets are small scale in nature and reflect the local average and context. Such data enables a comparison of factors contributing to the highest or lowest total fertility rates in the smallest administrative units and thereby relevant to compare between countries. By so doing, we are able to analyze the real manifestation and the trend of fertility rates among the most vulnerable and marginalized cohorts. Even in demographic health surveys, if the data is not analyzed to the level of the smallest administrative units, and treated as stand-alone units, with their specific characteristics, then the issues of the few, vulnerable and marginalized communities will always be overshadowed by those of the majority populations.

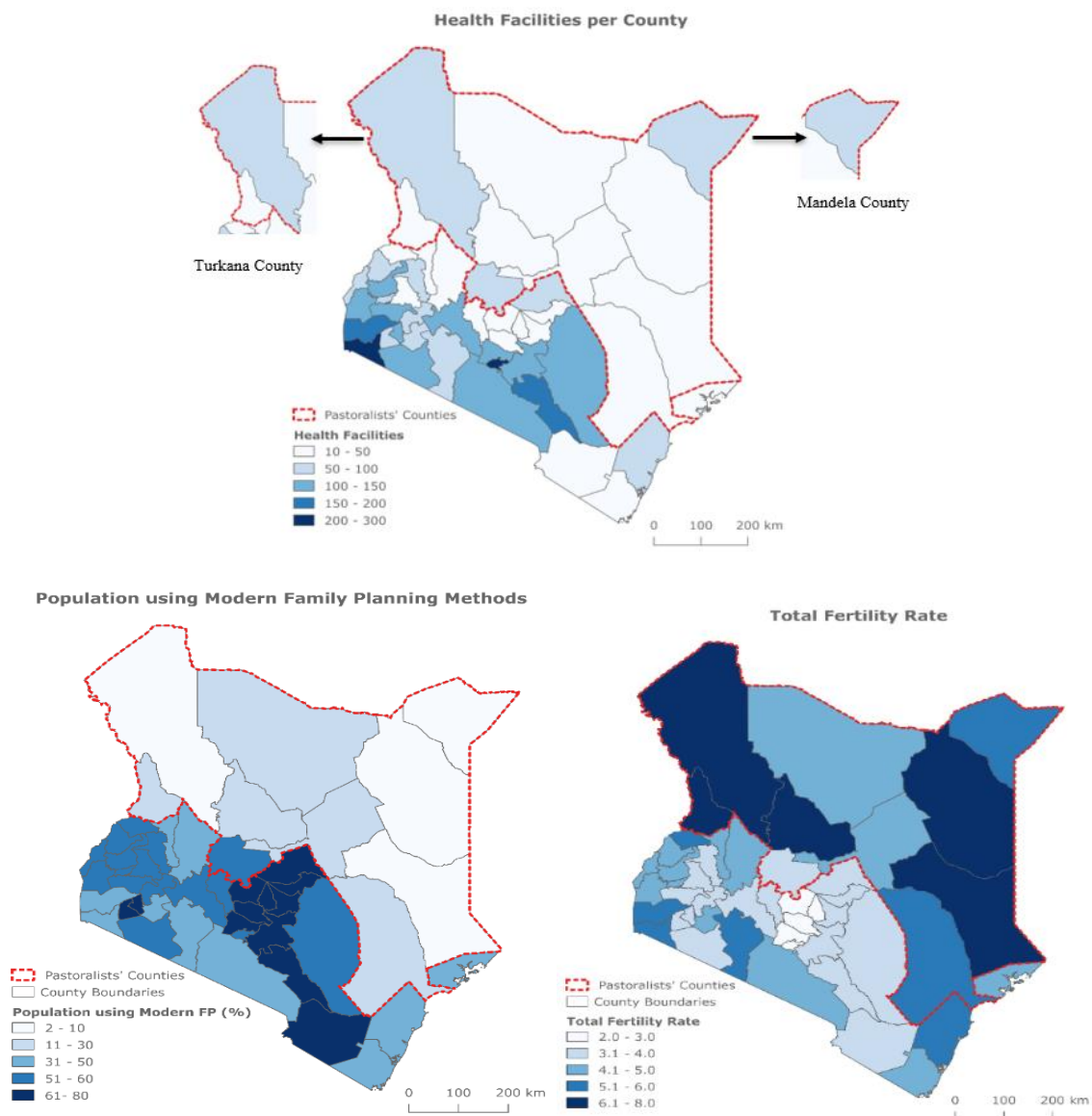
The number of healthcare facilities versus health facility reachability Index

Studies show that the number of health facilities is directly proportional to the accessibility of modern family planning methods, total fertility rates, as well as to the delivery at the health facilities. In other words, the presence of health facilities is inversely proportional to the fertility rate. Below is a spatial presentation of health demographic analysis in Kenya. As shown, the population in the two zoomed-in regions considered marginalized – Turkana County (Northeast corner) and Mandera County (Northwest corner). The two regions have arid

environmental characteristics where pastoralism and nomadism are the main economic activities. Turkana and Mandera have a total fertility rate of 5.2 and 6.9, respectively. The percentage number of population (15-49) using modern family planning is 10% and 2% respectively (DHS Kenya, 2014).

- In the first scenario, we study fertility rates and population growth rates of the two regions using the number of health facilities
- In the second scenario studies, we study the fertility rates and population growth rates of the two regions using HFRI

Scenario 1: Studying the total fertility rate using the number of health facilities in a region



Source: Authors' own analysis of DHS 2014 data (Kenya) and Kenya Master Health Facility List (KMHFL)

As shown above, it not clear how the two counties, Turkana and Mandera, appear to have a high number of health facilities; yet the use of modern family planning is exceptionally low, and the total fertility rate is extremely high. The situation goes against the conventional understanding of the relationship between the mentioned above variables. In this case, as it is the norm, there is a likelihood of policymakers to consider the number of health facilities (without geographical coverage) hence underestimating healthcare access as a significant concern.

Scenario 2: Studying total fertility rate using health facility reachability index (HFRI)

One of the healthcare access factors is geographical access – reachability to the health facility. This paper claims that the analysis of the number of health facilities in an area is not a proper indicator of measuring healthcare access. It thus proposes a Health facility Reachability Index. This is a methodology that brings into concern the geographical area served by a health facility. To establish a health facility reachability index:

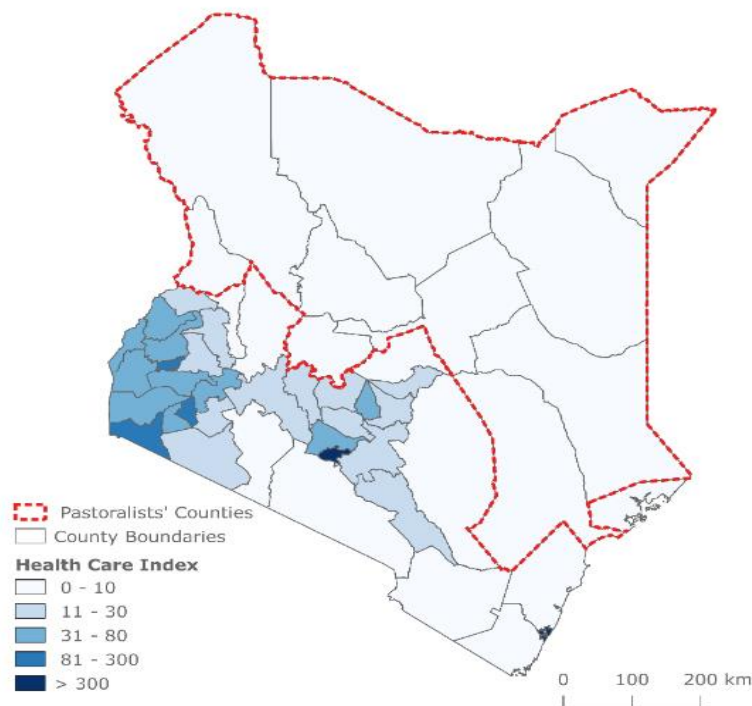
- Count the total number of health facilities in an area. (No. H.F.)
- Establish the total area of the region (KM²)
- Establish the area served by a health facility = (KM²/No. H.F.)

Health facility Reachability Index (HRI) is the reciprocal of the area served by a health facility.

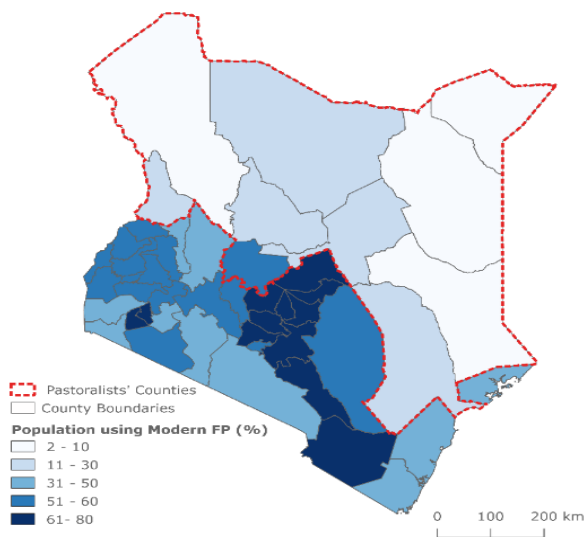
$$\mathbf{HFRI=1/ (KM^2/No. H.F.)}$$

By definition, Health facility Reachability Index refers to the unit distance required to reach a health facility. Healthcare reachability is different from healthcare service provision. Health service provision relates to the ratio of health facilities to the number of people. It involves the services to people offered by a health facility. Healthcare reachability involves the area served by a health facility. The variable involved includes: Geographical area (Ind. V.) and Health facilities (dependent V.)

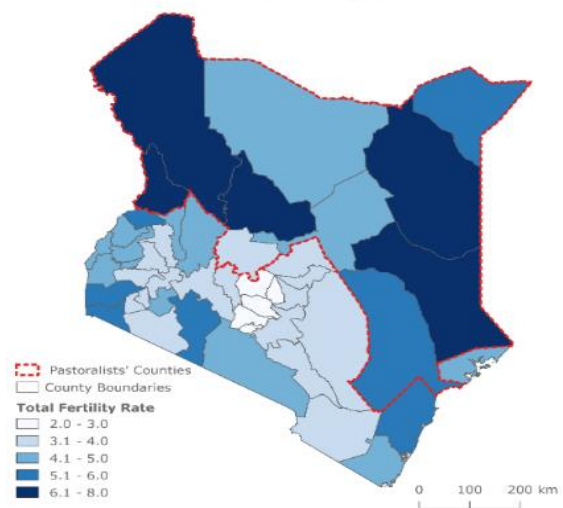
Health Facility Reachability Index



Population using Modern Family Planning Methods



Total Fertility Rate



Source: Author's own analysis of DHS 2014 data (Kenya) and Kenya Master Health Facility List (*KMHFL*)

NB. *The range of HFRI between counties is extensive, i.e., 0.1 < to >300. The geospatial presentation does not clearly bring out this variance.*

The low healthcare reachability index in Turkana and Mandela Counties explains better the reason why irrespective of having a relatively higher number of health facilities, there is still low usage of modern family planning methods, and as a consequence, there are high total fertility rates.

Conclusion

There is a need to think new ways of measuring and bringing the issues of the minority and vulnerable populations onto the policymaking table. Health Facility Reachability index highlights the health issues of the two regions as opposed to the traditional health facility count approach. Another analytical finding was that the larger the administrative unit is geographically, the lower the HFRI.

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