

# Geographical accessibility and spatial coverage of health services in Ethiopia

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**Background:** Primary health care is essential in improving and maintaining the health of populations. It has the potential to accelerate achievement of the SDGs and fulfill the “Health for All” doctrine of the Alma-Ata Declaration. Understanding the performance of the health system from a geographic perspective is important for improved health planning and evidence-based policy development. The aims of this study were to measure geographical accessibility, model spatial coverage of the existing primary health facility network, estimate the number of primary health facilities working under capacity and the population underserved in Ethiopia.

**Methods:** This study uses health facility, population and ancillary data for Ethiopia. Two different travel scenarios utilized by the population to attend the nearest primary health facility were defined with a maximum travelling time of 30, 60, 90 and 120 minutes: Scenario 1 – walking; Scenario 2 – walking and motorized transport. Considering these scenarios, a raster surface of travel time between primary health facilities and population was developed. To model spatial coverage and estimate the number of primary health facilities working under capacity, the catchment area of each facility was calculated by taking into account population coverage capacity, the population distribution, the terrain topography and the travelling modes through the different land cover categories.

**Results:** The average travel time to reach to health facilities is estimated to be 75 and 96 minutes under scenario 1 and scenario 2 respectively with clear differential among various administrative units. The total population covered differs depending on the type of travel scenario. The existing health facility network covers 44, 65, 78 and 86 percent of the population respectively for a maximum travel time limit of 30, 60, 90 and 120 minutes. In Scenario 2, the use of motorized transport increases the population being served by 28 percent. There are also significance differentials of referral travel time. Only 57 percent of the population can reach to hospital within 180 minutes if referred from health centers

**Conclusions:** Significant spatial variations in geographical accessibility and spatial coverage were observed across the two travel scenarios. The analysis demonstrates that regardless of which travel scenario is used, the majority of the population in the Ethiopia does not have access to the existing primary health facility network. Our findings also demonstrate the usefulness of GIS methods to leverage multiple datasets from different sources in a spatial framework to provide support to evidence-based planning and resource allocation decision-making in developing countries.