

Measuring geographic access to emergency obstetric care: a comparison of travel time estimates modelled using Google Maps Directions API and AccessMod in three Nigerian conurbations

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Abstract

Google Maps Directions Application Programming Interface (the API) and AccessMod tools are increasingly being used to estimate travel time to healthcare. However, no formal comparison of estimates from the tools has been conducted. We modelled and compared median travel time (MTT) to comprehensive emergency obstetric care (CEmOC) using both tools in three Nigerian conurbations (Kano, Port-Harcourt, and Lagos). We compiled spatial layers of CEmOC healthcare facilities, road network, elevation, and land cover and used a least-cost path algorithm within AccessMod to estimate MTT to the nearest CEmOC facility. Comparable MTT estimates were extracted using the API for peak and non-peak travel scenarios. We investigated the relationship between MTT estimates generated by both tools at raster celllevel (0.6 km resolution). We also aggregated the raster cell estimates to generate administratively relevant ward-level MTT. We compared ward-level estimates and identified wards within the same conurbation falling into different 15-minute incremental categories (<15/15-30/30-45/45-60/+60). Of the 189, 101 and 375 wards, 72.0%, 72.3% and 90.1% were categorised in the same 15- minute category in Kano, Port-Harcourt, and Lagos, respectively. Concordance decreased in wards with longer MTT. AccessMod MTT were longer than the API's in areas with ≥ 45 min. At the raster cell-level, MTT had a strong positive correlation (≥ 0.8) in all conurbations. Adjusted R² from a linear model (0.624-0.723) was high, increasing marginally in a piecewise linear model (0.677-0.807). In conclusion, at <45-minutes, ward-level estimates from the API and AccessMod are marginally different, however, at longer travel times substantial differences exist, which are amenable to conversion factors.

Keywords: Spatial accessibility, least cost path, AccessMod, Google Maps Directions API, urban area, maternal health