

Assessing the utility of mobile network operator data in geospatial models of poverty - a Ghana case study

Christopher J Brooks^{†*}, James Harrison[†], Omar Seidu[×], Veronique Lefebvre[†]

[†][Flowminder Foundation](#), [×][Ghana Statistical Service](#)

*corresponding author email: chris.brooks@flowminder.org

Poverty mapping is becoming an important means of informing geographic targeting of programmes by governments, NGOs and other actors involved in progressing poverty reduction across low- and middle-income countries (LMICs). Regular production of subnational estimates of poverty rates has the potential to provide decision makers with up-to-date information with which to dynamically allocate often scarce programme resources in a more optimal fashion. Traditional approaches to poverty mapping rely heavily on census data, which limits their intercensal relevance. There has been an increasing interest in combining household surveys with earth observation (EO) data, owing to its increasing quality, availability and geographic coverage, with demonstrable predictive strength across many poverty mapping studies. The additional integration of mobile network operator (MNO) data has also garnered much attention owing to the ubiquitous nature of mobile phones, with similarly positive results being reported. However, exactly how much added value proprietary MNO data has in comparison to freely available EO data on this type of modelling should be assessed, particularly given the acquisition costs for development and humanitarian programs. In recent years, there has been a strong drive by the Ghanaian Government to integrate non-traditional data sources into the production of a range of national statistics. The current study is being conducted under one such initiative; the Data for Good Partnership involving Ghana Statistical Service (GSS), Vodafone Ghana and Flowminder Foundation, which aims to leverage MNO data to support decision making across the Ghanaian Government.

We report on progress made towards integrating MNO data, in the form of Call Detail Records (CDR) and network coverage predictions, into subnational poverty maps of Ghana. Using microdata from the 2021 Ghana Population and Housing Census (PHC) and geo-referenced data from three rounds of the 2022 Ghana Annual Household Income and Expenditure Survey (AHIES), we obtain both a non-monetary Wealth Index and the Ghana Multidimensional Poverty Index (MPI). A comprehensive set of geospatial covariates were derived from publicly available EO and other spatial data sources, ranging from building footprints to vegetation indices. A candidate set of interpretable features were derived from CDR data covering the period of the census and household panel survey rounds, and together with network coverage estimates, were spatially harmonised to the geospatial covariates. Both subscriber-centric and cell tower-centric features were extracted, including assortativity measures across settlement types and urban morphologies, urban-rural mobility, commuting patterns, weekly and seasonal mobility and usage patterns, and others. The consolidated dataset was then used to address the question of whether adding CDR-derived covariates alongside existing geospatial covariates can reliably enhance estimates of non-monetary poverty at the neighbourhood level across Ghana. We report on initial results from this work-in-progress, outline the upcoming elements of the study, and provide additional reflections on future directions for the initiative.

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