Title: Analyzing Rural-Urban Disparities in Geographic Healthcare Access Coverage across 256 Territories

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Conflicts of Interest:
None

Background:
Rural-urban healthcare disparities lead to poor health outcomes for people in rural and remote regions. Geographical access to healthcare is an important determinant of population health. Past studies have shown that 9% and 43% of the global population cannot reach their nearest healthcare facility within an hour, by motorized vehicle or by walking, respectively. However, rural-urban disparities in geographic healthcare access are not known. Our aim was to analyze disparities in geographic healthcare access coverage (HAC) by walking and motorized transport to nearest healthcare facilities in rural and urban areas.

Methods:
The study was a geospatial analysis combining data from several raster and boundary datasets for 256 territories. We used the global Urban-Rural Catchment Area (URCA) raster ($1km^2$) to define rural (CA label > 7) and urban (CA label = 1 to 7) areas. We took motorized and walking travel times to healthcare facilities raster ($1 km^2$) data from the Malaria Atlas Project (MAP), high resolution population estimates ($1 km^2$) from WorldPop, and level-0 (national) and level-1 (subnational) administrative boundaries of sovereign states and dependent territories from GADM-3.6. Healthcare access coverage was determined by the proportions (%) of population within 1 hour and 30 minutes from their nearest healthcare facilities by motorized (HAC-M) and walking (HAC-W) modes of transport, respectively. These values were obtained by a custom

raster analysis pipeline that uses geospatial intersections and overlays among URCA, MAP, and WorldPop ratsers.

Findings:

Globally, 90.535% of the rural population had HAC-M compared to 94.499% urban population. Strikingly, only 22.409% of the rural population had HAC-W compared to 84.379% urban population. Further analysis across other time thresholds showed that 44.359% of rural population and 94.489% of urban population had HAC-W within 1 hour, 95.979% rural population and 99.790% urban population had HAC-M within 2 hours. The territories with the largest urban-rural differences for HAC-M and HAC-W were Solomon Islands (77.349%) and Bhutan (91.373%), respectively. Null differences in HAC-M were observed for Andorra and Czech Republic while Macao showed null differences for HAC-M and HAC-W.

Interpretation:

We found that the difference between rural and urban was quite large for HAC-W compared to HAC-M. Future research should investigate subnational rural-urban HAC disparities. Findings can inform the global health disparities agenda to include rural healthcare access problems. The estimates are limited by questionable accuracy and completeness of parent datasets.

Source of Funding:
None

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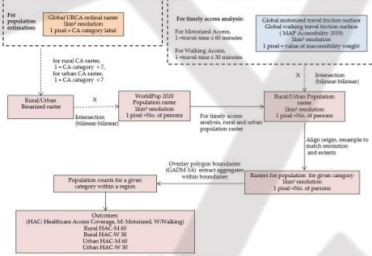
1 Association for Socially Applicable Research (ASAR), Pune, Maharashtra, India 2 SCTR's Pune Institute of Computer Technology, Pune, Maharashtra, India 3 Department of Surgery, Duke University School of Medicine, Durham, North Carolina, United States
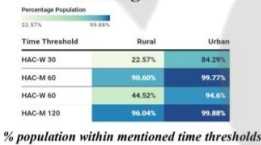
Background

- Rural-urban healthcare disparities lead to poor health outcomes for people in rural and remote regions. Geographical access to healthcare is an important determinant of population health.
- We aimed to analyse disparities in geographic healthcare access coverage (HAC) by walking (HAC–W) in 30 minutes and motorized (HAC-M) in 60 minutes transport to nearest healthcare facilities in rural and urban areas.

Methodology

Healthcare Access Coverage Flowchart

Findings

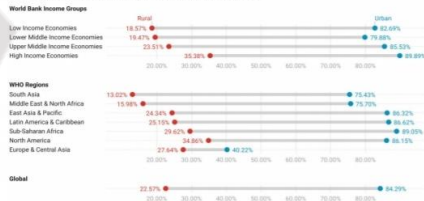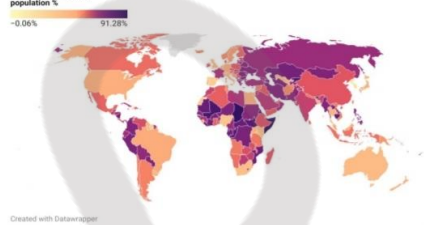| Time Threshold	Rural	Urban
HAC-W 30	22.57%	84.29%
HAC-M 60	90.60%	99.77%
HAC-W 60	44.52%	94.6%
HAC-M 120	96.04%	99.88%

% population within mentioned time thresholds

Rural-Urban Disparities in HAC-W 30 minutes

Territories classified based on WHO Regions and World Bank Income Groups

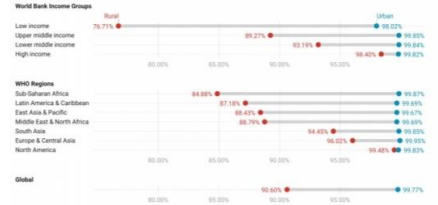## Rural-Urban Disparities HAC-W 30 minutes

Diff. in Urban & Rural population %
-0.06% — 91.28%

Created with Datawrapper

Rural-Urban Disparities in HAC-M 60 minutes

Territories classified based on WHO Regions and World Bank Income Groups

Rural-Urban Disparities in HAC-M 60 minutes

Diff. in Urban & Rural population %
-9.01% — 89.58%

Created with Datawrapper

References

1. Weiss DJ, et al. A global map of travel time to cities to assess inequalities in accessibility in 2015. Nature. 2018 Jan 18;553(7688):333–6.
2. Cattaneo A, Nelson A, McMenomy T. Global mapping of urban-rural catchment areas reveals unequal access to services. Proc Natl Acad Sci USA. 2021 Jan 12;118(2).

Conclusion

We found that the difference between rural and urban was quite large for HAC-W compared to HAC-M. Findings can inform the global health disparities agenda to include rural healthcare access problems. The estimates are limited by questionable accuracy and completeness of parent datasets.