Methodology for calculating corrected population-weighted centroids (KobS) for small-scale routing analyses in health care using the example of postal code areas

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DOI: 10.20364/VA-21.02

Abstract

In order to provide comprehensive health care for the entire population, the accessibility of healthcare facilities must be calculated as precisely as possible. As a starting point for analyses of the spatiotemporal accessibility of healthcare, the population's place of residence plays a central role. Therefore, previous studies on accessibility analyses use population-weighted instead of geometric centroids. However, in practical health planning, population-weighted centroids may also be located in places unsuitable for routing analyses, such as uninhabited places. Therefore, the present work aims at developing a methodology to compute well-defined starting points for routing analyses at residential-representative, central, and populated locations for practical use.

As a result, corrected population-weighted centroids (German: *korrigierte bevölkerungsgewichtete Schwerpunkte, KobS*) are calculated, which meet the requirements for a representative starting point for routing analyses in healthcare. Using the example of the zip code areas in Westphalia-Lippe, it can be seen that the average travel time difference for 3 physician groups between the geometric centroid and the KobS is 1.2 – 1.5 minutes, between the population-weighted centroid and the KobS 0.2 – 0.3 minutes. Looking at individual zip code areas, travel time differences between population-weighted centroid and KobS of min = –13 minutes (nearest orthopedist's office, zip code 32825, district of Lippe) and max = 9 minutes (nearest family doctor's office, zip code 48432, district of Steinfurt) can be detected. Although in comparison both longer and shorter travel times can be detected for KobS to practice locations of different physician groups, KobS represent the residential reality of the population to be served in routing analyses better than geometric or population-weighted centroids.

Keywords

Accessibility analyses, routing starting point, population centroid, corrected population-weighted centroid, spatial analysis, health care planning

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Citation

Völker S, Kempchen J, Hering R. Methodology for calculating corrected population-weighted centroids (KobS) for small-scale routing analyses in health care using the example of postal code areas. Central Research Institute of Ambulatory Health Care in Germany (Zi). Versorgungsatlas Report No. 21/02. Berlin 2021. DOI: 10.20364/VA-21.02. URL: https://doi.org/10.20364/va-21.02