

Title: Towards vertical spatial equity of urban facilities: An integration of spatial and aspatial accessibility

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Report:

The paper emphasizes the critical role of public service facilities in enhancing the quality of life, which is fundamental to equity policies. It outlines that equitable access to these facilities across urban spaces is essential for public satisfaction and health. These public service facilities can include parks, community centers, etc. The paper criticizes previous author's focus on horizontal spatial equity, referring to equal distribution of facilities, without considering the nuanced needs and conditions of different population segments (children, elderly, etc.). The paper proposes a more comprehensive framework that integrates both spatial and aspatial accessibility, which focuses on socio-economic status, demographic characteristics etc. The method used by the paper is based on a gravity-based measure.

The primarily methodological contribution is the development of an integrated spatial accessibility index:

1. Supply to demand ratio calculation: For each facility type and location (uniquely identifying facility), we calculate the ratio of facility service capacity to the weighted sum of the population within a travel threshold. The effect of population is weighed by a Gaussian travel impedance function.
2. Spatial accessibility determination: We sum the supply to demand ratios for all facilities within a resident's catchment area to get the spatial accessibility of each facility type.
3. Integrated spatial accessibility calculation: We combine the spatial accessibility scores for all facility types, weighted by the relative importance of each type of facility, to compute the overall spatial accessibility at each residential location.

The core idea behind this method is that it allows separation of populations into segments and separately evaluates the accessibility index for that population. It allows us to see the disparity if any between different population segments and identify actions that result in maximum improvement for that segment. Aspatial accessibility is incorporated through the development of social-need and demographic-demand indices, which are used to adjust or interpret the spatial accessibility measures. This approach allows for the examination of whether the distribution of facilities aligns with the actual needs and demands of different demographic groups. For instance, facilities essential for the elderly or children can be weighed differently based on local demographic profiles. The integration of these indices helps to assess vertical spatial equity—ensuring that the most disadvantaged or needy populations have appropriate access relative to their specific circumstances.

This sophisticated model provides a detailed and nuanced understanding of both the physical and socio-economic dimensions of urban facility accessibility, addressing gaps in traditional methods that only consider spatial factors.