Editorial

Improving equity using dynamic geographic accessibility data for urban health services planning

Mejorando la equidad usando datos dinámicos de accesibilidad geográfica para la planificación de servicios de salud urbanos

Luis Gabriel Cuervo [a,*], Eliana Martínez-Herrera [b,c], Daniel Cuervo [d], Ciro Jaramillo [e]

[a] Biomedical Research Methodology and Public Health, Universitat Autònoma de Barcelona, Barcelona, Spain
[b] Faculty at the National School of Public Health, Universidad de Antioquia, Medellín, Colombia
[c] Research Group on Inequalities in Health, Environment and Employment Conditions (GREDS-EMCONET); Department of Political and Social Sciences, Universitat Pompeu Fabra, Barcelona, Spain
[d] Iquartil SAS, Bogotá, Colombia
[e] School of Civil Engineering and Geomatics, Universidad del Valle, Cali, Colombia

"Before big data, our analysis was usually limited to testing a small number of hypotheses that we defined well before we even collected the data. When we let the data speak, we can make connections that we had never thought existed."

Viktor Mayer-Schönberger and Kenneth Cukier. Big Data. HarperCollins, Kindle Edition. (2014) p. 14.

Equity in accessibility to health services is central to social justice. It is also a key element of the Health in All Policies approach to intersectoral action for achieving the Sustainable Development Goals of the United Nations Agenda 2030.[1] Geographical accessibility, a determinant of health that requires intersectoral action, is vital to achieving universal access to health care.[2] However, urban planning has rarely incorporated relevant research that measures and improves equity in geographical accessibility to health services. Moreover, much of that research has used sampling techniques that offered limited practical value.

Despite high-level calls for intersectoral action, few implementation strategies show how to shift the standard approach to intersectoral collaborations that address the determinants of health.[3,4] Community engagement, a driver for intersectoral action, requires involved stakeholders to communicate effectively, share their understanding of issues, and agree how to use knowledge and metrics.[5,6]

This editorial examines the emergence of studies that show the value of adopting accurate, dynamic travel times to assess equity in geographic accessibility to essential health services. These studies are novel for using readily available data coupled with digital technologies and big data analytics to reveal new data and correlations using metrics that stakeholders can understand and share. Emerging studies can thus spur intersectoral collaboration and democratic urban and health services planning. Using big data offers new insights into what is happening and allows researchers and stakeholders to make predictions that would otherwise be impossible. Big data thus arms citizens, governments, and consumers with new tools to address equity and accessibility.

Place of residence is a spatial determinant of health and health equity. It defines which populations can reach health services in a timely and affordable manner by different means of transportation.[7–9] The inability to reach essential health services can harm people and cause financial hardship.[10–12]

Common approaches for assessing accessibility to health services study the shortest distance or time to the nearest facility.[13,14] Traditionally, these assessments are proxy measures that rely on distance or fixed travel-time estimates.[15] For example, actual travel distances on road networks and travel times are often estimated with traffic and transportation models from static data and on typical days captured with samples through surveys and field gauging.[16] These estimates are suboptimal as they use small sample sizes, rarely focus on specific health services and do not account for temporospatial variations of accessibility, such as those resulting from traffic congestion.

Dynamic accessibility assessments are needed to account for the substantial traffic variations that are common in busy urban settings and emerging reports and preprints show that this approach is being adopted.[12,17–20]

These reports mostly follow sophisticated methods and use jargon and complex formulas that require advanced field expertise to understand.[10,21] Many stakeholders may thus find these reports difficult to access or understand and would struggle to communicate their methods and findings to their peers and counterparts. These complications are an important limitation hindering the use and implementation of the knowledge such reports contribute.[22] They require access to specialized sources that many stakeholders lack, and some are behind paywalls. The complexity of these reports and their lack of simple communication materials make them difficult for diverse stakeholders to use. Stakeholders need to grasp essential issues, communicate findings to others, and explore their relevance in specific settings.[22,23]

Research that drives societal change must be accessible to stakeholders who shape decisions and plans for health services that must consider land use, mobility, public health, and smart cities.[23,24] These stakeholders include representatives from the government (e.g., local authorities from different sectors, lawmakers), the community (e.g., watchdogs, academics), and service users and providers (e.g., insurers, service providers, consumer representatives, patients).[23,25]

* Corresponding author.
  E-mail address: LuisGabriel.Cuervo@autonoma.cat (L.G. Cuervo).

Stakeholders can spur collaborations and knowledge uptake by contributing to the research process and to deliberations that shape the implementation of policies, plans, and programs.[5,26,27].

How then to approach the challenges presented here in a way that promotes equitable accessibility and is scalable?

Adopting these technologies paired with data science is a dramatic step forward. These technologies simplify assessments of accessibility by using metrics that all stakeholders understand, such as time to destination. Simplified assessments generate action-oriented data that lets stakeholders explore variations in the assessments under different assumptions and reveals equity implications. Emerging reports present these benefits.[12,19]

When data is available in simple interactive platforms, knowledge users can quickly adopt and adapt these data to deliver accurate estimates of travel times and equity analyses while exploring different assumptions and scenarios. The essential value of these data is that they expose the interactions between traffic congestion, the sociodemographic characteristics of the population, and travel to (or from) health services. This perspective has been missing in urban and health services planning. It is relevant to land use, urbanism, mobility, smart cities, and health services. This perspective also benefits service providers and users, advocacy groups and researchers seeking to address social justice issues through intersectoral approaches.[12,18,19]

What if these data were combined with the location of health services and sociodemographic population data to reveal equity and accessibility measurements that inform health services planning and land use?

These digital technologies' superior accuracy, speed, and affordability distinguishes them from traditional origin-destination study methods. The data these digital technologies generate is thus more likely to be available in time to challenge current thinking and inform plans, increasing the value of these data.[10,12,20,22]

While traditional studies rely on few measurements, widely available technologies use millions of travel time measurements (big data) accumulated from mobile phone apps to promptly deliver detailed data that constantly improves in accuracy.[12,17,19,20,22,28] This is an important advantage over one-time assessments.

Frequent users of ambulatory care services incur costs to access those services. These costs can become barriers to access and force tough choices between risking health or suffering financial hardship.[10,15,21] Assessments of equity in accessibility to health services help to identify and address the social injustice harming the most vulnerable populations, who pay a greater share of their income to reach adequate essential health services.[29]

Other than providing a situational analysis, what else could be done?

Beyond providing situational analyses, digital platforms and analytics could predict changes and help to optimize accessibility. Digital platforms can thus broaden the understanding of possible solutions, considering different ranges of assumptions.

For example, predictive and prescriptive analytics help planners anticipate the impact that changes in infrastructure (e.g., new roads, road closures, adding or removing services), population (e.g., migration), or traffic conditions (changes in traffic congestion or service schedules) have on equity in accessibility.[28]

The capacity to accurately predict and swiftly identify the effects of changes in service schedules or availability, or a new situation (e.g., changes to traffic during a public health emergency, such as COVID-19 pandemic travel restrictions) merits further assessment and is already being explored.[19] It is possible to, for example, identify the areas where new services would reach the most people under new traffic conditions.[30]

Importantly, these approaches are adaptable to and scalable in many high-, middle-, and low-income settings where essential data is publicly available. These data include inputs such as georeferenced population data with sociodemographic characteristics, the location of health services, and travel-time big data. Integrating these data make it possible to deliver clear statistics and visualizations (e.g., choropleth maps and frequency tables and graphs) that reveal equity in accessibility to or from health services that stakeholders and decision makers can quantify, understand and share.[12,19,22]

These data are game-changing and can be further refined if more elaborate analyses were needed to account for insurance, preference, means and direction of transportation, service capacity and quality.

Similar technologies have transformed the hospitality and commodities sectors. It is time to adopt them to reveal and address the needs of citizens as we move towards a healthier and fairer society that meets the Sustainable Development Goals of the United Nations Agenda 2030.

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