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Public Health

journal homepage: www.elsevier.com/puhe

Original Research

# Access to emergency care services: a transversal ecological study about Brazilian emergency health care network

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ARTICLE INFO

*Article history:*
Received 20 February 2017
Received in revised form
3 July 2017
Accepted 10 July 2017

ABSTRACT

*Objectives:* Studies of health geography are important in the planning and allocation of emergency health services. The geographical distribution of health facilities is an important factor in timely and quality access to emergency services; therefore, the present study analyzed the emergency health care network in Brazil, focusing the analysis at the roles of small hospitals (SHs).

*Study design:* Cross-sectional ecological study.

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http://dx.doi.org/10.1016/j.puhe.2017.07.013

*Keywords:*
Spatial analysis
Hospitals
Evaluation
Emergency health services
Access to health services

*Methods:* Data were collected from 9429 hospitals of which 3524 were SHs and 5905 were high-complexity centers (HCCs). For analytical purposes, we considered four specialties when examining the proxies of emergency care capability: adult, pediatrics, neonatal, and obstetric. We analyzed the spatial distribution of hospitals, identifying municipalities that rely exclusively on SHs and the distance of these cities from HCCs.

*Results:* More than 14 and 30 million people were at least 120 km away from HCCs with an adult intensive care unit (ICU) and pediatric ICU, respectively. For neonatal care distribution, 12% of the population was more than 120 km away from a health facility with a neonatal ICU. The maternities situation is different from other specialties, where 81% of the total Brazilian population was within 1 h or less from such health facilities.

*Conclusion:* Our results highlighted a polarization in distribution of Brazilian health care facilities. There is a concentration of hospitals in urban areas more developed and access gaps in rural areas and the Amazon region. Our results demonstrate that the distribution of emergency services in Brazil is not facilitating access to the population due to geographical barriers associated with great distances.



## Introduction

Adequate spatial distribution of emergency care services (ECSs) is fundamental for health system access. The demand for ECS is projected to increase amid an aging global population.[1] Adequate access to ECS is vital to reduce avoidable deaths and losses related to disability-adjusted life years.[2] Access barriers are the main challenge to overcome to guarantee an effective reduction in morbidity and mortality associated with lack of care. Access barriers are especially strong in the context of low- and middle-income countries.[2,3]

The literature on access to ECS focuses heavily on social determinants of health related to demand-side barriers, such as unaffordable costs or lack of patient education.[4] However, in the case of ECS, the role of supply-side factors, particularly the geospatial distribution of health facilities, is not well understood.[5] The majority of geographically-oriented studies concentrate on travel time or distance to primary care facilities and the subsequent effect on healthcare access and patient outcomes.[6,7] Likewise, there exists a volume of studies on the distribution of emergency services in relation to patient mortality and morbidity.[8,9] However, there is a lack of studies dedicated to examining spatial distribution of high-complexity facilities and the resultant impact on access to health care.

The interest in spatial distribution of health services infrastructure has increased in recent years. Geospatial analysis studies regarding this infrastructure are a component of the field of health geography, which can be divided into two groups: geographic epidemiology and health systems planning.[10,11] Geospatial analysis has also proved to be of great utility to study the allocation and planning of health services.[12] Several studies containing literature reviews contemplate the evolution of research in the field of health geography and its different applications in diverse countries.[12–15] These studies show that spatial analysis has been widely used to investigate the relationship between access, utilization, quality, and health indicators to assess disparities in health systems.[12,13] For this reason, studies of this nature are essential for health managers to analyze and define priorities for the provision of health services.[12,13]

The adequate distribution of health service facilities is a challenge that runs through the Brazilian reality. Brazilian's health system combines a mix between interconnected public and private providers. The users choice between each provider depends on aspects such as access and ability to pay.[16] The Brazilian challenges associated with hospital care are the same as those faced by other countries: lack of efficiency, need of quality assurance, lack of access, and coordination among the different levels of providers.[17] The discussion between access and the spatial distribution of services is crucial for the Brazilian reality. One in five hospital admissions in the public system occurs in hospitals in different municipalities to those where the patient lives. Thus, inhabitants of low-income municipalities are less likely to obtain hospitalization than inhabitants of high-income municipalities.[18]

In Brazil, the spatial distribution of health services has been gaining attention in recent years.[19,20] One study mapped the network of the provision of health services, based on the origin and destination of patients.[20] The results revealed an extensive network of primary health care provision, in which only a few municipalities are disconnected. Despite that, almost half of the Brazilian municipalities are disconnected from a network providing ECS. For the present work, health care networks (HCNs) can be understood as a network composed by multiple nodes offering emergency care, connected to each other, and allowing the transit of patients among each node of the web constituted. Great distances to ECS are a critical geographic barrier to access. In 2014, the Brazilian hospital system was composed of 9429 hospitals divided into two categories: 3524 small hospitals (SHs) and 5905 high-complexity centers (HCCs). In Brazil, a SH is defined as a hospital with 50 or fewer beds, while the HCC are units certified as of emergency and capable to perform surgeries and deliveries.

Units classified as SH are recognized to face operational and quality problems, despite their large number in Brazil.[21] In most cases, SHs offer services similar to primary health care