

Overview of barriers to healthcare access: Medical deserts and individual sandboxes

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ABSTRACT

This mini-review examines review studies on barriers to healthcare access in “medical deserts”—regions with limited healthcare resources—and “individual sandboxes,” personal or societal factors preventing care-seeking. Relevant reviews published after 2010 were included, identified through a search on PubMed. The selection resulted in a sample of 18 review studies. An overview of the review studies was conducted, thematically analyzed, and subsequently placed within a context of eHealth with a question, how can eHealth services solve the challenges, in what are called here, medical deserts and individual sandboxes. The data revealed geographical, individual, and resource-based barriers to healthcare access. In the context of eHealth solutions, their potential is particularly recognized in primary care, mental health, and culturally sensitive settings. For medical deserts, in addition to staff-attracting strategies such as incentives for healthcare workers, telemedicine solutions and AI-driven scheduling can improve service availability. In individual sandboxes, eHealth has a unique advantage in reducing participation barriers and addressing cultural needs, thereby enhancing healthcare inclusivity and accessibility. eHealth solutions hold significant promise in regular consultations and psychotherapy, as well as in addressing the healthcare needs of multicultural and diverse populations. AI assistance, then, offers significant potential to enhance the effectiveness of healthcare service provision in medical deserts, contingent upon financial feasibility. However, for these solutions to be effective, healthcare staff must receive education and training on how to integrate and utilize new-generation technologies in their daily practices, ensuring that they can fully develop and optimize their work.

Keywords: eHealth, healthcare accessibility, healthcare administration, public health, rural practitioners, telemedicine

Introduction

Simultaneously increased service needs and difficulties attracting and retaining the workforce in healthcare have caused *medical deserts*, where certain regions or communities experience limited access to healthcare services. These areas, which are often rural or socioeconomically disadvantaged, face shortages in healthcare providers, facilities, and resources, exacerbating health disparities. The prolonged COVID-19 pandemic disproportionately affected historically marginalized

populations, which has increased current attention on the need to address health disparities.^[1]

The term medical desert was used already in the 1970s in a study concentrating on the history of medical practice in France.^[2] In addition to the institution of medical deserts, personal or societal “sandboxes”—situations or mindsets—may limit people from seeking medical help. Here, the concept of individual sandboxes is used metaphorically to describe the personal and societal barriers that limit care-seeking behavior. While individual sandboxes are not always within anyone’s direct responsibility to create or change, they can subtly contribute to barriers in accessing care. In the continuum of individual and cultural barriers, one of the most common individual barriers is anxiety toward care. More sociocultural

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barriers include societal norms that discourage talking about certain health issues.

Owing to recent leaps in artificial intelligence (AI) and robotic sensor technology development, eHealth has become an increasingly relevant solution in complementing traditional healthcare services. However, it is unclear how eHealth services can solve the challenges, in what are called here, medical deserts and individual sandboxes.

Materials and Methods

A mini-review is a useful method when a broad overview at a field or subject is needed. It can provide a general sense of key findings in a specific domain, especially for practitioners seeking actionable insights based on existing research.^[3] The current mini-review is a meta-review of review articles, synthesizing significant outcomes from multiple comprehensive reviews to offer a consolidated perspective on different-level barriers to healthcare access.

The data for the mini-review of reviews (N = 18) was obtained through a search of PubMed as the selected database. Search terms included: “care accessibility”; “barrier* AND access* AND health AND care; medical desert*”. Reviews published after 2010 were included in the selection. A total of 132 items were retrieved. After limiting the selection to review studies and removing duplicates, a semantic philtering process was applied. At this stage, theoretical studies and those with insufficient relevance (e.g., accessibility not as a dependent variable) were excluded. Additionally, studies were excluded if they focused on incorrect topics (e.g., foster care) or involved highly specific sample populations (e.g., “older prisoners”).

In thematic analysis and interpretation, the review data were analyzed initially to explore the nature of barriers to accessing healthcare services. This was followed by an examination of potential solutions brought into a context of eHealth. The particular emphasis on eHealth is justified for the new-generation, intelligent technologies that provide a promising remedy for addressing the challenges faced by medical deserts and sandboxes.

As an umbrella term, eHealth encompasses various forms of digital health practices, including telehealth, mHealth, and other health-related digital tools designed to improve healthcare delivery, access, and management.^[4] Telehealth means delivering healthcare remotely, that is, using technology to connect doctors and patients when they are not in the same place. Using mobile technology, mHealth adds to telehealth by making healthcare more accessible on the go, enabling patients and providers to connect anytime and anywhere.

Contextualized findings

The findings from the 18 reviews are listed in Table 1.^[5-22]

Table 1: Review articles (n=18)

Author and year	Topic
Brown <i>et al.</i> 2016 ^[5]	Mental health care among at-risk young people
Chadwick <i>et al.</i> 2012 ^[6]	Healthcare access among mentally ill
Chiu <i>et al.</i> 2017 ^[7]	Multiple Sclerosis
Churcher 2013 ^[8]	HIV care
Geleto <i>et al.</i> 2018 ^[9]	Obstetric care
Gil-González <i>et al.</i> 2015 ^[10]	Healthcare access among migrants
Hierink <i>et al.</i> 2021 ^[11]	Health care on infectious diseases
Hooker <i>et al.</i> 2012 ^[12]	Primary care
Kalich <i>et al.</i> 2016 ^[13]	Healthcare access among immigrants
Kronfol 2012 ^[14]	Healthcare access
Kyei-Nimakoh <i>et al.</i> 2017 ^[15]	Obstetric care
Lavingia <i>et al.</i> 2020 ^[16]	Mental care among older adults
Lazar <i>et al.</i> 2018 ^[17]	Health care access for low income families
Nakamura <i>et al.</i> 2019 ^[18]	Specialty care access
Nelson <i>et al.</i> 2021 ^[19]	Palliative care
Parajuli <i>et al.</i> 2020 ^[20]	Health service utilisation among refugees
Shahid <i>et al.</i> 2021 ^[21]	Oral health care
Vedio <i>et al.</i> 2017 ^[22]	Healthcare for hepatitis among migrant populations

Geographical barriers

Geographical barriers stand out as significantly decreasing the accessibility of healthcare services. The distant location of a healthcare facility and the transport challenges associated with it are considered risks in many health care sectors, i.e. palliative, infectious disease, obstetric, and multiple sclerosis care.^[7,9,11,15,19]

One solution lies in the question of how to attract medical staff in rural areas with low population densities.^[23] The concrete solution mix includes targeted incentives for healthcare practitioners (e.g., financial rewards, housing support, and relocation assistance) to recognize and compensate for their efforts in moving to and working in these underserved regions, as well as a legislative mandate of public service for newly graduated doctors in societies where their medical education is publicly funded.^[24]

Given the greater picture of overall health care, it is impossible to suggest eHealth as a solution that would fit all scenarios. While telemedicine works sufficiently in general cases, such as occupational health consultations and automated calls for periodic physicals, it has quite limited means to address the shortage of more critical healthcare services, such as dialysis and cancer care. To date, telehealth has focused primarily on verbal interaction complemented by home-based measurements, which are mostly restricted to blood pressure and body temperature, along with basic observational assessments of the skin, respiratory rate, and musculoskeletal movements.^[25] That said, telemedicine solutions have transformative potential to enhance home care quality, for example, by incorporating automated monitoring, video calls, and possibly even telepresence robots in addition to traditional home visits.^[26,27]

Individual variance

In addition to geological distance, a social type of distance was also found in the reviews. Ethnicity has been found to be a sociodemographic factor in healthcare accessibility in the general population,^[14,19] but especially in immigrant and refugee populations.^[10,20,22] Immigrants struggle particularly with language skills, cultural competence, and a lack of information about available healthcare services.^[10,13,22] AI-based eHealth systems have much promise in not only translating content but also in renewing healthcare services by providing services to minorities in their own language. However, since this is an emerging technology, it remains an understudied topic to date.

In a study of migrant populations, Vedio *et al.*^[22] reported that, in addition to a lack of knowledge about one's medical condition, it can also be perceived as a stigma—both factors contributing to delayed care and diagnosis. Stigmatization as a barrier was not limited to immigrant populations, but in the review studies, stigma was found to be a healthcare accessibility challenge in contexts that are considered more sensitive. Perceived stigma was identified as one of the barriers to seeking obstetric care^[15] and mental care.^[16]

In a review of oral health care, dental anxiety was found to be a significant factor preventing people from seeking dental care.^[21] In another review, individual attitudes were considered the strongest barrier to seeking mental health care. For example, Lavingia *et al.*^[16] reported that when older adults do not seek mental health counseling, they often have an attitudinal mindset in which they are convinced that they do not need such care or assistance.

Telemedicine solutions have been found to be valuable in mental health services in terms of lowering participation barriers, making seeking therapy more effective, and improving the quality of life of the patients.^[28,29] For example, people with social anxiety have a lower threshold for attending therapy sessions in the comfort of their own homes. Mental eHealth has also been found to reduce cultural barriers among immigrant populations.^[30] Furthermore, certain web-based appointments have value in offering anonymous consultation for people who are stigmatized by their condition.^[31]

The quantity and quality of resources

Finally, poor resources emerged as a characteristic of medical deserts. In the reviews, barriers to seeking health care include long appointment waiting times, poor communication quality between patients and care personnel, poor communication among service providers, and mistrust toward services.^[6,7,17,18] One of the solutions to the primary barrier of workforce shortage is to consider replacing occupational groups that are difficult to recruit with occupational groups that are easier to recruit. Hooker and Everett reported that physician assistants can contribute to the successful attainment of accessibility.^[12] Other studies have found that solutions of telemedicine can enhance motivation and performance among physicians in remote areas.^[29]

In addition to the resources of healthcare providers, patients' schedules have been viewed as a barrier. The difficulty in matching possible appointment times has been highlighted in a previous primary care study,^[32] as well as in a specialty care study.^[33] AI-based systems can help synchronize schedules between the patient and the service provider. Machine learning models have already been applied in optimizing the scheduling of appointments, which has also been found to increase patient satisfaction.^[34]

Conclusions

The overview of reviews regarding the barriers to care accessibility revealed both medical deserts and individual sandboxes that decrease people's access to healthcare services. Medical deserts are understood as structural shortages that reduce the accessibility of healthcare services, but in addition to medical deserts, healthcare accessibility is sometimes lower because of peoples' individual boundaries. Individual sandboxes, as a concept introduced in this paper, refer to personal barriers varying from socioeconomic background to psychological conditions preventing to seek medical treatment.

People seeking healthcare services in medical deserts may encounter long travel distances and extended appointment waiting times. Addressing these gaps requires coordinated efforts, including policy changes, incentives for healthcare professionals, and investment in telemedicine and mobile health units to provide accessible, good-quality care. With respect to medical deserts, the administrative work of synchronizing schedules between the patient and the service provider is concluded as the most promising healthcare setting that could benefit from new technology.^[32-34] The use of automated systems would alleviate the scheduling problem that makes practicalities in medical deserts even more challenging.^[35] However, a new AI-based system is likely to be a high-cost investment, which is identified as a general obstacle in implementing telemedicine solutions.

In addition, eHealth offers possibilities in general health care, especially in areas such as preventive care, health monitoring, and routine consultations.^[26,27] Through video-mediated consultations, automated reminders, and remote monitoring, eHealth enables easier access to particularly primary care. However, its impact is more limited in specialized healthcare services, which often require complex, in-person medical resources and equipment.^[25] Therefore, while eHealth enhances accessibility in general health care, its role in addressing intensive, specialized medical needs remains more constrained. Educating practitioners of the most potential telemedicine solutions and applications is one of the priorities in promoting eHealth. Rather than just formal education, this refers to continuous learning and training at the workplace, and particularly involving staff members to the technological changes ahead.^[36]

In medical sandbox settings, telemedicine works as a particularly promising complementary service form in mental healthcare

services. Its convenience and ability to reduce stigma can be viewed to make all eHealth solutions appealing. Online appointments should be offered, especially to patients with social anxiety, to help them overcome isolation. Moreover, telemedicine also results in significant cost-saving benefits, a crucial advantage at a time when mental health services face resource constraints and increasing demand. By reducing the need for in-person infrastructure and enabling more flexible service delivery, solutions of telemedicine help stretch limited resources to reach more patients remotely. Nonetheless, it is crucial that patients are afforded the right to be actively involved in decision-making regarding their chosen course of care. Not all patients perceive telemedicine as a safe or reliable mode of service delivery.

Overall, with patient groups becoming increasingly multicultural, eHealth solutions hold significant promise for meeting diverse healthcare needs.^[30] New-generation digital service paths have great potential, for example, in AI assistance when navigating foreign healthcare systems^[37] and in providing services in various languages, including simultaneous translations assisting patient-practitioner interactions.^[38] The studies in the data implied that cultural competency and more advanced language skills would bring immigrants closer to the services they need. AI-based systems offer an alternative solution, where technology serves as a mediator until these skills are developed.

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Conflicts of interest

There are no conflicts of interest.

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