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Exploring The Interplay Between Digital Divide, Health Resource Shortage, and Telehealth Utilization

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EXPLORING THE INTERPLAY BETWEEN DIGITAL DIVIDE, HEALTH RESOURCE SHORTAGE, AND TELEHEALTH UTILIZATION

TREO Paper

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Abstract

We conducted a retrospective study to investigate the intersectionality of digital divide, health professional shortage, and telehealth utilization for chronic disease management. Our results suggest that digital divide is negatively associated with telehealth usage (p -value < 0.001), and rural counties have significantly higher level of digital divide than non-rural counties (p -value < 0.001). Our geographical weighted regression (GWR) analysis further reveals an interaction effect of digital divide and health professional shortage on telehealth utilization. Patients in counties facing higher health professional shortages but with a lower digital divide may increasingly turn to telehealth services to bridge the gap in healthcare provision. Our findings highlight the need for targeted strategies to promote telehealth adoption. It is imperative that we emphasize the complexities of community resources and characteristics that may influence telehealth adoption and engagement at the community and individual level.

Keywords: Telehealth, Digital divide, Health professional shortage, Chronic disease management.

Extended Abstract

Telehealth services are becoming standard practice to deliver health and social services across many areas of the United States (Bagchi, 2019). Telehealth services can reach areas that traditional medical facilities struggle to penetrate. However, the lack of technological infrastructure and provider shortages contribute to decreased telehealth utilization (Chen et al., 2020). This study investigates telehealth utilization focusing on location-specific factors including digital divide and healthcare resource shortages.

We analyzed medical visit records from 50,750 patients; the study period was April to December 2019 and April to December 2020. Patient level data were retrieved from a State of Florida Medicaid and Medicare Managed Care Organization. over the study period. The dataset encompassed 67 counties in the state of Florida. Community level analysis was conceptualized at the county level. We aggregated telehealth use at the county level and calculated by the percentage of the patients who used video telehealth in each county during the study period. To examine the associations of location specific factors with telehealth utilization, we retrieved data from Digital Divide Index (DDI) and Health Professional Shortage Area (HPSA) designations.

Video telehealth visits necessitate access to computer devices and reliable Internet. The digital divide has significant implications for telehealth adoption, as access to digital resources is essential for accessing and utilizing telehealth services. The Digital Divide Index is a scale that spans from 0 to 100, with 100 representing the most significant digital divide. This index consists of two sub-scores ranging from 0 to 100: the infrastructure/adoption (INFA) and socioeconomic (S.E.) scores. The INFA score is a comprehensive measure encompassing five critical factors related to broadband infrastructure and adoption: population without access to fixed broadband with a minimum speed, percentage of households without essential computing devices and any internet access, and median maximum upload and download speeds. INFA scores are related to broadband infrastructure and adoption. The S.E. score also considers five factors influencing technology adoption: the percentage of people aged 65+, the percentage of people 25+ with less than a high school education, the individual poverty rate, and the percentage of the population with disabilities. S.E. scores are related to socioeconomic variables such as age, education, poverty, and disability. The Internet income ratio (IIR) relates to technology use (Gallardo, 2023).

Health Professional Shortage Areas (HPSA) are geographic areas with a shortage of primary, dental, or mental health care providers. Health Professional Shortage Area (HPSA) scores developed by the National Health Service Corps (NHSC) determine priorities for the assignment of clinicians to geographic areas. The scores range from 0 to 26; the higher the score, the greater the priority (Health Resource and Service Administration [HRSA], 2023).

Results from a simple linear regression analysis revealed a negative association (p -value $< .001$) between the Digital Divide Index and telehealth utilization. This suggests a higher digital divide is linked to lower telehealth utilization rates. Moreover, separate simple linear regression analyses were conducted for each factor due to the high correlation between Infrastructure (INFA) scores and Socioeconomic (S.E.) scores. Both INFA and S.E. scores demonstrate a negative association with telehealth utilization.

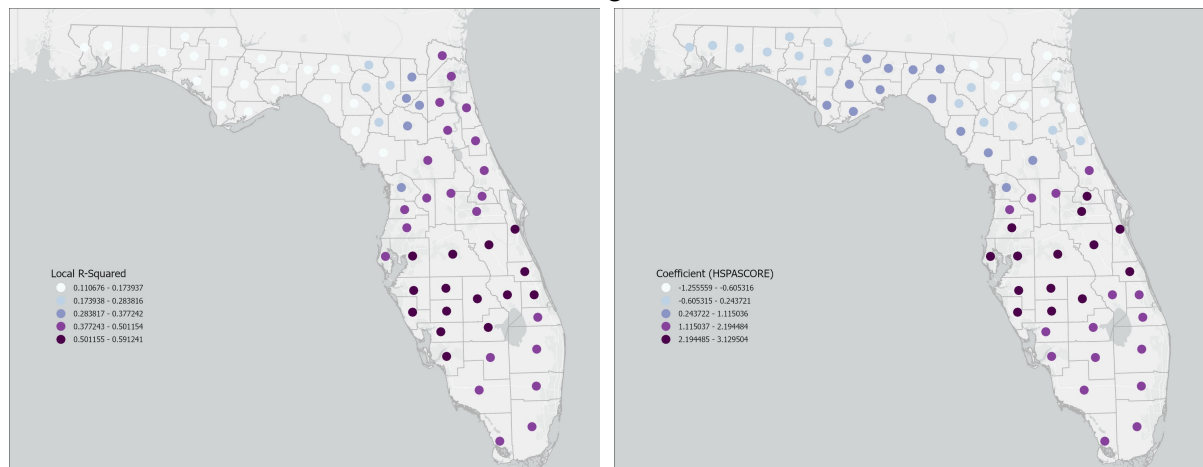


Figure 1. The association between telehealth utilization and health professional shortage

We conducted a geographically weighted regression (GWR) to understand how the relationship between telehealth utilization and HPSA differs from one location to another. As depicted in Figure 1, the local R^2 values suggest a stronger and positive relationship between telehealth utilization and HPSA in the southern area, where there is a lower digital divide. We separate the data into different groups based on DDI, HPSA, and Telehealth Utilization to delve into the intricate relationships among these factors. The analysis suggests that patients in counties facing higher health professional shortages but with a lower digital divide may increasingly turn to telehealth services to bridge the gap in healthcare provision.

Analyzing data from Florida counties, we discern disparities in telehealth use. Previous studies suggest that counties with more urgent needs for healthcare facilities present higher telehealth utilization to compensate the shortage of healthcare facilities (Talbot et al., 2018). However, the body of literature is inconclusive. Other studies suggested that residents in HPSA areas were less likely to use telehealth

(Fischer et al., 2020; Hossain et al., 2022). Our study found the interaction effect of digital divide and health professional shortages on telehealth utilization.

Our findings highlight the need for targeted strategies to promote telehealth adoption. We recommend prioritizing improvements in healthcare infrastructure and policies to enhance accessibility and effectiveness. This research sheds light on the potential of telehealth in addressing healthcare disparities and offers insights for policymakers and healthcare providers to optimize healthcare services in diverse geographical contexts. The DDI is an important indicator of telehealth use, we should carefully consider it alongside other determinants of health. It is also imperative that we emphasize the complexities of community resources and characteristics that may influence telehealth adoption and engagement at the community and individual level.

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