

Data Analytics and Informatics

Heterogeneity in Online Medical Record Use Based on the Intersectionality of Community and Racioethnicity: A National Study Using Health Information National Trends Survey Data

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Keywords: area deprivation measure, social determinants of health, racioethnicity, digital health equity, United States, record access, electronic health record, electronic medical record, medical record

<https://doi.org/10.63116/YVLD1335>

Advances in Health Information Science and Practice

Vol. 1, Issue 1, 2025

Background

An individual's racioethnicity can affect their use of digital health tools and access to digital resources. In this study, the authors examine the relationship between community Social Determinants of Health (cSDoH) and racioethnicity with access and use of online medical records.

Methods

Data were used from the Health Information National Trends Survey (HINTS)—specifically, HINTS 5 Cycle 1 (2017), HINTS 5 Cycle 2 (2018), HINTS 5 Cycle 3 (2019), HINTS 5 Cycle 4 (2020). Predicted probabilities of accessing online medical records based on interactions of cSDoH and racioethnicity were estimated using adjusted weighted logistic regression. Among online medical record users, the authors explored how they accessed the Internet by racioethnicity and cSDoH.

Results

A combined analytical dataset was created with 16,092 pooled observations from all four HINTS 5 cycles, including 14,103 respondents who answered a question about whether they accessed their online medical record (with 5,766 responding yes). From a range of predicted probabilities between 0 and 1, Hispanic, Non-Hispanic (NH) Black, and NH White communities had predicted probabilities for accessing online medical records of 0.20, 0.33, and 0.38, respectively, in the most disinvested neighborhoods. We also found differences in how individuals accessed their online medical record by racioethnicity and cSDoH.

Conclusions

Results suggest that incorporating cSDoH and racioethnicity in digital health decision making may help bridge the digital divide. Further research should explore the complex interplay between cSDoH, racioethnicity, online medical record access and use to promote digital health equity.

INTRODUCTION

Patient attributes, such as racioethnic identity (or one's race and ethnicity), can collectively contribute to health outcomes.¹⁻³ Socioeconomic and environmental conditions in one's community⁴ or community Social Determinants of Health (cSDoH) can also contribute to health inequities and reflect the environment in which one lives, plays, and

works.⁵ Intersectionality is a theoretical framework that examines how complex factors (e.g., race, class, gender) interact with one another.⁶⁻⁸ Intersectionality can be used to help explain health disparities and inequities.^{1,9} An intersectional view on the combined effect of racioethnicity and community provides an opportunity to learn about disparities in digital health technology, which has been demon-

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strated to have a positive contribution to health and health equity.¹⁰

An individual's race/ethnicity can affect their use of digital health tools and access to digital resources. Studies have indicated lower patient portal use and access to digital resources (e.g., broadband Internet) among communities marginalized due to race/ethnicity.^{11,12} Factors such as digital redlining, or deliberate limiting of access to digital resources and services, have contributed to these digital inequities.^{13,14} Increasing digital technology in the healthcare space may worsen health disparities if digital inclusion is not considered.^{15,16} For instance, applications for food, housing, or employment related programs may be only offered online,¹⁷ and ideally via an online medical record as health systems are increasingly involved in the collection and management of unmet social needs.^{18,19}

Based on the extant literature, it is known that communities marginalized by race/ethnicity have lower use of online medical records.^{18,20} However, the health implications for these individuals across different communities are unclear.²¹ There is limited research on the intersection of race/ethnicity with cSDoH as it pertains to online medical records use at the national level. Examining this intersection can provide valuable insights on how we can better serve individuals who live in different types of communities. This can help reduce the digital divide or "the gap between those able to easily access digital health services and those that cannot."²² Existing literature has indicated that the digital divide persists among communities that are marginalized by race/ethnicity, despite efforts to promote Internet access in the United States.²³ Thus, national-level data is necessary to address these challenges and gain a deeper understanding of the contributing factors to these disparities. We leveraged data from the Health Information National Trends Survey (HINTS), a national survey that collects a variety of health information, to investigate the intersectionality between race/ethnicity and cSDoH and to obtain national estimates, which is a first of its kind to provide formative evidence on digital inclusion at the national level.

METHODS

This study used data from HINTS, sponsored by the National Cancer Institute (NCI). HINTS represents a sample of individuals over 18 years of age in the United States. Individuals report how they obtain and use health information, such as healthcare access and health outcomes. This study used data from HINTS 5 Cycle 1 (2017), HINTS 5 Cycle 2 (2018), HINTS 5 Cycle 3 (2019), HINTS 5 Cycle 4 (2020). Stratified postal address frames are used to randomly sample residential addresses. HINTS uses survey weights to increase generalizability to the population.²⁴

PREDICTORS

Our predictors were cSDoH and race/ethnicity. Race/ethnicity was assessed by the HINTS question, "What is your race? One or more categories may be selected." Answer op-

tions were "White," "Black or African American," "American Indian or Alaska Native," "Asian Indian," "Chinese," "Filipino," "Japanese," "Korean," "Vietnamese," "Other Asian," "Native Hawaiian," "Guamanian or Chamorro," "Samoan," and "Other Pacific Islander." We recoded race/ethnicity into four categories: non-Hispanic (NH) White, NH Black, Hispanic, or NH Other. To quantify cSDoH, we used ZIP codes and Area Deprivation Index (ADI) ranking data from all 50 states using the University of Wisconsin-Madison Neighborhood Atlas.²⁵ We chose to use 2020 data from the Neighborhood Atlas since it aligned the most with the HINTS 5 cycles. ADI is a measure that considers multiple community-level factors such as income, housing, and education. ADI rankings range from 1 to 100. The higher the ADI ranking, the more disinvested the neighborhood.²⁵ This master dataset with the cSDoH was merged to our HINTS data based on ZIP code. ADI rankings were categorized into quintiles.

OUTCOME

Our primary outcome was whether the individual accessed their online medical record. This was assessed by the HINTS question, "How many times did you access your online medical record in the last 12 months?" with options of "None," "1 to 2 times," "3 to 5 times," "6 to 9 times," and "10 or more times." Options other than "None" were recoded to "Yes," and "None" was recoded to "No." There were 1,989 respondents (12.36% of total observations) with missing data or who were unable to answer this question.

COVARIATES

Clinical and sociodemographic characteristics used as covariates included *gender* (male or female), *age* (18–34, 35–49, 50–64, 65–75, 75+), *education* (high school graduate or less, some college/bachelor's degree, or college graduate), *metropolitan status* (metropolitan area or non-metropolitan area), *general health* (excellent/very good/good, fair, or poor), *health insurance status* (insured or uninsured), and *Internet access* (yes or no). These variables were selected because they align with previous studies on online medical records.^{26,27}

DATA AND ANALYTICAL PLAN

A logistic regression model was used with population weights to estimate the likelihood of accessing online medical records. The model included the interaction of ADI quintiles and race/ethnicity with covariates: internet access, age, gender, metropolitan status, general health status, health insurance, and education. We plotted the predicted probabilities of the interaction of ADI quintiles and race/ethnicity (Figure 1). The 95% confidence intervals of each interaction are displayed on the plot.

POST HOC ANALYSIS

We plotted the weighted population estimates of Internet sources by race/ethnicity and ADI quintiles for those who

accessed online medical records (Figure 2). For Internet sources, we used the HINTS question, “How often do you access the Internet through each of the following? a. Computer at home b. Computer at work c. Computer in a public place (library, community center, other) d. On a mobile device (cell phone/smart phone/tablet).” Answer options for each sub question were “Daily,” “Sometimes,” “Never,” and “Not Applicable.” For each Internet source, “Daily” and “Sometimes” were recoded to “Yes,” and “Never” was recoded to “No.”

We also obtained estimates for our main predictors using a two-stage model to predict the likelihood of online medical record use and intensity of online medical record use based on a weighted zero-inflated order logistic regression model.²⁸ We categorized the outcome variable into three groups: “None,” “1 to 5 times,” and “6 or more times” to explore the differences between nonusers, users that access the online medical record at least bi-monthly, and those that access it less frequently over a 12-month period. We calculated predicted probabilities for each group (results not shown) and found similar results to our primary analysis. Stata/ME version 18.0 was used to conduct all analyses.

RESULTS

A combined analytical dataset was created with 16,092 pooled observations from all four HINTS 5 cycles (3285 [20.41%] from Cycle 1, 2017; 3504 [21.77%] from Cycle 2, 2018; 5438 [33.79%] from Cycle 3, 2019; 3865 [24.02%] from

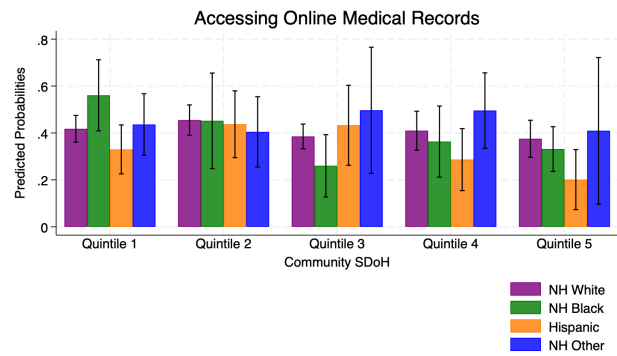


Figure 1. Predicted Probabilities of Access to Online Medical Record by ADI Quintile and Racioethnicity

NOTE: Predicted probabilities are based on population weight estimates (n = 4,211; N = 316,165,858). Error bars are 95% confidence intervals of each interaction. SDoH: Social Determinants of Health; ADI: Area Deprivation Index; NH: Non-Hispanic; Q1: Quintile 1 (ADI rank of 1-20); Q2: Quintile 2 (ADI rank of 21-39); Q3: Quintile 3 (ADI rank of 40-59); Q4: Quintile 4 (ADI rank of 60-80); Q5: Quintile 5 (ADI rank of 81-100).

Cycle 4, 2020). There were 14,103 respondents who answered if they accessed their online medical record, and 5,766 (40.8%) responded that they had.

Figure 1 shows the predicted probabilities of accessing the online medical record by each ADI quintile and racioethnicity. Predicted probabilities for accessing online medical records were lowest in ADI quintile 5 for NH White and Hispanic communities. Predicted probabilities were



Figure 2. Relative Proportions of Individuals from Specific Racioethnic Populations who use Online Medical Records by ADI Quintile and Internet Source

NOTE: Chi-square tests were used to assess if there are associations between racioethnicity, community SDoH, and internet sources for those who access their online medical record. There was a difference for home, work, and mobile device in distributions across quintiles and racioethnicity with p-values < 0.05. ADI: Area Deprivation Index; NH: Non-Hispanic; Q1: Quintile 1 (ADI rank of 1-20); Q2: Quintile 2 (ADI rank of 21-39); Q3: Quintile 3 (ADI rank of 40-59); Q4: Quintile 4 (ADI rank of 60-80); Q5: Quintile 5 (ADI rank of 81-100).

highest in ADI quintiles 1 and 2 for NH White, NH Black, and Hispanic communities. Predicted probabilities were similar across all ADI quintiles for NH White communities. NH White communities were more likely to access the online medical record than NH Black for all ADI quintiles except for ADI quintile 1. NH White communities had a higher predicted probability of accessing online medical records compared to NH Black and Hispanic communities for the higher ADI quintiles (more deprivation).

Figure 2 displays the relative proportions of individuals from specific racioethnic populations who use online medical records by ADI quintile and Internet source. Among each racioethnic community, NH Black, Hispanic, and NH Other communities had a relatively higher proportion of respondents who accessed the Internet from a public place than NH White communities in ADI quintile 1. NH Black communities reported the highest use of all four Internet sources across the higher ADI quintiles (more deprivation) among all racioethnic communities. Among respondents who identified as Hispanic, those who lived in higher ADI quintiles accessed the Internet the least, across all racioethnic communities and Internet sources.

Our zero-inflated ordinal logistic regression analysis indicated lower probabilities of higher intensity online medical record use among all racioethnic communities. The range of predicted probabilities (between 0 and 1) for reporting no access to online medical records was 0.48 to 0.80. For accessing the online medical record 1 to 5 times, the range of predicted probabilities was 0.18 to 0.39. Predicted probabilities for accessing the online medical record 6 or more times were between 0.02 and 0.14. NH Black and Hispanic communities had higher predicted probabilities of not accessing the online medical record than NH White communities in higher ADI quintiles. In the models predicting access to the online medical record 1 to 5 times and 6 or more times, NH White communities were more likely to access the online medical record than NH Black and Hispanic communities in higher ADI quintiles.

DISCUSSION

PRINCIPAL FINDINGS

In this brief report, our primary analysis demonstrated differences in the predicted probabilities for accessing online medical records associated with the intersectionality of racioethnicity and cSDoH. There was a variation in Internet sources accessed by racioethnicity and cSDoH among those who accessed online medical records (Figure 2), with higher use in some ADI quintiles for specific racioethnic communities. These results illustrate a complex interplay between the influences of racioethnicity, cSDoH, digital inclusion, and online medical record access and use. Our results align with previous studies in which NH Black and Hispanic communities were found to be less likely to access their online medical record compared to NH White communities in more disinvested communities.^{11,23,29,30} Among online medical record users, NH Black communities accessed the Internet the most, and Hispanic communities accessed the

Internet the least in higher ADI quintiles across all racioethnic communities and Internet sources. Differences in Internet sources, racioethnicity, and communities support other studies highlighting potential contributors to the digital divide.^{31,32}

It is important to consider the intersection between racioethnicity and cSDoH to promote health equity.³³ Policy initiatives should prioritize addressing racial disparities in the most disinvested communities to reduce health inequities across the US.^{33,34} Policymakers can use cSDoH such as ADI to help make well-informed decisions on allocating resources and implementing interventions that can improve healthcare access.^{33,35} The Center for Medicare and Medicaid Services has used ADI in their policy updates on payment and care models to promote health equity.³⁶ Similar approaches may be useful for reimbursement models, with the additional incorporation of factors such as intersectionality and digital inclusion to augment health equity initiatives. Additionally, community partners can also contribute to digital health equity initiatives by providing resources like technology-related support groups to communities in need.³⁷

IMPLICATIONS FOR PRACTICE

Healthcare institutions can prioritize tailored strategies that consider the community's availability of devices and Internet access to encourage individuals to engage with digital health tools.^{10,17} Care team members within these healthcare institutions must be aware of the effects of the intersection of non-medical factors (e.g., racioethnicity) and community characteristics on patient care.³⁸ It is important to consider Internet accessibility, digital affordability, and digital literacy³⁹ for those with limited access to their online medical records. For example, social workers can advocate for patients living in marginalized communities and ensure that they can access digital resources, reducing the digital divide.³⁹ In addition to practitioners, health information professionals could evaluate the adoption of online medical records and their use to encourage digital health equity using an intersectional perspective.^{40,41} An area-dependent measure such as ADI can be used to identify communities that may need tailored interventions (e.g., community events and campaigns) to promote online medical record use and education to manage overall health.⁴² Health information professionals should incorporate cultural competency tools and skills to promote digital equity in disinvested communities.⁴³ Health information professionals can become more aware of digital inclusion and equity by attending training programs^{44,45} focused on intersectionality, which can help motivate and build trust between patients and health systems.

LIMITATIONS

There are some limitations to our study. First, we cannot infer causality since HINTS uses a cross-sectional design. Second, HINTS provides survey data that can be susceptible to recall bias. However, HINTS utilizes sampling and survey weights to mitigate potential biases and increase general-

izability.⁴⁶ ADI may not have included all relevant cSDoH variables related to our dependent variable: access and use of online medical records. Lastly, ADI may not fully capture socioeconomic characteristics since it was created based on census blocks.⁴⁷

CONCLUSIONS

We used a nationally representative sample by leveraging HINTS data to explore the effects of racioethnicity, cSDoH, and Internet sources on access to online medical records. We found variations in predicted probabilities for accessing the online medical record and variations in relative weighted proportions for accessing the Internet from different sources across ADI quintiles and specific racioethnic communities. Further investigation can help policymakers design targeted health interventions and implement strategies to promote digital health equity.

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DISCLOSURES

The authors have nothing to disclose.

FUNDING

The authors received no funding for this research.

DATA AVAILABILITY

The data used for this study were obtained from the National Cancer Institute's (NCI) Health Information National Trends Survey. The main data set is publicly available for access at <https://hints.cancer.gov/>. NCI provided the restricted geocoded data used in our study.

Submitted: December 03, 2024 EDT. Accepted: March 03, 2025 EDT.

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