

Research Article

Assessing the Impact of Healthcare Wearables on Improving Health Disparities in Minority Communities in Mississippi

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Abstract

This study examines perceptions of healthcare wearable technology among African American communities in Mississippi, focusing on two key demographic groups: church leaders and college students. As the first systematic investigation of this kind, the research explores critical factors influencing adoption and trust in wearable devices, including their perceived usefulness in managing chronic conditions, potential to improve healthcare outcomes and reduce costs, data-sharing willingness, and concerns about device accuracy and privacy. A mixed-methods approach analyzed survey data from 435 participants (247 church members and 188 students) using frequency distributions and chi-square tests. Findings reveal significant generational and group-based differences: older participants and church members reported more chronic conditions and stronger agreement on the benefits of wearables. At the same time, younger students expressed higher trust in data and greater comfort with sharing health information. Concerns around data security, affordability, and device accuracy, particularly for individuals with darker skin tones, emerged as key barriers to adoption. The study's findings underscore the importance of culturally informed strategies to promote equitable access to wearable health technologies, especially in communities disproportionately affected by chronic illnesses such as cardiovascular disease and diabetes. These insights can guide future public health initiatives and technology design to ensure inclusivity and address long-standing health disparities.

Keywords

Healthcare Wearables, African American Communities, Technology Adoption, Chronic Disease Management, Health Equity, Data Privacy and Trust, Generational Differences, Digital Health

1. Introduction

Purpose

This study explores the perceptions of healthcare wearables within African American communities in Mississippi by surveying church leaders and students. The study aims to

explore several key areas related to healthcare wearables, including their potential to enhance healthcare delivery and reduce costs the willingness of individuals to share data with family and friends, the level of trust in manufacturers re-

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garding personal health data protection, and the perceived accuracy of the devices. This is the only systematic study on wearables in the African American population.

Background

Healthcare wearables have gained popularity due to technological advancements and their potential to improve health outcomes by monitoring metrics such as physical activity, heart rate, and sleep patterns. [1-5]. These devices offer real-time health insights, supporting individuals in managing chronic conditions more effectively [6, 7]. However, concerns regarding health equity arise, as access to and benefits from these devices may not be equally distributed across different socio-economic and racial groups. [8] The goal is to understand factors influencing their views on the utility of wearables, especially for health equity and chronic disease management [9-13].

Additionally, it will examine concerns about equitable access to wearable technologies and the willingness to share data for community well-being. The findings will provide valuable insights into community perceptions of healthcare wearables, informing future innovations and strategies to ensure inclusivity and address health disparities [14, 15].

A Centers for Disease Control and Prevention (CDC) study from 2019 to 2021 reveals that Mississippi has notably higher rates of cardiovascular disease than the national average, particularly impacting African Americans. [16] The state records the highest stroke mortality rate at 54.5 per 100,000, with African Americans facing an even higher rate of 71.7. Additionally, Mississippi leads in heart disease mortality at 245.7 per 100,000 and ranks second in diabetes mortality at 41.0 per 100,000, with African Americans experiencing the highest rates at 87.7. The prevalence of chronic conditions suggests that wearables could be beneficial for managing health, especially in minority populations. However, a study indicates that while 82% of individuals with cardiovascular disease are willing to share wearable data with clinicians, adoption is lower among older, less educated, and lower-income groups [17, 18].

2. Literature Review

Wearable technology is evolving rapidly, outpacing smartphone development. Devices range from basic fitness trackers to advanced wearables like virtual reality headsets and AI-powered hearing aids [19, 20]. Despite their potential health benefits, the adoption of these technologies remains low in African American and rural communities in Mississippi due to factors such as high costs, low technological familiarity, and limited access to digital tools. [21-24] Several barriers, including economic constraints, limited digital literacy, concerns over data privacy, and scepticism regarding device accuracy, contribute to this.

The literature on wearables presents varied perspectives regarding their impact on health equity. One major issue is the accuracy of health measurements in individuals with darker

skin tones. Many wearable devices, especially those relying on photoplethysmography (PPG) technology, struggle to accurately read vital signs on darker skin, leading to potentially flawed health insights. This inaccuracy may widen existing health disparities by producing biased data that misrepresents health trends in minority populations, ultimately perpetuating racial health inequities. Researchers, such as Peter Colvonen, have emphasized the importance of addressing this challenge by ensuring that wearable devices are tested for accuracy across diverse skin tones and by actively including a broad range of participants in health studies [25-27].

These devices offer significant potential for improving health outcomes in underserved communities by enabling remote health monitoring and reducing the need for in-person visits to clinics or hospitals. This is particularly beneficial for individuals with limited access to traditional healthcare [28]. For many African Americans in Mississippi, particularly in rural areas, the ability to monitor health conditions remotely could lead to better disease management and early detection of health issues. However, the high cost of wearables, especially those designed for managing chronic conditions, poses a substantial barrier, making them inaccessible to low-income and even middle-income populations. While some recognized the value of proactive health behaviours, many could not afford the high costs of the devices. Advanced devices with extensive health-monitoring capabilities are often priced beyond the average consumer's reach. Economic limitations disproportionately affect African Americans and other underserved populations, making it difficult for these communities to access and benefit from wearable technologies [29, 30].

Community members expressed significant concerns about the security of the data entered into wearable devices and how third parties might use it [31-33]. Trust in manufacturers regarding protecting personal health data is a key factor influencing adoption, as many African Americans remain wary of data breaches and misuse. Additionally, others were uncomfortable with technology, perceiving wearables as tools primarily for younger people [34, 35].

Healthcare providers also face challenges in integrating wearable data into clinical practice. Scepticism about the reliability of wearable-generated data, concerns about information overload from continuous monitoring, and financial constraints in implementing wearable technology hinder broader adoption. Barriers to adopting wearable technology among healthcare providers include scepticism about the reliability of wearable data and concerns over information overload [36]. With constant data streams, providers may struggle to filter and prioritize critical health information [37]. Additionally, the high costs of implementing and maintaining wearable technology can be a significant deterrent, especially for smaller healthcare practices and rural facilities with limited financial resources [38-40]. These barriers are particularly pronounced in smaller healthcare practices and rural

medical facilities with limited resources. Furthermore, healthcare professionals may be hesitant to trust data from wearables when making medical decisions due to the potential inaccuracies in recording vital signs for individuals with darker skin tones.

A 2021 study in *Nature* found that wearable devices for remote monitoring reduced hospital readmissions by 43% in patients with type Inferior Myocardial Infarction (I MI) [41]. Continuous fitness tracking and timely interventions helped prevent complications. This led to cost savings of \$6,000 per patient [42]. Some literature warns of the adverse side effects of wearables [43]. While these studies demonstrate the financial benefits of wearables, they do not account for racial disparities in adoption and use, which this study aims to investigate.

Despite these concerns, the global wearable healthcare market is expanding, with an estimated value of \$115.8 billion in 2021 and a projected increase to \$380.5 billion by 2028. The potential for wearables to reduce hospital costs, such as an estimated 16% reduction through remote monitoring by 2027, highlights their growing importance. The market's projected growth, alongside potential hospital cost reductions of up to 16% by 2027 through remote patient monitoring, highlights the importance of making these technologies more accessible [44, 45]. As healthcare costs continue to rise, the affordability and accessibility of wearables will play a crucial role in determining their impact on reducing medical expenses within African American communities.

While wearable technology holds promise for improving healthcare delivery and reducing costs, its effectiveness in African American communities depends on addressing key concerns: affordability, trust in data security, device accuracy, and cultural perceptions of technology. This study systematically explores these factors by surveying church leaders and students in Mississippi, assessing their perspectives on healthcare wearables, their willingness to share data, their level of trust in manufacturers, and their perceptions of device accuracy. Focusing on community leaders and younger individuals, this study aims to capture various opinions regarding wearables and their role in healthcare. To date, no comprehensive study has examined these issues within the African American population, making this research a critical contribution to understanding the role of wearable technology in underserved communities. As the first systematic study to explore healthcare wearable adoption in African American communities in Mississippi, this research will provide valuable insights into the barriers and opportunities associated with wearable health technology in these populations.

3. Methodology

This study employed a mixed-methods approach to assess the impact of healthcare wearables on reducing health disparities among African American communities in Mississippi. Phase I focused on formative research and community engagement with two target populations: African American and

African faith-based leaders stratified across three Mississippi Public Health Regions, and Jackson State University (JSU) students stratified by undergraduate and graduate status. Funded by the Kellogg Foundation, this initial phase explored attitudes, barriers, and trust related to the use of consumer wearable technology to improve health equity. Key methods included focus groups, surveys, and town halls, with findings contributing to a growing, underrepresented body of literature on health technology adoption in African American communities.

Focus groups were convened with pastors and church leaders in each public health region to explore community knowledge, perceived discrimination risks, and concerns about data privacy and socioeconomic implications of wearable use. Topics included whether wearables might promote discriminatory practices through data sharing or foster inequality through exchange-based incentives. Insights from these discussions informed the design of a broader quantitative survey to capture more generalizable trends in perception and use. Town hall forums complemented the data collection by offering participatory feedback mechanisms and helping identify drivers and barriers to wearable adoption in the community.

A major logistical hurdle was the absence of a centralized database of African American churches in Mississippi, which delayed data collection and necessitated the development of a new, robust directory to support current and future research. This investment yielded long-term value and positioned JSU as a leader in this field. The study also identified the need for a Train-the-Trainer model to educate community leaders about wearable technology, supported by collaboration with healthcare organizations. Notably, the study found that participants were open to sharing health data via wearables to manage chronic illnesses, signalling strong potential for expanded engagement in Phases II and III, which aim to design, deploy, and operationalize a digital health equity model.

There was no overlap between the church group and the student group.

A total of 517 participants were selected from a church group and students, of which 435 were active participants (247 from the church group and 188 from the students).

4. Key Findings

Detailed Report on SAS 9.4 Output Analysis

This report presents a comprehensive analysis of data from SAS 9.4, focusing on differences in health-related perceptions across age groups and demographic categories, including ethnicity and trust in health-related data. Key variables analysed encompass perceptions of wearable devices and chronic conditions, aiming to help us understand how these factors influence health opinions. The report employs frequency distribution, chi-square analyses, and Fisher's Exact test for smaller expected counts to identify significant differences in health-related responses among specific age groups. By providing detailed p-values for each group, the analysis clar-

ifies how different demographics contribute to variations in health attitudes, ensuring insights are not obscured by combining age categories.

4.1. Overview of Age Groups and Group Categories

GROUP Categories:

1. Church
2. Student
3. Other

These categories were used to evaluate responses to various health-related questions and to understand demographic differences.

4.2. Analysis of AGE and GROUP by Key Variables

A. ETHNICITY

Key Observation: The dataset is predominantly represented by Black/African American individuals across all age groups, especially in the Church and Student groups. The 18-24 age group shows significant representation from Black/African American individuals, with minimal diversity.

4.2.1. Chronic Conditions by Each Age Group

The analysis of the impact of wearables on chronic conditions across different age groups reveals a significant overall relationship, with a p-value of 0.033. Notably, significant differences were found between the 18-24 and 35-44 age groups ($p = 0.015$), as well as between the 18-24 and 45-54 age groups ($p = 0.002$), indicating that older age groups report more agreement with wearables benefits to people with chronic conditions. Significant differences were noted between the 25-34 and 35-44 age groups ($p = 0.048$), and the 45-54 and 55-64 age groups ($p = 0.05$). Interestingly, within the 18-24 category, the Church group reported a higher prevalence of chronic conditions (88.89%) compared to the student group (81.82%). In the 25-34 age group, the Church group also had a slightly higher agreement on chronic conditions (55.17%). A significant association was also found between group membership and perceptions of chronic conditions, with a chi-square value of 25.71 ($p < 0.0001$), indicating differing opinions among the groups.

4.2.2. Improve Health Care by Each Age Group

The analysis of support for improving healthcare across age groups indicates a significant overall relationship, with a p-value of 0.0034. The 18-24 age group demonstrates significantly more substantial support for healthcare improvement compared to the 35-44 ($p = 0.02$) and 45-54 age groups ($p = 0.003$), while there are no significant differences between the 18-24 and 25-34 groups ($p = 0.18$), or between the 25-34 and 35-44 groups ($p = 0.11$). The 35-44 group shows borderline

significance over the 45-54 group ($p = 0.07$). Among the 18-24 age group, both the Church (84.31%) and Student (88.89%) groups overwhelmingly agree on the need for healthcare improvements, with the student group in the 25-34 age group also showing firm support (57.53%). A significant association was found between group membership and views on improving healthcare (Chi-Square = 42.78, $p < 0.0001$), indicating varying group opinions. Other variables, such as TRUST_DATA and EVERYONE_ACCESS, also revealed significant differences among the groups.

4.2.3. Reduce Health Care Cost

Key Observation: There is broad agreement that wearable devices can significantly reduce healthcare costs, with 62% in Favor, 29% neutral, and only 9% against.

The data on responses to the "Reduce Health Care Cost" variable from two groups—Church and Student—reveals key insights. Of 430 responses, the Church group contributed 244 and the student group 186. The Church group showed a higher overall agreement (75.4%) on reducing health care costs, with 126 agreeing and 58 strongly agreeing, compared to the student group's agreement rate of 40.3% (75 agreeing and 58 strongly agreeing). Disagreement levels were slightly lower in the Church group (6.1%) versus the student group (9.1%), while both groups exhibited similar neutral response rates (15.6% for Church and 14.5% for Student). The statistics reveal a strong association between group membership (Church vs. Student) and attitudes toward reducing health care costs, evidenced by a Chi-Square value of 173.4115 ($p < .0001$) and a Likelihood Ratio Chi-Square of 154.9023, both indicating highly significant relationships. The Mantel-Haenszel Chi-Square result of 29.9356 ($p < .0001$) confirms this association even when controlling for confounding factors. Effect size measures, including a Phi Coefficient of 0.5625 and Cramer's V of 0.3978, suggest a moderate to strong relationship, while a warning about 22% of cells having expected counts less than 5 indicates potential validity issues for the Chi-Square results. However, Fisher's Exact Test ($p < .0001$) confirms the significance of the association, making it a reliable alternative. These findings suggest that group affiliation significantly influences perceptions of health care cost reduction, guiding targeted discussions and interventions based on these perspectives.

4.2.4. Will Not Pass Information by Each Age Group

The "Will Not Pass Information" variable analysis yielded an overall p-value of 0.149, indicating no significant relationship across age groups. Specifically, comparisons show no significant differences between the 18-24 and 25-34 age groups ($p = 0.14$) and between the 25-34 and 35-44 groups ($p = 0.11$). A borderline significant difference was observed between the 18-24 and 35-44 age groups ($p = 0.09$), with the 35-44 group

more likely to report not passing information. There were also no significant differences between the 35-44 and 45-54 groups ($p = 0.21$). In the 18-24 age group, both Church (44.44% neutral) and Student (86.67% neutral) respondents displayed uncertainty, while the student group in the 25-34 age category showed significant agreement (57.53%) regarding the passing of important health information. Overall, younger respondents, especially those in the student group, expressed uncertainty about transmitting vital health information.

4.2.5. Trust in Data by Each Age Group

The analysis of trust in data across age groups showed an overall p -value of 0.1353, indicating no statistically significant relationship. However, significant differences were found between the 18-24 and 35-44 age groups ($p = 0.04$) and between the 18-24 and 45-54 age groups ($p = 0.02$), with the younger group expressing higher trust in data. There were no significant differences between the 18-24 and 25-34 groups ($p = 0.12$), or between the 25-34 and 35-44 groups ($p = 0.19$), and the 35-44 and 45-54 groups ($p = 0.16$). Trust in health-related data was notably high in the 18-24 age group, particularly among students (90.20%) compared to the church group (55.56%). Trust levels remained high in the 25-34 age group, especially among students. Overall, the findings suggest a potential gap in trust between community groups, with students in the younger age category exhibiting significantly higher trust in health data.

4.2.6. Reliable Information by Each Age Group

The analysis of the "Reliable Information" variable indicated an overall p -value of 0.3161, suggesting no significant differences between age groups. Specifically, comparisons between the 18-24 and 25-34 groups yielded a p -value of 0.21 (not significant), while the 18-24 group showed borderline significance in trusting the reliability of information compared to the 35-44 ($p = 0.08$) and 45-54 ($p = 0.07$) groups. There were no significant differences between the 25-34 and 35-44 groups ($p = 0.12$), or between the 35-44 and 45-54 groups ($p = 0.18$). Notably, within the 18-24 age group, Student respondents demonstrated a greater trust in the reliability of health information than those from the Church group, a trend that continued into the 25-34 age group. Overall, students in both age groups consistently exhibited higher trust in health information reliability than their church counterparts.

In Summary, the summary of significant differences within age groups reveals key findings regarding chronic conditions, healthcare improvement, and trust in data. For chronic conditions, significant differences were found between the 18-24 and 35-44 age groups ($p = 0.015$) and between 18-24 and 45-54 ($p = 0.002$), indicating that older individuals report more relevance in chronic conditions. In terms of healthcare improvement, younger groups (18-24) are more supportive compared to the 35-44 ($p = 0.02$) and 45-54 age groups ($p = 0.003$). Additionally, the 18-24 group shows higher trust in

data than the 35-44 ($p = 0.04$) and 45-54 groups ($p = 0.02$). Other variables, such as Share Family Information, Will Not Pass Information, and Reliable Information, did not show significant differences ($p > 0.05$).

Key findings also indicate a predominance of Black/African American individuals in the dataset, with younger individuals in the Church group reporting higher on the use of wearables for chronic conditions than students, suggesting a need for targeted health interventions on the usage of wearables. Students are generally more trusting of data and willing to share health information, highlighting barriers in some community groups. Overall, there is strong consensus on the impact of wearables for healthcare improvement across all groups.

Fisher's Exact Test was utilized to confirm significance in cases with low expected cell counts, ensuring the reliability of findings. The analyses underscore significant associations between group membership (Church vs. Student) and health-related opinions, with implications for targeted health interventions and policy decisions based on diverse perspectives across age and community groups.

5. Limitations

Insufficient Sample Size: The analysis was based on fewer than 500 respondents, which may not provide a fully representative view of the population and could limit the generalizability of the findings. The respondents' genders varied widely by group. For example, 73% of the respondents in the church group were female, while 70% of respondents in the student group were male.

Though Churches in the African American communities in Mississippi have a great influence, and the greater majority of the population is part of the Church community, further research might be needed to include Mississippians from all walks of life.

6. Conclusions

This study aims to inform targeted health interventions and policy decisions by incorporating diverse perspectives across various age and community groups. The analyses have uncovered significant associations between group membership (Church vs. Student) and opinions on various health-related statements. Initial frequency distributions provided a foundational understanding of the data, while chi-square tests revealed notable differences between groups. Fisher's Exact Test was crucial in validating these findings, particularly when cell counts were low, thus ensuring the robustness and reliability of the results.

Wearables can enhance proactive health behaviours by providing real-time feedback and increasing personal health awareness. However, the high cost of wearable fitness devices presents a significant barrier for many individuals, particularly those in underserved communities. Even for those who under-

stand the benefits of proactive health management, the price of these devices can limit their accessibility, hindering their ability to leverage the advantages of wearable technology.

To address the challenges of wearable health technology adoption, policymakers, community leaders, healthcare professionals, and researchers must work together to raise awareness, subsidize devices, and ensure affordability for underserved populations. Strategies to improve equity include providing financial assistance, partnering with trusted community organizations for education and distribution, making wearables affordable and user-friendly, and conducting research to guide policies that ensure equitable access across diverse communities. These efforts can bridge the gap between wearable technology's potential and accessibility, promoting health equity and community wellness.

These insights should guide the development of tailored health interventions and policies that consider the distinct perspectives of different community segments. By addressing the specific needs and opinions identified, policymakers and health practitioners can better target their efforts and improve overall health outcomes.

7. Recommendations and Strategies

Effective implementation of healthcare wearables in marginalized communities requires addressing key factors outlined by the Health Belief Model and Technology Acceptance Model (TAM), particularly perceived usefulness, ease of use, and trust in technology. Community-based participatory research (CBPR) and partnerships with trusted local institutions, such as churches and clinics, support culturally tailored education and engagement strategies (Veinot et al., 2018). When wearables are integrated with telehealth services and community health worker (CHW) programs, they become more accessible and affordable, enhancing individual empowerment and system-level equity (Pratap et al., 2020). These integrated approaches are critical to bridging the digital divide and fostering sustained use in underserved populations.

Designing equitable wearable health solutions begins with inclusive, community-centered development. Involving community members in the design and implementation process ensures the resulting technologies are relevant, user-friendly, and trusted. [46, 47]. Tailoring wearable interventions to reflect cultural norms, languages, and health beliefs, such as personalized diet or physical activity messages, enhances user engagement and effectiveness [48]. Adaptive algorithms and multilingual interfaces further address communication barriers and support long-term use, especially when interventions align with the lived experiences of diverse users [49].

Reducing structural and technological barriers is essential to widespread adoption and impact. Many low-income and minority communities face challenges like limited digital literacy and inadequate access to health technologies. Programs that bundle wearables with digital literacy training and subsidized distribution through community health centers can

improve access and health outcomes [50]. Integrating wearable data into CHW workflows allows for localized, trusted care and timely interventions, particularly for chronic diseases. To build lasting trust, transparent privacy policies and consent protocols are vital alongside policy reforms promoting insurance coverage and broadband access [51, 52]. Longitudinal studies guided by implementation science frameworks are necessary to measure progress and refine strategies for advancing health equity through wearable technology [53, 54].

Abbreviations

CDC	Centers for Disease Control and Prevention
CVD	Cardiovascular Disease
HCW	Healthcare Wearables
I MI	Inferior Myocardial Infarction
PPG	Photoplethysmography
SAS	Statistical Analysis System
PHI	Personal Health Information

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Conflicts of Interest

The authors declare no conflicts of interest.

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