



Improving Accessibility and Delivery of Healthcare Services to Underserved Children through Technology: A Comprehensive Approach of Literature Review

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Abstract: This study investigates the use of technology to improve healthcare accessibility and delivery for children in underprivileged communities through article review comprehensively. A literature review with qualitative method that involved four distinct steps. In the initial stage, the search was conducted using Google Scholar (GS) and Scopus website. The second stage was filtering, which entails selecting the journals that will be examined. The last stage was analysis the articles, this analysis uses a 4-step PRISMA process to identify 123 articles published from 2019 to 2024 in Scopus journal. The review was evaluated the efficacy of telemedicine, mobile health applications, and wearable devices in monitoring and addressing children's health, while considering genetic predispositions and underlying medical issues that influence growth patterns. The research emphasizes the importance of a comprehensive strategy in evaluating child growth and development, utilizing health data to tailor interventions. Online systems, such as mobile phones and PDAs, can support healthcare workers in underserved rural areas. The integration of technology is essential for addressing unique challenges in underserved areas and ensuring access to high-quality healthcare services for all children. Current monitoring methods include regular check-ups, growth charts, and developmental screenings, with advancements in technology providing new tools like mobile health apps and wearable devices. Involving various stakeholders in the evaluation process is crucial, with participatory research focusing on community empowerment, ownership, and capacity building. Online systems offer efficient and accessible ways to track health data but may come with privacy concerns and data breach risks. The study focuses on the effectiveness of online systems for monitoring child health indicators, discussing data collection methods, sampling strategies, and ethical considerations. Findings reveal the need to address areas such as limited social interaction and incorporate interactive activities and group projects into online curriculum. Understanding the impact of online learning on students' health and well-being is crucial for tailoring approaches to ensure comprehensive support. The research findings have significant implications for child health policy and practice, emphasizing the importance of social connection and mental well-being in online learning environments.

Keywords: Mobile Health Application; Child Growth Patterns; Healthcare Accessibility; Underserved Communities; Online Monitoring Systems.

Introduction

Implementing timely and proactive measures is essential for mitigating the consequences of future health problems, particularly in the realm of mental

health among young individuals. Implementing multidisciplinary and trans-diagnostic models of care can help detect and treat mental disorders early, leading to better long-term outcomes and potentially reducing healthcare costs (Colizzi et al., 2020). For instance, if a

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child continually falls below the expected weight and height percentiles, it may suggest a possible problem with nutrition or growth hormone levels. Through early identification and resolution of these difficulties, healthcare providers can proactively prevent enduring health complications and guarantee the child's optimal development. This data can also be utilized to create specific interventions, such as nutritional assistance programs or educational campaigns, aimed at enhancing the overall health outcomes of children in the neighborhood (Roddy et al., 2017). Nevertheless, it is crucial to take into account the possibility of other elements influencing a child's growth patterns, such as genetic predispositions or underlying medical issues. For example, a child who repeatedly falls below the predicted weight and height percentiles may genuinely be in good health but have a smaller physique due to their genetic makeup. Implementing therapies that merely target diet or growth hormone levels in this scenario may be superfluous and potentially detrimental to the child's overall health and welfare.

Healthcare practitioners and caregivers must adopt a comprehensive strategy when evaluating a child's growth and development. This entails taking into account all the variables that may be impacting their growth patterns, rather than solely concentrating on one element. By considering genetic predispositions and probable underlying medical issues, interventions can be customized to address the specific requirements of each child, resulting in enhanced and individualized care. In conclusion, this method can effectively guarantee that children acquire the necessary assistance for their own advancement and progress, thereby enhancing their general welfare and health results. Utilizing online systems to track and monitor child health progress is crucial for improving outcomes. Mobile health (mHealth) approaches have been implemented in various countries, such as Mozambique and Uganda, using mobile phone networks and low-cost PDAs for data dissemination and collection. These systems have shown improvements in data quality and stock monitoring at health facilities. Projects like SMS for Life in Tanzania have successfully reduced medicine stock-out rates using electronic mapping technology.

However, the sustainability of mHealth programs relies on national health care program incorporation, which is lacking in many African countries. The use of mobile technologies, such as mobile phones and PDAs, can support health care workers in underserved rural areas where community health workers deliver care to sick children (Källander et al., 2013). By analyzing trends and patterns in their health data, interventions can be tailored to address any potential issues early on. Additionally, online systems can also facilitate communication and collaboration among healthcare

providers, ensuring that all relevant information is shared and coordinated effectively. Overall, the use of online systems can play a crucial role in improving child health outcomes and promoting overall well-being in underserved rural areas (Y. Wang et al., 2018). By utilizing technology to monitor and analyze health data, healthcare workers can target their efforts more effectively and provide timely interventions. With improved communication and coordination through online systems, the quality of care for sick children can be greatly enhanced, leading to better health outcomes and overall well-being in these communities. The integration of technology in healthcare delivery is essential for addressing the unique challenges faced in underserved areas and ensuring that all children have access to the care they need, regardless of their location.

This innovative approach can help bridge the gap in healthcare disparities and improve health equity for children living in rural areas. By utilizing telemedicine and virtual consultations, healthcare providers can reach children in remote areas who may not have easy access to a local clinic or hospital. Additionally, the use of mobile health apps and wearable devices can help track and monitor a child's health status, allowing for early intervention and prevention of potential health issues. Overall, the integration of technology in healthcare delivery has the potential to revolutionize the way healthcare is delivered to underserved communities, ultimately improving the health outcomes and well-being of children in these areas (Colizzi et al., 2020; Roddy et al., 2017; L. Wang et al., 2017).

The objective of this research paper is to investigate the diverse methods by which technology can be employed to enhance the accessibility and delivery of healthcare services to children in underprivileged communities. Our objective is to determine the most promising strategies for improving healthcare outcomes in these populations by evaluating the efficacy of telemedicine, mobile health applications, and wearable devices in monitoring and addressing the health of children. We endeavor to offer healthcare providers, policymakers, and other stakeholders insights and recommendations for utilizing technology to address the distinctive challenges encountered by underserved children in accessing quality healthcare services by conducting a thorough examination of existing literature and case studies. Our objective is to illuminate the potential of technology to address the healthcare disparities that affect underprivileged children through our research. We intend to emphasize innovative solutions and best practices that can be implemented on a larger scale by examining the data and outcomes from a variety of technological interventions. In the final analysis, our objective is to provide healthcare stakeholders with the necessary knowledge and

resources to guarantee that all children, irrespective of their origin or circumstances, have access to the high-quality healthcare services

Method

This systematic review focuses on the most recent research of the year (2019–2024) in using Digital Technologies in academic institutions. The study adopts a rigorous systematic review protocol that follows the PRISMA process. This process has the following steps: (1) Identification of relevant literature related to the study, (2) Screening using criteria determined by the authors, (3) Classification of articles filtered methodically using themes that have been determined by the authors, and (4) Determining articles to be included in analysis.

1. Identification

The Google Scholar and Scopus database is used to conduct literature searches due to its comprehensive coverage of journals.

2. Filtering

In this phase, the literature identified from the Google Scholar database search is filtered by the following criteria: (1) published in 2019 – 2024, (2) written in English, (3) in the form of reputable journal articles, proceedings articles, books, dissertations and (4) relevant to the topic analyzed. The relevance of the meaning is determined by examining the title, abstract, results, and method. Any article that does not meet these screening criteria is excluded from the analysis.

3. Classification

The articles identified and researched are in the discipline of health science; Therefore, these articles are then classified. Initially, the classification process allocated journal article codes related to the discipline of article research.

4. Thematic Analysis (AT)

Following the classification of the included journal articles, further insights and trends in the articles are determined by thematic analysis. This process is consistent with the thematic analysis (AT) method that identifies and analyzes patterns of meaning (themes) in qualitative data (Borowiec et al., 2021; Tang et al., 2023). This method can be applied in a variety of theoretical frameworks and can be used to analyze almost any form of qualitative data, to answer different types of research questions. The AT used in this review involves themes (Guyon et al., 2016; Siswati et al., 2023).

To produce the trends identified in the literature, the six-phase Braun and Clarke method is used as follows:

- (1) Introduction with data: Selected articles are read to understand if they fit the topic discussed.

- (2) Coding: Creating code relevant to the topic. This encoding is not just a method of data reduction; This is an analytical process.
- (3) Finding themes: Themes are coherent and meaningful patterns in the article being reviewed that are relevant to the topic of the article. This analysis constructs eight themes relevant to learning
- (4) Reviewing themes: This step involves reflecting on a theme to tell a story, defining the nature of the theme, and identifying relationships between themes and different sub-themes within a theme.
- (5) Defining and naming themes: This step involves defining each theme and building information for each theme.
- (6) Writing: Write a coherent and persuasive article about the article being reviewed.

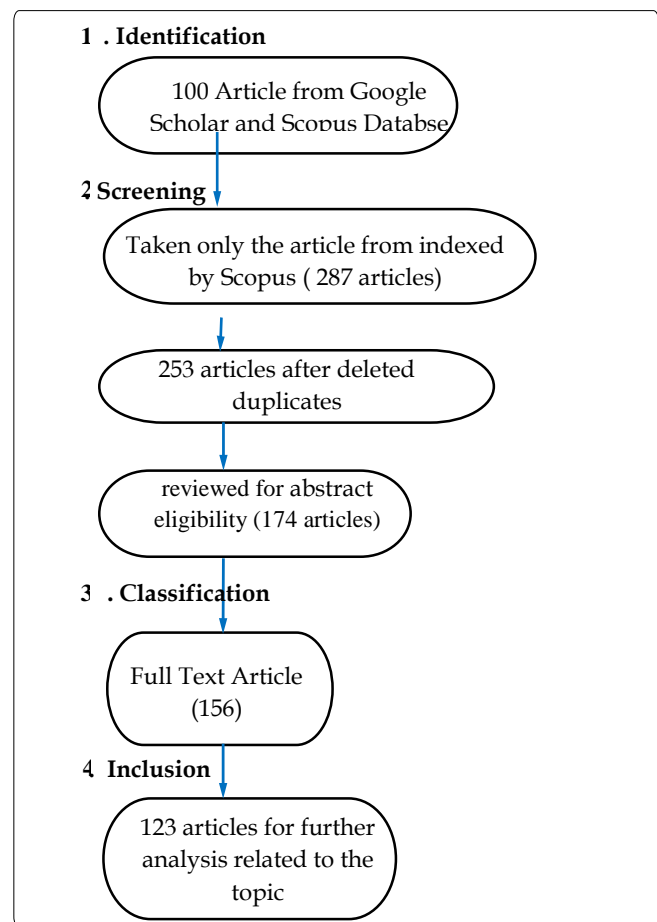


Figure 1. Flow of Article Review Process

Result and Discussion

Revealed several key findings regarding the effectiveness of online learning for children. While some students reported feeling more engaged and motivated when using online platforms, others preferred traditional classroom settings. Students favored face-to-face instruction over Zoom sessions, with many

indicating a preference to return to in-person classes post-COVID-19 lockdown. The use of Zoom was found to offer flexibility and convenience, but student participation was noted to be low at times. Additionally, a study on the effectiveness of Zoom in foundation engineering units showed increased student satisfaction and reduced instructor workload. Overall, the impact of COVID-19 on learning has highlighted varying levels of engagement in online courses (Oraif & Elyas, 2021). Hands-on learning activities offer opportunities for active participation and concrete learning experiences which support the learning styles of early adolescents. The enthusiasm for lab days in classrooms has a positive effect on students' attitudes towards science. Using textbooks in conjunction with hands-on learning approaches provides a successful learning environment (Haury & Rillero, 1994).

These results suggest that while online learning can offer many benefits, there are still areas that need to be addressed in order to provide a well-rounded educational experience for all students. For example, incorporating more interactive activities and group projects into online curriculum could help address the issue of limited social interaction. Additionally, "Incorporating hands-on learning experiences, such as virtual labs or simulations, can help bridge the gap between online and traditional learning by providing students with interactive and engaging educational tools (Corter et al., 2007) By addressing these concerns and continuing to improve online learning platforms, educators can ensure that students receive a comprehensive and engaging educational experience no matter where they are learning from.

To assess the impact of online learning on child health outcomes, it is important to consider factors such as the amount of time spent on distance learning, the level of enjoyment and motivation experienced by the child, and the presence of physical or mental reactions to online learning. Additionally, understanding how changes in daily routines and lack of predictability affect a child's mental and social-emotional health is crucial. Future research should also focus on strategies to keep students engaged and motivated during online learning, especially vulnerable groups like English language learners and students with learning disabilities (Hamzeh, 2021). Studies could analyze factors such as sleep patterns, physical activity levels, stress levels, and overall emotional well-being to determine if there are any significant associations between them (Park, 2014). Studies could analyze factors such as sleep patterns, physical activity levels, stress levels, and overall emotional well-being to determine if there are any significant associations between them (Park, 2014)

This information could then be used to make informed decisions about the implementation of online

learning programs in schools. By understanding the impact of online learning on students' health and well-being, educators can tailor their approach to ensure that students are receiving the support they need to thrive academically and emotionally. Ultimately, this research has the potential to shape the future of education and ensure that students are able to succeed in a variety of learning environments. One significant finding from the research on online learning and child health outcomes is the potential for increased screen time to negatively impact students' mental and physical health. Studies have shown that excessive screen time can lead to issues such as eye strain, poor posture, and disrupted sleep patterns. Additionally, the lack of face-to-face interaction in online learning environments can contribute to feelings of isolation and "To ensure students receive a comprehensive and engaging education in online learning platforms, educators must focus on effective communication, technology, learning, and feedback strategies, as well as instructor presence and student engagement. It is crucial to address potential barriers like perceived isolation, poor motivation, and technical challenges to prevent increased attrition rates.

Providing comprehensive orientation services, course-specific resources, and technical support are vital for student success in intensive online learning environment. Instructors should assess student competencies and provide necessary resources before the course begins to bridge any gaps. Adequate technical scaffolding and ongoing technical support are essential to reduce delays and ensure student satisfaction with online courses loneliness among students. These findings highlight the importance of implementing strategies to promote healthy screen habits and social connections in online learning programs. For example, parents and educators can encourage students to take regular breaks from screens, practice good posture while using devices, and establish a bedtime routine that limits screen time before sleep. Additionally, incorporating group projects and virtual social activities into online learning can help students build relationships and combat feelings of isolation. However, it is important to note that not all students experience isolation and loneliness in online learning environments. "Some students may thrive in virtual settings and feel more connected to their peers through online interactions." (Vu & Fadde, 2013)

Additionally, not all screen time is detrimental to mental health, as some students may find solace and comfort in using technology for socialization and learning purposes. "Educators should be mindful of the individual needs and preferences of their students when designing online learning experiences to enhance learners' confidence and self-efficacy in both learning

and teaching online. Providing ongoing opportunities for interaction with content, exploring technology tools, and allowing for self-paced learning can benefit teachers and teacher educators in integrating online components in courses for differentiation. Choices in class engagement and participation in various online formats can enrich the classroom environment and maximize teaching and learning opportunities (He, 2014). By offering a "By focusing on interactions in virtual worlds and physical classrooms, instructors can enhance learner engagement. Hybrid virtual learning models emphasize the importance of interactions in both environments to promote engagement (Cavinato et al., 2021; Christopoulos et al., 2018). Ultimately, "Fostering a sense of community in online learning can contribute to overall student well-being and academic success. Successful strategies include intentional course design, clear expectations, and supportive online environments.

The research findings discussed in this paper have significant implications for child health policy and practice. By highlighting the importance of social connection and mental well-being in online learning environments, educators and policymakers can prioritize the development of strategies and resources that support student well-being "While there is a lack of research-driven policy or infrastructure for educators to be trained and supported in creating an ideal virtual learning environment (VLE) for students' needs, it is important to consider implementing guidelines for virtual classroom engagement and providing training for educators on creating inclusive online spaces. Investing in mental health support for both students and educators is crucial for overall well-being (Aithal & Aithal, 2023; Caprara & Caprara, 2022).

This may include "To implement guidelines for virtual classroom engagement, provide training for educators on creating inclusive online spaces, and invest in mental health, institutions can consider investing in robust mental health services on campus, providing faculty and staff training on recognizing and addressing emotional issues in students, establishing student peer support networks, integrating mental health education into the curriculum, and creating accessible wellness programs. These strategies can help create a supportive and nurturing environment for students, faculty, and staff (Aithal & Aithal, 2023; Caprara & Caprara, 2022). Additionally, the findings suggest that a focus on community-building and belonging in online learning can have long-term benefits for student academic success and overall well-being. By incorporating these insights into child health policy and practice, stakeholders can work towards creating a more supportive and inclusive educational environment for all students. For example, a school district could establish virtual classroom norms that promote active

participation and foster a sense of belonging among students. Educators could also undergo training on how to address mental health concerns in a virtual setting and provide resources for students in need of support. By prioritizing community-building activities, such as virtual clubs or peer support groups, schools can help students feel more connected and engaged, leading to improved academic outcomes and overall well-being (Greenhalgh et al., 2017; Park, 2014).

However, despite these efforts, there may still be challenges in creating an inclusive environment for all students. For instance, if students do not have access to reliable internet or technology, they may be excluded from participating in virtual activities and feel isolated from their peers "To prevent students from feeling excluded due to lack of access to reliable internet or technology, it is important to increase opportunities for interaction, especially among under-represented racial groups in STEM. Synchronous peer-peer and student-faculty interactions can help students navigate feelings of isolation and lack of belonging. Incentivizing student-student interaction in asynchronous courses can also enhance cognitive and affective engagement. Blended learning, which combines face-to-face and online experiences, can help reinforce feelings of community belonging and improve collaboration (Ferri et al., 2020; Thacker et al., 2022). Additionally, some students may struggle with mental health issues that require more intensive support than what can be provided through virtual resources alone. It is crucial for schools to address these challenges and ensure that all students have access to the necessary resources and support to feel included and supported (Ekeland et al., 2010; Triantafyllidis & Tsanas, 2019).

Providing technology and internet access to students in need, as well as offering additional mental health services, such as a virtual mental health clinic for university students, can be beneficial. Participants in a study viewed the concept of a virtual clinic favorably as an additional option for mental health services, particularly suitable for students reluctant to access other services due to stigma. They expressed a desire for human support, centralized information, access to professionals, and peer-to-peer support in a virtual clinic (Farrer et al., 2015; Mustafa et al., 2020). By actively working to create a more inclusive environment, schools can help all students thrive and succeed academically and emotionally. It is important for educators and administrators to continuously assess and address the needs of all students to foster a sense of belonging and support within the school community include the reliance on self-reported data from students, which may not always accurately reflect their true experiences (Cargo & Mercer, 2008; Jolley, 2014; Shediak-Rizkallah & Bone, 1998)

Additionally, the study may not have accounted for all potential factors that could impact students' sense of inclusion and support. Future research could benefit from incorporating more objective measures and considering a wider range of variables that may influence students' well-being in the school environment. Overall, while the findings provide valuable insights, it is important to acknowledge the limitations of the study in order to interpret the results accurately. By addressing these limitations, future research can build upon the foundation laid by this study and provide a more comprehensive understanding of the factors that contribute to students' sense of inclusion and support in schools. This will ultimately lead to more effective interventions and strategies for promoting student well-being and academic success. Ultimately, acknowledging and addressing these limitations is crucial in order to ensure the validity and reliability of research findings in the field of education (Aranda-Jan et al., 2014; Faruk et al., 2020; L. Wang et al., 2017).

include conducting longitudinal studies to track changes in students' sense of inclusion over time, exploring the impact of specific interventions on student outcomes, and examining the role of school climate and culture in fostering a sense of belonging. Additionally, researchers could investigate the intersectionality of identity markers such as race, gender, and socioeconomic status in shaping students' experiences of inclusion in schools. By expanding the scope of research in this area, scholars can gain a more nuanced understanding of the complex factors that influence students' well-being and academic success (Gmmash & Faquih, 2022). This deeper understanding can inform the development of more targeted interventions and policies to create more inclusive school environments. By considering how different aspects of students' identities intersect and influence their sense of belonging, educators and policymakers can work towards creating more equitable and supportive learning environments for all students. Ultimately, this research can lead to more effective strategies for promoting student well-being and academic achievement across diverse populations (Sices, 2007; Towle et al., 1999; Varshney, 2007)

Conclusion

Online systems play a crucial role in improving child health growth by providing access to essential resources and information. By ensuring that technology is user-friendly and accessible to all families, we can bridge the gap in healthcare disparities and ensure that every child has the opportunity to thrive. Additionally, prioritizing data security measures will give parents the

assurance that their children's information is protected. Overall, by addressing these key factors, we can create a more equitable healthcare system that benefits all children, regardless of their circumstances. This will ultimately lead to better health outcomes for children across the board, regardless of their socioeconomic status or geographical location. With the right technology and support in place, we can empower families to make informed decisions about their children's health and well-being. By investing in and prioritizing these initiatives, we can work towards a future where every child has the opportunity to live a healthy and fulfilling life.

One recommendation for implementing online systems in child health monitoring is to ensure that the technology is user-friendly and accessible to all families, regardless of their socioeconomic status or level of technological literacy. This can help to bridge the digital divide and ensure that all children have equal access to important health information and resources. Additionally, it is important to prioritize data security and privacy measures to protect sensitive information about children's health. By following these recommendations, online systems can effectively support child health monitoring and contribute to better health outcomes for all children. By making sure that the technology is easy to use and available to families of all backgrounds, we can ensure that no child is left behind when it comes to accessing crucial health resources. Implementing strong data security measures will also give parents peace of mind knowing that their children's information is safe. Ultimately, by addressing these key factors, we can create a more equitable healthcare system that benefits all children, regardless of their circumstances.

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The author declares no conflict of interest

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