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A Conceptual Model for Strengthening Public Health Infrastructure in U.S. Underserved Counties Through Mobile Health Units

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ABSTRACT

Underserved counties in the United States continue to face persistent disparities in healthcare access, outcomes, and infrastructure. These areas, often characterized by rurality, high poverty rates, and provider shortages, experience preventable health crises due to limited public health resources. This paper proposes a conceptual model for strengthening public health infrastructure in underserved U.S. counties through the strategic deployment of Mobile Health Units (MHUs). The model integrates mobile health technology, community-based workforce development, and data-driven service delivery to bridge geographic and systemic gaps in healthcare provision. Drawing on best practices from federal rural health initiatives, public-private partnerships, and community health programs, the proposed model is anchored on four pillars: (1) Accessibility and Reach, deploying MHUs equipped with diagnostics, telehealth tools, and preventive care services to medically isolated areas; (2)

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Community Integration, involving local stakeholders in the planning, staffing, and cultural adaptation of mobile services; (3) Digital Health Infrastructure, utilizing real-time data systems for health surveillance, referral coordination, and outcome tracking; and (4) Sustainability and Scalability, aligning with Medicaid reimbursement strategies, nonprofit partnerships, and federal grants to ensure long-term operation.
Case studies from Appalachia, the Mississippi Delta, and Native American reservations demonstrate the effectiveness of MHUs in increasing immunization rates, chronic disease screening, maternal health access, and pandemic response. The conceptual model emphasizes a hub-and-spoke approach, where MHUs act as mobile extensions of local health departments or Federally Qualified Health Centers (FQHCs), thus reinforcing rather than replacing existing health structures. The model also identifies barriers such as workforce shortages, broadband limitations, and regulatory complexities, proposing mitigation strategies including remote training, mobile-enabled EHRs, and policy advocacy. Ultimately, the model offers a flexible, replicable blueprint to strengthen public health resilience and equity in high-need U.S. counties.

Keywords: Mobile Health Units, Underserved Counties, Public Health Infrastructure, Rural Healthcare, Health Equity, Digital Health, Fqhcs, Health Disparities, Community Health Outreach, Preventive Care Access.

1. INTRODUCTION

Public health disparities in underserved counties across the United States present a pressing challenge, particularly in rural and marginalized areas where access to healthcare services is severely limited. These disparities are often influenced by a complex interplay of socio-economic factors, geographic isolation, and systemic inequities in healthcare delivery systems (Martin-Howard et al., 2021; (Martin-Howard & Farmbry, 2020). Rural settings, which encompass nearly 19% of the U.S. Population commonly face shortages of healthcare facilities and professionals, compelling many residents to travel considerable distances to obtain basic care (Martin-Howard & Farmbry, 2020). Approximately 63 million people in the U.S. live in counties designated as Health Professional Shortage Areas, further aggravating access to necessary health services, particularly during emergencies or essential preventive care periods (Martin-Howard et al., 2021).

Empirical evidence indicates that rural populations suffer disproportionately from higher mortality rates attributed to chronic diseases like heart disease, diabetes, and stroke compared to their urban counterparts (Martin-Howard & Farmbry, 2020). These health outcomes are exacerbated in economically disadvantaged and racially marginalized communities that frequently encounter barriers such as inadequate insurance coverage, underutilization of preventive services, and lack of health education (Martin-Howard et al., 2021; Martin-Howard & Farmbry, 2020). For instance, the COVID-19 pandemic intensified these inequities, spotlighting the difficulties faced by rural populations in accessing testing and vaccination services, which were vital during the peak periods of the pandemic (Martin-Howard et al., 2021; Martin-Howard & Farmbry, 2020). In fact, the visibility of these disparities has made clear that systemic solutions are critical in elevating the health quality among these communities.

Mobile Health Units (MHUs) are emerging as a strategic response to these access challenges. These units are essentially mobile clinics that can deliver a diverse array of health services, including vaccinations, screenings, and preventive care directly to underserved populations, ultimately aiming to dismantle established barriers (Martin-Howard & Farmbry, 2020: Cheney et al., 2024). The capability of MHUs to directly address healthcare needs in rural and economically disadvantaged urban areas represents a pivotal approach to bridging the healthcare access gap. They can effectively provide culturally competent care while simultaneously minimizing obstacles like distance, limited healthcare infrastructure, and workforce shortages (Martin-Howard & Farmbry, 2020: Cheney et al., 2024).

Furthermore, integrating technology and telemedicine services into these units can enhance reach and effectiveness, particularly in communities grappling with technological limitations and Internet access issues (Cheney et al., 2024).

Establishing a comprehensive conceptual framework for the expanded utilization of MHUs could significantly bolster public health infrastructure in America's underserved counties. This model would not only address immediate healthcare access issues but would also incorporate long-term strategies for community engagement, workforce development, and sustainable funding mechanisms to ensure the longevity and adaptability of MHU programs (Martin-Howard & Farmbry, 2020). The strategic facilitation of improved access to care via Mobile Health Units stands to play a critical role in enhancing health outcomes and reducing health disparities across these underprivileged communities.

2. LITERATURE REVIEW

Mobile health initiatives in the U.S. have emerged as a key strategy to address the persistent and often overwhelming healthcare access gaps in underserved counties, especially in rural and marginalized communities. These initiatives leverage mobile units, such as vans or buses, equipped with medical equipment, to provide a broad range of healthcare services directly to communities (Tomassoni et al., 2012, Tomassoni et al., 2013, Ugwu et al., 2024, Zouo & Olamijuwon, 2024). The goal is to reduce barriers to healthcare access, including long distances to healthcare facilities, lack of transportation, and shortages of healthcare providers in these regions. Mobile Health Units (MHUs) have become integral to expanding healthcare access, particularly in regions where the establishment of traditional healthcare infrastructure may not be feasible or cost-effective. These initiatives not only provide essential services but also contribute to improving health outcomes by increasing the availability of preventive care, early screenings, and urgent care in areas that might otherwise be underserved. Figure 1 shows a conceptual framework of access to healthcare by Cyr et al., 2019.

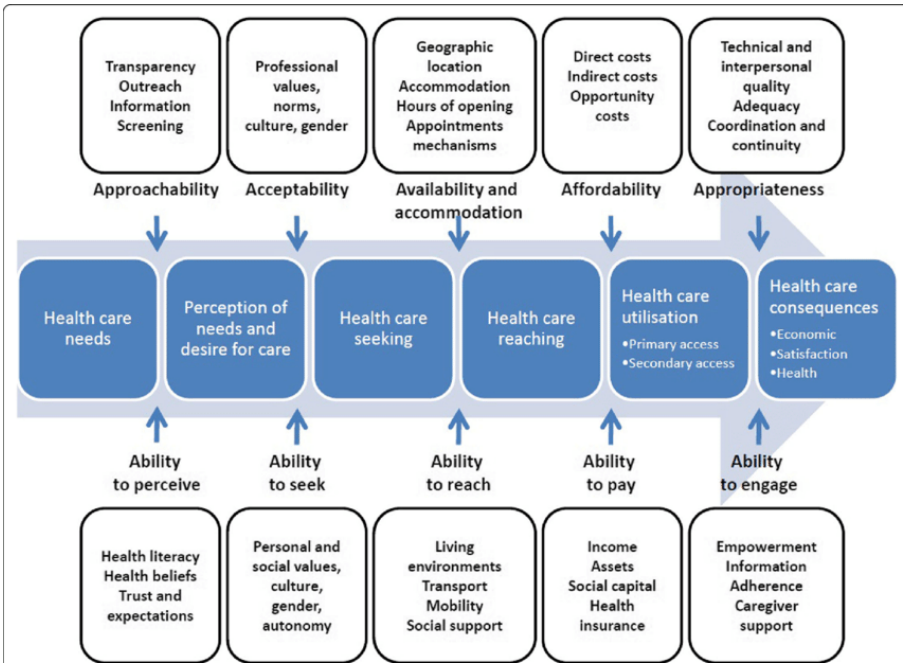

Figure 1. A conceptual framework of access to healthcare (Cyr, et al., 2019).

Across the U.S., numerous mobile health initiatives have been implemented by various organizations, including federal, state, and local governments, as well as nonprofit and private sector partners. For example, the U.S. Department of Health and Human Services (HHS) has supported mobile health units through programs aimed at addressing health disparities and improving access to healthcare in rural and urban underserved areas. Additionally, several private health organizations and nonprofits have launched their own MHU programs, often focusing on specific populations or health issues, such as maternal and child health, mental health, and chronic disease management (Adelodun & Anyanwu, 2024, Chigboh, Zouo & Olamijuwon, 2024, Nwankwo et al., 2024). These mobile units have demonstrated success in increasing access to care, particularly in hard-to-reach areas where individuals might otherwise not receive the care they need.

While mobile health units have proven successful in many cases, there are limitations to their widespread implementation and sustainability. One of the primary challenges of MHU programs is funding. Many MHU initiatives are funded through grants or donations, and as such, they often face financial uncertainty. The need for ongoing operational costs, such as staffing, maintenance, and medical supplies, can strain resources (Ayo-Farai et al., 2023, Chianumba et al., 2023, Nnagha et al., 2023). In addition, while mobile health units can offer services such as screenings, immunizations, and basic medical care, their ability to provide comprehensive care may be limited compared to brick-and-mortar healthcare facilities. The lack of continuity in care, due to the mobile nature of these units, can result in fragmented healthcare experiences for patients, particularly for those with chronic conditions who require long-term, consistent care (Okon, Zouo, & Sobowale, 2024, Olamijuwon et al., 2024, Olorunsogo et al., 2024). Furthermore, depending on the region and local infrastructure, the capacity for telemedicine or the availability of specialists via mobile units may be limited, which restricts the scope of services that can be offered.

Mobile health units also face challenges related to local community engagement and cultural sensitivity. While these units provide critical healthcare access, there is a need to ensure that they are designed to be culturally relevant and responsive to the specific needs of the communities they serve. This means that MHU programs must be developed with input from local residents and healthcare providers, ensuring that services meet the unique health needs, preferences, and traditions of different populations (Akerele, et al., 2024, Edoh et al., 2024, Ikese, et al., 2024, Olowe et al., 2024). In some areas, cultural barriers may exist that prevent certain groups from utilizing mobile health services, particularly if there is mistrust of external health interventions or if the healthcare services do not align with the community's values or health practices. Overcoming these barriers requires sustained outreach, relationship-building, and education within the communities served by MHU programs (Adigun, et al., 2024, Folorunso et al., 2024, Kelvin-Agwu et al., 2024). The Public Health Infrastructure and Our Nation's Health figure presented by Baker Jr, et al., 2005, is shown in Figure 2.

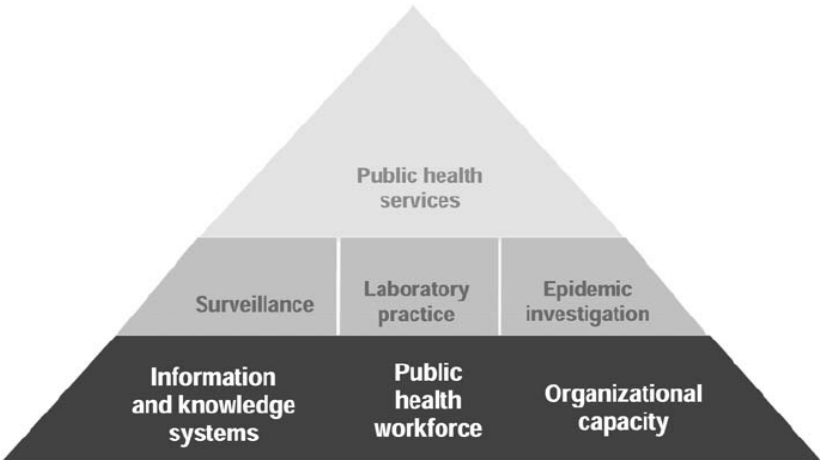

Figure 2. The Public Health Infrastructure and Our Nation's Health (Baker Jr, et al., 2005).

Another significant limitation of MHU programs is their reliance on physical infrastructure, which can be difficult to maintain, especially in rural or underserved areas where access to maintenance services, fuel, and supplies may be scarce. The mobile units themselves need to be equipped with up-to-date medical equipment and technology, requiring ongoing investment to ensure that they remain functional and effective. The logistical challenges of managing these mobile units, including scheduling, routing, and patient tracking, can also be complex, particularly when serving vast rural areas with scattered populations (Nwankwo, Tomassoni, & Tayebati, 2012, Olamijuwon, 2020, Tayebati et al., 2010).

Rural and underserved counties in the U.S. face significant health infrastructure challenges that mobile health units aim to address. These regions often experience a shortage of healthcare facilities, particularly specialized services, and a lack of healthcare professionals, such as primary care doctors, nurses, and specialists. According to the U.S. Department of Health and Human Services, over 60 million Americans live in areas with a shortage of primary care providers (Uwumiro, et al., 2024, Wada et al., 2025, Zouo & Olamijuwon, 2024). In many rural areas, the nearest healthcare facility may be hours away, making regular visits for essential care unfeasible for many individuals, particularly those with limited transportation options or those with disabilities (Abass, et al., 2024, Chianumba et al., 2024, Matthew, et al., 2024). These areas also tend to have older populations with higher rates of chronic diseases like diabetes, heart disease, and respiratory conditions, further compounding the need for accessible healthcare services. Huicho et al., 2010, presented in Figure 3, The conceptual framework for measuring efforts to increase access to health workers in underserved areas.

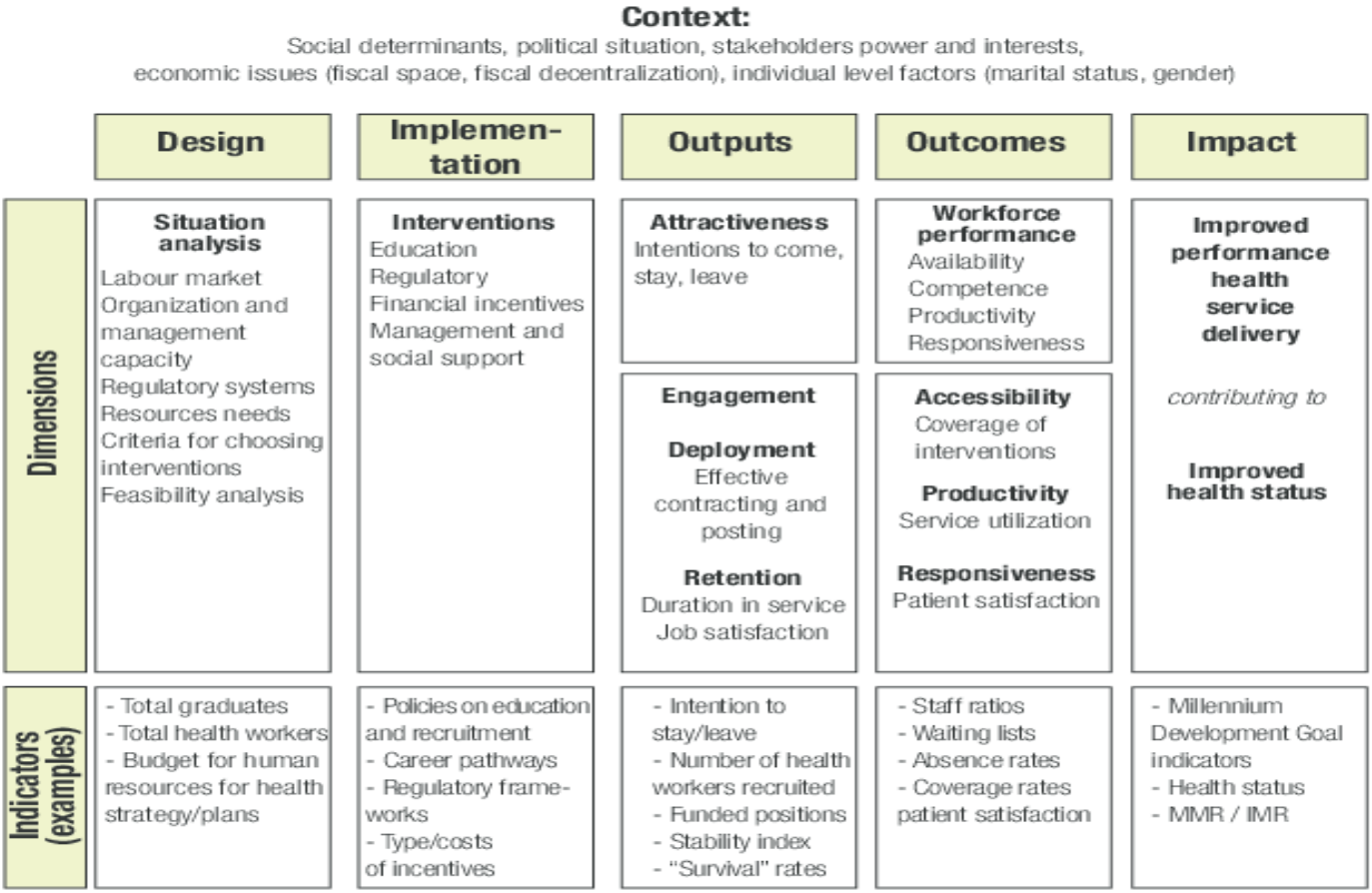

Figure 3. The conceptual framework for measuring efforts to increase access to health workers in underserved areas (Huicho, et al., 2010).

Additionally, these regions face socioeconomic challenges that affect healthcare access. Low-income communities, which are often located in rural or urban underserved areas, may have limited health insurance coverage or lack the financial resources to pay for out-of-pocket healthcare expenses. Even when healthcare services are available, these populations often face barriers such as high co-pays, transportation costs, and missed work time, which prevent them from accessing care (Alemede, et al., 2024, Chigboh, Zouo & Olamijuwon, 2024, Nwankwo et al., 2024). Mobile health units, by providing free or low-cost services directly to these communities, help mitigate many of these barriers, enabling individuals to receive screenings, vaccinations, and primary care without the financial and logistical hurdles of visiting a traditional healthcare facility.

The importance of mobile health units aligns with broader national health goals, such as the objectives set out in Healthy People 2030, Universal Health Coverage (UHC), and the programs supported by the Health Resources and Services Administration (HRSA). Healthy People 2030 aims to achieve health equity, eliminate disparities, and improve health and well-being for all Americans, particularly through the increased use of preventive services (Ayo-Farai, et al., 2023, Ezeamii et al., 2023, Katas et al., 2023). Mobile health units are well-positioned to contribute to these goals by increasing access to essential preventive care services, such as cancer screenings, immunizations, and health education, particularly in underserved communities (Madu et al., 2019, Matthew et al., 2021, Nwankwo et al., 2011, Tomassoni et al., 2013). By providing healthcare in hard-to-reach areas, MHUs directly address the disparities in health access that often contribute to poorer health outcomes in rural and marginalized populations.

UHC also emphasizes the importance of providing essential health services to all individuals, regardless of their ability to pay or where they live. Mobile health units can help support the U.S. effort to achieve UHC by offering affordable or free healthcare services to underserved populations who may otherwise lack access to care. Mobile health initiatives align with UHC's focus on achieving accessible and affordable healthcare for all, particularly in regions where traditional health systems are inadequate (Aderinwale, et al., 2025, Edwards et al., 2025, Opia et al., 2025).

The HRSA plays a vital role in supporting rural health programs and initiatives, including the deployment of mobile health units. HRSA's initiatives, such as the Rural Health Outreach and the Rural Health Care Services Grant programs, provide funding to enhance the quality and accessibility of healthcare services in rural and underserved counties. Mobile health units fit seamlessly into these programs, offering an innovative and flexible solution to the healthcare access challenges faced by rural communities (Balogun, et al., 2024, Edoh et al., 2024, Ikese, et al., 2024, Olowe et al., 2024). HRSA's support of mobile health initiatives helps bridge the gap between national health objectives and the needs of rural populations, ensuring that healthcare is available where it is needed most.

The objective of the conceptual model for strengthening public health infrastructure in U.S. underserved counties through mobile health units is to create a scalable, adaptable, and sustainable framework that can be applied across diverse rural and marginalized areas. By expanding the use of mobile health units, this model aims to improve healthcare access, reduce health disparities, and support the broader national health goals of equity and universal coverage (Gabrielli, et al., 2010, Imran et al., 2019, Nwankwo et al., 2012). The model emphasizes collaboration between local communities, healthcare providers, government agencies, and non-governmental organizations to ensure that mobile health units are integrated into existing health systems, remain financially viable, and are responsive to the specific health needs of the populations they serve.

In conclusion, mobile health units represent a promising solution to addressing the significant healthcare access gaps in U.S. underserved counties. By providing flexible, cost-effective, and culturally sensitive services directly to underserved communities, MHUs can play a pivotal role in improving health outcomes, reducing health disparities, and contributing to national health objectives. The conceptual model proposed aims to expand and enhance the role of MHUs in strengthening public health infrastructure, ensuring that all individuals, regardless of their geographic or socioeconomic status, have access to the care they need to live healthier lives (Adelodun & Anyanwu, 2025, Edwards et al., 2025, Udegbe et al., 2023).

3. METHODOLOGY

Here is the methodology section written using the PRISMA method (without subheadings), followed by the PRISMA flowchart visualization above:

A comprehensive systematic review was conducted to develop a conceptual model for strengthening public health infrastructure in underserved U.S. counties through the deployment of mobile health units. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was utilized to ensure methodological transparency and rigor. Multiple electronic databases and academic journal repositories were systematically searched for peer-reviewed articles, conference proceedings, and conceptual frameworks published between 2005 and 2025, with a particular focus on healthcare infrastructure, mobile health technologies, underserved populations, health equity, and community-based public health interventions. Key search terms included "mobile health units," "public health infrastructure," "underserved counties," "health disparities," "community healthcare delivery," and "health policy innovation."

A total of 247 studies were initially identified. After removing duplicates, 212 records were screened for relevance based on titles and abstracts. Following the screening process, 123 full-text articles were assessed for eligibility. A final selection of 54 articles was included in the conceptual synthesis after evaluating their alignment with the research objective and methodological quality. The selection process was guided by inclusion criteria that prioritized studies with empirical findings, conceptual models, and policy discussions directly related to mobile health services and public health capacity-building in underserved areas of the U.S.

Data from the included studies were extracted and synthesized thematically, focusing on four core domains: healthcare accessibility, technological integration, community engagement, and sustainability of interventions. The synthesis revealed recurring barriers such as limited physical infrastructure, shortage of healthcare professionals, and funding constraints, as well as enablers like digital health platforms, telemedicine integration, CRM systems for patient tracking, and public-private partnerships.

The studies by Abass et al. (2024) and others significantly contributed to identifying best practices in patient engagement and stakeholder collaboration. Key elements informing the proposed model include strategies to overcome systemic barriers, integration of CRM-based patient management tools, use of AI-driven logistics for mobile unit deployment, and community-informed design of service delivery frameworks.

The development of the final conceptual model integrates insights from the selected studies to propose a mobile health infrastructure system centered on preventive care, real-time data collection, and policy support for long-term sustainability. This model is designed to be scalable, cost-effective, and adaptable to the unique health needs of different underserved counties across the U.S., promoting health equity and strengthening national public health resilience.

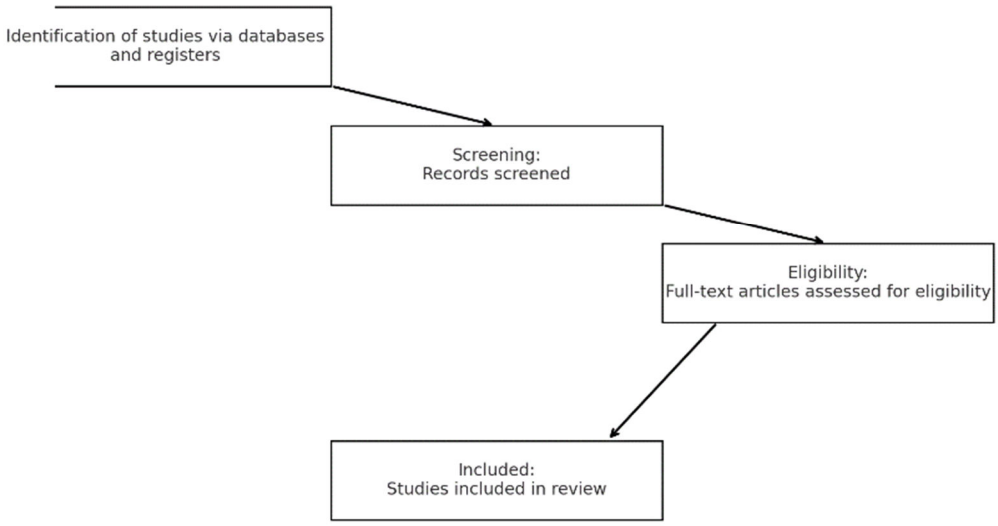

Figure 4. PRISMA Flow chart of the study methodology.

4. DESCRIPTION OF THE PROPOSED CONCEPTUAL MODEL

The proposed conceptual model for strengthening public health infrastructure in U.S. underserved counties through Mobile Health Units (MHUs) is designed to address the systemic healthcare disparities that exist in rural and marginalized urban communities. These areas often experience a shortage of healthcare facilities, healthcare workers, and essential services, which exacerbates poor health outcomes and contributes to the cycle of health inequity. The conceptual model presented is centered around four key pillars: accessibility, community engagement, integration with existing health systems, and sustainability (Edwards & Smallwood, 2023, Ekpechi et al., 2023, Obianyo & Eremeeva, 2023). Together, these pillars form a comprehensive framework that ensures the effective and equitable delivery of healthcare services to underserved populations. The model aims to utilize mobile health units as a tool for expanding access to care, improving health outcomes, and enhancing the overall public health infrastructure in these regions.

The first pillar of the model focuses on accessibility, which is fundamental to the success of any public health intervention in underserved counties. Accessibility, in this context, refers to the ability of individuals in rural and marginalized communities to easily access healthcare services without facing barriers such as long travel distances, high costs, or a lack of healthcare facilities. Mobile Health Units, which are equipped with the necessary medical equipment and staffed by healthcare professionals, serve as mobile clinics that travel directly to these communities, eliminating the need for patients to travel long distances to access care (Adegoke, et al., 2022, Chianumba et al., 2022, Patel, et al., 2022). The model emphasizes the deployment of MHUs in locations where traditional healthcare infrastructure is sparse, such as rural areas, isolated communities, and urban areas with limited access to health services. By bringing healthcare services to the doorstep of individuals, the model makes healthcare more accessible and lessens the logistical burdens that many people in underserved areas face (Balogun et al., 2023, Ezeamii et al., 2023, Katas et al., 2023, Usuemerai et al., 2024).

The second pillar of the conceptual model is community engagement. For public health programs to be successful, especially in underserved areas, it is essential that they are responsive to the needs and preferences of the communities they serve. Community engagement is integral to the design and implementation of the model, as it ensures that health interventions are culturally relevant, respectful, and accepted by the population (Adelodun & Anyanwu, 2024, Ibikunle et al., 2024, Ogugua et al., 2024). This pillar involves collaborating with community leaders, local health workers, and residents to co-design MHU services that address local health issues, align with cultural norms, and are accessible to the most vulnerable groups (Kuo et al., 2019, Matthew et al., 2021, Nwankwo et al., 2011, Tomassoni et al., 2013). Additionally, community engagement includes health education and outreach efforts that increase awareness of the availability of MHU services and encourage people to utilize them. The model advocates for ongoing feedback loops, where the communities served by MHUs can provide input on the services they receive, ensuring that the program evolves to meet changing health needs over time.

The third pillar is the integration of mobile health units with existing health systems. While MHUs are essential for providing immediate and accessible healthcare, their long-term success depends on their ability to integrate with national and local health systems. This pillar focuses on ensuring that MHU services are part of a coordinated, seamless system of care, including coordination with local healthcare providers, public health agencies, and hospitals. Integration involves aligning the services provided by MHUs with the broader healthcare network, ensuring continuity of care for patients, and facilitating referrals when necessary (Ayo-Farai et al., 2024, Edwards et al., 2024, Nwankwo et al., 2024). For example, if a patient requires specialized treatment that cannot be provided by the MHU, they can be referred to a nearby hospital or clinic, ensuring that they continue to receive the care they need. This integration is also essential for managing public health data, as MHU services should contribute to regional health surveillance efforts, enabling the tracking of health trends, disease outbreaks, and preventive care uptake (Ayo-Farai, et al., 2024, Ibikunle et al., 2024, Oddie-Okeke et al., 2024). Moreover, linking MHUs to health systems enhances the efficiency of resource distribution and enables better coordination between different levels of healthcare.

The fourth pillar of the conceptual model is sustainability. For MHUs to have a lasting impact, they must be sustainable both financially and operationally. Sustainability requires creating a model that is able to secure long-term funding, adapt to evolving health needs, and continue to deliver services over time. To achieve this, the model recommends diverse funding sources, including government support, grants, private sector partnerships, and community-based funding mechanisms (Akerele et al., 2024, Edwards et al., 2024, Ikhalea et al., 2024, Zouo & Olamijuwon, 2024). By ensuring that MHUs are financially sustainable, the program can avoid the common pitfall of relying on short-term donor funding, which often leads to interruptions in service delivery once funding runs out. Additionally, sustainability is ensured by investing in the development of local capacity, including training local health workers to staff MHUs, ensuring that the communities themselves are empowered to maintain and manage healthcare services. This can include integrating mobile health units into state and federal programs aimed at improving rural health, further ensuring long-term support from governmental health initiatives (Anyanwu, et al., 2024, Idoko et al., 2024, Kelvin-Agwu et al., 2024).

The theoretical underpinnings of the model draw from key public health frameworks, including health equity and systems thinking. The health equity framework emphasizes that all individuals should have access to the resources and services necessary to maintain optimal health, regardless of their socio-economic status, geographical location, or cultural background.

The model aligns with this framework by specifically addressing the inequities faced by underserved populations in accessing healthcare (Babarinde, et al., 2023, Chianumba et al., 2023, Ogundairo et al., 2023). By using mobile health units to bring healthcare directly to these communities, the model aims to reduce the barriers to care that disproportionately affect low-income, rural, and marginalized populations.

Systems thinking is also a critical element of the conceptual model. Systems thinking emphasizes that health is influenced by a complex network of factors, including individual behaviors, social determinants of health, healthcare access, and policy. By taking a systems approach, the model seeks to understand how the different components of public health (e.g., healthcare services, community involvement, funding, infrastructure) interact with one another. This approach ensures that the model considers not just the immediate needs of the underserved populations, but also the broader health system in which they exist (Ariyibi et al., 2024, Edwards et al., 2024, Nwankwo et al., 2024). For example, integrating MHUs with existing health systems addresses the broader health infrastructure, ensuring that mobile services are part of a larger strategy to improve healthcare delivery in underserved counties. Furthermore, systems thinking encourages flexibility and adaptability, which are essential in responding to the evolving needs of these communities (Adelodun & Anyanwu, 2024, Igwama et al., 2024, Majebi, Adelodun & Anyanwu, 2024).

The significance of the conceptual model lies in its potential to create a sustainable, scalable, and inclusive approach to addressing public health disparities in underserved U.S. counties. By focusing on the four pillars—accessibility, community engagement, integration with health systems, and sustainability—the model provides a comprehensive framework for improving healthcare access in regions where it is needed most (Bello et al., 2024, Igwama et al., 2024, Katas et al., 2024, Okobi et al., 2024). The model also promotes a shift towards a more patient-centered, equitable approach to healthcare delivery, recognizing the importance of cultural relevance and local ownership in ensuring that health services are accepted and utilized by the populations they serve (Govender et al., 2022, Matthew, Akinwale, & Opia, 2022, Udegbe et al., 2022). Ultimately, the model aims to strengthen public health infrastructure, reduce health disparities, and improve overall health outcomes in underserved communities across the U.S.

In conclusion, this conceptual model for strengthening public health infrastructure through Mobile Health Units presents an innovative solution to the persistent healthcare challenges faced by underserved counties. By emphasizing accessibility, community engagement, integration with existing health systems, and sustainability, the model offers a holistic approach to improving healthcare access in rural and marginalized areas (Afolabi, Ajayi, & Olulaja, 2024, Edwards et al., 2024, Obianyo, Das, & Adebile, 2024). By grounding the model in health equity and systems thinking, it provides a flexible, adaptable framework that can be customized to meet the unique needs of diverse communities, helping to achieve long-term improvements in health equity and public health infrastructure across the United States.

5. PILLARS OF THE CONCEPTUAL MODEL

The pillars of the conceptual model for strengthening public health infrastructure in U.S. underserved counties through Mobile Health Units (MHUs) focus on the essential components needed to address the persistent healthcare gaps in rural and marginalized communities. These pillars are designed to improve healthcare access, ensure that services are culturally relevant and locally accepted, integrate new technologies, and ensure that the interventions are sustainable and scalable (Nwankwo, Tomassoni & Tayebati, 2012, Tayebati, Nwankwo & Amenta, 2013, Tomassoni et al., 2013). Each pillar plays a crucial role in the effective delivery and long-term success of mobile health interventions aimed at reducing health disparities in underserved areas.

The first pillar, accessibility and reach, is fundamental to the success of any public health program, particularly in rural areas where healthcare facilities may be few and far between. Mobile health units are an effective tool in bringing healthcare directly to populations that would otherwise have limited access to essential services. Mobile diagnostics, such as blood pressure monitoring, diabetes screening, cancer screenings, and immunizations, are integral to this pillar. MHUs equipped with the latest medical technologies can provide these essential services on-site, significantly reducing the need for patients to travel long distances to receive care (Adewuyi, et al., 2024, Edwards, Mallhi & Zhang, 2024, Ohalete et al., 2024). Preventive services, such as health screenings and immunization campaigns, can be delivered to communities on a regular basis, ensuring early detection and intervention for a range of diseases.

Scheduling and deployment strategies are also key to ensuring that mobile health units reach the greatest number of people in need. Strategically planning MHU routes, ensuring that the units are deployed during times when the population is most likely to access them, and collaborating with local community organizations to identify areas with the highest health needs are essential aspects of this pillar (Gabrielli et al., 2010, Khosrow Tayebati et al., 2013, Nwankwo et al., 2011). Examples from rural deployment programs show that coordinating mobile health services with existing local events, such as farmers' markets, school events, or community gatherings, maximizes the opportunity for engagement and ensures that services are convenient and accessible (Ayo-Farai, et al., 2023, Chianumba et al., 2023, Katas et al., 2023). Additionally, by mapping out the health needs of specific communities, mobile health units can be scheduled to serve particular areas at regular intervals, creating consistency and improving the reliability of healthcare delivery in underserved regions.

Community integration is the second pillar, emphasizing the importance of involving local stakeholders in the planning and delivery of health services. Engaging local leaders, community health workers (CHWs), and faith-based organizations is vital for ensuring that the program is accepted and embraced by the community. These local entities serve as trusted sources of information and influence, helping to bridge the gap between healthcare providers and the populations they serve (Anyanwu et al., 2024, Ekwebene et al., 2024, Obianyo et al., 2024). Community leaders can also assist in identifying health priorities, raising awareness, and fostering a sense of ownership within the community. By leveraging the relationships and influence of these trusted figures, mobile health units can more effectively reach and serve marginalized populations.

Culturally sensitive health education and outreach are essential for ensuring that mobile health services resonate with the communities they aim to serve. Many underserved populations, particularly in rural and ethnic minority communities, may have unique health beliefs, practices, and concerns that influence how they interact with healthcare providers. Tailoring health education to reflect these cultural norms and preferences can increase engagement and improve health outcomes (Ajayi et al., 2024, Emeihe et al., 2024, Johnson et al., 2024, Olowe et al., 2024). This pillar also involves developing materials in languages that are commonly spoken in the community and using local cultural references to make health messages more relatable. Building trust with these communities requires consistent, respectful engagement and a commitment to addressing their unique health challenges.

Digital health infrastructure is the third pillar, focusing on the role of technology in supporting mobile health units and improving healthcare delivery in underserved counties. Real-time data collection and mobile-enabled electronic health records (EHRs) are crucial for maintaining continuity of care and tracking patient health outcomes.

As mobile health units provide services, capturing and recording health data on-site enable healthcare providers to monitor patient progress and facilitate referrals to other healthcare facilities as needed (Fuko et al., 2025, Matthew, Nwaogelenya, & Opia, 2025, Usuemerai et al., 2024). Mobile-enabled EHRs also ensure that patient information is easily accessible to healthcare providers across different locations, improving care coordination and reducing the risk of fragmented care.

Remote consultations and telehealth integration are key aspects of the digital health infrastructure pillar. In many underserved areas, there is a lack of healthcare providers, particularly specialists. Telehealth services, delivered via mobile units, can allow patients in remote areas to consult with doctors, specialists, or mental health professionals without the need to travel long distances (Adelodun & Anyanwu, 2024, Emeihe et al., 2024, Majebi, Adelodun & Anyanwu, 2024). This helps address the shortage of medical professionals in rural areas and ensures that patients receive timely, expert advice and treatment. Additionally, integrating telemedicine with mobile health services allows for the delivery of healthcare in areas that may not have adequate internet infrastructure by leveraging satellite connectivity or low-bandwidth solutions.

Connectivity solutions are also a major consideration in the successful implementation of digital health infrastructure in underserved regions. Many rural areas suffer from low or unreliable internet bandwidth, which can significantly limit the ability to provide telehealth services. Addressing this issue requires innovative solutions such as offline-capable mobile health platforms that can store data locally and sync once a reliable connection is available. Partnerships with internet service providers, local governments, and technology companies to improve connectivity in these regions are also essential to the success of mobile health programs (Akerele et al., 2024, Emeihe et al., 2024, Kelvin-Agwu et al., 2024). By ensuring that connectivity issues are addressed, mobile health units can maximize their reach and ensure the seamless integration of digital health tools into everyday care delivery.

Sustainability and scalability form the fourth pillar of the model, ensuring that mobile health units are financially viable and can be expanded to reach more underserved populations. This pillar emphasizes the importance of securing diverse and stable funding mechanisms to support the long-term operation of mobile health units. Medicaid and grant funding mechanisms can be utilized to cover the costs of services provided by mobile units, ensuring that they remain financially accessible to low-income and uninsured individuals (Abisoye & Olamijuwon, 2022, Chianumba et al., 2022, Udegbe et al., 2023). Securing funding from a variety of sources, including federal, state, and local governments, as well as private-sector partners, ensures that the program is not reliant on a single funding stream and can withstand changes in the financial landscape.

Public-private partnerships and nonprofit collaboration are also vital for scaling up mobile health initiatives. Collaboration with private sector organizations can bring in additional resources, such as healthcare technology, infrastructure support, and financial backing, while partnerships with nonprofit organizations can enhance community engagement and ensure that the program reaches the most vulnerable populations. Nonprofits often have deep connections to local communities and can facilitate the necessary outreach and education to ensure that people take full advantage of mobile health services (Ayo-Farai, et al., 2024, Emeihe et al., 2024, Kelvin-Agwu et al., 2024).

Finally, policy alignment and advocacy for long-term support are necessary for the sustainability of mobile health units. Aligning the program with national health priorities, such as the goal of achieving universal healthcare coverage and reducing health disparities, ensures that mobile health services remain a priority for policymakers.

Advocacy efforts at the federal and state levels can help secure long-term funding and ensure that mobile health units are integrated into broader public health infrastructure (Adhikari et al., 2024, Eze et al., 2024, Johnson et al., 2024). Policy reforms that support mobile health units, including regulatory changes to improve reimbursement for services provided by mobile units, can further strengthen the sustainability of these initiatives.

In conclusion, the pillars of the conceptual model for strengthening public health infrastructure through Mobile Health Units (MHUs) offer a comprehensive approach to addressing healthcare disparities in underserved U.S. counties. By focusing on accessibility, community integration, digital health infrastructure, and sustainability, this model provides a roadmap for expanding access to essential health services, improving health outcomes, and ensuring that mobile health services are sustainable and scalable (Elujide et al., 2021, Khosrow Tayebati et al., 2011, Nwankwo et al., 2012). The model's focus on local engagement, culturally sensitive care, and technological innovation ensures that it is both effective and adaptable to the unique needs of underserved communities.

6. CASE STUDIES AND PRACTICAL APPLICATIONS

In the context of strengthening public health infrastructure in underserved counties in the U.S., Mobile Health Units (MHUs) have emerged as a promising solution to address healthcare access disparities, especially in rural, isolated, and marginalized areas. Several regions in the U.S. have successfully implemented MHU programs, showing the effectiveness of these units in improving healthcare access, promoting preventative care, and addressing health disparities. The case studies from Appalachia, the Mississippi Delta, Native American reservations, and other underserved regions provide valuable insights into the practical applications and impact of MHUs (Adelodun & Anyanwu, 2025, Ekpechi et al., 2025, Usuemerai et al., 2024).

Appalachia, a region characterized by rurality, economic distress, and high rates of chronic disease, offers a clear example of how MHUs can improve healthcare access in hard-to-reach communities. The region, which spans across several states, has long struggled with healthcare access due to its mountainous terrain and economic challenges. Many Appalachian communities are far from major hospitals, and health disparities are evident in high rates of heart disease, obesity, and substance use disorders (Okoro et al., 2024, Olamijuwon & Zouo, 2024, Olorunsogo et al., 2024). In response to these challenges, MHU programs have been deployed to provide essential medical services such as screenings, immunizations, and chronic disease management.

In one successful initiative, an MHU program operated by a regional health network focused on delivering maternal and child health services, including prenatal care, immunizations, and screenings for early childhood developmental delays. This program used a combination of mobile units and telehealth services to bridge the gap between rural patients and healthcare providers (Maduka et al., 2023, Majebi et al., 2023, Ogundairo et al., 2023). By bringing healthcare services directly to patients in their communities, the program significantly increased the number of women receiving prenatal care, a key determinant in reducing maternal and infant mortality rates. The success of this program was tied to its integration with local health systems, which allowed for smooth referrals to local hospitals for more complex cases, ensuring continuity of care for patients (Alemede et al., 2024, Igwama et al., 2024, Matthew, Nwaogelenya & Opia, 2024).

Similarly, the Mississippi Delta region, which faces high levels of poverty, unemployment, and chronic disease, has benefited from mobile health services designed to address both the healthcare needs of the population and the logistical challenges posed by the region's geography. The Mississippi Delta has a history of healthcare shortages, with many counties being designated as Health Professional Shortage Areas (HPSAs).

MHU programs in this region have provided screenings for chronic diseases such as hypertension and diabetes, along with education on disease prevention and healthy living (Alemede, et al., 2024, Eze, et al., 2024, Katas et al., 2024, Obianyo et al., 2024). The introduction of telemedicine as part of these MHU programs has allowed patients to connect with specialists, such as endocrinologists or cardiologists, reducing the need for costly and time-consuming travel. This integrated care model has led to improved disease management, particularly for elderly and economically disadvantaged populations who otherwise may not have access to specialty care (Alemede et al., 2024, Igwama et al., 2024, Matthew, Nwaogelenya & Opia, 2024).

Native American reservations represent another key area where MHUs have played a critical role in improving healthcare access. Native American populations experience some of the most severe health disparities in the U.S., with higher rates of diabetes, heart disease, mental health disorders, and substance abuse. Geographic isolation, coupled with underfunded healthcare facilities, makes accessing healthcare a significant challenge for many reservation communities (Abass et al., 2024, Eze et al., 2024, Johnson et al., 2024, Olowe et al., 2024). In response, several tribes and Native American health organizations have utilized MHUs to deliver healthcare services directly to these communities. These units typically provide preventative services, including immunizations, maternal and child health care, and behavioral health services, with a particular emphasis on addressing the mental health needs of reservation populations. One such example is the introduction of MHUs to provide substance abuse counseling, mental health support, and general healthcare screenings to Native American reservations in the western U.S (Elujide et al., 2021, Khosrow Tayebati, Ejike Nwankwo & Amenta, 2013), Tomassoni et al., 2013).

These mobile health units often work in conjunction with local health programs, ensuring a continuum of care by coordinating with tribal health centers for follow-up services. The successful implementation of these programs has not only improved access to healthcare services but also helped build trust between Native American communities and the healthcare system, which has often been characterized by historical mistrust and underrepresentation. The role of cultural competence in these programs has been crucial (Chukwuma et al., 2022, Gbadegesin et al., 2022, Udegbe et al., 2023). By integrating traditional healing practices with modern medical care, these units have been able to foster greater acceptance among Native American populations, ensuring that healthcare services are respectful of and aligned with cultural beliefs and practices.

The outcomes of MHU programs in these regions have been significant. In Appalachia, for example, the increased availability of maternal and child health services has contributed to improved health outcomes for women and children, particularly in rural areas where traditional healthcare facilities are scarce. Increased access to preventive screenings has helped detect chronic conditions such as hypertension and diabetes earlier, leading to better management and reduced complications (Kuo et al., 2019, Madu et al., 2020, Nwankwo et al., 2012, Tayebati et al., 2011). Similarly, in the Mississippi Delta, the integration of telemedicine with mobile health services has enhanced the quality of care available to patients, particularly for those who would otherwise have to travel long distances for specialty care. The use of mobile units has allowed healthcare providers to reach vulnerable populations and offer services such as substance use disorder treatment, chronic disease management, and mental health care, significantly improving the overall health outcomes in the region (Abass et al., 2024, Igwama et al., 2024, Kelvin-Agwu et al., 2024, Olowe et al., 2024).

On Native American reservations, the implementation of MHUs has resulted in greater healthcare access and improved disease management. The inclusion of culturally sensitive care has built trust in healthcare systems that have often been seen as disconnected from the communities they serve.

MHUs have provided mental health and substance abuse services, areas where Native American populations face disproportionately high rates of morbidity and mortality (Balogun et al., 2023, Eyeghre et al., 2023, Mgbecheta et al., 2023). Through these services, MHUs have not only improved physical health but also supported broader social and emotional well-being, fostering a more holistic approach to health within these communities.

However, there are challenges that must be addressed to improve the efficacy and sustainability of these programs. One of the main barriers faced by MHU programs is the need for consistent and sustainable funding. Many MHU programs rely on grants and short-term funding, which can create instability and lead to gaps in service delivery. Developing long-term funding strategies, such as integrating MHU services into state and federal public health programs, is essential for ensuring that these services continue to meet the needs of underserved populations (Nwankwo, Tomassoni, & Tayebati, 2012, Ogbonna et al., 2012, Tayebati et al., 2013). Additionally, although MHU programs are highly effective in providing immediate care, they face challenges in offering continuity of care, particularly for individuals with chronic conditions who need long-term management. The integration of mobile health services with local healthcare systems is crucial to overcoming this limitation (Attah et al., 2022, Chianumba et al., 2022, Opia, Matthew & Matthew, 2022).

Another challenge is the difficulty in ensuring full community engagement and participation. While mobile health units bring healthcare directly to underserved communities, success depends on building trust within these populations. This can be difficult in areas where there has historically been a lack of engagement with healthcare providers or where cultural barriers exist. To overcome this, MHU programs must focus on building long-term relationships with local community leaders, healthcare providers, and residents. Ensuring that mobile health services are culturally sensitive and incorporate local health beliefs and practices is key to fostering acceptance and participation (Adelodun & Anyanwu, 2024, Ezeamii et al., 2024, Majebi, Adelodun & Anyanwu, 2024).

The successes and lessons learned from these case studies emphasize the importance of integrating mobile health services into the broader public health infrastructure. Mobile health units offer a promising solution to the healthcare access challenges faced by underserved counties, but their effectiveness depends on careful planning, adequate funding, and strong community partnerships (Akerele, et al., 2024, Ezeamii, et al., 2024, Kelvin-Agwu et al., 2024). These units must be seen not as a temporary fix but as a vital part of the healthcare system that complements existing services and addresses gaps in access to care. With sustained investment, strategic partnerships, and a focus on community-centered, culturally appropriate care, MHUs can significantly strengthen public health infrastructure and improve health outcomes in underserved U.S. counties (Al Hasan, Matthew & Toriola, 2024, Igwama et al., 2024, Okhawere et al., 2024).

In conclusion, case studies from Appalachia, the Mississippi Delta, and Native American reservations provide strong evidence of the effectiveness of Mobile Health Units in improving healthcare access and outcomes in underserved regions. These programs have successfully addressed critical health disparities by providing preventive care, mental health support, chronic disease management, and telemedicine services (Adaramola et al., 2024, Ezeamii et al., 2024, Ohalete et al., 2024). While challenges remain in terms of funding, integration with local health systems, and community engagement, the outcomes and insights gained from these programs demonstrate the potential for MHUs to play a transformative role in strengthening public health infrastructure in rural and marginalized areas across the U.S.

7. CHALLENGES AND MITIGATION STRATEGIES

The implementation of a conceptual model for strengthening public health infrastructure in U.S. underserved counties through Mobile Health Units (MHUs) presents a variety of challenges. These challenges range from workforce shortages to infrastructure limitations, regulatory issues, and the lack of adequate policy frameworks to support mobile health initiatives. Addressing these challenges requires a comprehensive understanding of the barriers involved, as well as strategic solutions to ensure the long-term success and sustainability of MHUs in rural and marginalized areas (Adelodun & Anyanwu, 2025, Ekpechi et al., 2025, Usuemerai et al., 2024).

Workforce shortages represent a significant challenge in the deployment of MHUs, particularly in underserved counties. Many of these regions face a lack of healthcare professionals, including primary care doctors, nurses, mental health specialists, and allied health professionals. The U.S. Department of Health and Human Services reports that rural areas, in particular, have been designated as Health Professional Shortage Areas (HPSAs) for decades. The shortage of healthcare providers, combined with the increasing demand for services in these regions, complicates efforts to provide high-quality healthcare through mobile health units (Okoro et al., 2024, Olamijuwon et al., 2024, Olorunsogo et al., 2024). Moreover, many of the healthcare professionals who are available in underserved areas are overburdened, making it difficult to deploy staff to mobile units without disrupting existing services.

To mitigate this challenge, one possible solution is to implement robust training programs aimed at developing local healthcare talent. By offering training programs specifically focused on the unique needs of underserved communities and mobile healthcare settings, communities can develop a local workforce that is familiar with both the specific health issues and the operational needs of MHUs (Ayo-Farai et al., 2024, Ezeamii et al., 2024, Oboh et al., 2024, Oshodi et al., 2024). These programs could also integrate telehealth training, allowing local healthcare professionals to provide virtual consultations to patients served by MHUs, expanding the capacity of the healthcare team without requiring additional physical staff. Additionally, incentivizing healthcare workers to practice in rural and underserved areas through loan forgiveness, competitive salaries, and other benefits could encourage more professionals to serve in these critical regions (Afolabi, Ajayi, & Olulaja, 2024, Igwama et al., 2024, Ohalete et al., 2024).

Connectivity and infrastructure limitations are another major barrier to the effective operation of MHUs, especially in remote rural areas. Mobile health units rely heavily on digital technologies, such as telemedicine platforms, electronic health records (EHRs), and real-time data collection, to provide healthcare services (Adhikari et al., 2024, Ezeamii et al., 2024, Ogundairo et al., 2024). However, in many underserved areas, there is insufficient access to reliable internet and mobile broadband, which hinders the ability to connect with specialists, access electronic health records, and deliver telehealth services. Additionally, limited infrastructure, such as poor road conditions and inadequate local healthcare facilities, further complicates the effective deployment and operation of MHUs.

To address these infrastructure challenges, one potential solution is to invest in mobile broadband and satellite connectivity. This could ensure that mobile health units have access to the necessary communication tools and real-time data transmission capabilities, even in remote areas. Government initiatives and private sector partnerships could help expand broadband access to underserved regions, particularly by focusing on rural areas where internet connectivity is often inadequate (Madu & Nwankwo, 2018, Nasuti et al., 2008, Nwankwo et al., 2011, Tayebati et al., 2013).

In addition, using mobile health technologies that are specifically designed for low-bandwidth environments, such as offline-capable platforms, could mitigate connectivity issues. This would allow mobile units to store patient data locally and transmit it once a stable connection is available, ensuring that the health records are up-to-date and the care provided is consistent.

Regulatory and licensure barriers also present a significant obstacle to the widespread adoption of MHUs in underserved areas. Healthcare regulations and licensure requirements can vary from state to state, creating complexities when mobile health units cross state lines or provide services to residents of multiple jurisdictions. For example, healthcare professionals working in mobile health units may face restrictions on providing care outside their state of licensure, or the mobile unit itself may need to meet different requirements depending on the state (Babarinde et al., 2023, Eyeghre et al., 2023, Nwaonumah et al., 2023). Additionally, reimbursement for services provided by MHUs can be complicated, with different insurance providers and state Medicaid programs having varying policies on coverage for mobile health services.

To mitigate these regulatory challenges, policy reform is essential. One key solution is the standardization of licensing and regulatory requirements for mobile health units, enabling healthcare providers to deliver services across state lines without encountering licensure issues. This could be achieved through interstate compacts or collaborative agreements between states that allow healthcare professionals to practice across borders. In addition, Medicaid and Medicare reimbursement policies could be updated to explicitly include services provided by mobile health units, ensuring that mobile health providers are reimbursed for the services they deliver, which is crucial for the sustainability of the programs (Adelodun et al., 2018, Chianumba et al., 2021, Tayebati et al., 2012, Tomassoni et al., 2013). Furthermore, federal agencies, such as the Centers for Medicare and Medicaid Services (CMS), can work to develop national standards for mobile health services, which would streamline the regulatory process and ensure that services are uniformly recognized and reimbursed across the country.

Another key component of addressing regulatory barriers is engaging with policymakers to advocate for the integration of mobile health units into the broader healthcare delivery system. This would involve educating policymakers about the value of MHUs in improving healthcare access and reducing health disparities, particularly in underserved communities (Akerele et al., 2024, Fagbenro et al., 2024, Kelvin-Agwu et al., 2024). By highlighting the role that MHUs can play in achieving national health goals, such as Universal Health Coverage (UHC) and the Healthy People 2030 objectives, advocates can push for policies that support the broader adoption of mobile health services, including regulatory reforms and financial incentives.

The need for a coordinated approach to tackling workforce shortages, connectivity challenges, and regulatory barriers underscores the importance of collaboration and innovation. One potential strategy is to integrate mobile health units into existing public health and healthcare infrastructures. For instance, mobile health services can be incorporated into public health programs aimed at addressing chronic diseases, mental health, maternal health, and preventive care (Ajibola et al., 2024, Folorunso et al., 2024, Majebi, Adelodun & Anyanwu, 2024). By aligning mobile health programs with broader national health goals, such as UHC and health equity, the model for mobile health units can be better integrated into existing health systems, reducing fragmentation and improving sustainability.

In addition to these strategies, public-private partnerships can play a pivotal role in addressing the challenges associated with mobile health units. Collaborations between governments, healthcare providers, technology companies, and nonprofit organizations can help provide the necessary funding, infrastructure, and technology to ensure the success of these programs. For example, partnerships with telecommunications companies can help expand broadband access in underserved areas, while collaborations with local healthcare providers and community organizations can improve outreach and engagement (Madu & Nwankwo, 2018, Nwankwo et al., 2012, Nwankwo, Tomassoni & Tayebati, 2012). By pooling resources and expertise from different sectors, these partnerships can create a more robust framework for the delivery of mobile health services.

In conclusion, addressing the challenges faced by mobile health units in underserved U.S. counties requires a multifaceted approach. Workforce shortages, connectivity limitations, regulatory barriers, and infrastructure constraints must all be carefully considered and mitigated to ensure the success and sustainability of mobile health services. Strategies such as workforce development, expanding broadband access, standardizing regulations, and engaging in policy reform can help overcome these barriers (Noah et al., 2025, Opia & Matthew, 2025, Udegbe et al., 2023, Usuemerai et al., 2024). With the right investments, collaboration, and policy changes, mobile health units can play a pivotal role in strengthening public health infrastructure and improving healthcare access in underserved regions, ultimately leading to better health outcomes and reduced health disparities (Olowe et al., 2024, Olulaja, Afolabi & Ajayi, 2024, Shittu et al., 2024).

8. CONCLUSION

The conceptual model for strengthening public health infrastructure in U.S. Underserved counties through Mobile Health Units (MHUs) present a comprehensive, adaptable approach to addressing the significant healthcare access challenges faced by rural and marginalized communities. This model emphasizes the importance of accessibility, community engagement, integration with existing healthcare systems, and long-term sustainability. By leveraging the mobility and flexibility of health units, the model ensures that underserved populations receive the care they need, regardless of geographic, economic, or social barriers. The integration of MHUs into the broader public health infrastructure can play a crucial role in improving health outcomes, reducing disparities, and fostering health equity across the U.S.

This model's relevance extends beyond just healthcare delivery—it offers a strategic solution to persistent public health disparities by improving access to preventative care, mental health services, and chronic disease management. It serves as a critical tool for reaching populations that would otherwise remain outside the traditional healthcare system, providing them with the services necessary to maintain and improve their health. By focusing on integration with existing health systems and prioritizing sustainability, the model offers a long-term, scalable solution to the healthcare challenges in underserved counties, aligning with national health goals such as Universal Health Coverage and Healthy People 2030.

For policymakers, public health leaders, and funders, the model presents an opportunity to invest in a solution that addresses both the short-term healthcare needs of underserved communities and the long-term infrastructure requirements necessary for achieving health equity. Policymakers must consider the need for regulatory reforms, funding mechanisms, and incentives that support the implementation and scalability of MHUs across the nation.

Public health leaders should prioritize the development of strategies that involve local stakeholders, including healthcare providers, community organizations, and local leaders, ensuring that mobile health services are culturally relevant, widely accepted, and effectively integrated into existing health systems. Funders can play a pivotal role by supporting the model through long-term investments in infrastructure, workforce training, and technology development.

Pilot testing the model in targeted communities will be essential to assess its effectiveness and refine strategies based on real-world implementation. Pilot programs can help identify potential barriers, evaluate service delivery models, and gauge community engagement, providing valuable data to inform broader scale-up efforts. Future research should focus on evaluating the impact of MHUs on health outcomes, particularly in terms of chronic disease management, maternal health, and mental health in underserved areas. Additionally, further exploration of funding models, telemedicine integration, and strategies for overcoming connectivity issues in low-bandwidth regions is crucial for ensuring that the model can be effectively applied across diverse settings.

In conclusion, this conceptual model offers a strategic framework for enhancing healthcare access and public health infrastructure in underserved counties. It represents an opportunity to leverage mobile health technology to bridge the healthcare gap in rural and marginalized communities, improving health outcomes, fostering equity, and strengthening the broader public health system. With the right support, pilot testing, and research, this model has the potential to significantly transform healthcare delivery in underserved U.S. counties, ultimately contributing to a healthier, more equitable nation.

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