# Beyond the Clinic Walls: *Exploring the Potential of Mobile Health*

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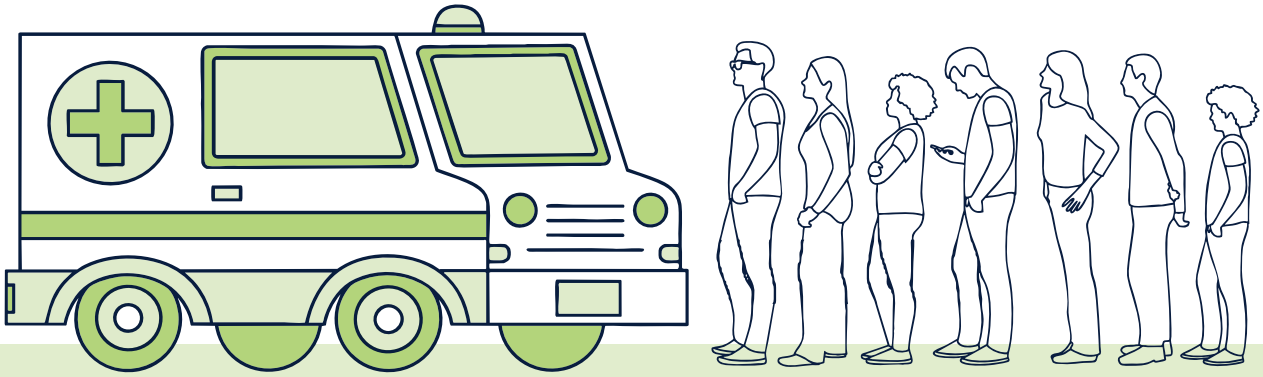
Leon Lowenstein Foundation

# Mobile Health as an Access Strategy

***Despite spending nearly $5 trillion annually on health care, millions of Americans struggle with access to health care.***

Barriers like lack of insurance, provider shortages, unreliable transportation, language difficulties, and experiences of discrimination persist nationwide. These can disproportionately affect specific populations: those living in rural areas; racial, ethnic, sexual, and gender minorities; immigrants and seasonal agricultural workers; those experiencing homelessness or a substance use disorder; and schoolchildren in low-income areas. These inequities translate directly into poorer health outcomes and shorter life expectancies for underserved communities.

Improving access to care typically requires bolstering the health care workforce and expanding available points of care, especially in underserved communities. The latter can either mean building new fixed-site clinics, which demands significant financial investments and infrastructure development, or investing in flexible alternatives like mobile and telehealth models, which can expand access to care more efficiently and affordably. Telehealth has gained substantial policy attention, especially after the COVID-19 pandemic, due to its remote consultation capabilities. However, despite its unique advantages, mobile health remains comparatively under-explored in the policy space.



Mobile health can complement telehealth by providing essential in-person services—such as physical examinations, vaccinations, diagnostic tests, preventive health screenings, counseling, and immediate treatment—that telehealth alone cannot deliver. Mobile units can also reach populations who face significant digital barriers, such as lack of broadband connectivity, low digital literacy, or lack of internet-enabled devices. They can even bring broadband connectivity to communities facing digital barriers and host telehealth visits with specialists. Given these distinct advantages, understanding the impact and effectiveness of mobile health can help policymakers craft more comprehensive solutions to health care access challenges.

This narrative review examines the specific impacts and evidence base behind different mobile health models. First, it defines the contours of "mobile health" (Section II). Then, it summarizes current evidence on the effectiveness of different mobile health delivery models (Section III). Finally, it identifies ways to bridge evidence gaps (Section IV).

## *Mobile health often provides in-person services such as:*

PHYSICAL EXAMINATIONS

VACCINATIONS

DIAGNOSTIC TESTS

PREVENTIVE HEALTH SCREENINGS

COUNSELING

IMMEDIATE TREATMENT

## *Mobile units can reach populations who face significant digital barriers:*

LACK OF BROADBAND CONNECTIVITY

LOW DIGITAL LITERACY

LACK OF INTERNET-ENABLED DEVICES

# What We Mean by "Mobile Health"

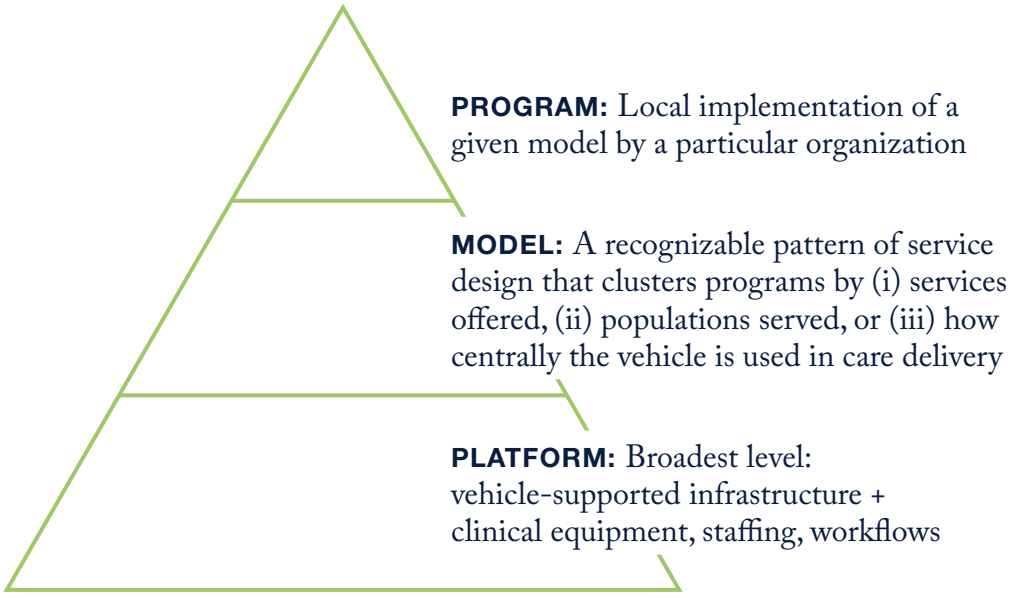
## MOBILE HEALTH AS A CARE DELIVERY PLATFORM

The term "mobile health" does not refer to one monolithic care delivery model or program type. Instead, it is a broader care delivery platform—a chassis that providers, community-based organizations, and local health departments have tailored to meet their communities' needs. Organizations commission a van, bus, trailer, or retrofitted ambulance to achieve anything ranging from targeted outreach (e.g., serving the specific health needs of people who inject drugs or PWID) to general population health improvement (e.g., providing routine primary care in health care deserts).

*Mobile health serves as a versatile and modular platform that can be leveraged to fill the diverse access gaps outlined in Section I.*

Figure A shows how we use the terms platform, model, and program to avoid confusion throughout this review.

**FIGURE A: CLARIFYING TERMINOLOGY: PLATFORM, MODEL, AND PROGRAM**



## APPLYING A "CARE-FIRST" INCLUSION TEST

This review focuses on 'care-first' models–those in which vehicles are essential for structured, recurring clinical or preventive health care rather than incidental logistical support. In excluded models, vehicles may be used exclusively for navigation purposes and are fungible with other modes of transportation. The inclusion threshold emphasizes the vehicle's functional role in enabling and delivering health care. Specifically, we include mobile health models meeting at least one of the following criteria while recognizing these elements frequently overlap:

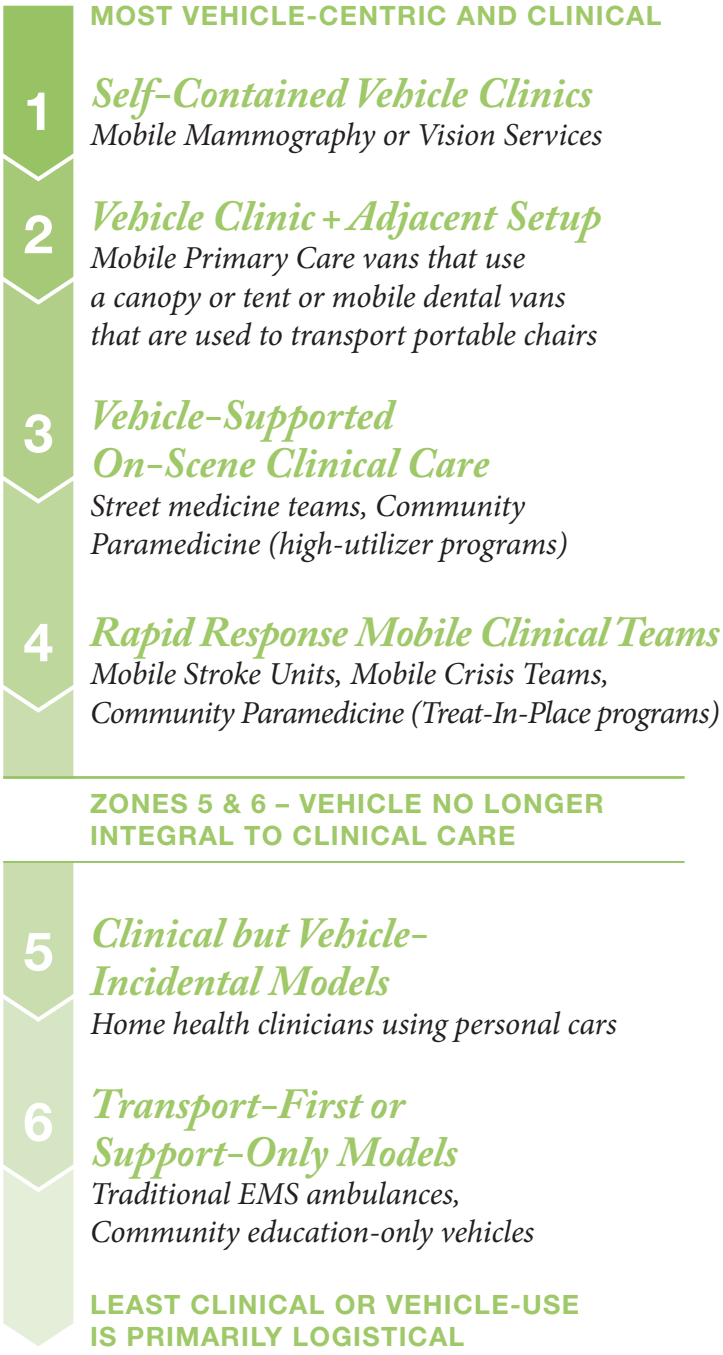
1. The vehicle serves as a structured clinical base, directly hosting care services or supporting care delivered close to it.
2. The vehicle enables timely, on-demand or regularly recurring clinical or preventive care outreach to defined populations.
3. The vehicle is integral to a clinical team's operation, directly facilitating staffing; documentation; or storage of equipment, medical supplies, pharmaceutical drugs, vaccination doses, health education materials.

## EXCLUDED MODELS

- ⃠ Clinical but vehicle-incidental models, in which care is delivered primarily in patients' homes, streets, or other fixed settings, and the vehicle is fungible with any other form of transport.
- ⃠ Transport-first models, such as traditional Emergency Medical Services (EMS) ambulances, whose primary purpose is patient conveyance with limited stabilization en route.
- ⃠ Support-only or outreach-only vehicles, used exclusively for logistical, navigational, or outreach functions without facilitating direct clinical or preventive health care.

## FIGURE B: SPECTRUM OF MOBILE HEALTH DELIVERY MODELS ANALYZED IN THIS REVIEW

*Included and Excluded Uses of Vehicles Based on Their Role in Care Delivery*




*Note: Zones 1–4 represent 'care-first' models. Zones 5 and 6—where vehicles aren't integral to the provision of direct care—are excluded.*

# Unpacking the Evidence: Mobile Health Models in Practice

As discussed earlier, the mobile health platform encompasses diverse programs varying significantly in terms of services offered, populations served, and how they use their vehicles. Given this heterogeneity, most published studies evaluate a single site or program rather than pooled multi-site datasets.

To organize and synthesize this diverse evidence clearly, we define mobile health models by clinical service line—such as primary care, vision care, or behavioral health crisis care—and then highlight key details about populations targeted or variations in vehicle usage within each model where relevant.

**FIGURE C: DIMENSIONS OF MOBILE HEALTH PROGRAMS**

### *Service Mix*

| NARROW | BROAD |
|---|---|
| SINGLE SERVICE | MULTI-SERVICE |
| *e.g., mammography* | *e.g., primary care van + infectious disease testing + mental health services* |

### *Population Focus*

| NARROW | BROAD |
|---|---|
| TARGETED | COMMUNITY-WIDE |
| *e.g., PWID* | *e.g., rural county wellness bus* |

### *Centrality of the Vehicle*

| NARROW | BROAD |
|---|---|
| *All care delivered inside vehicle* | *Vehicle as mobile base for curbside or in-school visits* |

The following sections summarize the evidence base for each notable mobile health model. They synthesize evidence from 160 quantitative and qualitative studies published between 2015 and March 2025 (we have chosen to include certain older studies where relevant). Databases searched included PubMed and Google Scholar. We applied explicit criteria (see Section II) to define which models qualified for inclusion in this review. Our findings are extensive but not exhaustive.

## *A. Primary Care Models*

Mobile primary care models deliver comprehensive frontline medical services to underserved communities, addressing routine and preventive health needs. While mobile primary care has historical roots stretching back to early 20th-century rural outreach initiatives, modern programs offer an expansive range of clinical services—from chronic disease screenings and mental health assessments to infectious disease prevention and vaccinations. They often enhance patient trust through culturally matched staffing, community partnerships, and repeated visits to familiar locations (Bouchelle 2017, Ramirez 2022, Mann 2025). During the COVID-19 pandemic, mobile clinics demonstrated flexibility and utility by rapidly reaching underserved groups for testing and vaccination (Baker 2021, Gupta 2022, Hoard 2023).

The evidence below highlights how primary care models have successfully improved access, patient engagement, and health outcomes and, in some cases, contributed to cost savings.

***Street medicine*** teams offer tailored primary care services to people experiencing homelessness (PEH), but do not always anchor services in a van. For this review, we have omitted any studies about street medicine programs that do not appear to use a mobile van to store supplies or provide services.

### Mobile primary care programs frequently reach hard-to-reach populations that fixed-site facilities often miss.

- ***Urban hot spot targeting.*** Programs in Detroit (Levy 2021), Baltimore (Baker 2021), and Boston (Gupta 2022) have leveraged population-level data to deploy their services to the communities that need them the most. For example, Detroit's mobile unit program progressively increased the share of patients from the most socially vulnerable ZIP codes from 25% to 41% through geospatial hot spot targeting using CDC Social Vulnerability Index data (Levy 2021).
- ***Reaching rural communities.*** Several programs specifically target their outreach efforts to rural areas that are "medical deserts" or lack local providers (Brant 2024, Bylander 2017). One program operating in rural Minnesota spared many patients from a 30 to 60-mile drive (Iqbal 2022). Another Tennessee program has successfully launched a mobile-telehealth hybrid model that has extended access to specialty services for rural populations (Dedmon 2024).
- ***Immigrant and migrant worker outreach.*** Programs in Arizona, California, Connecticut, Minnesota, and Texas have tailored their outreach strategy and services to effectively reach low-income, foreign-born, farm worker, and Latino populations who otherwise have limited access to traditional, fixed-site facilities (Soto 2023, Phelan 2024, Tulimiero 2020, Gibson 2017, Hoard 2023, Manusov 2019, Jaramillo 2023).
- ***Street-level care for PEH.*** To target the specific burdens of PEH, programs in Baltimore and Detroit have brought HIV and hepatitis C screening directly to the streets (Puryear 2018, Mann 2025). During a recent mpox outbreak, a program in Phoenix was able to mobilize quickly and vaccinate encampments (Zeien 2023).

## Across very different settings, many patients have voiced a clear preference for mobile primary care over nearby fixed sites.

PEH in Austin described a once-weekly van as safer, more convenient, and more respectful than the shelter-based clinic just a few blocks away (Ramirez 2022). In Boston, interviews with clients aboard the Family Van mobile clinic echoed these themes—plain-language communication, culturally matched staff, and on-the-corner access made the van their first choice even when they had insurance and a regular doctor (Bouchelle 2017).

As a result of their reach, some mobile clinics can even outperform nearby fixed-site clinics on engagement and follow-through, especially with respect to underserved populations.

For example, a mobile unit operating in Miami retained a higher proportion of patients on pre-exposure prophylaxis (PrEP) to prevent HIV acquisition after 48 weeks, compared to its sister fixed-site location (Doblecki-Lewis 2024).

## Mobile primary care programs have been able to surface—and, in some cases, successfully manage—previously undetected medical conditions, often serving as a gateway to further care.

- ***Cardiometabolic risk and control.*** Mobile clinics report success in identifying and, in some cases, managing previously undiagnosed cardiometabolic risks. For example, one California program found that 40% of screened adults had untreated hypertension (Shubrook 2023; see also Brook 2022 for Detroit). Another California program found that 29–47% of 2,620 rural adults screened had at least one abnormal result for cholesterol or blood sugar (Guerra 2017; Shubrook 2023). At least one study found that mobile programs can also support effective management: repeat patients at a Massachusetts clinic saw average systolic blood pressure reductions of about 10 mmHg (Song 2013).
- ***Infectious disease control.*** Mobile clinics have played a vital role in infectious disease control in certain communities. In Baltimore, a mobile HIV van identified about one new case for every 70 repeat testers each year, catching infections earlier than the city clinic was able to (Puryear 2018). Two rural programs diagnosed hepatitis C (HCV) infections in roughly 1 of 6 people tested. In one program, about 80% of patients who began treatment completed the course and cleared the infection—a result linked to consistent follow-up and trusted community partnerships (Rennert 2024; see also Howard 2024).
- ***Mental health screenings.*** Mobile programs serving Latino and migrant populations that have added depression screening to the services they offer have been able to identify depression or anxiety indicators in about 20-37% of people screened. (Manusov 2019, Jaramillo 2023). Those who screened positive in these programs were then linked—either on-site or via telehealth—to psychologists and counseling services, showing that mobile screening can be the first step toward concrete follow-up care.

## Mobile primary care programs can help steer patients into continuing care and provide linkages to social services.

One street medicine program successfully provided follow-up care to PEH after discharge from the hospital (Feldman 2021; see also Mann 2025 connecting PEH to hepatitis C confirmatory testing), while another Arizona program phones clients at the one and three-month mark after mobile clinic visits to ensure continued care and to troubleshoot barriers such as lack of insurance enrollment or unmet social needs (Soto 2023). Another Detroit program that linked its patients to social services programs tracked its referrals and confirmed completion for nearly half the patients (Levy 2021).

## Some mobile primary care programs have kept patients out of emergency departments (EDs) and hospitals and likely generated cost savings for hospitals and payers.

Measuring downstream utilization by patients of certain older mobile programs has demonstrated anywhere from a 1.3:1 to 15:1 return on investment, primarily driven by reduced cardiovascular events and self-reported ED avoidance (Song 2013, Brown-Connolly 2014). One of the earliest economic analyses, based on 2008 data from Boston's Family Van, estimated a 36:1 ROI by modeling avoided ED visits and the value of preventive care using quality-adjusted life years (Oriol 2009).

More recent modeling of a street medicine program finds that even a modest 15% drop in hospital and ED use would more than offset its roughly $9,000 per-patient annual cost (Lynch 2022). By contrast, two newer, small-scale efforts have not yet been able to show clear utilization or cost benefits (Levenson 2025, Chen 2022—routine on-van days).

## Mobile primary care programs can inspire and develop tomorrow's health care workforce.

They teach aspiring clinicians about cultural humility, emphasize social determinants of health, and give hands-on exposure to interprofessional team-based care (Firchow 2025, So 2020, Cockroft 2020). Programs have incorporated students from different health professional schools, public health schools, and even undergraduate programs. This has allowed them to plug day-to-day workforce gaps, while simultaneously building a talent pipeline (Nguyen 2019, Guerra 2017). Follow-up surveys of participants consistently show that these rotations inspire a sizable share of trainees to choose careers in primary care or to practice in underserved communities (Bunker Alberts 2024, Davis 2024).

While evidence consistently highlights the benefits of mobile primary care models, notable limitations remain, including variability across programs that can complicate generalizability. Additionally, the evidence base has gaps in long-term health outcomes and systematic cost-effectiveness assessments.

# *B. Specialty Care Models*

Specialty care mobile health models deliver targeted interventions requiring specialized equipment, provider training, or distinct regulatory oversight. This section outlines each specialty care model's core design and historical context and summarizes available evidence on their impact across similar metrics—access, patient engagement, health outcomes, and cost-effectiveness.

The specialty care mobile health models reviewed in this section were selected due to their relatively robust peer-reviewed evidence base and notable relevance to public health. While other types of specialty care models exist, they are either too niche or have not been sufficiently studied to date. Future updates of this review may incorporate additional models as the evidence base expands.

## MENTAL HEALTH AND SUBSTANCE USE DISORDER MANAGEMENT

Mobile mental health and substance use disorder (MH/SUD) programs deliver specialized clinical services designed to help populations, such as people experiencing homelessness (PEH) and people who inject drugs (PWID), overcome significant barriers to accessing care. These programs diagnose and treat MH/SUDs, dispense Medication for Opioid Use Disorder (MOUD includes buprenorphine, naltrexone, and methadone), and deliver harm reduction supplies and services. Programs often include primary care services (such as infectious disease screenings, vaccinations, and wound care) and other wraparound social services to more holistically meet the needs of the populations they serve.

### Mobile MH/SUD programs effectively engage underserved populations and provide care that meets patients' needs.

- ***Improved reach and equity.*** New Jersey mobile methadone units enrolled far more Black, homeless, and uninsured clients than fixed clinics (Hall 2014), and one Chicago buprenorphine program served 65% Black and >50% uninsured patients (Messmer 2023). A jail-side unit effectively engaged recently released individuals and started MOUD on-site (Krawczyk 2019).
- ***Patient satisfaction and trust.*** In Chicago, 87% of buprenorphine recipients said they would not have started treatment that day without the van—citing pharmacy-related delays, lack of transportation, and the importance of a non-judgmental, accessible setting (Messmer 2024). Qualitative work highlights speed, flexibility, respectful staff, and harm reduction resources offered by mobile units as critical factors fostering patient trust and satisfaction (Suen 2023, Grieb 2022).

## Mobile MH/SUD programs can have a meaningful impact on patients' ability to stay connected with treatment.

- ***Buprenorphine retention.*** A study of a Baltimore-based program providing buprenorphine and other wraparound services found that 60% of patients who received higher daily buprenorphine doses along with integrated wound and hepatitis C care continued to remain on the medication 90 days later (Harris 2025; see also Rosecrans 2022). Studies examining programs offering low-threshold buprenorphine[1] access showed high one-month retention among PEH but noted a gradual decline over five months (O'Gurek 2021; see also Krawczyk 2019 for 30-day retention in a justice-involved cohort). This decline may reflect how structural instability—such as housing transience, trauma, and limited continuity supports—can interfere with sustained treatment engagement, rather than indicating a lack of willingness to engage in care (O'Gurek 2021).
- ***Linkage to ongoing care.*** Mobile engagement—meaning transportation and direct accompaniment to intake by a mobile outreach team—boosted outpatient SUD treatment use by 23 percentage points and methadone maintenance by 32 percentage points compared to standard referral pathways such as walk-ins, court orders, or provider referrals. Mobile programs can also serve as critical first contact points with the broader health system, attracting patients who previously lacked formal care relationships (Regis 2020). However, qualitative studies suggest that some patients prefer to continue care via mobile clinics and perceive traditional clinical settings as rigid or less welcoming (Martinez 2024).

## Mobile MH/SUD programs can also generate critical system-level benefits.

- ***Reduced ED use and cost-effectiveness.*** Mobile health units effectively reduce reliance on EDs for psychiatric crises. One robust evaluation demonstrated a significant decline in psychiatric ED visits over eight months among patients enrolled in a mobile MH clinic (Weissinger 2020). Further, per-encounter costs for a mobile program offering low-threshold access to buprenorphine can be notably low (about $108 per patient visit, according to one estimate), further highlighting their cost-effectiveness (Shah 2024).
- ***Public safety spillovers.*** Mobile MOUD programs can have beneficial spillover effects on neighborhood public safety. In Pittsburgh, buprenorphine vans aligned with a 34% drop in total and drug-related arrests (Fixler 2024).

Long-term clinical outcomes, comparative effectiveness relative to fixed-site care, and standardized retention metrics remain key gaps in the evidence base.

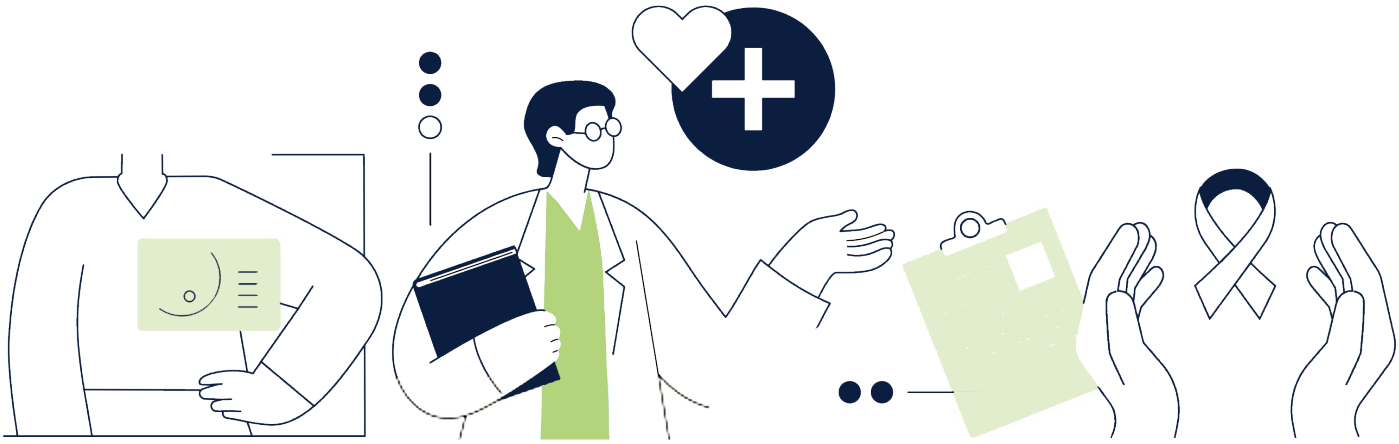
[1]Under low-threshold buprenorphine programs, recipients do not have to adhere to specific requirements such as proving sobriety or regularly attending group therapy to maintain access to the medication.

## BREAST CANCER SCREENING

Mobile mammography vans bring fully digital breast cancer scanners to community locations such as churches, housing complexes, and work sites. The model was first piloted in the mid-1970s, and the Centers for Disease Control and Prevention's National Breast and Cervical Cancer Early Detection Program, established in 1990, helped expand it nationwide. Many mobile mammography programs target women who face insurance, transportation, or scheduling barriers to fixed-facility screening.

**Mobile mammography programs can reach women who are least likely to obtain facility-based screening and detect cancers at an early stage. Still, programs struggle to convert that first touch into sustained screening and timely diagnosis.**

- ***Reaching underserved populations.***
  - According to Medicare claims data between 2004 and 2021, mobile screenings were disproportionately used by American Indian/Alaska Native women, rural residents, and women residing in the lowest-income ZIP codes. Though rare overall—accounting for less than 0.5% of all screening mammograms among female Medicare fee-for-service beneficiaries—mobile screenings are disproportionately used by specific hard-to-reach populations (Pelzl 2025).
  - In New York City, 63% of the 32,000 participants screened at a no-cost van reported annual incomes ≤ $25,000, and 30% were uninsured (Van de Bruele 2022).
  - Among uninsured women aged 50-67 in St. Louis, African American women were likelier to use the van more than once, suggesting that the program was able to engage this population on an ongoing basis (Drake 2015; see also Mizuguchi 2014).
  - A study of mobile mammography van service distribution in Dallas and surrounding areas found that it mainly boosted access in inner-city uninsured tracts, with little added benefit in surrounding rural counties (Hughes 2020).



- ***Ability to detect cancer.*** Large single-program audits report cancer detection rates between 1 and 8 per 1,000 exams, with most cancers caught at either stage 0 or 1 (Stanley 2017, Tsapatsaris 2021, Spak 2022). This detection rate is comparable to fixed-site benchmarks despite the mobile units primarily serving uninsured or Medicaid-insured women (Stanley 2017).
- ***Patient experience and preferences.*** Qualitative studies among Latina and African American women highlight convenience, shorter wait times, and culturally concordant staff as advantages of using a mobile mammography unit (Scheel 2019, Chen 2016). Focus groups of low-income African American women in Houston revealed that they viewed mobile mammography vans as 'highly appealing' if parked at trusted community venues with evening/weekend hours (Hall 2017).
- ***Follow-up and repeat screening gaps.*** Only 45% of women with abnormal results on a New York mobile unit obtained recommended follow-up within 60 days versus 72% at fixed clinics (Vang 2022). In a mobile program serving 24 Indian Health Service clinics, just 39% of women met biennial rescreening guidelines and were far more likely to wait over 27 months between screenings than those in the national registry data (Roubidoux 2021).

Evidence on cost-effectiveness, long-term health impacts, or possible harms of a poorly implemented model is sparse. Studies have primarily focused on access metrics.

## PREVENTIVE AND RESTORATIVE DENTISTRY

Mobile and portable dentistry programs deliver dental services directly into community locations using fully equipped vans or portable dental equipment, including screenings, preventive care, and treatments. Mobile and portable dentistry expanded significantly in the late 1980s through state-funded dental sealant initiatives for schoolchildren. Subsequent federal grants, most recently via the Action for Dental Health Act of 2017, have further helped boost this model. In the 2010s, the model further expanded to address increasing dental needs among seniors and residents of long-term care (LTC) facilities, reflecting the needs of an aging population retaining more teeth.

**Mobile dentistry effectively reaches populations who face significant barriers to traditional care, improving access and oral health outcomes.**

- ***Improving access and equity.*** Mobile dental vans and portable clinics often serve populations facing geographic, financial, or mobility barriers, including low-income schoolchildren, nursing home residents, medically complex adults, and rural communities (OHWRC 2020). In one Minnesota program, LTC residents served by mobile dentistry had significantly worse baseline oral health than outpatient seniors, reflecting high unmet needs in LTC populations (Smith 2020). Almost 90% of schoolchildren served by a program in Missouri did not have access to a local clinic, indicating that mobile dentistry has successfully engaged previously underserved populations (OHWRC 2020).
- ***Oral health outcomes and quality.*** A comprehensive Ohio school-based program found that shifting to mobile and portable dentistry significantly increased preventive care and reduced invasive treatments, indicating improved oral health outcomes (Partido 2021). Similarly, a Los Angeles mobile dental clinic study found that the model can curb tooth decay even when visits occur less frequently than recommended (Enciso 2015). Qualitative evaluations confirm that the quality and effectiveness of mobile dental services are comparable to traditional clinical settings, including among vulnerable populations such as nursing home residents and patients with special needs (Helgeson 2015).

## Mobile dentistry can deliver routine care at a modest cost and theoretically curb avoidable ED spending.

- ***Relative cost-effectiveness.*** Four Southern programs report an average $123 submitted charge per mobile visit—well below fixed-site prices (Attipoe-Dorcoo 2020). Likewise, Apple Tree Dental's mobile dental program patients saw average per-patient charges fall from $1,876 to $1,037 over three years as initial disease backlogs were cleared, mirroring declines in its outpatient cohort (Smith 2020).
- ***Untapped ED savings.*** In 2018, Americans made 2 million ED visits for dental problems, and 95% were simply treated and released at a total cost exceeding $2 billion (HCUP Statistical Brief 280). Although no study has directly measured how mobile dentistry affects dental-related ED use, expanding access to community-based mobile clinics could plausibly curb much of this avoidable spending.

Long-term clinical outcomes, comprehensive cost-effectiveness, and optimal strategies for sustaining patient engagement remain sparsely studied.

### VISION SCREENING AND EXAMINATIONS

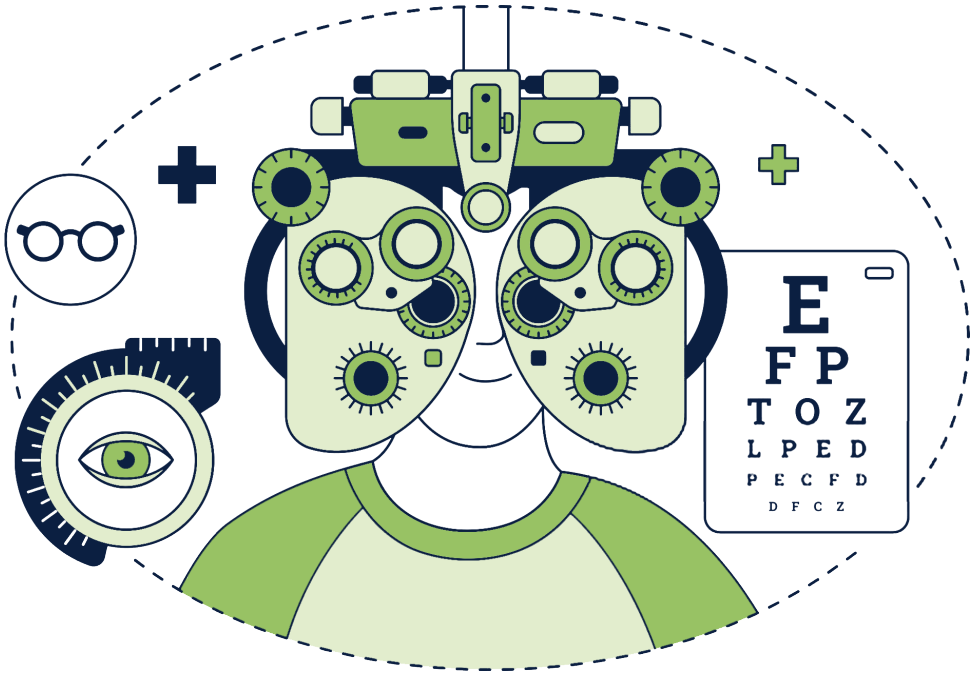
Mobile vision programs station fully-equipped eye-care vans at schools, shelters, and community hubs to deliver on-the-spot screenings, comprehensive eye exams, eyeglass dispensing, and referrals. Piloted in the 1970s, the model scaled rapidly in the 2010s as nonprofits such as Vision to Learn and citywide collaboratives (such as Vision for Baltimore) partnered with school districts and philanthropies to expand the model, particularly for schoolchildren. Variants of this model now include teleophthalmology vans for adults (which combine on-van imaging with off-site specialist review) and low-vision rehabilitation clinics (staffed by occupational therapists to assist legally blind patients).

## Mobile vision programs can reach populations with high unmet vision needs.

- ***Schoolchildren:*** After the in-school screening, mobile clinics immediately complete full exams for 60-80% of referred students, exceeding the follow-up rates seen when families are asked to travel to community providers. Roughly 70% of those examined via mobile clinics required glasses (Kruszewski 2022, Hunter 2022; see also Griffith 2016, Hong 2024, Rohn 2023, Kodjebacheva 2015).
- ***Adults:*** Studies find that 20-32% of adults who undergo screening need follow-up specialty care, and one study found that almost 60% have never had a prior eye exam (Brinks 2018, Williams 2019, Al-Aswad 2021, Chheda 2019).
- ***People Experiencing Homelessness:*** A University of Pittsburgh street medicine pilot found that about 91% of PEH screened for vision needs received and accepted their new glasses on the spot (Samanta 2025).

## Mobile vision programs rapidly correct students' vision, and randomized controlled trials (RCTs) show linked short-term gains in educational outcomes. They can also help detect more serious, undiagnosed vision problems.

- ***Vision outcomes.*** In Baltimore, 70% of 4,972 students seen through a school-based mobile eye clinic experienced noticeable improvements in their ability to see clearly at distance after receiving glasses—gains that were sustained for at least two years (Guo 2021; see also Mudie 2022 for two-year sustained gains). A street medicine pilot showed comparable gains in adults (Samanta 2025).
- ***Educational outcomes.*** A cluster RCT in Baltimore City's public schools, which predominantly serve low-income students, found that mobile vision care led to higher reading scores after one year (Nietzel 2021; see also Slavin 2018, Collins 2022). A separate Florida RCT showed initial reading- and math-score gains that faded over time (Glewwe 2018). An LA cohort, however, recorded language arts gains that persisted two years after receiving glasses (Dudovitz 2020).
- ***Detection of sight-threatening diseases.*** Teleophthalmology vans demonstrate the ability to detect previously undiagnosed glaucoma and diabetic retinal disease (Tan 2021, Al-Aswad 2021), while school-based vans have caught amblyopia in 8-9% of children and developed treatment plans to prevent vision loss (Hendler 2016, Hunter 2022).



## Limited evidence on cost-effectiveness.

One New Mexico mobile program that combined biometric and retinal screenings statewide generated an estimated $10 million (USD) in quality-adjusted life-year savings from the retinal component alone (Brown-Connelly 2014). However, an analysis of a mobile vision program serving 37 San Francisco public preschools found that community-based fixed-site follow-up care was more cost-effective than mobile on-site exams—unless the mobile program either increased the share of children receiving follow-up exams or significantly reduced its per-case costs (Lowry 2016).

## Adherence and continuity of care concerns.

Two mobile vision programs serving similar low-income urban school populations reported different 12-month eyeglass retention rates—44% in Baltimore vs. 71% in Philadelphia—potentially due to differences in program design. The Philadelphia program used structured school nurse follow-up, while the Baltimore program relied on students and families to request replacements (Mukherjee 2018; Alvi 2015). Programs and researchers have also been exploring ways to improve follow-through on complex pediatric referrals, including ensuring children attend in-person appointments with specialists (Tucker 2024).

Despite a robust field of evidence tracking improvements in access and short-term outcomes, gaps in evidence remain. More research is needed to establish (1) long-term academic and socioeconomic impacts (beyond two years), (2) ways to improve care continuity, and (3) the cost-effectiveness between various mobile vision models and in comparison to brick-and-mortar community-based services.

## Other Specialized Mobile Models Currently Operating in the U.S.

Several other mobile health models are actively being piloted or implemented across the country, including those that provide:

- kidney disease screening
- cancer screening—
  - colorectal
  - lung
  - skin
- dermatology
- oncology infusion
- maternal/prenatal care
- sexual and reproductive health care for adolescents and adults
- cardiology
- audiology
- psychotherapy
- gastroenterology
- diabetic foot care/podiatry

These models have been excluded because they are either too niche or not well-studied enough yet. However, as their evidence base expands, they may warrant a deeper evaluation in future reviews.

# C. *Models Linked to Emergency Care*

Emergency-linked mobile health models leverage the EMS infrastructure to deliver clinical care where and when patients need it most. These models aim to cut avoidable hospital use, reduce law enforcement involvement, and smooth transitions from acute events to ongoing care. This section outlines each model's design, historical context, and evidence base related to access, patient engagement, health outcomes, and cost-effectiveness.

## ACUTE STROKE RESPONSE

Mobile Stroke Units (MSUs) bring hospital-level stroke care to patients, shaving critical minutes off diagnosis and treatment. The first MSU in the U.S. launched in Houston in 2014; now, more than 18 MSUs operate nationwide. Each MSU is a specialized ambulance outfitted with a Computed Tomography (CT) scanner, clot-dissolving drugs, and a stroke-trained team; some programs also allow neurologists to guide care via telehealth.

**While MSUs consistently show promise in improving response times for stroke care and short-term outcomes, questions remain about the model's long-term benefits.**

- ***Improved response times.*** Conventional wisdom holds that "time is brain" and that a patient's nervous tissue rapidly deteriorates by the second, making even minor improvements in time to treatment critical. Multiple studies have found that MSUs can start stroke treatment about 15–30 minutes faster than standard EMS programs. (Cerejo 2015, Davis 2025a, Grotta 2021, Itrat 2016, Kummer 2019, Morey 2020; see also Taqui 2017 for mini-MSU).
- ***Better short-term clinical outcomes.*** Multiple U.S. studies show that MSU patients have better functional recovery 90 days after stroke—improved mobility, speech, and ability to perform daily activities—than those treated by standard EMS programs (Grotta 2021, Morey 2020, Czap 2024; see also Mac Grory 2024 for discharge-level real-world data). Follow-up of the Grotta multicenter cohort confirmed that this functional independence advantage was still present at the 12-month mark (Grotta 2024).
- ***Unclear long-term clinical impact.*** Although one study found a 6.8 percentage point reduction in one-year mortality for MSU-treated patients compared to standard EMS patients, this finding was not statistically significant, and the study found no decrease in functional outcomes (measured using the modified Rankin Scale), hospitalization or ED utilization in the MSU-treated patients (Khullar 2025).

**Although MSUs can lower overall stroke costs, their cost-effectiveness hinges on local volume, accurate triage, and transport patterns.**

Key factors shaping MSU cost-effectiveness include:

- ***Annual patient volume.*** Economic modeling shows MSU cost-effectiveness improves sharply as annual treated volume rises (Rajan 2024).
- ***Minimizing false positives.*** Modeling also flags the share of "stroke mimics" (when it turns out to be a non-stroke case) as a significant cost driver (Rajan 2024, Rink 2024). An international audit of 20 MSU programs–including several U.S. sites–found that about 48% of on-scene MSU assessments were non-stroke cases, underscoring the need for stronger initial and ongoing dispatcher training (Nour 2024).
- ***Ambulance transfer type.*** MSUs save more in rural or remote regions that rely heavily on expensive air ambulance transfers (Reimer 2020).

However, one urban Medicare study showed no significant difference in total health care spending after one year between MSU-treated patients and standard EMS patients, underscoring that cost savings are likely context-dependent (Khullar 2025).
To curb capital costs, several systems are piloting a telemedicine-enabled "mini-MSU" model that layers remote neurologist support and stroke-specific protocols onto standard EMS ambulances, avoiding the need for a dedicated, CT-equipped MSU (English 2021).

## BEHAVIORAL CRISIS INTERVENTION

For individuals experiencing mental health or substance use disorder crises, calling 911 has traditionally summoned a police response rather than specialized clinical care. But law enforcement involvement can escalate tensions, result in the use of force, and discourage individuals from seeking help. Mobile Crisis Teams (MCTs) offer a better alternative by rapidly dispatching behavioral health professionals to crisis locations. Trained to provide on-scene support, link people to ongoing care, and reduce unnecessary ED visits or incarceration, MCTs represent a critical shift in crisis response.

Each team typically includes a licensed mental health clinician, often paired with a medic and/or crisis specialist. Teams operate either as behavioral health practitioner-only (BHP-only) units or as co-responder units in coordination with law enforcement.

First piloted in a few cities in the late 1960s, the model remained small for decades but has expanded rapidly since the opioid crisis and calls for non-police responses beginning in 2020; as of 2024, roughly 40% of U.S. counties host at least one team (Burns 2024). A national law-enforcement survey likewise shows that four in ten agencies now field co-responder units, though most lack 24/7 coverage and rarely track outcomes (Uding 2024; see also IACP/UC 2021). Though programs now operate in hundreds of jurisdictions, coverage remains patchy—especially outside large urban counties—and often hinges on Substance Abuse and Mental Health Services Administration (SAMHSA) block grants, state funding for the 988 mental health crisis hotline, and Medicaid support (Burns 2024, Newton 2022, Anderson 2025).

## MCTs improve follow-up care and reduce stigma, yet long-term health effects remain under-studied.

- ***Linkage to follow-up care.*** A study of multiple BHP-only teams in Michigan found that they were more likely to link individuals directly to ongoing treatment and arranged follow-up than co-responder or police-only responses (Bakko 2025). Nationally, 44% of adults served by an MCT engaged with community care within 30 days (Kim 2017).
- ***Improved patient experience.*** People receiving BHP-only MCT services consistently report greater satisfaction than traditional police responses, citing a more empathetic, non-stigmatizing, and person-centered approach (McDaniel 2024, Pope 2023, Townsend 2023). However, there are common complaints about slow response times and capacity limits (IACP/UC 2021).
- ***Long-term clinical outcomes.*** Rigorous U.S. studies tracking medium- and longer-term outcomes—such as whether referred individuals remain engaged in care 3 to 6 months later—remain scarce, marking a key research gap.

## Available evidence suggests that most documented savings from MCTs likely benefit police departments and hospitals but not health insurers—which could impact the model's ability to scale up.

- ***Reduced justice involvement.*** Denver's BHP-only team cut minor criminal charges by 34% (Dee & Payne 2022), and Oregon's CAHOOTS model lowered on-scene arrests while increasing connections to follow-up services (Davis 2025b). A Delaware co-responder team diverted enough people from jail and EDs to save an estimated $2.8 million over three years (Donnelly 2025).

  A randomized trial in a suburban-rural U.S. county found no sustained reduction in repeat police contacts after implementing a co-response model in which clinicians responded only after police secured the scene—highlighting that without real-time clinical support or strong treatment follow-up, co-response alone may have limited long-term effects (Yang 2024).

- ***Avoided ED and hospital utilization.*** In Boston, the Boston Emergency Services Team (BEST)—a multi-modal psychiatric crisis system that includes MCTs—cut the share of its psychiatric emergency encounters occurring in EDs from 70% in 2005 to 58% in 2016 (Oblath 2022). In Connecticut, a youth-focused MCT program was associated with a 25% reduction in the odds of a repeat behavioral health ED visit over 18 months compared with matched controls (Fendrich 2019).

Further evaluation is needed to clarify the long-term health outcomes, cost-effectiveness, and optimal deployment strategies for different MCT models. Ongoing federal and state policy initiatives may help address evidence gaps and strengthen the model's effectiveness and accessibility.

## COMMUNITY PARAMEDICINE

Community Paramedicine (CP) programs (often branded under the broader umbrella of "mobile integrated health care" or MIH)[2] leverage emergency medical personnel to deliver non-emergency preventive, primary, or follow-up care directly at patients' homes or in community settings. Initially emerging in rural areas to expand access to primary care in areas with provider shortages, CP programs eventually found a home in urban areas as a way to divert frequent ED utilizers to lessen the strain on the acute care system.

Each CP program typically involves certified paramedics with specialized training operating under medical direction. Based on our review of the literature, U.S. programs cluster into three functional models:

1. **Scheduled post-hospital follow-up care** to reduce hospital readmissions[3]
2. **High-utilizer interventions** designed to manage frequent ED and 911 users proactively
3. **"Treat-in-place" responses** where paramedics provide on-scene care instead of automatic ED transport for low acuity cases.

### CP programs often improve patients' continuity of care and experience.

- ***Improved clinical control and continuity.*** A rural South Carolina CP program for high-risk adults helped patients reduce their blood pressure and blood glucose levels while also cutting down on ED visits (Bennett 2018). Resolving medication-related needs through CP was linked to a 65% drop in 30-day readmissions (Miller 2023), and a CP program with interprofessional care coordination (including paramedics, nurses, social workers, and others) reported that participants felt more confident managing their ongoing care (Roeper 2018).
- ***High patient satisfaction.*** 97% of users in a suburban Texas program would recommend CP services (Adio 2020), older adults in an advanced-illness CP model rated the home-based, personalized care very highly (Abrashkin 2016), and most participants in a randomized ED-to-home trial said they would choose an ED that offers CP follow-up (Shah 2018).

[2]CP programs allow paramedics and emergency medical technicians to provide routine health care services, while MIH programs also incorporate primary care teams and other community-based providers. For simplicity, this section uses "CP" to cover both CP and MIH models.

[3]Many CP/ MIH programs leverage existing EMS vehicles that are already equipped to provide basic medical care as the clinical base for visits, underscoring that the vehicle can be integral to care rather than merely a mode of transport.

## CP programs have demonstrated significant cost savings by reducing avoidable hospital admissions and ED utilization.

However, these savings primarily accrue to hospitals and payers, but not always to EMS agencies, which can be a barrier to scaling the model.

- ***Reduced hospitalizations.*** Multiple evaluations have documented substantial reductions in hospitalizations associated with CP programs. An urban CP transitional-care pilot cut 90-day inpatient hospitalizations by about 80% (Siddle 2018), a post-discharge CP intervention nearly halved 120-day readmissions and saved over $400,000 in health care costs (Burnett 2023), while a Medicare Advantage MIH program yielded a 3-to-1 return on investment by reducing inpatient and ED use (Roeper 2018).
- ***Reduced strain on EDs and EMS systems.*** A multi-site review of 12 U.S. CP programs found a 44% overall drop in ED visits (Lurie 2023; see also Castillo 2016 for reductions in Medicare Advantage populations). Single-site studies echo this effect: a high-utilizer CP program in Wisconsin cut avoidable ED use by 59% (Myers 2020); home visits to those with chronic diseases in rural Oregon achieved a 39% reduction (Currier 2023); and an on-scene diversion program in a midsize city reduced EMS transports to the ED for enrolled patients from 64.6% to just 8.5% (Gingold 2022).

Despite growing evidence, substantial gaps remain. Additional research is needed to:

1. Clarify long-term clinical outcomes
2. Develop standardized clinical protocols and common quality metrics (Martin 2019, Okoe 2023)
3. Harmonize the scope of practice variation across states
4. Ensure that CP is used in clinically appropriate contexts (AHRQ 2022)

Recent policy developments like the Centers for Medicare and Medicaid Services Emergency Triage, Treat, and Transport initiative may provide essential evidence and pathways for broader adoption and scaling.

# Closing the Evidence Gaps: Research Priorities and Next Steps

***Mobile health consistently reaches underserved populations, improves access, and shows clear potential to reduce costly utilization of hospitals, EDs, and jails—while also supporting better health outcomes and psychosocial well-being for patients and communities.***

These findings provide policymakers with a solid foundation for immediate action and investment in mobile health. Nonetheless, filling remaining evidence gaps—especially related to sustained long-term outcomes and cost efficiency—would enable more strategic, targeted, and sustainable expansion of mobile health programs moving forward.

Currently, the literature predominantly consists of single-program evaluations with relatively few RCTs or comparative studies directly assessing mobile health against fixed-site alternatives—an evidence gap compounded by the ethical and logistical challenges of randomizing access to care in high-need populations. These limitations also reflect the inherent complexity and diversity of mobile health programs, which make apples-to-apples comparisons across programs challenging. Innovative quasi-experimental methods or stepped-wedge trial designs may offer more ethical and feasible alternatives.

Further, standardizing reporting frameworks and establishing common data elements across mobile programs would significantly strengthen research quality and facilitate comparisons. Developing a core dataset (patient encounters, demographics, payer type, and key outcomes such as ED visits and follow-up rates) alongside optional, condition-specific metrics (e.g., Hemoglobin A1c, viral load suppression, blood pressure control) would further streamline data capture. Some of this infrastructure already exists: for example, Mobile Health Map provides a platform for collecting many of these core data elements, and broader participation with standardized entry could enhance its utility as a national resource. Additionally, aligning claims fields—such as consistent place-of-service codes—would enable clearer cross-program comparisons using claims data.

Closing these evidence gaps will reinforce the case for mobile health, accelerate broader adoption, and promote more equitable, effective, and sustainable health care delivery nationwide—while also enabling the field to evolve strategically through ongoing evaluation, shared learning, and refinement of best practices.

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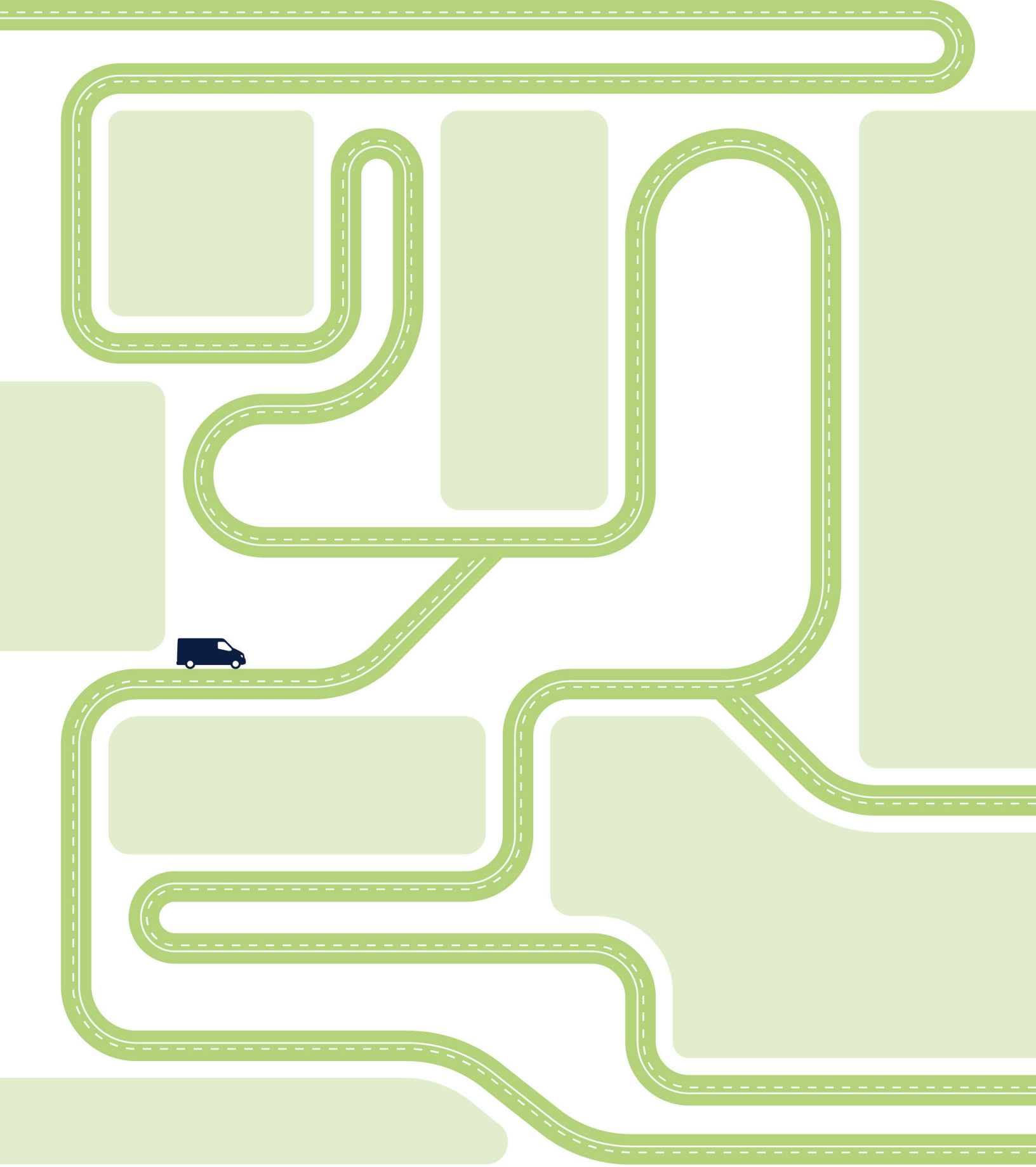

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