A Blockchain Solution to Homelessness

by Empowering Social Safety Nets

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Abstract

Homelessness represents a persistent global challenge affecting millions, with approximately 750,000–771,000 individuals experiencing homelessness in the United States on any given night in 2024. Homeless populations require coordinated access to diverse services, including healthcare, food assistance, mental health support, and shelter, yet service fragmentation across geographic and organizational boundaries creates critical gaps in care delivery. This paper examines blockchain technology as an innovative solution to address coordination challenges in homeless services. Blockchain's distributed network

architecture offers unique advantages: nationwide deployment unconstrained by political boundaries, universal accessibility via smartphones, enhanced data security through cryptographic protection, privacy preservation for vulnerable populations, real-time identification of service gaps, and reliable auditing capabilities. We further analyze the application of blockchain technology to homeless veteran populations—who constitute approximately 5% to 13% of the homeless adult population and are at a moderately higher risk of homelessness compared to the general population—as a potential model for broader implementation. Case studies, including the Blockchain for Social Impact initiative, Blockchain Charity Foundation, and emerging homeless registry systems, demonstrate practical applications. The integration of blockchain technology into social safety net infrastructure provides a scalable framework for ensuring equitable access to essential services while respecting individual privacy and dignity. This approach offers immediate implementation potential for governments and nonprofit organizations seeking to optimize resource distribution and close critical service gaps for vulnerable populations.

Keywords: blockchain, homelessness, social safety nets, vulnerable populations, healthcare access, veterans, distributed systems, service coordination, digital identity, resource allocation

Introduction

Homelessness remains a complex, multifaceted challenge affecting millions of people globally. In the United States alone, approximately 750,000 to 771,000 individuals experience homelessness on any given night in 2024 (1). This population faces numerous barriers to accessing essential services, including healthcare, food assistance, mental health

support, employment services, and emergency shelter. The causes of homelessness are diverse and interconnected, including poverty, lack of affordable housing, mental health conditions, substance use disorders, and systemic inequalities.

Homeless veterans represent a particularly vulnerable subpopulation within this broader crisis. Current estimates suggest that approximately 5-13% of homeless individuals in the United States are veterans, with several hundred thousand veterans experiencing homelessness over the course of a year (2). Veterans face an increased risk of homelessness compared to the general population. This elevated risk stems from factors including service-related trauma, difficulty transitioning to civilian life, mental health challenges, and inadequate support systems.

The Challenge of Service Coordination

Homeless individuals require access to a wide array of services provided by diverse organizations spanning multiple jurisdictions, funding sources, and organizational structures (3,4). These service providers include government agencies, nonprofit organizations, faith-based institutions, healthcare systems, and community volunteers. The fragmented nature of this service ecosystem creates significant coordination challenges, particularly given the high mobility of homeless populations across geographic and political boundaries (5).

This fragmentation results in critical problems:

- Duplication of services while other needs remain unmet
- Inability to track service utilization across jurisdictions

- Gaps in essential care that go unidentified
- Inefficient resource allocation
- Compromised continuity of care
- Limited ability to assess outcomes or identify best practices

Consider a common scenario: a homeless individual visits a food bank in one city, receives emergency medical care at a hospital in another jurisdiction, and seeks shelter through a faith-based organization in a third location. Each organization maintains separate records, creating information silos that prevent a comprehensive understanding of the individual's needs and service history. When an individual presents to a single organization, that provider lacks visibility into which services have already been accessed and which critical gaps remain.

Current database solutions face inherent limitations in addressing these challenges. Centralized databases require single-point administration, making nationwide deployment across diverse organizations politically and operationally challenging (6). They are vulnerable to single points of failure, data breaches, and access restrictions that can exclude smaller community organizations (7). Privacy concerns and regulatory requirements further complicate data sharing across organizational and jurisdictional boundaries (8).

Blockchain Technology: A Paradigm Shift

Blockchain technology offers a fundamentally different approach to these challenges through its distributed network architecture. Originally developed as the underlying technology for cryptocurrency transactions, blockchain creates an immutable, transparent,

and decentralized ledger that securely stores and shares information among multiple parties without a central authority or administrator.

Key technical characteristics of blockchain relevant to homeless services include:

• Distributed consensus mechanisms that ensure data integrity without centralized control

• Cryptographic security protecting individual privacy while enabling appropriate data sharing

• Immutability prevents unauthorized alteration of service records

• Transparent audit trails documenting all system interactions

• Permissioned access controls allowing graduated visibility based on role and relationship

• Interoperability enabling integration across diverse organizational systems

These technical capabilities directly address the coordination challenges facing homeless service delivery. A blockchain-based system can simultaneously serve organizations across the nation while maintaining data security, respecting individual privacy, and enabling real-time identification of service gaps (8).

Blockchain Advantages for Homeless Services

The application of blockchain technology to homeless service coordination offers seven distinct advantages over traditional database approaches.

Nationwide Deployment Without Jurisdictional Barriers

A distributed blockchain network can be readily deployed across geographic and political boundaries without requiring centralized administration or unified governance structures. Service providers in different cities, counties, and states can participate in the same network without ceding control to a single administrative entity. This eliminates the political and logistical challenges that have prevented nationwide coordination systems in the past (9).

Universal Accessibility Through Standard Devices

Blockchain networks are accessible through standard internet-connected devices, including smartphones, tablets, laptops, and desktop computers. This accessibility extends to both service organizations (from large healthcare systems to small community nonprofits) and to homeless individuals themselves, who increasingly have access to smartphones even when lacking stable housing. Mobile-first design principles ensure that resource-constrained organizations can participate without significant infrastructure investment (10).

Minimization of Coordination Errors

The immutable nature of blockchain records ensures that service histories remain accurate and cannot be altered or lost due to system failures, organizational changes, or administrative errors. This is particularly critical for medication records, where homeless individuals often receive care from multiple providers across jurisdictions. Blockchain implementations in pharmaceutical supply chain management have demonstrated the technology's ability to maintain accurate tracking despite complex multi-party interactions (11).

Privacy Preservation Through Cryptographic Security

Homeless individuals deserve the same privacy protections afforded to all patients and service recipients. Blockchain technology employs advanced cryptographic techniques—similar to those used to secure financial transactions—to protect individual identities while enabling appropriate information sharing (12). Individuals can maintain control over their own records, granting access permissions to specific organizations for defined purposes and time periods. This approach respects dignity and autonomy while facilitating necessary coordination.

Real-Time Identification of Service Gaps

When a homeless individual interacts with any participating organization, that provider can instantly identify what services the individual has recently accessed and what critical needs remain unmet. For example, when an individual arrives at a medical clinic, the provider can determine whether the person has secured food assistance, temporary shelter, or mental health services. The organization can then not only provide its own services but also facilitate connections to other needed resources. This real-time gap identification enables accurate wraparound service delivery.

Reliable Auditing and Outcome Assessment

Blockchain's transparent and immutable audit trail enables rigorous program evaluation and outcome assessment (13). Researchers and administrators can analyze service utilization patterns, identify best practices, and assess program effectiveness across organizations and jurisdictions. This evidence base can inform resource allocation

decisions and policy development. The system's reliability ensures that data integrity issues do not compromise the validity of the analysis.

Rights Preservation and Democratic Participation

Beyond service coordination, blockchain technology can help protect the fundamental rights of homeless citizens. Secure digital identity systems can facilitate voter registration and ballot access, ensuring that housing instability does not result in disenfranchisement (14–16). Similarly, blockchain-based systems can document work history, educational credentials, and other records that homeless individuals need to rebuild stable lives (17).

Case Studies: Blockchain Initiatives Addressing Homelessness

Several pioneering initiatives demonstrate the practical application of blockchain technology to homelessness and vulnerable population services:

Blockchain for Social Impact Initiative

The Blockchain for Social Impact initiative represents a collaboration between the Blockchain Trust Accelerator, World Identity Network, and United Nations Development Programme (18). This program focuses on creating secure, decentralized identity systems for refugees and homeless individuals. By establishing portable digital identities that individuals control, the initiative enables access to essential services regardless of geographic location or documentation status. The system's cryptographic security ensures

that sensitive personal information remains protected while allowing appropriate sharing with service providers.

Binance Charity Foundation

The Binance Charity Foundation has developed a blockchain-based platform that enables direct donor contributions to charitable causes, eliminating traditional intermediaries and their associated overhead costs (19). The platform's transparency ensures that donors can track how their contributions are utilized, increasing accountability and donor confidence. For homeless services, this model enables more efficient resource allocation and reduces administrative costs, directing a greater proportion of donated funds to direct services.

Emerging Homeless Registry Systems

Several jurisdictions such as Austin, Texas, are piloting blockchain-based registries for homeless individuals (20). These registries create secure, decentralized records of service utilization and needs assessment. By providing a comprehensive view of each individual's circumstances and service history, these registries enable more targeted and effective interventions. The distributed nature of blockchain ensures that registry access extends across organizational and jurisdictional boundaries while maintaining data security and individual privacy.

Healthcare Applications Demonstrating Transferable Principles

Blockchain technology has been successfully implemented in healthcare supply chain management, demonstrating principles directly applicable to homeless services (21).

The BlockPres system, for example, uses blockchain to address prescription medication management challenges in resource-limited settings (22). The system's ability to track medications across multiple providers and prevent errors mirrors the challenges faced in managing healthcare for highly mobile homeless populations. These healthcare implementations provide proof-of-concept validation for broader service coordination applications.

Discussion

Implementation Considerations

Translating blockchain's theoretical advantages into practical homeless services requires careful attention to implementation challenges:

1. Technology Access: While smartphone ownership is increasing among homeless populations, digital divides persist. Successful implementation requires parallel analog systems and support for individuals lacking device access or digital literacy.

2. Organizational Capacity: Many homeless service providers operate with limited resources and technical capacity. Implementation must include training, technical support, and user-friendly interfaces that do not impose excessive burdens on resource-constrained organizations.

3. Governance Models: Blockchain networks require governance frameworks that define participation rules, data standards, access permissions, and dispute-resolution mechanisms. Multi-stakeholder governance models involving

government agencies, nonprofit organizations, and homeless individuals themselves can ensure that systems serve the needs of all participants.

4. Regulatory Compliance: Healthcare and social service data in the United States are subject to privacy regulations, including HIPAA. Blockchain implementations must be designed to comply with applicable regulatory frameworks while leveraging the technology's privacy-enhancing capabilities.

5. Interoperability Standards: To realize the coordination benefits of blockchain, participating organizations must adopt common data standards and interoperability protocols (23). This requires coordination across diverse organizational cultures and existing information systems.

Ethical Considerations

The application of technology to vulnerable populations raises important ethical considerations:

1. Consent and Autonomy: Systems must be designed to respect individual autonomy, with transparent consent processes and the ability to control information sharing. Homeless individuals should not be required to participate in blockchain systems as a condition of receiving services.

2. Equity and Access: Implementation must not create new barriers or exacerbate existing inequalities. Parallel systems and access support must ensure that technology does not exclude individuals or organizations.

3. Surveillance Concerns: While coordination improves service delivery, comprehensive tracking of vulnerable populations raises legitimate concerns about surveillance and control. System design must balance the benefits of coordination with privacy risks and potential misuse.

Relationship to Equitable Healthcare Access

The integration of blockchain technology into homeless services aligns with broader goals of healthcare equity (24). By enabling seamless care coordination across providers and settings, blockchain systems can help overcome barriers that have historically limited healthcare access for homeless populations. Real-time identification of care gaps enables proactive outreach and engagement. Portable digital health records ensure continuity as individuals move across jurisdictions.

For homeless veterans specifically, blockchain coordination could integrate services across Veterans Affairs facilities, community health centers, emergency departments, and nonprofit providers. This integrated approach addresses the fragmented care that contributes to poor health outcomes in this population.

Future Directions

The successful application of blockchain to homeless services could serve as a model for other vulnerable populations facing service coordination challenges, including:

- Rural populations with limited service infrastructure
- Migrant workers moving across jurisdictions for employment
- Individuals with severe mental illness navigating complex treatment systems

- Refugees and asylum seekers accessing services in new countries
- Foster youth transitioning between placements and aging out of systems

The principles established in homeless service coordination—distributed networks, privacy protection, real-time gap identification, and transparent auditing—are broadly applicable to service delivery challenges across populations and settings.

Conclusion

Homelessness is a complex social challenge that requires innovative approaches that transcend traditional organizational and jurisdictional boundaries. Blockchain technology offers a proven technical foundation for addressing the coordination challenges that have historically limited the effectiveness of homeless services.

The advantages of blockchain—nationwide deployment, universal accessibility, error minimization, privacy preservation, gap identification, and reliable auditing—directly address the core challenges facing homeless service delivery. Case studies from identity management, charitable giving, and healthcare supply chains demonstrate practical applications and provide implementation models.

For governments and nonprofit organizations seeking to optimize homeless services, blockchain technology provides an immediately implementable solution that respects individual dignity while enabling comprehensive coordination. The technology's distributed architecture eliminates political and logistical barriers to nationwide implementation, while cryptographic security ensures privacy protection.

The path forward requires pilot implementations, stakeholder engagement, and careful attention to equity and ethics. However, the technical foundation is proven, and the potential benefits are substantial. By leveraging blockchain technology, society can move closer to ensuring equitable access to essential services for all individuals, regardless of housing status.

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