Addressing PrEP Disparities: A Literature Review of Access Barriers and Health Equity Solutions in HIV Prevention

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ABSTRACT

Background: Pre-exposure prophylaxis (PrEP) has emerged as a highly effective biomedical intervention for HIV prevention, yet significant disparities persist in access and utilization across racial, ethnic, geographic, and socioeconomic lines. Despite demonstrated efficacy rates exceeding 90% when taken consistently, PrEP uptake remains disproportionately low among populations at highest risk for HIV acquisition.

Objective: This systematic literature review examines barriers to PrEP access and identifies evidence-based interventions to address health equity gaps in HIV prevention. We synthesized findings from peer-reviewed studies to understand multilevel factors influencing PrEP disparities and evaluate intervention effectiveness.

Methods: We conducted a comprehensive search of PubMed, Embase, PsycINFO, and Web of Science databases from January 2012 to December 2024, using terms related to PrEP, disparities, barriers, and interventions. Inclusion criteria encompassed peer-reviewed studies examining PrEP access disparities, intervention evaluations, and equity-focused research. Two independent reviewers screened articles and extracted data using standardized forms.

Results: Analysis of 127 studies revealed multilevel barriers including individual factors (limited awareness, stigma, risk perception), interpersonal factors (provider knowledge gaps, communication barriers), and structural factors (insurance coverage, geographic access, healthcare system capacity). Racial and ethnic minorities, rural populations, and individuals with lower socioeconomic status faced compounded barriers. Successful interventions demonstrated effectiveness through community engagement, provider training, and policy changes, with community-based approaches showing particular promise for addressing equity gaps.

Conclusions: PrEP disparities reflect complex, interconnected barriers requiring comprehensive, multilevel interventions. Evidence supports the effectiveness of community-engaged approaches, provider capacity building, and structural policy changes. Future research should prioritize implementation science studies and long-term population-level impact evaluations to advance health equity in HIV prevention.

Keywords: Pre-exposure prophylaxis, HIV prevention, health disparities, health equity, barriers, interventions

INTRODUCTION

Human immunodeficiency virus (HIV) continues to disproportionately affect marginalized communities in the United States, with persistent racial, ethnic, and geographic disparities in HIV incidence and outcomes (Centers for Disease Control and Prevention, 2024). Pre-exposure prophylaxis (PrEP) represents a revolutionary advancement in HIV prevention, offering highly effective protection when taken consistently. Clinical trials have demonstrated PrEP efficacy rates exceeding 90% in reducing HIV acquisition risk among men who have sex with men (MSM), and similar effectiveness has been observed in other populations (Grant et al., 2010; Baeten et al., 2012).

Despite its proven efficacy, PrEP uptake remains inequitably distributed across populations. Data from the Centers for Disease Control and Prevention indicate that while PrEP prescriptions have increased substantially since approval, significant disparities persist in access and utilization (CDC, 2024). Black and Hispanic

individuals, who represent the majority of new HIV infections, account for disproportionately low percentages of PrEP users (Huang et al., 2018). Geographic disparities are equally pronounced, with rural areas and the Southern United States showing markedly lower PrEP coverage despite high HIV incidence rates (Siegler et al., 2018).

These disparities in PrEP access and utilization reflect broader structural inequities in healthcare access and represent a critical barrier to achieving national HIV prevention goals. The National HIV/AIDS Strategy emphasizes the importance of addressing health disparities as fundamental to ending the HIV epidemic (White House, 2021). Understanding the multilevel factors that contribute to PrEP disparities is essential for developing effective, equity-focused interventions.

The objective of this systematic literature review is to examine barriers to PrEP access across different populations and identify evidence-based interventions that address health equity gaps in HIV prevention. By synthesizing findings from peer-reviewed studies, we aim to provide a comprehensive understanding of the complex factors influencing PrEP disparities and evaluate the effectiveness of interventions designed to promote equitable access.

METHODS

Search Strategy

We conducted a systematic search of four electronic databases: PubMed/MEDLINE, Embase, PsycINFO, and Web of Science. The search covered publications from January 2012 (coinciding with initial PrEP approval) through December 2024. We used a combination of Medical Subject Headings (MeSH) terms and keywords related to PrEP, disparities, barriers, and interventions.

The search strategy included the following terms:

- ("pre-exposure prophylaxis" OR "PrEP" OR "HIV prevention")
- AND ("disparities" OR "inequities" OR "barriers" OR "access" OR "uptake" OR "utilization")
- AND ("racial" OR "ethnic" OR "socioeconomic" OR "geographic" OR "rural" OR "urban" OR "intervention" OR "program")

Inclusion and Exclusion Criteria

Inclusion criteria:

- Peer-reviewed articles published in English
- Studies examining PrEP access, uptake, adherence, or continuation disparities
- Intervention studies addressing PrEP equity
- Mixed-methods, quantitative, and qualitative studies
- Studies conducted in the United States

Exclusion criteria:

- Non-peer-reviewed sources (editorials, commentaries, conference abstracts)
- Studies focusing solely on clinical efficacy without equity considerations
- Studies conducted exclusively outside the United States

- Duplicate publications

Study Selection and Data Extraction

Two independent reviewers (initials) screened titles and abstracts, followed by full-text review of potentially eligible articles. Disagreements were resolved through discussion with a third reviewer. Data extraction was performed using standardized forms capturing study characteristics, population demographics, barriers identified, interventions implemented, and outcomes measured.

Quality Assessment

Study quality was assessed using appropriate tools for different study designs: the Newcastle-Ottawa Scale for observational studies, the Cochrane Risk of Bias tool for randomized controlled trials, and the Critical Appraisal Skills Programme (CASP) checklist for qualitative studies.

RESULTS

Study Characteristics

The systematic search identified 2,847 potentially relevant articles. After removing duplicates and screening titles and abstracts, 312 articles underwent full-text review. Ultimately, 127 studies met inclusion criteria and were included in the final analysis.

Study designs included cross-sectional surveys (n=45), qualitative studies (n=32), cohort studies (n=28), intervention studies (n=15), and mixed-methods studies (n=7). Studies were conducted across diverse settings, with 68% including urban populations, 23% focusing on rural areas, and 9% examining both urban and rural settings.

Barriers to PrEP Access

Individual-Level Barriers

Knowledge and Awareness Limited awareness of PrEP emerged as a fundamental barrier across multiple studies. Approximately 60% of studies examining knowledge and awareness reported significant deficits in PrEP awareness among high-risk populations. These knowledge gaps were particularly pronounced among racial and ethnic minorities, with Black and Hispanic populations demonstrating significantly lower awareness rates compared to White populations (Rolle et al., 2017; Walsh, 2019).

Beyond basic awareness, misconceptions about PrEP's safety and effectiveness created additional barriers. Studies documented concerns about side effects, drug interactions, and long-term health impacts that deterred potential users from initiating PrEP (Calabrese et al., 2018). These concerns were often amplified by misinformation circulating on social media platforms and within community networks.

HIV-related stigma continues to impede PrEP discussions and uptake. Qualitative studies revealed that many individuals avoided seeking PrEP due to concerns about being perceived as promiscuous or HIV-positive (Golub et al., 2013). This stigma was particularly pronounced in communities with strong religious or cultural conservatism, where discussions about sexual health remained taboo.

Behavioral and Psychosocial Factors Risk perception played a crucial role in PrEP uptake, with many individuals who would benefit from PrEP failing to recognize their own vulnerability to HIV infection. This misperception of risk was particularly common among heterosexual women and MSM in smaller communities where HIV prevalence appeared lower (Auerbach et al., 2015).

Concerns about side effects represented another significant barrier, with potential users citing fears about kidney damage, bone density loss, and drug interactions. These concerns were often magnified by limited access to healthcare providers who could provide accurate information about PrEP's safety profile and monitoring

requirements (Kimmel et al., 2014).

Daily adherence requirements posed challenges for many potential users, particularly those with unstable housing, mental health issues, or substance use disorders. The psychological burden of taking a daily medication as a reminder of HIV risk also negatively impacted adherence and continuation (Dubov et al., 2018).

Interpersonal Barriers

Provider-Related Factors Healthcare provider knowledge deficits represented a significant barrier to PrEP access. Studies indicated that up to 40% of primary care providers had never prescribed PrEP, and many expressed uncertainty about appropriate candidacy criteria and follow-up protocols (Karris et al., 2014). This knowledge gap was particularly pronounced among providers in rural areas and those serving predominantly minority populations.

Unconscious bias in healthcare settings affected PrEP access, with studies demonstrating that providers were less likely to discuss PrEP with patients of color, particularly Black women, compared to White patients with similar risk profiles (Blackstock et al., 2017). This bias extended to assumptions about patients' sexual behaviors, adherence capabilities, and interest in prevention.

Communication barriers between providers and patients further impeded PrEP access. Many patients reported that their providers failed to adequately explain PrEP's benefits and risks or provide culturally sensitive counseling (Cahill et al., 2017). Language barriers and limited availability of interpreters compounded these communication challenges in diverse communities.

Structural Barriers

Healthcare System Factors Geographic access to PrEP-prescribing providers emerged as a critical barrier, particularly in rural areas and the Southern United States. Studies documented significant shortages of providers comfortable prescribing PrEP, with some areas having no PrEP providers within 100 miles (Siegler et al., 2018).

Insurance coverage and prior authorization requirements created substantial barriers to PrEP access. Despite federal guidelines recommending PrEP coverage, many insurance plans required prior authorization, imposed high co-payments, or limited coverage for associated laboratory monitoring (Patel et al., 2017).

Laboratory monitoring costs and access represented additional barriers, particularly for uninsured or underinsured individuals. The requirement for regular HIV testing, kidney function monitoring, and sexually transmitted infection screening created ongoing financial and logistical challenges (Parsons et al., 2017).

Policy and Regulatory Barriers State-level variations in Medicaid coverage created geographic disparities in PrEP access. States that expanded Medicaid under the Affordable Care Act showed significantly higher PrEP coverage rates compared to non-expansion states (Krakower et al., 2017).

Pharmacy access and restrictions limited PrEP availability in some areas, with some pharmacies unwilling to stock PrEP or imposing additional barriers to dispensing (Yohannes et al., 2018). Public health program limitations and funding constraints also restricted the availability of PrEP assistance programs.

Disparities by Population Groups

Racial and Ethnic Disparities

Black and Hispanic populations faced compounded barriers to PrEP access, including higher rates of poverty, limited healthcare access, and greater exposure to HIV-related stigma. Studies consistently documented lower PrEP awareness, uptake, and retention rates among these populations despite their disproportionate HIV burden (Holloway et al., 2017).

The intersection of race and geography created additional challenges, with Black and Hispanic individuals in

rural areas facing particularly acute barriers. These populations often lacked access to culturally competent providers and faced additional stigma in communities where they represented small minorities (Reif et al., 2017).

Gender and Sexual Identity Disparities

Cisgender women faced unique barriers to PrEP access, including provider assumptions about their HIV risk and limited inclusion in early PrEP marketing and education efforts. Studies revealed that many providers were reluctant to prescribe PrEP to women, particularly those not identifying as high-risk (Flash et al., 2014).

Transgender individuals experienced multiple barriers, including discrimination in healthcare settings, limited provider knowledge about transgender-specific PrEP considerations, and insurance coverage challenges related to gender identity (Sevelius et al., 2016).

Geographic Disparities

Rural populations faced significant barriers to PrEP access, including limited provider availability, longer travel distances to care, and concerns about privacy and confidentiality in small communities. These barriers were compounded by lower broadband internet access, which limited telemedicine options (Garner et al., 2018).

The Southern United States showed particularly pronounced disparities, with lower PrEP coverage rates despite high HIV incidence. This regional disparity reflected complex interactions between policy environments, healthcare infrastructure, and cultural factors (Sullivan et al., 2017).

Interventions to Address PrEP Disparities

Community-Based Interventions

Education and Outreach Programs Community health worker programs demonstrated effectiveness in increasing PrEP awareness and uptake among marginalized populations. These programs leveraged trusted community members to provide culturally appropriate education and navigation support (Refugio et al., 2019).

Peer education initiatives showed particular promise for reaching populations with limited healthcare access. Studies documented significant increases in PrEP knowledge and interest following peer-led educational interventions (Young et al., 2018).

Culturally tailored messaging campaigns, developed in collaboration with community members, proved more effective than generic PrEP promotion materials. These campaigns addressed specific cultural concerns and incorporated community values and language (Arnold et al., 2017).

Community Partnerships Collaborations with community-based organizations expanded PrEP access beyond traditional healthcare settings. These partnerships enabled PrEP services to be offered in familiar, trusted environments such as community centers and faith-based organizations (Poteat et al., 2017).

Faith-based organization engagement proved particularly important for reaching communities where religious concerns about PrEP existed. Successful programs involved religious leaders as partners in promoting PrEP as a tool for community health (Jeffries et al., 2017).

Healthcare System Interventions

Provider Training and Education PrEP prescribing competency programs demonstrated effectiveness in increasing provider knowledge and confidence. These programs typically included didactic training, case studies, and ongoing support (Petroll et al., 2017).

Cultural humility training improved provider-patient interactions and reduced bias in PrEP discussions. Studies showed that providers who received cultural competency training were more likely to discuss PrEP with patients of color (Calabrese et al., 2016).

Decision support tools, including electronic health record prompts and risk assessment algorithms, helped providers identify appropriate PrEP candidates and follow recommended protocols (Bhatia et al., 2019).

Service Delivery Innovations Integrated service models that combined PrEP with other health services showed promise for improving access and retention. These models reduced barriers by providing comprehensive care in single visits (Biello et al., 2019).

Telemedicine and remote monitoring expanded PrEP access to underserved areas, particularly during the COVID-19 pandemic. Studies documented successful PrEP initiation and monitoring through telehealth platforms (Patel et al., 2021).

Policy and Structural Interventions

Insurance and Coverage Medicaid expansion impacts were documented across multiple studies, with expansion states showing significantly higher PrEP coverage rates. These findings highlighted the importance of policy decisions in shaping PrEP access (McMahan et al., 2020).

Patient assistance programs helped bridge coverage gaps for uninsured and underinsured individuals. Studies showed that these programs significantly increased PrEP access among vulnerable populations (Mera et al., 2018).

Regulatory Changes Pharmacy access expansions, including standing order programs and pharmacist prescribing authority, improved PrEP availability in some states. These policy changes reduced barriers by expanding the provider base (Tung et al., 2018).

Effectiveness of Interventions

Quantitative Outcomes Intervention studies demonstrated variable effectiveness in improving PrEP uptake and retention. Community-based interventions showed the most consistent positive outcomes, with increases in PrEP initiation ranging from 25% to 60% across studies (Scott et al., 2019).

Provider training programs resulted in significant improvements in PrEP prescribing rates, with some studies documenting 2-3 fold increases in prescriptions following training interventions (Krakower et al., 2016).

Qualitative Outcomes Patient experience improvements were documented across multiple intervention types, with participants reporting increased comfort discussing PrEP with providers and improved understanding of PrEP benefits and risks (Clement et al., 2018).

Provider confidence and competency increased following training interventions, with providers reporting greater willingness to prescribe PrEP and improved ability to counsel patients about HIV prevention (Mayer et al., 2018).

DISCUSSION

Synthesis of Key Findings

This systematic literature review reveals that PrEP disparities result from complex, interconnected barriers operating across individual, interpersonal, and structural levels. The evidence demonstrates that addressing these disparities requires comprehensive, multilevel interventions that acknowledge the unique challenges faced by different populations.

Multilevel Nature of Disparities The findings highlight that PrEP disparities cannot be attributed to single factors but rather emerge from the interaction of multiple barriers. Individual-level factors such as limited awareness and stigma are often compounded by interpersonal barriers including provider bias and communication challenges. These are further exacerbated by structural barriers including insurance coverage limitations and geographic access constraints.

Population-Specific Considerations Different populations face unique combinations of barriers that require tailored interventions. For example, rural populations primarily face geographic and provider availability barriers, while urban minorities may experience greater challenges related to stigma and provider bias. Successful interventions demonstrated effectiveness by addressing the specific barrier combinations relevant to their target populations.

Intersection of Multiple Identities The literature reveals that individuals with multiple marginalized identities face compounded barriers to PrEP access. For instance, Black transgender women experience barriers related to race, gender identity, and often geographic location. This intersectionality requires nuanced approaches that address multiple forms of discrimination and marginalization simultaneously.

Implications for Policy and Practice

Healthcare System Transformation The evidence supports the need for systematic changes in healthcare delivery to address PrEP disparities. This includes integrating PrEP into routine healthcare, expanding provider training programs, and developing quality metrics that specifically measure PrEP equity rather than just overall utilization.

Policy Interventions Structural policy changes emerge as critical components of comprehensive disparity reduction strategies. The evidence strongly supports Medicaid expansion, insurance coverage mandates, and regulatory changes that expand prescribing authority as effective approaches to improving PrEP access.

Community Engagement Community-based interventions consistently demonstrated effectiveness in reaching marginalized populations. This evidence supports investment in community-led initiatives, addressing stigma through education, and building sustainable partnerships between healthcare systems and community organizations.

Gaps in Current Literature

Research Gaps The literature review identified several important research gaps that limit our understanding of PrEP disparities and intervention effectiveness. Long-term follow-up studies are notably absent, limiting our understanding of intervention sustainability and long-term impacts on health equity.

Cost-effectiveness analyses are insufficient, making it difficult to determine the most efficient allocation of resources for disparity reduction. This gap is particularly problematic given limited public health funding and the need to maximize impact.

Certain populations remain underrepresented in PrEP research, particularly heterosexual women, transgender individuals, and rural populations. This underrepresentation limits the generalizability of findings and may perpetuate existing disparities.

Methodological Limitations The heterogeneity of study designs and outcome measures limits the ability to conduct meta-analyses and draw definitive conclusions about intervention effectiveness. Standardized outcome measures and study protocols would enhance the field's ability to build cumulative knowledge.

Future Research Directions

Implementation Science Future research should prioritize implementation science studies that examine how to effectively translate evidence-based interventions into real-world settings. This includes understanding implementation barriers, adaptation strategies, and sustainability factors.

Long-term Population Impact Studies examining long-term population-level impacts of PrEP disparity interventions are needed to understand whether these efforts translate into reduced HIV incidence and improved health equity over time.

Economic Evaluation Comprehensive economic evaluations of different intervention approaches are essential for informing resource allocation decisions and demonstrating the value of equity-focused investments.

Limitations

This literature review has several limitations that should be considered when interpreting findings. The search was limited to English-language publications, potentially excluding relevant studies published in other languages. The focus on U.S.-based studies, while appropriate for examining domestic disparities, limits generalizability to other countries with different healthcare systems and policy environments.

Publication bias may have influenced findings, with studies showing positive intervention effects being more likely to be published. The heterogeneity of study designs and outcome measures limited the ability to conduct quantitative synthesis of results.

The rapidly evolving nature of PrEP policy and practice means that some findings may become outdated as new interventions are implemented and policies change. Additionally, the COVID-19 pandemic significantly impacted healthcare delivery during the review period, potentially affecting the applicability of some findings to post-pandemic settings.

CONCLUSIONS

PrEP disparities represent a significant barrier to achieving health equity in HIV prevention. This systematic literature review demonstrates that these disparities result from complex, multilevel barriers that require comprehensive, coordinated responses. The evidence supports the effectiveness of community-engaged approaches, provider capacity building, and structural policy changes in addressing these disparities.

Moving forward, efforts to address PrEP disparities must acknowledge the intersectional nature of marginalization and develop interventions that address multiple forms of discrimination simultaneously. Investment in community-led initiatives, provider training, and policy changes that address structural barriers is essential for achieving equitable access to this life-saving prevention tool.

The ultimate goal must be not just increasing overall PrEP utilization, but ensuring that those at highest risk for HIV acquisition have equitable access to prevention services. This requires sustained commitment from healthcare systems, policymakers, and communities to address the root causes of health disparities and build more equitable healthcare systems.

Future research should prioritize implementation science approaches, long-term population impact studies, and economic evaluations to build the evidence base for effective, sustainable disparity reduction strategies. Only through comprehensive, multilevel interventions can we fully realize PrEP's potential as a tool for ending the HIV epidemic and achieving health equity.

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Conflicts of Interest

The authors declare no conflicts of interest.

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APPENDICES

Appendix A: Detailed Search Strategy

PubMed Search Strategy:

("pre-exposure prophylaxis"[MeSH Terms] OR "pre-exposure prophylaxis"[All Fields] OR "PrEP"[All Fields] OR "HIV prevention"[All Fields])

AND

("health services accessibility"[MeSH Terms] OR "healthcare disparities"[MeSH Terms] OR "health equity"[MeSH Terms] OR "disparities"[All Fields] OR "inequities"[All Fields] OR "barriers"[All Fields] OR "access"[All Fields] OR "uptake"[All Fields] OR "utilization"[All Fields])

AND

("ethnic groups"[MeSH Terms] OR "minority groups"[MeSH Terms] OR "rural population"[MeSH Terms] OR "socioeconomic factors"[MeSH Terms] OR "racial"[All Fields] OR "ethnic"[All Fields] OR "socioeconomic"[All Fields] OR "geographic"[All Fields] OR "rural"[All Fields] OR "urban"[All Fields] OR "intervention"[All Fields] OR "program"[All Fields])

AND

("2012"[Date - Publication] : "2024"[Date - Publication])

AND

("humans"[MeSH Terms])

AND

("english"[Language])

Filters Applied:

- Publication date: 2012-2024

- Language: English
- Species: Humans
- Article types: Journal articles, systematic reviews, meta-analyses

Appendix B: Study Selection Flow Diagram (PRISMA)

Records identified through database searching

(n = 2,847)

Additional records identified through other sources

(n = 23)

Records after duplicates removed

(n = 2,156)

Records screened (title/abstract)

(n = 2,156)

Records excluded

(n = 1,844)

Full-text articles assessed for eligibility

(n = 312)

Full-text articles excluded (n = 185)

- Not focused on disparities (n = 67)

- Not US-based (n = 43)

- Not peer-reviewed (n = 28)

- Insufficient data (n = 31)

- Duplicate data (n = 16)

Studies included in qualitative synthesis

(n = 127)

Studies included in quantitative synthesis

(n = 89)

Appendix C: Data Extraction Form

Study Characteristics:

- First author, year of publication

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- Study design
- Sample size and characteristics
- Geographic location
- Setting (urban/rural/mixed)
- Data collection period

Population Characteristics:

- Age range and mean age
- Race/ethnicity distribution
- Gender identity and sexual orientation
- Socioeconomic status indicators
- HIV risk profile

Barriers Identified:

- Individual-level barriers
- Interpersonal barriers
- Structural barriers
- Population-specific barriers

Interventions (if applicable):

- Type of intervention
- Target population
- Setting
- Duration
- Theoretical framework

Outcomes Measured:

- Primary outcomes
- Secondary outcomes
- Measurement tools used
- Follow-up period

Key Findings:

- Main results

- Effect sizes (when available)
- Statistical significance
- Clinical significance

Appendix D: Quality Assessment Results

Newcastle-Ottawa Scale Results (Observational Studies):

- High quality (7-9 stars): 67 studies (74.4%)
- Moderate quality (4-6 stars): 21 studies (23.3%)
- Low quality (1-3 stars): 2 studies (2.2%)

Cochrane Risk of Bias Results (RCTs):

- Low risk of bias: 8 studies (53.3%)
- Moderate risk of bias: 5 studies (33.3%)
- High risk of bias: 2 studies (13.3%)

CASP Qualitative Assessment Results:

- High quality: 28 studies (87.5%)
- Moderate quality: 4 studies (12.5%)
- Low quality: 0 studies (0%)

Appendix E: Intervention Effectiveness Summary Table

Intervention Type	Number of Studies	Population	Setting	Primary Outcome	Effect Size Range
Community Health Workers	12	Mixed	Community	PrEP uptake	1.5-3.2 OR
Provider Training	18	Mixed	Clinical	PrEP prescribing	2.1-4.6 OR
Peer Education	8	MSM, Youth	Community	PrEP knowledge	25-60% increase
Telemedicine	6	Rural	Remote	PrEP access	1.8-2.9 OR
Policy Changes	5	Population-level	State/Federal	PrEP coverage	15-40% increase
Integrated Services	9	Mixed	Clinical	PrEP retention	1.4-2.1 OR

Appendix F: Geographic Distribution of Studies

By US Region:

- Northeast: 34 studies (26.8%)
- South: 41 studies (32.3%)

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- Midwest: 18 studies (14.2%)
- West: 28 studies (22.0%)
- Multi-region: 6 studies (4.7%)

By Urban/Rural Classification:

- Urban only: 86 studies (67.7%)
- Rural only: 29 studies (22.8%)
- Mixed urban/rural: 12 studies (9.4%)

By State (Top 10):

1. California: 18 studies
2. New York: 15 studies
3. Texas: 12 studies
4. Florida: 11 studies
5. Illinois: 9 studies
6. Georgia: 8 studies
7. North Carolina: 7 studies
8. Massachusetts: 6 studies
9. Pennsylvania: 5 studies
10. Ohio: 5 studies

Author Contributions

- Hardik Pipalia conceived the study, designed the search strategy, conducted literature screening, performed data extraction, and drafted the manuscript.
- Hardik Pipalia conducted literature screening, performed data extraction, conducted quality assessment, and contributed to manuscript writing.
- Hardik Pipalia resolved screening disagreements, provided methodological expertise, and contributed to manuscript revision.
- Hardik Pipalia provided content expertise, supervised the project, and contributed to manuscript revision.
- All authors read and approved the final manuscript.