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Systematic Review

Health Education Interventions to Improve Retention in HIV Care in the United States: A Systematic Review and Evidence Gap Analysis

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Abstract

Background/Objectives: Retention in HIV care is essential for sustained treatment and viral suppression, yet evidence for educational and behavioral strategies remains inconsistent. The objective of this systematic review was to evaluate U.S.-based educational, behavioral, and supportive interventions designed to improve retention in HIV care or reduce loss to follow-up, while identifying methodological, population-level, and implementation-related evidence gaps. Methods: PubMed and Scopus were searched through 30 August 2025, CINAHL and PsycINFO through 20 September 2025, and Web of Science through 29 September 2025. Eligible studies were English-language, U.S.-based primary quantitative or mixed-methods research published from 2000 onward evaluating educational, counseling, behavioral, peer, coaching, digital, or navigation interventions among people with HIV. Non-U.S., non-English, non-human, non-primary, and qualitative-only studies were excluded. Risk of bias was assessed using design-specific Joanna Briggs Institute checklists. Findings were synthesized narratively using PICO and an evidence-gap framework. Results: Twenty-three studies (9177 participants) published from 2005–2025 were included; three had low, twelve had moderate, and eight had high risk of bias. Educational and behavioral strategies more consistently improved proximal outcomes than sustained retention. Enhanced personal contact produced the clearest controlled retention effect (visit constancy 55.8% vs. 45.7%; RR 1.22, 95% CI 1.09–1.36), whereas several trials were null. Multicomponent navigation and case-management programs showed favorable retention signals but limited component-specific attribution. Evidence was limited by heterogeneous retention definitions, methodological concerns, uneven population representation, and limited long-term and cost data. Conclusions: Education appears most useful when integrated with sustained personal, navigational, and social support.

Keywords: HIV; retention in care; loss to follow-up; health education; behavioral interventions; patient navigation; care engagement

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1. Introduction

The diagnosis and treatment of HIV have advanced substantially since the advent of antiretroviral therapy (ART), transforming HIV from a historically fatal disease into a manageable chronic condition. Although effective ART has markedly improved survival and clinical outcomes, successful management of HIV depends on sustained engagement in care and adherence to treatment [1]. Retention in care, defined as having two elements of HIV care at least 90 days apart in a 12-month period, serves as an important indicator of population-level success in combating HIV [2]. As of 2019, in the United States, only 57.8% of patients were retained in care, indicating a significant gap in the continuity and adequacy of care for people living with HIV (PLWH) [3]. The large proportion of PLWH without sustained clinical contact highlights the necessity for ongoing evaluation of barriers to care initiation and maintenance. Loss to follow-up (LTFU), characterized by failure to maintain regular engagement with HIV care, represents an important barrier to achieving optimal clinical outcomes, as missed clinic appointments and inadequate viral suppression are associated with increased all-cause mortality [4].

LTFU is driven by myriad and often interrelated factors, such as socioeconomic instability, younger age, and substance abuse, highlighting the influence of socioeconomic, behavioral, and structural barriers on sustained engagement in HIV care [5,6]. Because LTFU is multifactorial, interventions have targeted multiple points along this pathway.

Previous interventions have demonstrated variable success in improving retention in HIV care. Educational and behavioral approaches have shown benefits for proximal outcomes such as ART adherence and viral suppression, but evidence for sustained retention is less consistent. More intensive approaches, including patient navigation, case management, and enhanced personal contact, have demonstrated potential benefits; however, the multicomponent nature of these interventions makes it difficult to determine which individual strategies are most effective [7].

Despite increasing attention to interventions designed to improve HIV care engagement, uncertainty remains regarding which strategies are most effective for achieving sustained retention. Improvements in adherence or viral suppression may not necessarily translate into durable retention in care, and the effectiveness of educational, behavioral, and more intensive, multicomponent interventions remains unclear. Furthermore, heterogeneity in the definitions of retention, limited representation of diverse populations, and a lack of long-term and cost-related data limit comparisons across studies.

Therefore, this systematic review analyzes the literature published since 2000 that investigates the effectiveness of educational, behavioral, and supportive interventions designed to improve retention in HIV care (i.e., reduce LTFU) among PLWH. We further examine intervention characteristics associated with improved retention and identify gaps in the existing evidence to inform future strategies for sustaining engagement in HIV care.

2. Materials and Methods

2.1. Study Design and Search Strategy

This systematic review evaluated U.S.-based primary research examining health education-related interventions intended to improve retention in HIV care among PLWH. Eligible interventions encompassed patient and health education, counseling, motivational or behavioral interventions, peer-delivered support, health coaching, digital or mobile health approaches, patient navigation, and related supportive strategies containing an educational or behavioral component. The review was structured using the Population, Intervention, Comparator, and Outcome (PICO) framework and supplemented by a structured evidence-gap analysis examining population representation, intervention characteristics, outcome measurement, implementation requirements, scalability, sustainability, and methodological limitations. This systematic review was conducted and reported in

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accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement [8]. The completed PRISMA 2020 checklist is provided as Supplementary Table S2, and the study-selection process is presented in the PRISMA 2020 flow diagram (Figure 1).

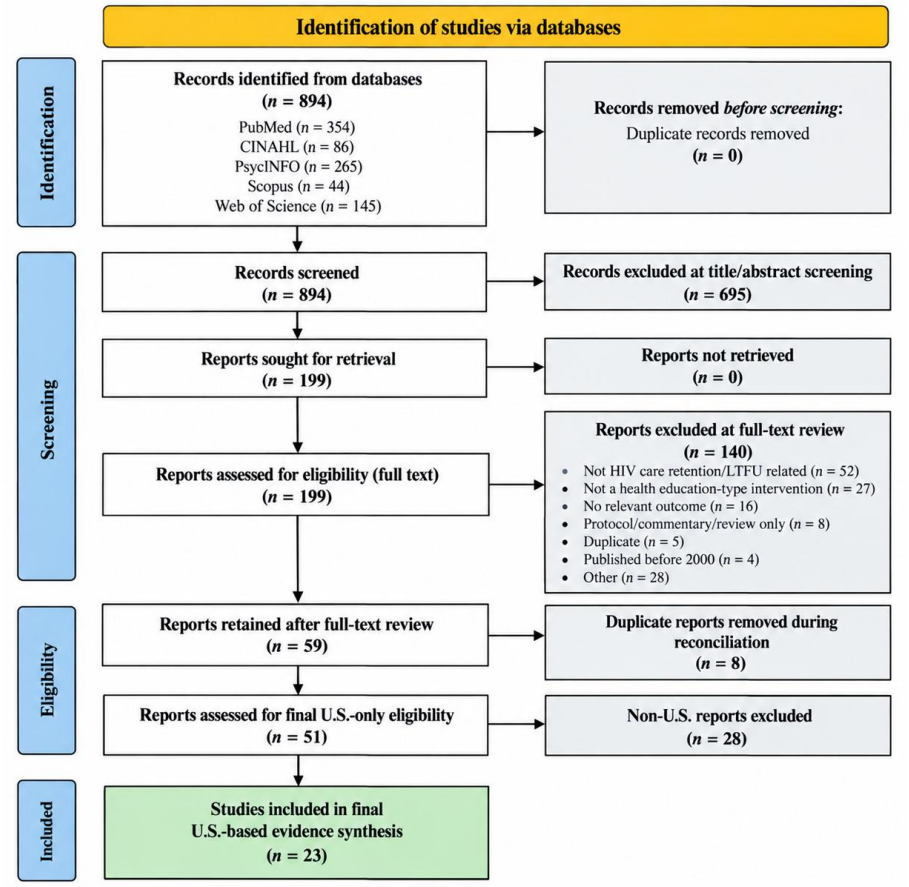


Figure 1. PRISMA 2020 flow diagram of study identification, screening, eligibility assessment, and inclusion in the final U.S.-based evidence synthesis. The database searches identified 894 records. Following title/abstract and full-text screening, duplicate reconciliation, and secondary screening for U.S.-only eligibility, 23 unique studies met the prespecified eligibility criteria and were included in the final systematic review. Flow diagram adapted from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement [8].

2.2. Information Sources and Literature Search

Literature searches were conducted across five bibliographic databases: PubMed, CINAHL, PsycINFO, Scopus, and Web of Science. Searches were initially conducted in August 2025, with the final database searches completed in September 2025. The date of the final search for each database is reported in Appendix A Table A2. Final data extraction was completed in January 2026. Database-specific search strategies were developed because terminology describing HIV retention and educational or behavioral interventions varied across disciplines. Search concepts combined controlled vocabulary, including MeSH terms where applicable, and free-text terms related to HIV/HIV infection; patient or health education, counseling, information, instruction, or behavioral intervention; and retention-related outcomes, including follow-up, LTFU, missed appointments, retention in care, and linkage to care. Selected searches additionally incorporated terms describing newly or recently diagnosed individuals. Search syntax was adapted to the requirements of each database, and the complete database-specific search strategies are provided in the Appendix A (Tables A1 and A2).

2.3. Eligibility Criteria

The initial search intentionally captured both the U.S. and non-U.S. literature, after which previously retained studies underwent a focused secondary screen for U.S.-only eligibility. Studies were eligible if they (1) were conducted in the United States; (2) included PLWH; (3) evaluated an educational or behavioral intervention, including education, counseling, motivational interviewing, peer education or support, digital educational support, coaching, navigation, or a comparable intervention; (4) reported an outcome related to retention in HIV care, LTFU, visit adherence or constancy, missed visits, linkage, or re-engagement; (5) presented primary quantitative or mixed-methods research; and (6) were published in or after 2000. Studies were excluded if they were conducted outside the United States; addressed medication adherence without a relevant care-engagement outcome; lacked an educational, counseling, or behavioral component; focused exclusively on HIV prevention or pre-exposure prophylaxis rather than retention among PLWH; represented reviews, editorials, protocols, or conference abstracts without usable primary data; were duplicates; or otherwise lacked a relevant retention-related outcome. The complete eligibility framework is presented in the Appendix A (Table A1).

2.4. Study Selection

The recorded database search runs yielded 894 records. Each record was initially screened by one reviewer at the title/abstract and full-text stages using the prespecified eligibility criteria. Exclusion decisions were subsequently independently verified by a second reviewer, and disagreements were resolved through discussion and consensus. No automated screening or machine-learning tools were used.

Following the initial screening process, the research team collectively reviewed the remaining candidate studies to identify duplicate records and conduct the secondary U.S.-only eligibility assessment. During this stage, exclusions were categorized using the standardized exclusion criteria noted above (Table A1). Following completion of screening, duplicate reconciliation, and U.S.-specific eligibility assessment, 23 studies were included in the final U.S. evidence synthesis. The complete study-selection process and exclusion counts are presented in the PRISMA 2020 flow diagram (Figure 1).

2.5. Data Extraction and PICO Classification

Data were extracted by one reviewer using a standardized study-level extraction framework and subsequently reviewed for accuracy and completeness by a second team member. Discrepancies were resolved through discussion and consensus. Study investigators were not contacted for additional or missing information, and no automated data-extraction tools were used. Extraction occurred in two sequential layers. The primary extraction captured bibliographic information, study design and setting, sample characteristics, PICO elements, follow-up or retention/LTFU outcomes, principal findings, and study-specific observations. Population characteristics included both demographic composition and clinically relevant contexts, such as newly diagnosed status, return to care following disengagement, rural residence, recent incarceration, or elevated risk for treatment failure. Interventions were categorized according to their dominant educational or behavioral mechanism while preserving information regarding multicomponent delivery. Comparators were classified as standard/usual care, active or attention-control conditions, alternative intervention delivery, historical comparison, or absence of a concurrent comparator. A secondary extraction expanded upon each included U.S. study to capture an evidence gap analysis component. Cross-study comparisons conducted within assigned article groups were subsequently incorporated into the overall evidence synthesis. No assumptions were made to impute missing study-level information; unclear or unreported characteristics were recorded as not reported.

2.6. Outcome and Evidence Classification

The primary outcomes were measures of sustained engagement in HIV medical care, including retention in care, LTFU, visit constancy, visit adherence, missed-visit reduction, gaps in care, linkage, and re-engagement. Secondary outcomes included antiretroviral therapy (ART) or refill adherence, viral suppression or viral load, CD4 count, treatment initiation, and relevant psychosocial or behavioral outcomes, including depression, trauma or post-traumatic stress symptoms, stigma, self-efficacy, substance use, and HIV knowledge. Research-study retention alone was not considered equivalent to retention in HIV medical care. Evidence was additionally classified according to its directness to the primary review question. Studies measuring retention, LTFU, visit constancy or adherence, linkage, re-engagement, or defined gaps in care were considered to provide direct evidence, whereas studies reporting only ART adherence, viral suppression, laboratory monitoring, psychosocial outcomes, or study completion were considered to provide indirect evidence regarding retention. Studies reporting retention as a secondary endpoint were distinguished from those in which retention or LTFU represented a principal efficacy outcome. When studies reported outcomes at multiple follow-up time points, all relevant retention-related outcomes available within the prespecified follow-up period were extracted and considered in the narrative synthesis. Outcomes were retained using the definitions reported by the original investigators rather than being converted to a common retention definition because substantial heterogeneity existed across studies.

2.7. Effect Measures

Because the included studies used heterogeneous designs and outcome definitions, effect measures were reported as presented in the original studies. These included risk ratios (RRs), odds ratios (ORs) or adjusted odds ratios (aORs), hazard ratios where applicable, between-group proportions or percentage-point differences, and within-group changes for uncontrolled studies. Corresponding 95% confidence intervals and *p*-values were reported when available. Effect estimates were not transformed to a common metric because quantitative meta-analysis was not performed.

2.8. Evidence-Gap Assessment Methods

A structured evidence-gap analysis was conducted across six domains: (1) population representation and equity, (2) intervention composition and attribution, (3) retention and outcome definitions, (4) study design and methodological rigor, (5) implementation and resource requirements, and (6) generalizability and scalability. Particular attention was given to populations that were infrequently represented across the evidence base, including women, transgender individuals, rural populations, older adults, pregnant or postpartum populations, non-English-speaking populations, and populations experiencing incarceration, housing instability, substance use, or substantial mental-health burden. Intervention-level gaps were assessed by examining whether observed outcomes depended on multicomponent services such as case management, patient or peer navigation, social-resource coordination, trained personnel, technology, financial or material incentives, or public-health data infrastructure. Implementation reporting was additionally examined for information regarding personnel requirements, intervention intensity, scalability, sustainability, and resource dependence.

2.9. Quality Assessment/Risk of Bias

The methodological quality and risk of bias of the included studies were assessed using design-specific Joanna Briggs Institute (JBI) Critical Appraisal Checklists. The revised JBI Checklist for Randomized Controlled Trials was applied to parallel-group, cluster-randomized, and pilot randomized trials [9]; the revised JBI Checklist for Quasi-Experimental Studies was applied to single-arm, pre–post, and historically controlled evaluations lacking randomization [10]; and the JBI Checklist for Cohort Studies was applied to prospective observational cohort designs [11]. Two reviewers independently assessed each included study using the applicable checklist, with individual items rated according to JBI response categories (yes, no, unclear, or not applicable). Disagreements were resolved through reviewer consensus.

Overall risk of bias was categorized as low, moderate, or high based on qualitative consensus judgment across design-relevant JBI domains rather than a numerical composite score. Ratings focused on threats to internal validity, including randomization and allocation procedures, comparability of study groups, outcome measurement, completeness and handling of follow-up, confounding, and appropriateness of statistical analysis. Low risk indicated that key internal-validity domains were adequately addressed with no major concern likely to materially affect the study findings; moderate risk indicated one or more concerns that could introduce bias but did not fundamentally undermine interpretation; and high risk indicated one or more major threats likely to materially distort the study findings. Sample size, statistical power, single-site setting, generalizability, and outcome directness were not used to determine risk-of-bias classifications.

Risk-of-bias assessments were used to contextualize, rather than quantitatively weight or exclude, studies from the narrative synthesis. Study-level classifications and supporting rationales are presented in Supplementary Table S1, and item-level consensus JBI responses for each study are provided in Supplementary Document S1.

Lastly, formal assessment of publication or small-study effects using funnel plots or statistical tests was not undertaken because the included studies were heterogeneous in design, intervention type, comparator, and outcome definition and were not quantitatively pooled. Potential selective outcome reporting and incomplete reporting within individual studies were considered within the design-specific JBI risk-of-bias assessments where applicable.

2.10. Data Synthesis

Because substantial clinical and methodological heterogeneity was observed across intervention composition, comparator conditions, participant risk profiles, follow-up periods, study designs, and definitions of retention and LTFU, findings were synthesized narratively rather than through quantitative meta-analysis. Studies were grouped according to dominant intervention strategy, including case management or patient navigation, peer support, clinician- or telephone-delivered counseling, health coaching, digital or mobile health interventions, trauma- or cognitive behavioral therapy-informed approaches, and passive educational media. Cross-study synthesis evaluated whether retention was measured directly, whether interventions demonstrated statistically or clinically meaningful retention signals, whether favorable findings could reasonably be attributed to an educational component or reflected a broader multicomponent intervention, and which population, methodological, and implementation gaps persisted. Findings from the PICO synthesis and evidence-gap analysis were then integrated to characterize patterns of intervention effectiveness and priorities for future U.S. HIV retention research.

Extracted findings were tabulated by study characteristics, PICO elements, intervention strategy, retention outcomes, implementation characteristics, and evidence-gap domains. No statistical transformations, imputations, or conversions were undertaken for

quantitative pooling. Clinical and methodological heterogeneity was explored descriptively by comparing intervention type, study design, population, comparator strength, follow-up duration, and retention-outcome definition across studies. Because no meta-analysis was performed, statistical heterogeneity testing and meta-regression were not conducted. No formal sensitivity analyses were performed.

2.11. Certainty of Evidence

A formal certainty-of-evidence framework such as GRADE was not applied because the review was designed as a heterogeneous narrative synthesis and evidence-gap analysis rather than a meta-analysis of a common intervention-effect estimate. Confidence in the evidence was instead interpreted descriptively in relation to study design, risk of bias, directness of retention outcomes, consistency of findings, and availability of controlled comparisons.

2.12. Protocol and Registration

This systematic review was not prospectively registered, and a formal review protocol was not published or made publicly available. Accordingly, there were no registered protocol amendments to report.

3. Results

3.1. Study Selection and Characteristics of Included Studies

The systematic search identified 894 records across PubMed, CINAHL, PsycINFO, Scopus, and Web of Science. Records were screened using the prespecified eligibility criteria, followed by duplicate reconciliation and a focused secondary screen restricting the synthesis to studies conducted in the United States. Twenty-three unique U.S.-based studies met the final eligibility criteria and were included in the qualitative synthesis and evidence-gap analysis. The complete selection pathway is presented in the PRISMA 2020 flow diagram (Figure 1).

The included studies were published between 2005 and 2025 and represented approximately two decades of U.S. research on educational and behavioral strategies to improve engagement in HIV care. Study designs were heterogeneous and included parallel-group randomized controlled trials, pilot randomized trials, a cluster-randomized trial, prospective cohorts, single-arm implementation studies, quasi-experimental evaluations, program evaluations, and feasibility studies. Sample sizes ranged from 9 participants in a brief feasibility pilot to 4003 participants in a large quasi-experimental clinic-based evaluation. Follow-up ranged from 3 months to approximately 2 years, although most studies assessed outcomes over 6 to 12 months. Detailed study design, setting, sample, follow-up, and intervention-family characteristics are summarized in Table 1.

Table 1. Characteristics of Included U.S.-Based Studies.

Study	Design	Setting	Population/Sample	Follow-Up	Intervention Family
Cook et al., 2009 [12]	Prospective single-arm effectiveness study	Nationwide U.S. centralized telephone nursing call center	98 adults starting/recently prescribed lopinavir/ritonavir-based ART; mean age 43.5; 38.8% women; race/ethnicity not collected	~6 months	Telephone nurse counseling/behavioral adherence support
Milam et al., 2005 [13]	Cluster-randomized controlled trial	6 HIV specialty clinics in California	437 adults continuously on ART; mean age 39; 87.9% male; 40.1% White, 39.1% Hispanic, 14.9% Black; predominantly low income	10–11 months intervention period	Brief provider-delivered adherence counseling

Kuo et al., 2019 [14]	Pilot randomized controlled trial	Washington, DC; correctional system and community re-entry	110 recently incarcerated adults with HIV; median age 42; 58% male, 24% female, 18% transgender women; ~85% non-Hispanic Black	6 months post-release	mHealth + computerized motivational counseling/SMS
Naar-King et al., 2009 [15]	Two-arm open-label randomized trial	University-affiliated adolescent HIV program, Detroit, MI	83 adolescents/young adults aged 16–29; mean 21.1; 92% Black; 40% female	12 months	Motivational interviewing delivered by peer outreach worker vs. master's-level staff
Lewis-Chery et al., 2025 [16]	Prospective observational cohort	Metro Atlanta, GA	100 Black women with HIV at elevated risk for poor outcomes; mean age 36.6; high food, housing, employment, and caregiving burden	~12 months	Bundled mHealth + peer navigation + workshops/social support
Gardner et al., 2014 [17]	Three-arm multisite randomized controlled trial	6 academically affiliated U.S. HIV clinics	1838 adults new to care or with missed visits/gaps; ~60–66% male; ~67–70% Black	12 months	Enhanced personal contact ± behavioral skills training
Konkle-Parker et al., 2012 [18]	Single-site two-arm pilot randomized controlled trial	Large public HIV clinic in Deep South	56 adults starting/restarting ART; 38% female; 89% Black; 64% income < $10,000	24 weeks	IMB/MI-based adherence intervention + calls and adherence devices
Melvin & Gipson, 2019 [19]	Cross-sectional/longitudinal EMR program evaluation	Open Arms Healthcare Center in Jackson, MS	231 patients aged ≥17 receiving HIV treatment; 90% Black; 85% male; 73% MSM	2015–2017	Integrated multidisciplinary HIV care model
Wohl et al., 2011 [20]	Prospective single-arm intervention study	2 HIV clinics, Los Angeles County, CA	61 African American and Latino young MSM, approximately ages 13–24, new to or poorly engaged in care	6 months	Youth-focused case management + treatment education/adherence support
Zurlo et al., 2020 [21]	Single-arm cohort, pre/post repeated measures	Harrisburg, PA	92 young adults aged 18–34; 72.8% male; 40% Black; 58.7% history of falling out of care	18 months	OPT-In for Life mobile app + care-team
Giordano et al., 2016 [22]	Multisite two-arm randomized controlled trial	Harris Health System in Houston, TX	460 hospitalized adults with newly diagnosed HIV or prior loss to care; 73% male; 67% Black; high illness burden	6-month post-discharge	HIV-positive peer mentoring + post-discharge calls
Konkle-Parker et al., 2014 [23]	Single-site two-arm randomized controlled trial	Large public hospital HIV clinic in Jackson, MS	100 adults with documented medication/visit adherence problems; 49% male; 90% Black; high depression/alcohol/drug-use burden	12 months	CLIMB: MI + HIV education + behavioral tools + calls
Bendetson et al., 2017 [24]	Single-arm prospective demonstration/evaluation	Los Angeles LGBT Center in California	118 newly diagnosed individuals; 98.3% male; predominantly young MSM; 51.3% Hispanic/Latino, 12% Black	12-month retention follow-up	Dedicated linkage specialist: MI + strengths-based case management
Moitra et al., 2015 [25]	Open single-arm feasibility pilot	Academic immunology clinic in Providence, RI	9 newly diagnosed adults; 6 men & 3 women; Includes White, Black, and Latino participants; mean age 33.1	3-month chart follow-up	Brief acceptance-based behavior therapy
Rajabiun et al., 2022 [26]	Multisite single-arm pre/post implementation study	3 urban clinics: Chester, PA; Chicago, IL; Nashville, TN	173 cis/transgender women of color; 93.1% Black; mean age 41; high trauma, incarceration and housing burden	12 months	Peer linkage/re-engagement navigation bundle
Wohl et al., 2016 [27]	Single-arm implementation/prospective cohort	7 publicly funded HIV clinics in Los Angeles County, CA	78 enrolled long-term out-of-care adults; 78% male; 18% female; 4% transgender; 71% Latino; predominantly low income/uninsured	12–18 months	Modified ARTAS case management + locator/navigation
Kalichman et al., 2022 [28]	Three-arm randomized controlled trial	Rural/central Georgia	240 adults receiving HIV care and at risk for treatment failure; 82% African American; 67% men; >50% income < $20,000	12–18 months	Telephone vs. clinic-based behavioral health counseling

Dale et al., 2024 [29]	Pilot randomized controlled trial	Metropolitan Miami/Southeastern U.S.	70 Black cisgender women with HIV, trauma/abuse history, and risk for suboptimal outcomes; 67% income < $11,999	Through post-intervention follow-up	STEP-AD trauma-informed CBT/empowerment + Life-Steps
Corado et al., 2018 [30]	Two-arm open-label randomized controlled trial	3 academic HIV clinics in Southern California	116 new-to-care or returning adults with detectable HIV RNA; 93% male; 66% Hispanic/Latino; 9% Black	Up to ~2 years time-to-LTFU follow-up	ALERT health coaching
Roth et al., 2012 [31]	Two-arm open-label randomized evaluation	Greater Indianapolis/Marion County, IN	Individual extraction reports 449 followed (91 intervention, 358 control); predominantly male adults with HIV	1 year	Lay health worker individualized health coaching
Kurth et al., 2014 [32]	Two-arm randomized controlled trial	Harborview Medical Center + community AIDS organization in Seattle, WA	240 adults with HIV; predominantly male; racially diverse	9 months	CARE+ computerized counseling
Parsons et al., 2005 [33]	Single-arm pilot study	New York City, NY	15 adults with HIV and substance use disorder enrolled; 14 men/1 woman; 12 completed 3-mo follow-up	3 months	8-session MI + CBT substance-use/adherence intervention
Neumann et al., 2018 [34]	Quasi-experimental study with historical comparison	HIV clinics in Atlanta, GA and Huntsville, AL	4003 clinic patients; ~75% male; sites selected for high Black representation; broad adult age range	10-month intervention period vs. historical period	29-min theory-based educational waiting-room video

Note. This table is intentionally restricted to study architecture, setting, sample composition, follow-up, and broad intervention family. Detailed PICO elements, retention definitions, effectiveness findings, and evidence gaps are presented separately to minimize redundancy. Abbreviations**:** ART, antiretroviral therapy; CBT, cognitive behavioral therapy; EMR, electronic medical record; IMB, Information–Motivation–Behavioral Skills; MI, motivational interviewing; mo, month; MSM, men who have sex with men; SMS, short message service.

Studies were conducted across multiple U.S. regions, including the Southeast, Northeast, Midwest, West Coast, and multisite settings. Clinical environments included academic HIV specialty clinics, publicly funded HIV clinics, community-based organizations, integrated multidisciplinary treatment centers, correctional re-entry programs, and hospital-based programs. Despite geographic diversity, the evidence base was concentrated in urban and academically affiliated settings; only one included an intervention specifically focused on a predominantly rural population. Several studies intentionally enrolled patients at high risk for disengagement, including newly diagnosed individuals, persons returning to care after prolonged absence, recently incarcerated adults, hospitalized patients requiring post-discharge linkage, young adults, women of color, and individuals with medication- or visit-adherence difficulties (Table 1).

Black/African American participants were strongly represented across several Southern and urban studies, with multiple cohorts comprising approximately two-thirds to more than 90% Black participants. Hispanic/Latino participants were also well represented in several California-based studies. However, representation was uneven across intersecting demographic and clinical contexts. Older adults, transgender people, rural populations, non-English-speaking populations, and pregnant or postpartum populations were infrequently targeted, while women overall remained less represented than men outside a small number of recent studies specifically centered on Black women or women of color. These patterns are further characterized in the population representation analysis (Table 2).

Table 2. Population Representation and Equity Gaps in Included Studies.

Population/Context	Representation in Evidence Base	Illustrative Studies	What Is Represented	Remaining Equity Gap
Black/African American adults	Strong	Gardner 2014; Konkle-Parker 2012/2014; Melvin 2019; Giordano 2016; Kalichman 2022; Kuo 2019; Rajabiun 2022; Lewis-Chery 2025; Naar-King 2009 [14–19,22,23,26,28]	Several studies enrolled predominantly Black samples (often 67–93%).	Strong representation in selected urban/Southern settings does not ensure representation across sex, age, geography, or gender identity.
Hispanic/Latino populations	Moderate	Milam 2005; Wohl 2011; Bendetson 2017; Wohl 2016; Corado 2018 [13,20,24,27,30]	Well represented in several California/Los Angeles studies.	Less evidence outside urban Western settings; non-English-speaking populations remain limited.
Women overall	Limited-to-moderate	Lewis-Chery 2025; Rajabiun 2022; Dale 2024; smaller proportions in Kuo, Kalichman, Konkle-Parker, Moitra [14,16,23,25,26,28,29]	Three studies intentionally centered women; most mixed cohorts were male-predominant.	Need larger controlled retention-focused studies in women across life stages and regions.
Black women	Targeted but limited	Lewis-Chery 2025; Dale 2024; Rajabiun 2022 (women of color, 93% Black) [16,26,29]	Important recent evidence addresses trauma, stigma, peer support, social needs, and mHealth.	Most evidence is observational/pilot and urban; direct LTFU efficacy remains incompletely tested.
Transgender people	Very limited	Kuo 2019 (18% transgender women); Rajabiun 2022 (11.6% transgender/other); Wohl 2016 and Corado 2018 included very small numbers [14,26,27,30]	Meaningful inclusion occurred in only a few studies.	Dedicated, adequately powered retention studies in transgender populations are needed.
Adolescents/young adults	Moderate	Naar-King 2009; Wohl 2011; Zurlo 2020; Bendetson 2017 includes predominantly young adults [15,20,21,24]	Youth-focused peer, case-management, and mHealth approaches are represented.	Transitions from pediatric to adult care and durable retention into later adulthood remain understudied.
Older adults (>60 y)	Minimal	Small representation in Gardner; otherwise rarely a focus [17]	Older adults were usually not a targeted population.	Aging, multimorbidity, polypharmacy, cognition, caregiving, and transportation may require distinct retention strategies.
Rural populations	Very limited	Kalichman 2022 [28]	Only one clearly rural-focused intervention in the extraction.	Major gap in rural implementation, workforce feasibility, transportation barriers, and technology access.
Justice-involved/recently incarcerated	Limited but important	Kuo 2019; Rajabiun 2022 includes incarceration history; Wohl 2016 includes recently released subgroup [14,26,27]	Kuo directly studies community re-entry; other programs include justice involvement as a vulnerability.	Need multisite post-release trials that combine digital support with housing, benefits, navigation, and substance-use services.
Housing instability/homelessness	Inconsistently represented	Lewis-Chery 2025; Rajabiun 2022; Wohl 2016 and other high-risk cohorts [16,26,27]	Several studies included participants with housing instability, but often as a baseline characteristic rather than intervention-stratification target.	Need retention strategies explicitly designed around unstable housing and material insecurity.
Substance use/mental health burden	Moderate	Parsons 2005; Gardner 2014; Giordano 2016; Konkle-Parker 2014; Dale 2024; Kalichman 2022 [17,22,23,28,29,33]	Substance use, depression, PTSD/trauma, and alcohol use are captured in multiple studies.	Individual-level counseling may be insufficient without integrated behavioral health and structural services.
Newly diagnosed patients	Moderate	Bendetson 2017; Moitra 2015; portions of Melvin, Giordano, Corado, Wohl 2011 [19,20,22,24,25,30]	Immediate linkage period is represented by several tailored programs.	Need controlled comparisons and longer-term follow-up beyond initial linkage.

Previously out-of-care/returning patients	Strong in selected studies	Wohl 2016; Corado 2018; Gardner 2014; Rajabiun 2022; Zurlo 2020 [17,21,26,27,30]	Several interventions intentionally target disengaged or returning patients.	More evidence is needed on which intensity of intervention is required for different disengagement phenotypes.
Non-English speakers	Limited	Some studies included Spanish speakers; several excluded non-English speakers	English/Spanish coverage appears in selected California/urban studies.	Other-language populations are largely absent, limiting linguistic and cultural generalizability.

Note. Representation categories are qualitative synthesis judgments based on the extracted study populations; they are not pooled prevalence estimates. Because many studies enrolled overlapping identities, studies can contribute to multiple rows. Abbreviations: LTFU, loss to follow-up.

Following reconciliation of duplicate reports, 51 reports underwent final U.S.-only eligibility assessment; 28 reports were excluded because the studies were conducted outside the United States, leaving 23 studies for inclusion. Studies that appeared otherwise eligible but were excluded during this final geographic assessment are presented in Supplementary Table S3.

3.2. PICO-Based Evidence Synthesis

The standardized PICO synthesis demonstrated substantial variation in patient risk profiles, intervention composition, comparator intensity, and outcome selection (Table 3). Populations generally consisted of PLWH who were newly diagnosed, beginning or restarting antiretroviral therapy (ART), inconsistently retained in care, returning after disengagement, or otherwise considered at elevated risk for treatment failure. Several studies additionally selected participants based on structural or psychosocial vulnerability, including recent incarceration, rural residence, trauma exposure, unstable housing, substance use, or behavioral health burden. Thus, although the review focused on a common retention question, the populations in whom interventions were tested represented different stages and mechanisms of disengagement.

Table 3. PICO Evidence Synthesis and Effect Estimates of Included Studies.

Study	Population (P)	Intervention (I)	Comparator (C)	Outcome(s) (O)	Effect Estimate and Precision	Principal Synthesis Finding
Cook 2009 [12]	Adults beginning/recently changing ART, many at high nonadherence risk	Individualized nurse telephone counseling using CBT/MI principles	No concurrent comparator; historical expected adherence rates	ART adherence ≥ 95%; treatment persistence; self-efficacy	NR; no comparative effect estimate or CI captured in extracted data	Favorable short-term adherence/persistence, but 58% study attrition and no direct care-retention endpoint.
Milam 2005 [13]	Established HIV specialty-care patients continuously on ART	Brief provider-delivered adherence counseling integrated into routine visits	Attention-control safer-sex counseling	Self-reported ART adherence; HIV RNA	≥95% adherence: 91.1% intervention vs. 75.2% control; effect estimate/95% CI NR in extracted data	≥95% adherence maintained more often with intervention; retention in HIV care not measured.
Kuo 2019 [14]	Recently incarcerated adults transitioning to community care	CARE+ Corrections computerized MI + SMS reminders	Standard discharge planning	Engagement in HIV care; viral suppression	Engagement: aOR 1.18 (95% CI 0.25–5.53); viral suppression: aOR 2.04 (95% CI 0.62–6.70)	No significant between-group difference in engagement or viral suppression.
Naar-King 2009 [15]	HIV-positive youth/young adults aged 16–29 already enrolled in care	MI delivered by peer outreach workers	MI delivered by master's-level staff	Gap score/retention; MI fidelity	No significant between-arm difference in gap scores; peer arm had greater intervention participation ($p < 0.05$); numerical retention effect estimate/CI NR	Peer arm showed greater intervention participation; not a usual-care comparison.
Lewis-Chery 2025 [16]	Black women with HIV at risk because of out-of-care status, missed visits, viremia, or comorbidity	B.WOW/PLCares app + peer navigation + education + social-resource support	None	Viral suppression; 2 visits/labs in 12 mo; psychosocial/social determinants	Viral suppression: 36.5%→72.9%; ≥2 visits/labs: 85.9%; no comparative estimate/CI	Viral suppression increased substantially; bundled design prevents attribution to education alone.

Gardner 2014 [17]	New, returning, or inconsistently retained adults across 6 U.S. clinics	Enhanced personal contact (EC) ± skills training	Standard care (SOC)	Visit constancy; visit adherence	Visit constancy: 55.8% EC, 55.6% EC + Skills vs. 45.7% SOC; RR 1.22 (95% CI 1.09–1.36) for both intervention groups. Visit adherence: 72.5% EC, 70.9% EC + Skills vs. 67.2% SOC; EC RR 1.08 (95% CI 1.05–1.11); EC + Skills RR 1.06 (95% CI 1.02–1.09)	Enhanced contact improved visit outcomes relative to SOC; adding skills training did not provide additional benefit.
Konkle-Parker 2012 [18]	Adults starting/restarting ART in a Deep South public clinic	IMB/MI sessions + 6 calls + peer video + pill-box/reminder watch	Usual care	Medication adherence; missed visits; viral load/CD4	Effects described as small-to-moderate and nonsignificant; overall attrition ~51%; numerical intervention effect estimate/CI NR	Mostly small-to-moderate, nonsignificant effects; severe attrition limited inference; viral-load improvement seen among completers.
Melvin 2019 [19]	Patients receiving HIV treatment in an integrated Jackson clinic	Case management + rapid linkage + behavioral health + adherence counseling + social support	None	Linkage; ART adherence; viral suppression; retention	2015→2017: adherence 83%→96%; viral suppression 59%→81%; retention 42%→53%; no comparative estimate/CI	Multiple outcomes improved over time; causal inference limited by uncontrolled design.
Wohl 2011 [20]	Young Black/Latino MSM new to or inconsistently engaged in HIV care	Youth-focused psychosocial case management + education/adherence support	Within-group baseline/follow-up	Retention at 3 and 6 mo	Retention: 90% at 3 mo; 70% at 6 mo. Previously intermittent-care subgroup: attendance at all primary-care visits 7%→73%. Six-month retention associated with intervention visits ($p = 0.05$) and intervention hours ($p = 0.02$); CI NR	High short-term retention; previously intermittent-care participants showed substantial improvement; no concurrent control.
Zurlo 2020 [21]	Young adults with HIV, many with prior disengagement or viremia	OPT-In for Life app: messaging, reminders, results, goals, education	None	Follow-up/retention and viral suppression over 18 mo	Retention: 41.3% baseline → 78.6% at 6 mo, 79.8% at 12 mo, 73.4% at 18 mo ($p < 0.0001$). Viral suppression: 64.1% baseline → 85% at 6 and 12 mo and 91.4% at 18 mo; reported $p = 0.002$–0.0002; CI NR	Retention and viral suppression improved over baseline, but efficacy analyses were vulnerable to completer bias and absence of a control group.
Giordano 2016 [22]	Hospitalized adults with newly diagnosed HIV or loss to care	Peer mentoring in hospital + 5 post-discharge calls	Time/contact-matched health-education control	Retention after discharge; VL/CD4; ART initiation; acute-care use	Primary success: 28% vs. 28%; RR 1.00 (95% CI 0.81–1.26). VL improvement: 54% vs. 48%, nonsignificant. Subgroup receiving service-linkage support: RR 1.58 (95% CI 1.10–2.27) for VL improvement	No overall benefit; possible benefit among participants also receiving service-linkage support.
Konkle-Parker 2014 [23]	Adults with documented medication or visit-adherence problems	CLIMB: MI + education + behavioral tools + telephone reinforcement	Usual care	Visit constancy; ART adherence	No significant difference in visit constancy or ART adherence; numerical effect estimate/CI NR	No significant improvement in visit constancy or ART adherence; individual counseling may be insufficient amid competing psychosocial/structural needs.
Bendetson 2017 [24]	Newly diagnosed, predominantly young MSM in an urban LGBT center	Dedicated linkage specialist using MI + strengths-based case management	None	Linkage ≤ 3 mo; 12-mo retention; viral suppression	Linked ≤ 3 mo: 94.1%; mean time to linkage: 25.5 days; retained at 12 mo: 91.9%; viral suppression among those with available labs: 94.0%; CI NR	High linkage, retention, and viral suppression; uncontrolled design limits causal inference.
Moitra 2015 [25]	Newly diagnosed adults in immediate post-diagnosis period	Two brief acceptance-based behavioral sessions	None	3-mo visit attendance/engagement; psychosocial outcomes	≥1 medical visit within 3 mo: 9/9 (100%); scheduled visits attended: 78%; ART initiation: 6/9 (66.7%); CI NR	Strong feasibility/engagement signal, but $n = 9$ and no control group.
Rajabiun 2022 [26]	Cis/transgender women of color, including newly diagnosed and out-of-care participants	Peer linkage/re-engagement bundle + education + practical-needs assistance	None	Linkage; HRSA-style retention; viral suppression	Linkage ≤ 3 mo: 95.9%; case management at 6 mo: 57.9%; retention at 12 mo: 73.3%; viral suppression at 12 mo: 81.0%. Each additional 4 peer encounters associated with ~10% higher adjusted odds of retention and suppression; exact aOR/CI NR	High linkage, retention, and suppression; greater peer exposure associated with improved outcomes.
Wohl 2016 [27]	Long-term out-of-care adults identified through clinic/public-health systems	Modified ARTAS case management	None	Linkage at 3/6/12 mo; retention; viral suppression	Linkage: 68% at 3 mo, 85% at 6 mo, 94% at 12 mo; retention among linked partic-tion; viral suppression ipants: 82%. Viral suppression: 51% pre-	High linkage and reten-improved after linkage,

		+ intensive locator/navigation techniques			enrollment, 52% at linkage, 63% at retention; post-linkage change $\chi^2 = 11.8$, $p < 0.01$	but intervention was resource-intensive and surveillance-dependent.
Kalichman 2022 [28]	Rural Georgia patients at risk for treatment failure	Telephone behavioral counseling or clinic-based counseling	Attention-control nutrition education	Retention; viral load; ART adherence; alcohol use	Greater short-term medication adherence with telephone/clinic counseling; telephone arm completed more sessions and attended more scheduled medical appointments, but appointment effect did not persist after adjustment. No significant effect on VL or retention; numerical estimates/CIs NR	Short-term adherence improved; clinic counseling reduced alcohol use; no clear improvement in retention or viral load.
Dale 2024 [29]	Black cisgender women with HIV and trauma histories	STEP-AD trauma-informed CBT/empowerment intervention	Enhanced treatment as usual; all participants received LifeSteps	ART adherence; VL/CD4; PTSD; research follow-up	ART adherence and CD4 improved during active treatment; differences did not persist after excluding active-session data from later follow-up analyses. ~95% completed the study; no significant VL difference; exact effect estimates/CIs NR	Improved adherence during active sessions and reduced PTSD diagnosis; HIV medical-care retention/LTFU was not a primary outcome.
Corado 2018 [30]	New/returning adults with detectable HIV RNA	Five-session ALERT health coaching + literacy/navigation/reminders	Robust standard care	Time to LTFU (>180 d without provider visit)	LTFU: 29/60 (48.3%) vs. 24/56 (42.9%); HR 1.27 (95% CI 0.73–2.22), $p = 0.40$. Median time to LTFU: 81.7 vs. 93.6 weeks. ART initiation: median 2.0 vs. 3.6 weeks; HR 1.45 (95% CI 0.81–2.60), $p = 0.21$	No significant benefit for LTFU; strong standard care may have limited incremental intervention effects.
Roth 2012 [31]	Adults with HIV enrolled in an Indiana care-coordination/insurance program	Positive Choices lay-health-worker coaching	Standard care	Medication possession; VL testing; viral suppression; no clearly defined retention endpoint	Medication possession ratio: 82.9% vs. 72.8%, $p = 0.046$. VL testing: intervention 75.8%→95.6% vs. control 73.2%→87.7%, $p = 0.041$. VL < 50 copies/mL: 51.0% vs. 37.3%, $p = 0.011$; CIs NR	Improved medication possession and virologic outcomes; care-retention evidence remains indirect.
Kurth 2014 [32]	Adults with HIV receiving clinic/community services	CARE+ self-administered computerized counseling	Assessment-only tablet + standard care	Viral load; ART adherence; sexual risk; study retention	Study retention: 87%, with no significant between-group difference; reduced VL and improved adherence reported in intervention arm; exact comparative effect estimates/CIs NR	Reduced viral load and improved adherence; study retention was high, but clinical retention/LTFU was not the principal outcome.
Parsons 2005 [33]	Adults with HIV and substance use disorder	Eight sessions integrating MI and CBT	None	Substance use; medication adherence; study completion	Completed all sessions: 11/15 (73.3%); completed 3-mo follow-up: 12/15 (80.0%). No significant overall ART-adherence change; comparative effect estimate/CI not applicable/NR	Substance use decreased; no significant overall ART-adherence or viral-load change.
Neumann 2018 [34]	Large clinic populations in Atlanta and Huntsville	Waiting-room educational video, *Taking Care of Me*	Historical pre-intervention comparison	ART initiation; viral suppression; retention	Viral suppression: 62.7% intervention vs. 56.7% control, $p < 0.01$; ART initiation: 70.7% vs. 60.3%, $p < 0.01$; retention: 78.8% vs. 77.4%, $p = 0.35$. "Other" race/ethnicity subgroup retention: 81.6% (31/38) vs. 53.6% (15/28), $p = 0.03$	ART initiation and viral suppression improved; overall retention did not significantly change, and effects differed by site/subgroup.

Note. PICO elements were harmonized from the primary extraction and secondary evidence-gap review. The table distinguishes HIV medical-care retention from medication adherence, viral suppression, psychosocial outcomes, and research-study retention. Where an intervention was bundled, the finding should not be interpreted as the isolated effect of education. Effect estimates and measures of precision are reported as provided in the original studies and captured during data extraction. Where a comparative effect estimate or confidence interval was not reported in the extracted data, available group-level proportions, within-group changes, test statistics, and *p*-values are presented. No effect estimates or confidence intervals were calculated de novo by the review authors. Abbreviations: aOR, adjusted odds ratio; ART, antiretroviral therapy; CBT, cognitive behavioral therapy; CI, confidence interval; HR, hazard ratio; LTFU, loss to follow-up; MI, motivational interviewing; NR, not reported in the extracted study data; SOC, standard of care; VL, viral load.

Interventions were similarly diverse. Educational content included HIV and treatment literacy, medication adherence counseling, motivational enhancement, self-management, problem solving, appointment reinforcement, disclosure and stigma support, and patient empowerment. Education was rarely delivered in isolation. Instead, it was commonly combined with motivational interviewing, peer navigation, case management, lay health coaching, telephone follow-up, appointment reminders, digital or mobile health tools, trauma-informed or cognitive behavioral approaches, or multidisciplinary social-resource support. Accordingly, the PICO synthesis showed a temporal shift from primarily individual-level adherence education toward multicomponent care-engagement models that combined education with navigation, behavioral health, technology, or structural supports (Tables 3 and 4).

Table 4. Comparison of Educational and Behavioral Intervention Strategies.

Intervention Strategy	Representative Studies	Educational/Behavioral Content	Structural-Support Intensity	Cross-Study Effectiveness Pattern	Interpretation for Retention
Personal contact/appointment reinforcement	Gardner 2014; elements in Corado 2018 [17,30]	Basic HIV education paired with repeated individualized contact, reminders, missed-visit outreach, and relationship-building	Low-to-moderate; may include referral/problem-solving	Gardner demonstrated a clear improvement in visit constancy/adherence; Corado's more formal coaching did not improve time to LTFU over strong SOC.	Repeated personal contact may be more important than adding a formal skills curriculum when clinic SOC is already robust.
Case management/navigation	Wohl 2011; Melvin 2019; Bendetson 2017; Wohl 2016 [19,20,24,27]	Treatment education and adherence counseling embedded in individualized navigation/case management	High: linkage, referral, benefits/resource connection, locator services, behavioral health	Consistently favorable uncontrolled/real-world retention and linkage outcomes; strongest direct signals were in high-risk and out-of-care populations.	Promising for retention, but resource intensity and lack of concurrent comparators often limit causal attribution.
Peer-delivered support/navigation	Naar-King 2009; Giordano 2016; Rajabiun 2022; Lewis-Chery 2025 [15,16,22,26]	MI, treatment education, lived-experience support, stigma/disclosure support	Moderate-to-high in bundled peer-navigation models	Peer MI showed a moderate youth retention signal; hospital peer mentoring alone was null; peer-navigation bundles in women of color showed favorable direct outcomes.	Peer support appears most useful when paired with linkage, care coordination, and practical-needs support rather than as stand-alone mentoring.
Telephone/clinician behavioral counseling	Cook 2009; Kalichman 2022; Konkle-Parker 2012; Milam 2005 [12,13,18,28]	MI/CBT/IMB-based adherence counseling, problem-solving, readiness/self-efficacy work	Generally low structural content	Frequently improved adherence or short-term behavioral outcomes; direct retention benefits were inconsistent or absent.	Educational counseling may improve proximal behaviors without overcoming structural causes of disengagement.
Health coaching/multicomponent behavioral skills	Corado 2018; Konkle-Parker 2014 [23,30]	HIV literacy, navigation, adherence, disclosure, self-efficacy, MI, behavioral tools	Moderate but variable	Both trials with direct retention/visit outcomes were null against usual/robust care.	Incremental benefit may be low when existing case management is strong or when patient needs exceed individual-level coaching.
Digital/mHealth/computerized education	Kuo 2019; Zurlo 2020; Kurth 2014; Lewis-Chery 2025 [14,16,21,32]	SMS, computerized MI, app education, test results, reminders, goal setting, moderated peer community	Low in pure digital interventions; high in B.WOW bundle	Strongest effects were on adherence, communication, or viral suppression; Kuo showed no significant retention benefit; bundled app + peer/support models were more favorable.	Digital tools appear best positioned as access/engagement extenders rather than substitutes for human navigation and structural support.

Trauma-/acceptance-/CBT-informed counseling	Dale 2024; Moitra 2015; Parsons 2005 [25,29,33]	Trauma-informed CBT, acceptance-based therapy, MI/CBT for substance use, stigma and coping	Low-to-moderate	Psychosocial and adherence signals were favorable in selected studies; direct long-term retention evidence was sparse and mostly preliminary.	Mechanistically important for stigma, PTSD, depression and substance use, but requires stronger retention-focused efficacy trials.
Passive educational media	Neumann 2018; peer-video component in Konkle-Parker 2012 [18,34]	Theory-based waiting-room video or peer narratives	Minimal	Improved ART initiation and some virologic outcomes in Neumann, but no clear retention effect; video was only one component in Konkle-Parker.	Low-burden and scalable, but passive education alone is unlikely to address complex retention barriers.

Note. Intervention categories are analytic groupings created for this review; many programs were multicomponent and could reasonably fit more than one category. Structural-support intensity reflects whether interventions directly addressed linkage, navigation, transportation/housing/resource needs, or active tracing rather than education alone. Abbreviations: CBT, cognitive behavioral therapy; IMB, Information–Motivation–Behavioral Skills; MI, motivational interviewing; mHealth, mobile health; SOC, standard of care.

Comparator conditions ranged from standard or usual HIV care to active attention controls, alternate intervention delivery models, historical comparators, or no concurrent comparator. Importantly, standard care was not uniform across studies. In several randomized trials, usual care already included reminders, case management, adherence support, or linkage services, reducing the contrast between intervention and comparator conditions. In contrast, many implementation studies used single-arm or pre–post designs and therefore described change after program implementation without a concurrent control. This variability was important when interpreting apparently stronger effects in uncontrolled navigation programs versus more modest incremental effects in randomized trials conducted against robust standards of care.

Outcome selection was one of the most heterogeneous PICO components. Direct retention outcomes included visit constancy, appointment adherence, provider attendance, linkage to care, re-engagement, gap-in-care measures, Health Resources and Services Administration (HRSA)-style retention definitions, and time to loss to follow-up (LTFU). Secondary or indirect outcomes included ART adherence, refill adherence, viral suppression or viral load, CD4 count, treatment initiation, and psychosocial outcomes such as trauma symptoms, stigma, self-efficacy, depression, and substance use. This distinction between direct and indirect evidence was maintained throughout the synthesis because improvement in adherence or viral suppression did not necessarily establish improved longitudinal HIV medical-care retention (Tables 3, 5 and 6).

Table 5. Definitions and Findings for HIV Care Retention, Loss to Follow-up, and Related Engagement Outcomes.

Study	Retention/Engagement Definition	Time Frame	Extracted Effect/Estimate	Interpretation	Evidence Type
Kuo 2019 [14]	Engagement in HIV care: self-reported HIV provider visit in prior 6 mo	6 mo	aOR 1.18 (95% CI 0.25–5.53)	No significant intervention effect	Direct
Naar-King 2009 [15]	Gap-in-care score; 3-mo no-care interval within 12 mo framework	12 mo	POW gap score 1.34 vs. MLS 1.52; d ≈ 0.43	Moderate effect favoring peer delivery; comparator was alternate MI provider	Direct/retention-proxy
Lewis-Chery 2025 [16]	Two visits/lab tests in prior 12 mo; viral suppression	~12 mo	85.9% met 2-visit/lab indicator; VL suppression 36.5%→72.9%	Favorable pre/post; no control	Direct supportive, bundled
Gardner 2014 [17]	Visit constancy: ≥1 kept visit in each of three consecutive 4-mo	12 mo	Constancy 55.8% EC, 55.6% EC + Skills, 45.7% SOC; RR 1.22 (1.09–	Significant improvement for EC and EC + Skills; no	Direct

	intervals; visit adherence: kept/scheduled		1.36). Adherence 72.5%, 70.9%, 67.2%.	added benefit of skills component	
Konkle-Parker 2012 [18]	Missed medical visits/attrition; retention not primary	24 wk	~51–53% attrition from enrollment to final visit in team extraction	No clear retention benefit; attrition severely limited efficacy assessment	Indirect/supportive
Melvin 2019 [19]	Clinic retention rate	2015–2017	42%→47%→53%	Improved over time after integrated-care implementation; no control	Direct, uncontrolled
Wohl 2011 [20]	Proportion retained in primary HIV care	3 and 6 mo	90% at 3 mo; 70% at 6 mo; prior intermittent-care subgroup: all-visit attendance 7%→73%	Favorable within-group change	Direct, uncontrolled
Zurlo 2020 [21]	Study/care follow-up at 6/12/18 mo; team extraction reports baseline comparison	6/12/18 mo	78.6%, 79.8%, 73.4% follow-up; extraction reports $p < 0.0001$ for retention trend	Favorable pre/post, but no comparator and completer-dependent efficacy analyses	Direct/proxy, uncontrolled
Giordano 2016 [22]	Primary post-discharge retention composite/PCP follow-up	6 mo	Individual extraction: 28% success in both arms, RR 1.00 (95% CI 0.81–1.26).	No overall benefit as patients in the intervention group did not have significantly better outcomes	Direct
Konkle-Parker 2014 [23]	Visit constancy: ≥1 kept visit in each third of year	12 mo	No significant between-group difference	Null	Direct
Bendetson 2017 [24]	Linkage: face-to-face HIV-primary-care visit within 3 mo; retention: 2 visits ≥3 mo apart within 12 mo	3 and 12 mo	94.1% linked; 91.9% of linked retained	Favorable single-arm outcomes	Direct
Moitra 2015 [25]	≥1 medical visit every 3–4 mo/3-mo chart-review visit attendance	3 mo	9/9 attended ≥1 visit; mean 78% of scheduled visits attended	Feasibility signal only	Direct, exploratory
Rajabiun 2022 [26]	HRSA-style retention: 2 HIV-primary-care visits ≥3 mo apart in 12 mo	12 mo	73.3% retained; each +4 peer encounters associated with ~10% higher adjusted odds of retention ($p = 0.018$)	Favorable dose–response in single-arm study	Direct
Wohl 2016 [27]	Linkage at 3/6/12 mo; retention defined using a second VL test 12 mo after linkage	3–12 mo	68% linked by 3 mo, 85% by 6 mo, 94% by 12 mo; 82% retained	Favorable re-engagement/retention in true out-of-care population	Direct
Kalichman 2022 [28]	Medical-record retention over 18 mo; scheduled HIV appointment attendance	18 mo	No discernible significant retention difference; telephone arm completed more counseling and attended more scheduled visits before scheduling adjustment	Null for primary retention effect	Direct
Corado 2018 [30]	Time to LTFU: no HIV-provider visit at study sites for >180 d	Time-to-event; median > 80 wk	LTFU 48.3% ALERT vs. 42.9% SOC; median 81.7 vs. 93.6 wk; HR 1.27 (95% CI 0.73–2.22), $p = 0.40$	Null; intervention did not outperform strong SOC	Direct
Kurth 2014 [32]	Research-study retention reported; clinical retention not primary	9 mo	87% retained in study	Does not establish HIV-care retention benefit	Indirect
Parsons 2005 [33]	Intervention/research completion, not formal HIV-care retention	3 mo	11/15 completed all 8 sessions; 12/15 completed follow-up	Not a clinical retention endpoint	Indirect
Neumann 2018 [34]	Retention in HIV care assessed in EMR, but not the strongest/significant endpoint in extraction	Intervention vs. prior 10-mo period	Retention increased but not significantly	No clear retention effect	Direct/supportive
Cook 2009 [12]	No direct HIV-care retention measure; study attrition reported	6 mo	57/98 lost to study follow-up (~58%)	Adherence benefit does not establish care retention	Indirect

Milam 2005 [13]	No direct HIV-care retention/appointment endpoint	10–11 mo	Not applicable	Adherence maintained; retention not assessed	Indirect
Dale 2024 [29]	Research-study retention only; HIV medical-care retention not primary	Post-intervention follow-up	96% retained through T2; 93% through T3	High intervention feasibility, not evidence of clinical retention	Indirect
Roth 2012 [31]	No clearly defined LTFU/retention endpoint in team extraction	1 y	No direct estimate	Adherence/VL testing improvements provide indirect engagement evidence	Indirect

Note. Definitions varied markedly across studies, including visit constancy, time to LTFU, linkage, gap-in-care scores, provider-visit recall, laboratory-based retention, and research-study follow-up. Research retention and medication adherence are not treated as equivalent to HIV medical-care retention. Effect estimates are reported as indicated in each individual study. Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; EC, enhanced contact; HR, hazard ratio; HRSA, Health Resources and Services Administration; LTFU, loss to follow-up; MLS, master's-level staff; mo, month; POW, peer outreach worker; RR, risk ratio; SOC, standard of care; VL, viral load.

Table 6. Hierarchy of Direct and Indirect Evidence for HIV Care Retention.

Evidence Tier	Studies	Why the Evidence Belongs in This Tier	Interpretive Use in the Manuscript
Direct–controlled evidence	Gardner 2014; Kuo 2019; Giordano 2016; Konkle-Parker 2014; Kalichman 2022; Corado 2018; Naar-King 2009 [14,15,17,22,23,28,30]	Retention, engagement, visit constancy/adherence, gap-in-care, or time-to-LTFU was directly evaluated in a controlled design.	Gardner showed the clearest positive controlled retention effect; several other trials were null, emphasizing that more intensive education/coaching does not uniformly outperform SOC.
Direct–uncontrolled/implementation evidence	Melvin 2019; Wohl 2011; Bendetson 2017; Moitra 2015; Rajabiun 2022; Wohl 2016; Zurlo 2020; Lewis-Chery 2025 [16,19–21,24–27]	Direct linkage/retention or closely related care-engagement endpoints were measured, but without a concurrent control.	Many reported large improvements/high retention, especially navigation/case-management bundles, but causal attribution is weaker.
Direct but supportive/secondary evidence	Neumann 2018; Konkle-Parker 2012 [18,34]	Retention/visit outcomes were available but not the dominant or most robust efficacy endpoint.	Useful for triangulation, but retention conclusions should remain secondary to the study's principal adherence/virologic analysis.
Indirect adherence/virologic evidence	Cook 2009; Milam 2005; Roth 2012; Kurth 2014 [12,13,31,32]	Primary evidence concerns ART adherence, refill adherence, viral suppression, or testing rather than sustained HIV medical-care retention.	Supports plausible mechanisms of engagement, but should not be counted as proof of reduced LTFU.
Indirect psychosocial/mechanism evidence	Dale 2024; Parsons 2005 [29,33]	Interventions improve or target trauma/PTSD, substance use, stigma, coping, empowerment, or adherence mechanisms.	Highly relevant to reasons patients disengage, but direct retention-focused trials are needed to establish downstream effects.

Note. Direct evidence requires an HIV care-engagement endpoint such as retention, linkage/re-engagement, visit constancy/adherence, care gap, or time to LTFU. Viral suppression and ART adherence are clinically important secondary outcomes but are classified as indirect when no corresponding HIV-care retention endpoint is available. Research-study retention alone is not considered clinical retention. Abbreviations: ART, antiretroviral therapy; LTFU, loss to follow-up; SOC, standard of care.

3.3. Comparative Findings by Educational and Behavioral Intervention Strategy

Interventions were grouped by their dominant mechanism to permit cross-study comparison despite multicomponent delivery (Table 4). Eight analytic categories were identified: personal contact/appointment reinforcement; case management/navigation; peer-delivered support/navigation; telephone or clinician behavioral counseling; health coaching/multicomponent behavioral skills; digital/mHealth/computerized education;

trauma-, acceptance-, or cognitive behavioral therapy-informed counseling; and passive educational media. Across categories, the clearest pattern was that programs combining education with sustained interpersonal contact and structural support generally produced more favorable direct retention outcomes than interventions centered on information delivery or counseling alone.

Case-management and navigation programs produced the most consistently favorable direct retention signals, particularly among newly diagnosed, previously out-of-care, or otherwise high-risk populations. Bendetson et al. reported linkage within 3 months in 94.1% of participants and 12-month retention in 91.9% of those linked [24]. Wohl et al. (2016) reported linkage increasing from 68% by 3 months to 94% by 12 months, with 82% retained after linkage [27]. In a youth-focused case-management program, Wohl et al. (2011) reported 90% retained at 3 months and 70% retained at 6 months, with marked improvement among participants who had previously been intermittently engaged [20]. Melvin and Gipson observed retention increasing from 42% to 53% from 2015 to 2017 alongside improvements in adherence and viral suppression after implementation of an integrated multidisciplinary program [19]. These studies generally lacked randomized concurrent comparators, but they consistently demonstrated favorable real-world engagement in populations facing substantial barriers (Tables 3–5).

Peer-delivered interventions yielded more variable findings. In Naar-King et al., peer-delivered motivational interviewing produced a moderate retention effect relative to master's-level staff (Cohen's d approximately 0.43) and greater intervention participation [15]. Rajabiun et al. reported 73.3% 12-month retention in a peer-navigation program for women of color, with every four additional peer encounters associated with approximately 10% higher adjusted odds of retention ($p = 0.018$) [26]. Lewis-Chery et al. similarly reported favorable engagement within a bundled mHealth and peer-navigation intervention for Black women, with 85.9% meeting a two-visit/laboratory engagement indicator and viral suppression increasing from 36.5% to 72.9% [16]. In contrast, Giordano et al. found no overall advantage of peer mentoring over a time- and contact-matched health-education control for post-discharge retention (RR 1.00, 95% CI 0.81–1.26) [22]. Together, these findings suggest that peer involvement was most favorable when embedded in navigation or practical-needs support rather than delivered as mentoring alone (Tables 3–5).

Telephone-, clinician-, and health-coaching interventions more consistently improved proximal behavioral outcomes than direct retention. Milam et al. reported maintenance of at least 95% ART adherence in 91.1% of intervention participants compared with 75.2% of controls following brief provider-delivered adherence counseling [13]. Cook et al. reported favorable short-term adherence and treatment persistence after nurse telephone counseling, but no direct HIV-care retention outcome and substantial study attrition [12]. Kalichman et al. found short-term adherence and alcohol-use benefits from behavioral counseling in rural Georgia but no clear significant improvement in retention or viral load [28]. Corado et al. found that structured ALERT health coaching did not reduce LTFU compared with robust standard care (48.3% vs. 42.9%; HR 1.27, 95% CI 0.73–2.22; $p = 0.40$) [30]. Similarly, Konkle-Parker et al. reported no significant improvement in visit constancy in a multicomponent motivational interviewing/education intervention [23]. Thus, counseling and coaching frequently influenced adherence or other behavioral mechanisms but did not reliably translate into sustained retention when delivered without broader structural support (Tables 3–5).

Digital and computerized interventions showed a similar pattern. Kuo et al. found no significant between-group improvement in engagement after a computerized motivational intervention plus text reminders among recently incarcerated adults (aOR 1.18, 95% CI 0.25–5.53), nor a significant improvement in viral suppression (aOR 2.04, 95% CI 0.62–

6.70) [14]. Kurth et al. reported improved adherence and viral-load outcomes after computerized counseling, although clinical retention was not the principal endpoint [32]. Zurlo et al. reported favorable retention and viral suppression trends with the OPT-In for Life application, but the single-arm design and completer-dependent analyses limited causal inference [21]. The most favorable digital findings arose when technology was paired with peer navigation and social-resource support, as in Lewis-Chery et al. [16]. Overall, digital tools appeared to function most effectively as adjuncts that extended communication, reminders, education, and access rather than as substitutes for longitudinal human support (Tables 3, 4 and 7).

Table 7. Implementation, Fidelity, Resource Requirements, and Scalability of Included Interventions.

Study	Personnel/Training	Dose/Delivery	Technology/Resources	Fidelity/Uptake	Cost Evidence	Scalability/Sustainability Interpretation
Cook 2009 [12]	Registered nurses trained in CBT/MI/behavior-change counseling	Median ~3 completed calls across ~6 mo; individualized scheduling	Telephone call center; provider communication after encounters	High study attrition; repeated contact attempts required	Not reported	Potential geographic scalability, but successful contact/retention is a challenge.
Milam 2005 [13]	HIV care providers; ~4-h training + booster	Brief ~3–5 min counseling during routine visits, repeated	Educational brochures, schedules, posters/reminders	Integrated into routine workflow	Not reported	High workflow fit; depends on provider training and reinforcement.
Kuo 2019 [14]	Relatively limited personnel after computerized session; correctional/community coordination	Computerized counseling + post-release SMS over 6 mo	Computer/tablet + mobile phone/SMS	Study retention > 90%; 37% reincarcerated	Not reported	Scalable digital delivery, but may be insufficient without structural support.
Naar-King 2009 [15]	Peer outreach workers or master's-level staff; 2 full days MI training + weeks of practice + weekly coaching	30–45-min session at baseline and 6 mo	No specialized technology	Peer arm attended more sessions; fidelity differences favored peers	Not reported	Training/coaching burden may constrain dissemination despite peer workforce advantages.
Lewis-Chery 2025 [16]	Program manager, 2 patient navigators, peer counselor, all-women CAB	High-intensity; ~86 encounters on average plus workshops/app activity	PLCares app; phones/support; in-person + virtual workshops	51% app response; 49% medication check-in adherence; 85% with post-visit data	Not reported; incentives/phones used	Resource-intensive bundled model; scalability depends on clinic/community partnerships and funding.
Gardner 2014 [17]	Dedicated interventionists trained with didactic/interactive sessions	Brief visit contacts + interim calls + 7-/2-day reminders + missed-visit calls; skills session for EC + Skills	Telephone/reminder infrastructure	Call contact success in extraction ~47%; skills add-on did not improve retention	Not reported	Moderate-to-high staffing intensity; personal contact may be more efficient than added skills training.
Konkle-Parker 2012 [18]	Experienced NP trained in MI with fidelity monitoring	2 face-to-face sessions + 6 tapering calls	Phone; peer video; pillbox; reminder watch	Only ~55% completed 7–8 contacts; ~15% no intervention contacts; high attrition	Not reported	Low-tech but fidelity/retention problems threaten real-world effectiveness.
Melvin 2019 [19]	Multidisciplinary team including case manager, behavioral health, pharmacist/adherence	Ongoing integrated care	EMR-supported coordination	Program embedded in routine clinical practice	Not reported	Potentially replicable in integrated clinics; requires multidisciplinary capacity.

	counseling, social services					
Wohl 2011 [20]	Bachelor-level case managers	Individualized psychosocial case management over 6 mo	No specialized technology required	Greater intervention exposure associated with retention	Not reported	Feasible without advanced technology, but dedicated case-management workforce is required.
Zurlo 2020 [21]	Research, social-media, administrative teams + contracted app developer	Ongoing app access with messaging/reminders; repeated 6/12/18-mo follow-up	HIPAA-compliant app, secure messaging, telehealth; app updates	Highly variable use (0–1.94 openings/wk; ~3 min average time)	Not reported	Technical development and support burden may limit replication despite digital reach.
Giordano 2016 [22]	Trained HIV-positive peer mentors; standardized-patient training and 6-mo recertification	2 inpatient sessions + 5 calls over 10 wk	Telephone follow-up	Feasible completion, but no overall retention effect	Not reported	Training/recertification adds cost; benefit may depend on concurrent service-linkage infrastructure.
Konkle-Parker 2014 [23]	Trained intervention staff	2 face-to-face sessions + 6 phone calls	Education booklet, video, pillboxes/calendars, telephone	High attrition; baseline imbalance; dose–response suggested in higher-contact participants	Not reported	Simple tools are accessible, but intervention may be inadequate for high psychosocial burden.
Bendetson 2017 [24]	One full-time licensed clinical social worker linkage specialist	Mean 2.1 h and 4.9 contacts per participant; flexible phone/text/email/in-person	Routine communication channels	Real-world integration demonstrated	No cost-effectiveness data	Clear staffing benchmark supports replication, but evidence comes from a well-resourced LGBT specialty setting.
Moitra 2015 [25]	Doctoral-level clinical psychologist	Two very brief sessions (<20 min; 10–15 min booster)	No specialized technology	89% completed second session; high acceptability	Not reported	Low time burden, but doctoral-level staffing may constrain scale; durability unknown.
Rajabiun 2022 [26]	Full-time peers; 40-h training + weekly huddles/supervision + monthly coaching	Planned ≤4 mo; actual mean ~7 mo, range 2–19; mean 6.1 early encounters	No specialized platform required; practical-resource coordination	Only 17% transitioned to SOC within planned 4 mo	Not reported	Effective dose may require longer and more expensive support than originally planned.
Wohl 2016 [27]	Bachelor-level bilingual navigators with HIV case-management experience; access to DIS/public-health systems	Modified ARTAS up to 10 sessions; mean 4.5 visits/11.6 h	Phone/text/email/letters/home visits + surveillance/people-finder databases	Many participants needed only 1–3 visits; 29% of identified lost patients could not be located	Not reported	Highly resource- and data-access dependent; stepped-intensity model may improve efficiency.
Kalichman 2022 [28]	Community nurse or paraprofessional patient navigator	Up to 6 biweekly telephone or clinic sessions	Telephone for remote arm	Telephone participants more likely to complete all 6 sessions	Not reported	Strong rural access potential with basic technology; durability and cost remain unknown.
Dale 2024 [29]	Trained clinician/therapist	9 weekly individual STEP-AD sessions; all received LifeSteps	Wisepill for adherence monitoring; otherwise clinician-delivered	94% completed all 9 sessions; 96%/93% research follow-up at T2/T3	Not reported	High feasibility in pilot, but specialized mental-health workforce may limit scale.
Corado 2018 [30]	Trained ALERT specialists with cross-site fidelity support	5 standardized 1:1 coaching sessions	Calls/text/email/reminder channels	Only ~60% completed all 5 sessions	Not reported	Incremental value questionable in resource-rich clinics with strong SOC; completion is a key implementation issue.

Roth 2012 [31]	5 part-time lay health workers with vulnerable-population experience; orientation + monthly team meetings	Individualized face-to-face/phone coaching	Telephone + care-coordination infrastructure	Implementation feasible within insurance/care-coordination program	~$1600/client; ~ $10,000 per undetectable VL achieved (team extraction)	Rare study with economic information; generalizability depends on program financing and care-coordination infrastructure.
Kurth 2014 [32]	Computerized self-administered platform with safety flagging; program development team	4 sessions across 9 mo	Tablet/computer software; incentives for sessions	Good trial retention; self-report outcomes remain vulnerable	CDC/CFAR funded; participant incentives reported	Potentially scalable once platform exists, but development, safety monitoring, and incentives matter.
Parsons 2005 [33]	Trained therapist	8 weekly 1-h sessions	Computer-assisted self-interview for assessment	11/15 completed all sessions; 12/15 completed follow-up	Participant compensation reported; program cost not reported	High therapist time burden for a small pilot; clinic integration plausible but untested at scale.
Neumann 2018 [34]	Minimal ongoing staff once video deployed	29-min video loop in waiting room + posters	Display/video equipment; captions	Actual attention/exposure not measured	Funded by HHS Minority AIDS Initiative and CDC; intervention cost not reported	Very scalable/low marginal burden, but uncertain dose and weak retention effect.

Note. Implementation information was variably reported in the source studies and team extraction. 'Not reported' denotes absence of usable cost information in the extraction rather than proof that no cost analysis exists in the full article. Scalability interpretations are review-level inferences based on the extracted staffing, technology, dose, and infrastructure requirements. Abbreviations: CAB, community advisory board; CBT, cognitive behavioral therapy; CDC, Centers for Disease Control and Prevention; CFAR, Center for AIDS Research; DIS, disease investigator services; EC, enhanced contact; MI, motivational interviewing; NP, nurse practitioner; SOC, standard of care; VL, viral load.

Trauma-informed, acceptance-based, and cognitive behavioral interventions were represented by a smaller evidence base and primarily demonstrated psychosocial, adherence, or feasibility outcomes. Dale et al. reported improved ART adherence during active STEP-AD sessions and reductions in post-traumatic stress disorder diagnoses among Black women with trauma histories, but medical-care retention was not a primary endpoint [29]. Moitra et al. demonstrated feasibility of a brief acceptance-based intervention in nine newly diagnosed adults, all of whom attended at least one HIV medical visit within 3 months, with 78% of scheduled visits attended [25]. Parsons et al. reported decreased substance use after an eight-session motivational interviewing/cognitive behavioral intervention, but no significant improvement in ART adherence or viral load [33]. Passive educational media also showed limited direct retention effects: Neumann et al. observed improved ART initiation following a theory-based waiting-room video, but the increase in retention was not statistically meaningful [34]. These findings indicate that psychosocial and passive educational strategies may influence important mechanisms of engagement while leaving direct long-term retention less well established (Tables 3–5).

3.4. Retention Outcomes, Effect Estimates, and Outcome Heterogeneity

Direct retention findings are summarized in Table 5. Among controlled studies, Gardner et al. provided the clearest positive retention effect. Visit constancy was 55.8% with enhanced contact and 55.6% with enhanced contact plus skills training versus 45.7% with standard care; enhanced contact increased visit constancy relative to standard care (RR 1.22, 95% CI 1.09–1.36) [17]. Visit adherence was 72.5%, 70.9%, and 67.2%, respectively, indicating that the addition of behavioral skills training did not improve outcomes beyond

repeated personal contact [17]. Naar-King et al. also showed a moderate effect favoring peer-delivered motivational interviewing on a gap-in-care score, although the comparator was another motivational interviewing provider rather than usual care [15].

Several other controlled trials with direct retention endpoints were null. Giordano et al. reported equivalent primary post-discharge retention success in intervention and control groups (28% in each arm; RR 1.00, 95% CI 0.81–1.26) [22]. Corado et al. found no improvement in time to LTFU, with LTFU occurring in 48.3% of ALERT participants versus 42.9% receiving standard care; median time to LTFU was 81.7 versus 93.6 weeks (HR 1.27, 95% CI 0.73–2.22; $p = 0.40$) [30]. Konkle-Parker et al. (2014) found no significant between-group improvement in visit constancy, and Kalichman et al. found no discernible significant retention difference across the 18-month follow-up [23,28]. These null findings contrasted with the frequently favorable adherence, behavioral, or implementation outcomes observed in the same intervention families.

Uncontrolled and implementation studies more often reported high linkage and retention proportions. In addition to Bendetson et al. [24] and Wohl et al. (2016) [27], Rajabiun et al. reported 96% linkage, 73.3% retention, and 81% viral suppression at 12 months [26]. Melvin and Gipson reported retention improving from 42% to 47% to 53% over three program years, alongside adherence increasing from 83% to 96% and viral suppression from 59% to 81% [19]. Lewis-Chery et al. reported 85.9% meeting a two-visit/laboratory indicator over approximately 12 months [16]. These findings provide important implementation signals but cannot establish the isolated causal contribution of education because the programs were multicomponent and generally lacked concurrent controls.

A central result of the review was the marked inconsistency in how retention was operationalized. Definitions included at least one kept visit in each prespecified interval, two visits separated by at least 3 months, provider attendance in the prior 6 months, time to more than 180 days without a provider visit, linkage within a defined time period, laboratory-based retention, gap-in-care scores, and research-study follow-up. Some reports emphasized viral suppression or ART adherence despite not directly measuring longitudinal medical-care retention. For this reason, research-study completion, ART adherence, and viral suppression were not treated as equivalent to clinical retention. The heterogeneity in definitions, time horizons, and effect measures precluded defensible quantitative pooling and supported narrative synthesis (Tables 5 and 6).

3.5. Evidence-Gap Analysis

The evidence-gap analysis identified recurring gaps in population representation, intervention attribution, outcome standardization, implementation reporting, scalability, and durability (Table 8). Although the literature included several randomized trials and multiple real-world implementation studies, the strongest reported retention proportions frequently arose from multicomponent navigation or case-management programs in which the specific effect of educational content could not be isolated. Education was often bundled with reminders, peer or patient navigation, social support, behavioral health services, incentives, transportation or housing assistance, or active locator services. As a result, the evidence more strongly supports comprehensive care-engagement models than any single educational component.

Table 8. Evidence Gap Matrix Across the U.S. Retention-Intervention Literature.

Evidence-Gap Domain	What the Included Evidence Contributes	Persistent Gap	Implication for Future Evidence

Population coverage	Strong representation of Black adults in multiple Southern/urban studies; targeted studies of Black women, young Black/Latino MSM, recently incarcerated adults, women of color, and rural Georgia patients.	Women overall, transgender persons outside a few targeted studies, older adults, pregnant/postpartum people, non-English speakers, and rural populations remain inconsistently represented.	Limits equity-focused generalizability and prevents confident tailoring of retention interventions across demographic groups.
Geographic setting	Evidence spans multiple U.S. regions and several multisite trials.	Most studies are urban or academic; only Kalichman directly fills a rural-care gap. Few studies test interventions in low-resource rural clinics.	Urban academic efficacy may not transfer to rural settings with different transportation, workforce, broadband/phone, and specialty-care access.
Intervention attribution	Many studies describe rich, patient-centered interventions.	Education is frequently bundled with case management, navigation, social support, incentives, reminders, housing/transport assistance, or locator services.	The independent contribution of education/counseling cannot usually be isolated; dismantling/factorial or component-effectiveness studies are needed.
Outcome standardization	Multiple studies directly measured linkage or retention.	Definitions ranged from time to >180-day LTFU to visit constancy, 2 visits ≥3 months apart, provider visit in prior 6 months, laboratory proxies, and research follow-up.	Heterogeneity impedes pooling, comparative effectiveness, and translation. A prespecified core retention outcome set is needed.
Design rigor	Several randomized trials were identified (Gardner, Corado, Kalichman, Giordano, Kuo, Milam, Konkle-Parker, Dale, Kurth).	Many high-performing case-management/navigation studies were uncontrolled, pre/post, single-arm, or small pilots.	Observed improvements may reflect secular trends, regression to the mean, selection, or study participation rather than intervention effects.
Comparator strength	Some trials used active controls or robust SOC.	SOC varied greatly between sites and sometimes included reminders, case management, and new coordination teams.	Null findings may represent low incremental benefit over strong SOC rather than lack of efficacy in low-resource settings.
Implementation fidelity/dose	Several studies reported contacts, session completion, or app use.	Intervention completion was variable; some high-intensity programs exceeded planned duration, while other studies had substantial attrition or low call/app engagement.	Effectiveness depends on actual dose received; future studies should report reach, adoption, fidelity, and dose–response consistently.
Cost/economic evidence	Roth reported approximate program spending; some studies described staffing/time requirements.	Formal cost-effectiveness, budget impact, and reimbursement information were largely absent.	Health systems cannot judge scalability or sustainability from efficacy alone.
Scalability/sustainability	Telephone, video, and digital approaches are potentially scalable; some clinic-integrated models used existing workflows.	Many successful navigation models required dedicated staff, specialist training, public-health data access, phones/incentives, or prolonged engagement.	Future studies should test lower-intensity stepped-care versions and identify minimum effective intervention dose.
Structural determinants	Many studies measured or described housing, transportation, stigma, trauma, substance use, incarceration, poverty, and mental health.	Purely educational interventions often did not directly remediate these barriers; structural outcomes were inconsistently measured.	Retention interventions likely require integration of education with material/resource supports for highest-risk patients.
Long-term durability	Several studies followed participants for 12–18 months.	Many pilots were short (3–6 months), and durable effects after intervention cessation were rarely established.	Longer follow-up is needed to distinguish temporary engagement from sustained retention.
Equity/subgroup effects	Gardner and other studies explored effect modification; targeted studies address specific high-risk groups.	Most trials were not powered for subgroup effects, and demographic reporting was sometimes incomplete (e.g., Cook race/ethnicity).	Future trials should prespecify equity-relevant subgroup analyses and report social determinants using standardized measures.

Note. This matrix integrates the secondary evidence-gap fields completed for each included study: population representation, intervention type, outcome type, implementation, and evidence-gap contribution. The purpose is to identify recurring deficiencies across the literature rather than restate individual study limitations. Abbreviations: SOC, standard of care.

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Population representation was similarly uneven (Table 2). Black/African American adults were strongly represented in multiple Southern and urban studies, and targeted investigations included Black women, women of color, young Black/Latino men who have sex with men, recently incarcerated adults, and patients previously lost to care. However, women overall, transgender populations outside a small number of targeted studies, older adults, rural populations, non-English speakers, and pregnant or postpartum people remained inconsistently represented. Rural evidence was particularly limited, with Kalichman et al. providing the principal rural-focused intervention [28]. Several studies included participants experiencing housing instability, substance use, trauma, or mental-health burden, but these characteristics were often baseline vulnerabilities rather than prespecified intervention-stratification targets.

Implementation requirements varied widely across studies (Table 7). Low-intensity approaches included brief provider counseling, telephone support, passive video education, and computerized interventions; higher-intensity programs required dedicated navigators, peer workers, licensed clinical social workers, behavioral-health clinicians, multidisciplinary teams, or access to public-health surveillance and locator systems. Intervention uptake and fidelity were also variable. For example, only approximately 60% of participants completed all ALERT coaching sessions in the Corado et al. pilot, only about 55% completed seven or eight contacts in the Konkle-Parker pilot, and app engagement in Zurlo et al. was highly variable [21,23,30]. In contrast, Dale et al. reported 94% completion of all nine STEP-AD sessions, and telephone participants in Kalichman et al. were more likely to complete all six counseling sessions [28,29]. These differences indicate that delivered intervention dose, not only planned intervention content, varied substantially across the evidence base.

Cost and sustainability were among the least consistently reported implementation domains. Formal economic evaluation was uncommon; Roth et al. was a notable exception, with the team extraction reporting approximately $1600 per participant and approximately $10,000 per additional undetectable viral load achieved [31]. Several studies described staff time, training, technology, phones, incentives, or specialized data infrastructure without formal cost-effectiveness analysis. Potentially scalable digital and telephone approaches generally required fewer direct personnel resources but yielded less consistent retention effects when delivered without structural support. Conversely, high-performing navigation programs frequently required dedicated staff, prolonged follow-up, multidisciplinary coordination, or data systems that may be difficult to reproduce in resource-constrained settings (Tables 7 and 8).

Long-term durability also remained incompletely characterized. Although several studies followed participants for 12–18 months and Corado et al. used a time-to-event framework extending beyond 80 weeks, many pilot and feasibility studies were limited to 3–6 months. Few studies evaluated whether retention gains persisted after active intervention contact ended. Collectively, these gaps limit conclusions regarding the minimum effective intervention dose, long-term sustainability, and transferability of successful programs across different U.S. care settings (Table 8).

3.6. Direct Versus Indirect Evidence and Integrated Results Summary

The hierarchy of direct and indirect evidence is summarized in Table 6. Seven controlled studies directly evaluated retention, engagement, visit constancy/adherence, gap-in-care measures, or time to LTFU: Gardner, Kuo, Giordano, Konkle-Parker (2014), Kalichman, Corado, and Naar-King [14,15,17,22,23,28,30]. Within this tier, Gardner showed the clearest positive controlled retention effect, whereas several other trials were null or demonstrated only modest signals. Eight additional studies provided direct but uncontrolled or implementation evidence: Melvin, Wohl (2011), Bendetson, Moitra, Rajabiun,

Wohl (2016), Zurlo, and Lewis-Chery [16,19–21,24–27]. These studies frequently reported favorable linkage or retention but offered weaker causal attribution because they lacked concurrent controls. Neumann and Konkle-Parker (2012) provided supportive or secondary retention evidence [18,34], while Cook, Milam, Roth, and Kurth primarily contributed adherence or virologic evidence [12,13,31,32] and Dale and Parsons contributed psychosocial or mechanistic evidence [29,33].

Across the full synthesis, the clearest cross-study pattern was therefore not that all educational interventions improved retention, but that educational and behavioral strategies produced more consistent improvements in proximal engagement-related outcomes than in sustained medical-care retention. Direct controlled evidence for retention was mixed, while real-world navigation and case-management programs frequently reported favorable retention proportions in higher-risk populations. Interventions with the strongest direct retention signals generally incorporated repeated personal contact, navigation, care coordination, peer or social support, or practical assistance rather than education alone. At the same time, intervention effectiveness could not be separated from comparator intensity, study design, or implementation context, and favorable uncontrolled results should not be interpreted as equivalent to randomized comparative effects.

Taken together, the PICO and evidence-gap analyses show that U.S. HIV retention research has evolved toward increasingly multicomponent, patient-centered interventions that integrate education with behavioral, relational, and structural support. The current evidence base supports education as an important component of care-engagement strategies but provides less consistent evidence that education alone improves long-term retention. Outcome heterogeneity, unequal population representation, variable implementation fidelity, limited economic reporting, and scarce long-term sustainability data remain major limitations of the literature. These results form the basis for the interpretation of intervention mechanisms, clinical implications, and possible future research priorities.

3.7. Quality Assessment and Risk of Bias

Risk-of-bias assessment identified substantial variation in methodological rigor across the 23 included studies (Supplementary Table S1). Three studies (13.0%) were classified as having low risk of bias, 12 (52.2%) as moderate risk, and eight (34.8%) as high risk. Thus, 20 of 23 studies (87.0%) demonstrated at least moderate methodological concerns. Lower-risk studies generally used appropriate randomization, comparable groups, consistent or objective outcome measurement, adequate handling of follow-up, and appropriate statistical analyses. High-risk studies were characterized by major threats to internal validity such as non-random or selectively formed groups, absence of a concurrent comparator combined with other serious design limitations, substantial or inadequately handled attrition, baseline nonequivalence, or analyses vulnerable to selection or attrition bias. Additional concerns across studies included incomplete blinding, self-reported outcomes, and residual confounding. Sample size, statistical power, setting, generalizability, and outcome directness were not used to determine the risk-of-bias classification.

3.8. Additional Synthesis Assessments

Because quantitative meta-analysis was not performed, no statistical investigations of heterogeneity or sensitivity analyses were conducted. Formal synthesis-level assessments of risk of bias due to missing results (reporting bias) or certainty of evidence were not performed for the reasons described in the Methods.

4. Discussion

This systematic review of 23 U.S.-based studies suggests that the central question is not whether education has a role in HIV care retention, but how education is embedded within the broader system of care. Across the PICO synthesis, educational and behavioral strategies more consistently improved proximal outcomes, such as adherence, HIV knowledge, self-management, communication, and viral suppression, than sustained medical-care retention itself. The strongest direct retention signals generally arose from interventions that coupled education or counseling with repeated personal contact, navigation, case management, peer or social support, and practical assistance. In contrast, stand-alone counseling, passive education, and several digital or coaching approaches produced less consistent incremental retention effects, particularly when compared with already robust usual care. This pattern supports interpreting education as a foundational component of retention strategies rather than a sufficient stand-alone solution.

This interpretation is consistent with earlier U.S. evidence. Higa et al. concluded that successful retention interventions commonly used strengths-based case management, navigation, peer involvement, active outreach, and reduction in structural barriers, while also noting the difficulty of identifying the effect of any single component within multicomponent programs [35]. The present synthesis extends that work across studies published through 2025 and shows that this basic challenge has persisted even as intervention delivery has evolved toward mHealth, trauma-informed approaches, peer-navigation bundles, and multidisciplinary models. The finding that peer-containing strategies may be beneficial also accords with a 2021 meta-analysis of 20 randomized trials, in which peer support produced a modest improvement in 12-month retention (RR 1.07, 95% CI 1.02–1.12) as well as improvements in ART adherence [36]. Importantly, our U.S.-focused synthesis indicates that peer support appears most compelling when it functions as part of linkage, navigation, or practical-needs support rather than as isolated mentoring.

Although the present review was intentionally limited to U.S.-based studies, international evidence provides additional context for the challenges of achieving sustained HIV care retention. A systematic review and meta-analysis of 70 studies conducted in low- and middle-income countries after the introduction of universal test-and-treat policies found that retention remained a persistent challenge, particularly beyond the first two years of treatment [37]. These findings reinforce the importance of evaluating long-term engagement rather than relying exclusively on short-term adherence or treatment-initiation outcomes. However, differences in healthcare financing, treatment infrastructure, service delivery, and socioeconomic conditions limit direct comparisons between international settings and the United States. International evidence may therefore inform future intervention development, but it was not incorporated into the present review's U.S.-specific evidence synthesis.

The results further reinforce that retention is a multilevel outcome rather than solely a patient behavior. Knowledge and motivation may be necessary for engagement, but individuals cannot independently resolve transportation barriers, unstable housing, food insecurity, stigma, behavioral-health needs, competing life demands, or fragmented care. The favorable performance of navigation- and case-management programs is therefore clinically plausible: these models can translate education into action by helping patients overcome barriers between understanding recommended care and repeatedly accessing

it. This systems-oriented interpretation is consistent with contemporary HIV care-continuum frameworks, which recognize sustained engagement as the product of interacting individual, structural, and healthcare-system factors rather than patient knowledge or motivation alone. Importantly, the present findings also reinforce that improvements in medication adherence or viral suppression, although clinically meaningful, should not be assumed to indicate sustained retention in care. Educational strategies may therefore have their greatest impact when incorporated into care models that simultaneously support patients' ability to remain continuously engaged with the healthcare system.

Although ART and HIV-related clinical services may be supported through public programs, private insurance, and safety-net resources, people living with HIV may continue to experience substantial financial barriers to sustained care. Transportation expenses, insufficient insurance coverage, competing employment responsibilities, food insecurity, and housing instability may interfere with consistent appointment attendance. Previous U.S.-based research has identified transportation difficulties, insufficient insurance, and competing life demands as barriers to retention, while additional research has demonstrated the financial and operational costs associated with expanding socioeconomic support services for people living with HIV [38,39]. These findings suggest that educational interventions should be considered alongside financial navigation, transportation assistance, and other supportive services rather than as isolated solutions to disengagement. Future studies should evaluate both patient-level financial barriers and the cost-effectiveness of integrated retention interventions.

A second important implication is methodological. The review deliberately distinguished direct retention evidence from secondary or indirect outcomes because viral suppression, medication adherence, and study completion cannot be assumed to represent sustained HIV medical-care engagement. This distinction is especially important when evaluating interventions that improve biologic or behavioral outcomes without changing visit-based retention. Moreover, the marked variation in retention definitions across the included studies limits cross-study inference. This problem is not unique to the current review: Mugavero et al. compared six commonly used retention measures and found substantial variability in how they classified engagement, concluding that no single measure functioned as a clear gold standard [40]. Greater use of prespecified, standardized retention and LTFU measures—reported alongside viral suppression and adherence—would improve comparability and make future quantitative synthesis more feasible.

The evidence-gap analysis also changes how favorable intervention findings should be interpreted. Representation was strong for Black/African American adults in several urban and Southern cohorts and meaningful evidence has recently emerged for Black women and women of color; however, dedicated evidence remained sparse for transgender people, older adults, rural communities, non-English-speaking populations, and pregnant or postpartum individuals. Thus, demographic diversity within an overall sample should not be equated with evidence that an intervention has been adequately evaluated across intersecting identities, geographic contexts, or life stages. The concentration of studies in urban or academically affiliated settings is particularly relevant for scalability because interventions requiring dedicated navigators, repeated outreach, multidisciplinary personnel, or public-health data infrastructure may perform differently in rural or resource-constrained clinics.

Implementation reporting was another major gap. Many of the interventions with favorable retention signals were resource intensive, yet cost, staffing burden, fidelity, sustainability, and long-term maintenance were inconsistently reported. Conversely, lower-burden digital or passive educational approaches may be easier to scale but generally showed weaker direct retention effects when used without human or structural support. Future research should therefore move beyond efficacy alone and evaluate the trade-off

between effect, reach, personnel requirements, and sustainability. Pragmatic multicenter studies could test stepped or risk-stratified models in which scalable digital education and reminders are available broadly, while higher-intensity navigation, peer support, behavioral health, or social-resource coordination is targeted to patients with greater risk of disengagement. Factorial or dismantling designs may also help identify which components of multicomponent programs contribute independently to retention. The risk-of-bias assessment provides additional context for interpreting these findings. Only three of the 23 included studies were judged to have low risk of bias, whereas approximately half had moderate risk and more than one-third had high risk. Common methodological concerns included the absence of concurrent comparison groups, incomplete or inadequately addressed follow-up, small or underpowered samples, baseline imbalance, self-reported outcomes, selection bias, and residual confounding. Importantly, several favorable retention outcomes were reported in single-arm or quasi-experimental evaluations with moderate or high risk of bias, limiting the extent to which observed improvements can be causally attributed to the intervention itself. This contrasts with the more methodologically rigorous randomized evidence, which demonstrated mixed effects on direct retention outcomes. Accordingly, favorable findings from real-world navigation, case-management, peer-support, and multicomponent interventions should be interpreted as promising but not uniformly definitive evidence of efficacy. These findings reinforce the need for adequately powered, multicenter comparative studies using standardized retention measures, rigorous approaches to missing data and attrition, and designs capable of distinguishing the independent contribution of educational components from accompanying navigation, psychosocial, and structural supports.

4.1. Strengths and Limitations

A major strength of this review is the integration of study-level PICO synthesis with a structured evidence-gap analysis. This approach allowed intervention findings to be interpreted alongside population representation, comparator intensity, directness of retention evidence, implementation requirements, and scalability rather than reducing a heterogeneous literature to a simple effective-versus-ineffective classification. Restricting the synthesis to U.S. studies also improves relevance to U.S. HIV service delivery and permits comparison within a more similar policy and healthcare environment.

Several limitations nevertheless constrain inference. Clinical and methodological heterogeneity in intervention composition, comparator conditions, populations, follow-up duration, and retention definitions precluded meaningful meta-analysis. The evidence base included randomized controlled trials alongside observational, quasi-experimental, pilot, and single-arm implementation studies. Only three of the 23 included studies were classified as having a low risk of bias, while 12 had moderate and eight had high risk of bias. Several programs reporting favorable retention outcomes lacked concurrent comparison groups, limiting the ability to distinguish intervention effects from secular trends, selection bias, regression to the mean, and concurrent changes in clinical care. Consequently, high retention proportions observed in uncontrolled programs should be interpreted as promising implementation findings rather than definitive evidence of intervention efficacy. Furthermore, multicomponent interventions prevented attribution of benefit specifically to education, navigation, peer support, or structural assistance. Finally, the restriction to U.S.-based studies limits the international generalizability of the findings.

This review also has limitations related to the review process. The search was restricted to five bibliographic databases and to studies published from 2000 onward, and grey literature and trial registries were not systematically searched. Screening and data extraction were conducted using reviewer verification rather than fully independent duplicate assessment at every stage. Heterogeneity in study design and retention definitions

precluded quantitative pooling, and no formal certainty-of-evidence or synthesis-level publication-bias assessment was performed. Finally, the secondary restriction to U.S.-based studies, although intentional and relevant to the review question, limits applicability to health systems outside the United States.

An additional limitation is that this systematic review was not prospectively registered, and no formal review protocol was published. Although a structured review methodology was followed, the absence of a publicly available prespecified protocol limits transparency regarding methodological decisions and the ability to independently assess potential deviations from the original review plan. Future reviews should incorporate prospective protocol registration to strengthen transparency and reproducibility.

4.2. Future Research and Relevance

The next generation of HIV retention research should prioritize standardized direct retention endpoints, longer follow-up, transparent reporting of fidelity and costs, and deliberate recruitment of populations and settings that remain underrepresented. Studies should also evaluate whether multicomponent programs can be adapted without losing effectiveness when transferred from well-resourced academic or urban settings to community, rural, and safety-net environments. Most importantly, future trials should be designed to answer not only whether an intervention works, but for whom, through which component, at what resource intensity, and for how long. Such evidence would make retention research more actionable for HIV clinics seeking scalable strategies and would help align intervention development with the persistent need to sustain engagement across the HIV care continuum.

5. Conclusions

Across two decades of U.S. evidence, educational and behavioral interventions were more reliable at improving proximal engagement-related outcomes than at independently improving sustained retention in HIV medical care. The most favorable retention signals occurred when education was integrated with navigation, case management, peer or social support, repeated contact, and assistance addressing practical barriers. Education should therefore be viewed not as an isolated retention intervention, but as one component of a patient-centered system capable of responding to the structural and psychosocial conditions that shape continued engagement.

The evidence base is promising but incomplete. Heterogeneous retention definitions, multicomponent intervention designs, uneven population representation, limited implementation and economic reporting, and insufficient long-term sustainability data restrict conclusions about comparative effectiveness and scalability. Addressing these gaps through pragmatic, retention-focused, and equity-conscious implementation research will be essential to identify sustainable models that can improve long-term HIV care engagement across diverse U.S. settings.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/diseases14110425/s1. Supplementary Table S1, Study-Level Quality Assessment (Risk of Bias) Using Design-Specific JBI Critical Appraisal Checklists; Supplementary Table S2, PRISMA 2020 Checklist for Reporting of the Systematic Review; Supplementary Table S3, Studies Excluded During Final Eligibility Assessment and Reasons for Exclusion [41–68].; and Supplementary Document S1 Study-Level Item-Level JBI Critical Appraisal Checklists.

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Data Availability Statement: All data analyzed in this systematic review were derived from previously published studies. Study-level extracted data supporting the review are presented within the article and its Supplementary Materials. The study-level risk-of-bias assessments are provided in Supplementary Table S1 and Document S1. No analytic code was generated because the review used narrative synthesis and did not perform quantitative meta-analysis.

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Appendix A

Table A1. Eligibility Criteria Applied During Final U.S.-Only Study Selection.

Domain	Inclusion Criterion	Exclusion Criterion	Rationale/Operational Clarification
Geographic setting	Study conducted in the United States.	Study conducted outside the United States.	The final review was intentionally restricted to the U.S. healthcare context after an initially broader international search.
Population	Participants are people living with HIV.	Prevention/PrEP-only populations without an HIV care-retention population; studies that do not evaluate PLWH.	The review addresses engagement in HIV treatment/care rather than HIV prevention.
Intervention	Intervention includes education, counseling, motivational interviewing, peer education/support, digital educational support, lay coaching, health coaching, navigation/case-management with an educational/behavioral component, or similar support.	Intervention has no educational, counseling, coaching, peer, behavioral, or related patient-support component.	Maintains alignment with the review's health education/behavioral intervention focus while allowing real-world multicomponent programs.
Outcome	Reports retention in care, LTFU, visit adherence/constancy, missed visits, gaps in care, linkage/re-engagement, or another relevant care-engagement outcome.	Medication adherence only with no care-engagement/retention outcome; no relevant HIV-care engagement outcome.	Direct care-engagement outcomes are the primary scope. Adherence-only studies were excluded at final eligibility when no retention-related outcome was available.
Study type	Primary research study with quantitative or mixed-method data; eligible designs include RCTs, pilot trials, cohort studies, quasi-experimental studies, and other evaluative intervention designs.	Review, editorial, commentary, protocol, or conference abstract without usable primary outcome data.	The synthesis is based on original evaluative evidence.
Publication year	Published in 2000 or later.	Published before 2000.	The team's standardized second-stage exclusion reasons specified 'older than 2000' as ineligible.
Pediatric/adolescent scope	Adolescent/young-adult studies could be included when they fit the combined adult/adolescent HIV care-retention scope.	Pediatric-only studies that did not fit the final adult/adolescent combined scope.	The team's criteria explicitly treated pediatric-only exclusion as conditional rather than an absolute age cutoff.
Duplicate status	Unique eligible report/study retained after duplicate review.	Duplicate record/report.	Prevents double counting of the same evidence across multiple database searches.

Note. Records were labeled Include or Exclude during re-screening. Standardized exclusion reasons recorded were: not U.S.-based; not HIV care retention/LTFU related; not a health education-type intervention; no relevant outcome in regard to retention in care or secondary analysis related to retention in care; protocol/commentary/review only; duplicate; and older than 2000. Medication-adherence-only studies without a care-engagement outcome or secondary outcome were excluded

under the final eligibility framework. Abbreviations: LTFU, loss to follow-up; PLWH, people living with HIV; PrEP, pre-exposure prophylaxis; RCT, randomized controlled trial.

Table A2. Database-Specific Search Strategies, Search Dates, Applied Limits, and Initial Screening Yield.

Database	Date Searched	Platform	Search Strategy as Entered	Records Identified (n)	Excluded (n)	Initially Retained (n)
CINAHL	20 September 2025	EBSCOhost	("HIV") AND ("Health Education") AND ("loss to follow up")	9	6	3
CINAHL	20 September 2025	EBSCOhost	("HIV") AND ("Patient Education") AND ("loss to follow up")	4	3	1
CINAHL	20 September 2025	EBSCOhost	("HIV") AND ("Counseling") AND ("loss to follow up")	21	19	2
CINAHL	20 September 2025	EBSCOhost	("HIV") AND ("Information") AND ("loss to follow up")	52	48	4
PubMed	30 August 2025	PubMed (National Library of Medicine)	("HIV"[MeSH] OR "HIV Infections") AND ("Patient Education as Topic"[MeSH] OR "health education" OR "counseling" OR "instruction" OR "information" OR "intervention") AND ("Follow-Up Studies"[MeSH] OR "Loss to follow-up" OR "missed appointments" OR "retention in care" OR "linkage to care") AND ("Newly diagnosed" OR "recent diagnosis")	135	130	5
PubMed	30 August 2025	PubMed (National Library of Medicine)	("HIV"[MeSH] OR "HIV Infections"[MeSH]) AND ("Education"[MeSH] OR "Education, Public Health Professional"[MeSH] OR "Patient Education as Topic"[MeSH] OR "Health Education"[MeSH]) AND ("Loss to follow up" OR "retention" OR "missed appointments")	219	206	13
PsycINFO	20 September 2025	EBSCOhost	("HIV" OR "human immunodeficiency virus" (MeSH)) AND ("patient education" OR "health education" OR "counseling" OR "instruction" OR "intervention" OR "information" (MeSH)) AND ("follow-up" OR "followup" (MeSH))	155	151	4
PsycINFO	20 September 2025	EBSCOhost	("HIV" OR "human immunodeficiency virus" (MeSH)) AND ("patient education" OR "counseling") AND ("loss to follow up" OR "retention" OR "missed appointments")	110	102	8
Scopus	30 August 2025	Elsevier	("HIV" OR "hiv infections") AND ("Patient Education" OR "health education" OR "patient teaching" OR "health information" OR "counseling") AND ("loss to follow up" OR "missed appointments" OR "retention") AND ("newly diagnosed" OR "recently diagnosed")	44	35	9
Web of Science	29 September 2025	Clarivate Web of Science	("HIV"[MeSH] OR "HIV Infections") AND ("Patient Education as Topic"[MeSH] OR "health education" OR "counseling" OR "instruction" OR "information" OR "intervention") AND ("Follow-Up Studies"[MeSH] OR "Loss to follow-up" OR "missed appointments" OR "retention in care" OR "linkage to care") AND ("Newly diagnosed" OR "recent diagnosis")	145	135	10

Note. All database searches were restricted to studies published from 1 January 2000 through the date of the respective database search. Searches were limited to English-language publications and studies involving human participants. These limits were applied using the available database-specific filters or limit functions. Search syntax and controlled vocabulary were adapted as appropriate for each database and search interface. Record counts reflect the results retrieved after application of these limits. Multiple searches were intentionally conducted within PubMed, PsycINFO, and CINAHL using different combinations of search terms to maximize retrieval of potentially eligible studies. Across all recorded search runs, 894 records were identified, where 695 were excluded at initial abstract and title screening. Of the remaining 199 articles, 140 were excluded at full text screening based on inclusion and exclusion criteria excluding the U.S. based study criteria. The 59

that were retained for analysis included 8 duplicate studies between each of the databases; 28 of the remaining 51 studies were then excluded as non-U.S. based studies which led to 23 individual studies being used in this analysis. Multiple searches were intentionally conducted within PubMed, PsycINFO, and CINAHL using different term combinations. Abbreviations**:** CINAHL, Cumulative Index to Nursing and Allied Health Literature.

References

1. May, M.T.; Gompels, M.; Delpech, V.; Porter, K.; Orkin, C.; Kegg, S.; Hay, P.; Johnson, M.; Palfreeman, A.; Gilson, R.; et al. Impact on life expectancy of HIV-1 positive individuals of CD4+ cell count and viral load response to antiretroviral therapy. *AIDS* **2014**, *28*, 1193–1202. https://doi.org/10.1097/QAD.0000000000000243.
2. National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (U.S.); Division of HIV/AIDS Prevention. Behavioral and Clinical Characteristics of Persons with Diagnosed HIV Infection: Medical Monitoring Project, United States, 2023 Cycle: June 2023–May 2024): Figures. Centers for Disease Control and Prevention (CDC) (U.S.). 2026. Available online: https://stacks.cdc.gov/view/cdc/253408 (accessed on 18 August 2026).
3. National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (U.S.); Division of HIV/AIDS Prevention. Monitoring Selected National HIV Prevention and Care Objectives by Using Surveillance Data—United States and 6 Dependent Areas, 2019. 2021. Available online: https://stacks.cdc.gov/view/cdc/160192 (accessed on 18 August 2026).
4. Mugavero, M.J.; Westfall, A.O.; Cole, S.R.; Geng, E.H.; Crane, H.M.; Kitahata, M.M.; Mathews, W.C.; Napravnik, S.; Eron, J.J.; Moore, R.D.; et al. Beyond core indicators of retention in HIV care: Missed clinic visits are independently associated with all-cause mortality. *Clin. Infect. Dis. An Off. Publ. Infect. Dis. Soc. Am.* **2014**, *59*, 1471–1479. https://doi.org/10.1093/cid/ciu603.
5. Colasanti, J.; Stahl, N.; Farber, E.W.; del Rio, C.; Armstrong, W.S. An Exploratory Study to Assess Individual and Structural Level Barriers Associated with Poor Retention and Re-engagement in Care Among Persons Living With HIV/AIDS. *J. Acquir. Immune Defic. Syndr. (1999)* **2017**, *74*, S113–S120. https://doi.org/10.1097/QAI.0000000000001242.
6. Mgbako, O.; Conard, R.; Mellins, C.A.; Dacus, J.-D.; Remien, R.H. A Systematic Review of Factors Critical for HIV Health Literacy, ART Adherence and Retention in Care in the U.S. for Racial and Ethnic Minorities. *AIDS Behav.* **2022**, *26*, 3480–3493. https://doi.org/10.1007/s10461-022-03680-y.
7. Higa, D.H.; Crepaz, N.; Mullins, M.M.; Adegbite-Johnson, A.; Gunn, J.K.L.; Denard, C.; Mizuno, Y.; The Prevention Research Synthesis Project. Strategies to improve HIV care outcomes for people with HIV who are out of care. *AIDS* **2022**, *36*, 853–862. https://doi.org/10.1097/QAD.0000000000003172.
8. Page, M.J.; McKenzie, J.E.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E.; et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ* **2021**, *372*, n71. https://doi.org/10.1136/bmj.n71.
9. Barker, T.H.; Stone, J.C.; Sears, K.; Klugar, M.; Tufanaru, C.; Leonardi-Bee, J.; Aromataris, E.; Munn, Z. The revised JBI critical appraisal tool for the assessment of risk of bias for randomized controlled trials. *JBI Evid. Synth.* **2023**, *21*, 494–506.
10. Barker, T.H.; Habibi, N.; Aromataris, E.; Stone, J.C.; Leonardi-Bee, J.; Sears, K.; Hasanoff, S.; Klugar, M.; Tufanaru, C.; Moola, S.; et al. The revised JBI critical appraisal tool for the assessment of risk of bias for quasi-experimental studies. *JBI Evid. Synth.* **2024**, *22*, 378–388.
11. Moola, S.; Munn, Z.; Tufanaru, C.; Aromataris, E.; Sears, K.; Sfetcu, R.; Currie, M.; Qureshi, R.; Mattis, P.; Lisy, K.; et al. Chapter 7: Systematic reviews of etiology and risk. In *JBI Manual for Evidence Synthesis*; Aromataris, E., Munn, Z., Eds.; JBI: Adelaide, Australia, 2020.
12. Cook, P.F.; McCabe, M.M.; Emiliozzi, S.; Pointer, L. Telephone Nurse Counseling Improves HIV Medication Adherence: An Effectiveness Study. *J. Assoc. Nurses AIDS Care* **2009**, *20*, 316–325. https://doi.org/10.1016/j.jana.2009.02.008.
13. Milam, J.; Richardson, J.L.; McCutchan, A.; Stoyanoff, S.; Weiss, J.; Kemper, C.; Larsen, R.A.; Hollander, H.; Weismuller, P.; Bolan, R. Effect of a Brief Antiretroviral Adherence Intervention Delivered by HIV Care Providers. *JAIDS J. Acquir. Immune Defic. Syndr.* **2005**, *40*, 356–363. https://doi.org/10.1097/01.qai.0000159710.98960.81.
14. Kuo, I.; Liu, T.; Patrick, R.; Trezza, C.; Bazerman, L.; Uhrig Castonguay, B.J.; Peterson, J.; Kurth, A.; Beckwith, C.G. Use of an mHealth Intervention to Improve Engagement in HIV Community-Based Care Among Persons Recently Released from a Correctional Facility in Washington, DC: A Pilot Study. *AIDS Behav.* **2019**, *23*, 1016–1031. https://doi.org/10.1007/s10461-018-02389-1.

15. Naar-King, S.; Outlaw, A.; Green-Jones, M.; Wright, K.; Parsons, J.T. Motivational Interviewing by Peer Outreach Workers: A Pilot Randomized Clinical Trial to Retain Adolescents and Young Adults in HIV Care. *AIDS Care* **2009**, *21*, 868–873. https://doi.org/10.1080/09540120802612824.
16. Lewis-Chery, S.A.; Heath, C.D.; Zhang, X.; Ayafor, V.; Beaupierre, M.; Rajabiun, S. Black Women Organized for Wellness (B.WOW): A Bundled Approach to Enhance the Health of Black Women With HIV. *Am. J. Public Health* **2025**, *115*, S22–S27. https://doi.org/10.2105/AJPH.2025.308020.
17. Gardner, L.I.; Giordano, T.P.; Marks, G.; Wilson, T.E.; Craw, J.A.; Drainoni, M.-L.; Keruly, J.C.; Rodriguez, A.E.; Malitz, F.; Moore, R.D.; et al. Enhanced Personal Contact with HIV Patients Improves Retention in Primary Care: A Randomized Trial in 6 US HIV Clinics. *Clin. Infect. Dis.* **2014**, *59*, 725–734. https://doi.org/10.1093/cid/ciu357.
18. Konkle-Parker, D.J.; Erlen, J.A.; Dubbert, P.M.; May, W. Pilot testing of an HIV medication adherence intervention in a public clinic in the Deep South. *J. Am. Acad. Nurse Pract.* **2012**, *24*, 488–498. https://doi.org/10.1111/j.1745-7599.2012.00712.x.
19. Melvin, S.C.; Gipson, J. The Open Arms Healthcare Center's Integrated HIV Care Services Model. *Prev. Chronic Dis.* **2019**, *16*, E135.
20. Wohl, A.R.; Garland, W.H.; Wu, J.; Au, C.-W.; Boger, A.; Dierst-Davies, R.; Carter, J.; Carpio, F.; Jordan, W. A youth-focused case management intervention to engage and retain young gay men of color in HIV care. *AIDS Care* **2011**, *23*, 988–997.
21. Zurlo, J.; Du, P.; Haynos, A.; Collins, V.; Eshak, T.; Whitener, C. OPT-In For Life: A Mobile Technology–Based Intervention to Improve HIV Care Continuum for Young Adults Living With HIV. *Health Promot. Pract.* **2020**, *21*, 727–737. https://doi.org/10.1177/1524839920936247.
22. Giordano, T.P.; Cully, J.; Amico, K.R.; Davila, J.A.; Kallen, M.A.; Hartman, C.; Wear, J.; Buscher, A.; Stanley, M. A Randomized Trial to Test a Peer Mentor Intervention to Improve Outcomes in Persons Hospitalized with HIV Infection. *Clin. Infect. Dis.* **2016**, *63*, 678–686. https://doi.org/10.1093/cid/ciw322.
23. Konkle-Parker, D.J.; Amico, K.R.; McKinney, V.E. Effects of an intervention addressing information, motivation, and behavioral skills on HIV care adherence in a southern clinic cohort. *AIDS Care* **2014**, *26*, 674–683. https://doi.org/10.1080/09540121.2013.845283.
24. Bendetson, J.; Dierst-Davies, R.; Flynn, R.; Beymer, M.R.; Wohl, A.R.; Amico, K.R.; Bolan, R.K. Evaluation of a Client-Centered Linkage Intervention for Patients Newly Diagnosed with HIV at an Urban United States LGBT Center: The Linkage to Care Specialist Project. *AIDS Patient Care STDs* **2017**, *31*, 283–289. https://doi.org/10.1089/apc.2017.0057.
25. Moitra, E.; Chan, P.A.; Stein, M.D. Open Trial of an Acceptance-Based Behavior Therapy Intervention to Engage Newly Diagnosed HIV Patients in Care. *Behav. Modif.* **2015**, *39*, 670–690. https://doi.org/10.1177/0145445515590977.
26. Rajabiun, S.; Myers, J.; Goldberg, J.; Fortu, K.; Sullivan, M.; Berthaud, V.; Wahome, R.; Downes, A.; Cabral, H.J. Outcomes from the Adaptation of an Evidence-Based Peer Linkage & Re-Engagement Intervention for Women of Color with HIV in Three Urban Clinics. *AIDS Behav.* **2022**, *26*, 415–424. https://doi.org/10.1007/s10461-021-03395-6. PMID: 34609629.
27. Wohl, A.R.; Dierst-Davies, R.; Victoroff, A.; James, S.; Bendetson, J.; Bailey, J.; Daar, E.; Spencer, L.; Kulkarni, S.; Pérez, M.J. Implementation and Operational Research: The Navigation Program: An Intervention to Reengage Lost Patients at 7 HIV Clinics in Los Angeles County, 2012-2014. *J. Acquir Immune Defic. Syndr.* **2016**, *71*, e44–e50. https://doi.org/10.1097/QAI.0000000000000871. PMID: 26484741.
28. Kalichman, S.C.; Katner, H.; Eaton, L.A.; Hill, M.; Ewing, W.; Kalichman, M.O. Randomized Community Trial Comparing Telephone versus Clinic-Based Behavioral Health Counseling for People Living with HIV in a Rural Setting. *J. Rural Health* **2022**, *38*, 728–739. https://doi.org/10.1111/jrh.12618.
29. Dale, S.K.; Wright, I.A.; Madhu, A.; Reid, R.; Shahid, N.N.; Wright, M.; Sanders, J.; Phillips, A.; Rodriguez, A.; Safren, S.A. A Pilot Randomized Control Trial of the Striving Towards EmPowerment and Medication Adherence (STEP-AD) Intervention for Black Women Living with HIV. *AIDS Behav.* **2024**, *28*, 3483–3497. https://doi.org/10.1007/s10461-024-04408-w.
30. Corado, K.; Jain, S.; Morris, S.; Dube, M.P.; Daar, E.S.; He, F.; Aldous, J.L.; Sitapati, A.; Haubrich, R.; Milam, J.; et al. Randomized Trial of a Health Coaching Intervention to Enhance Retention in Care: California Collaborative Treatment Group 594. *AIDS Behav.* **2018**, *22*, 2698–2710. https://doi.org/10.1007/s10461-018-2132-3.
31. Roth, A.M.; Holmes, A.M.; Stump, T.E.; Aalsma, M.C.; Ackermann, R.T.; Carney, T.S.; Katz, B.P.; Kesterson, J.; Erdman, S.M.; Balt, C.A.; et al. Can lay health workers promote better medical self-management by persons living with HIV? An evaluation of the Positive Choices program. *Patient Educ. Couns.* **2012**, *89*, 184–190. https://doi.org/10.1016/j.pec.2012.06.010.
32. Kurth, A.E.; Spielberg, F.; Cleland, C.M.; Lambdin, B.; Bangsberg, D.R.; Frick, P.A.; Severynen, A.O.; Clausen, M.; Norman, R.G.; Lockhart, D.; et al. Computerized Counseling Reduces HIV-1 Viral Load and Sexual Transmission Risk. *JAIDS J. Acquir. Immune Defic. Syndr.* **2014**, *65*, 611–620. https://doi.org/10.1097/QAI.0000000000000100.

33. Parsons, J.T.; Rosof, E.; Punzalan, J.C.; Maria, L.D. Integration of Motivational Interviewing and Cognitive Behavioral Therapy to Improve HIV Medication Adherence and Reduce Substance Use Among HIV-Positive Men and Women: Results of a Pilot Project. *AIDS Patient Care STDs* **2005**, *19*, 31–39. https://doi.org/10.1089/apc.2005.19.31.
34. Neumann, M.S.; Plant, A.; Margolis, A.D.; Borkowf, C.B.; Malotte, C.K.; Rietmeijer, C.A.; Flores, S.A.; O'Donnell, L.; Robilotto, S.; Myint-U, A.; et al. Effects of a brief video intervention on treatment initiation and adherence among patients attending human immunodeficiency virus treatment clinics. *PLoS ONE* **2018**, *13*, e0204599. https://doi.org/10.1371/journal.pone.0204599.
35. Higa, D.H.; Marks, G.; Crepaz, N.; Liau, A.; Lyles, C.M. Interventions to Improve Retention in HIV Primary Care: A Systematic Review of U.S. Studies. *Curr. HIV/AIDS Rep.* **2012**, *9*, 313–325. https://doi.org/10.1007/s11904-012-0136-6.
36. Berg, R.C.; Page, S.; Øgård-Repål, A. The effectiveness of peer-support for people living with HIV: A systematic review and meta-analysis. *PLoS ONE* **2021**, *16*, e0252623. https://doi.org/10.1371/journal.pone.0252623.
37. Zheng, A.; Kileel, E.M.; Brennan, A.T.; Flynn, D.B.; Rosen, S.; Fox, M.P. Systematic review and meta-analysis of retention and disengagement after initiation on antiretroviral therapy in low- and middle-income countries after the introduction of Universal Test and Treat policies. *J. Int. AIDS Soc.* **2025**, *28*, e70026. https://doi.org/10.1002/jia2.70026.
38. Yehia, B.R.; Stewart, L.; Momplaisir, F.; Mody, A.; Holtzman, C.W.; Jacobs, L.M.; Hines, J.; Mounzer, K.; Glanz, K.; Metlay, J.P.; et al. Barriers and facilitators to patient retention in HIV care. *BMC Infect. Dis.* **2015**, *15*, 246. https://doi.org/10.1186/s12879-015-0990-0.
39. Wheatley, M.M.; White, K.M.; Peterson, A.D.; Hanft, J.; Rowles, D.; Blissett, T.; Enns, E.A. Barriers, opportunities, and potential costs of expanding HIV support services. *AIDS Care* **2023**, *35*, 1083–1090. https://doi.org/10.1080/09540121.2023.2179593.
40. Mugavero, M.J.; Westfall, A.O.; Zinski, A.; Davila, J.; Drainoni, M.-L.; Gardner, L.I.; Keruly, J.C.; Malitz, F.; Marks, G.; Metsch, L.; et al. Measuring Retention in HIV Care. *JAIDS J. Acquir. Immune Defic. Syndr.* **2012**, *61*, 574–580. https://doi.org/10.1097/QAI.0b013e318273762f.
41. Siril, H.N.; Kaaya, S.F.; Smith Fawzi, M.K.; Mtisi, E.; Somba, M.; Kilewo, J.; Mugusi, F.; Minja, A.; Kaale, A.; Todd, J. Clinical outcomes and loss to follow-up among people living with HIV participating in the NAMWEZA intervention in Dar es Salaam, Tanzania: A prospective cohort study. *AIDS Res. Ther.* **2017**, *14*, 18. https://doi.org/10.1186/s12981-017-0145-z.
42. Kweyamba, M.; Buregyeya, E.; Kusiima, J.; Kweyamba, V.; Mukose, A.D. Loss to Follow-Up among HIV Positive Pregnant and Lactating Mothers on Lifelong Antiretroviral Therapy for PMTCT in Rural Uganda. *Adv. Public Health* **2018**, *2018*, 7540587. https://doi.org/10.1155/2018/7540587.
43. Lifson, A.R.; Workneh, S.; Hailemichael, A.; Demisse, W.; Slater, L.; Shenie, T. Implementation of a Peer HIV Community Support Worker Program in Rural Ethiopia to Promote Retention in Care. *J. Int. Assoc. Provid AIDS Care* **2017**, *16*, 75–80. https://doi.org/10.1177/2325957415614648.
44. Panditrao, M.; Darak, S.; Kulkarni, V.; Kulkarni, S.; Parchure, R. Socio-demographic factors associated with loss to follow-up of HIV-infected women attending a private sector PMTCT program in Maharashtra, India. *AIDS Care* **2011**, *23*, 593–600. https://doi.org/10.1080/09540121.2010.516348.
45. Reece, R.; Norman, B.; Kwara, A.; Flanigan, T.; Rana, A. Retention in Care of HIV-Positive Postpartum Females in Kumasi, Ghana. *J. Int. Assoc. Provid AIDS Care* **2016**, *15*, 406–411. https://doi.org/10.1177/2325957415603507.
46. Yé, M.; Kagoné, M.; Sié, A.; Bagagnan, C.; Sanou, H.; Millogo, O.; Duclos, V.; Tinto, I.; Bibeau, G. Promoting access equity and improving health care for women, children and people living with HIV/AIDS in Burkina Faso through mHealth. *J. Public Health* **2018**, *40*, ii42–ii51. https://doi.org/10.1093/pubmed/fdy196.
47. Dulli, L.; Ridgeway, K.; Packer, C.; Murray, K.R.; Mumuni, T.; Plourde, K.F.; Chen, M.; Olumide, A.; Ojengbede, O.; McCarraher, D.R. A Social Media-Based Support Group for Youth Living With HIV in Nigeria (SMART Connections): Randomized Controlled Trial. *J. Med. Internet Res.* **2020**, *22*, e18343. https://doi.org/10.2196/18343.
48. Odeny, T.A.; Bukusi, E.A.; Cohen, C.R.; Yuhas, K.; Camlin, C.S.; McClelland, R.S. Texting improves testing: A randomized trial of two-way SMS to increase postpartum prevention of mother-to-child transmission retention and infant HIV testing. *AIDS* **2014**, *28*, 2307–2312. https://doi.org/10.1097/QAD.0000000000000409.
49. Schechter, J.; Bakor, A.B.; Kone, A.; Robinson, J.; Lue, K.; Senturia, K. Exploring loss to follow-up among women living with HIV in Prevention of Mother to Child Transmission programmes in Côte d'Ivoire. *Glob. Public Health* **2014**, *9*, 1139–1151. https://doi.org/10.1080/17441692.2014.970659.
50. Mutale, W.; Graybill, L.A.; Saidi, F.; Phanga, T.; Amico, K.R.; Freeborn, K.; Rosenberg, N.E.; Hill, L.M.; Hamoonga, T.; Richardson, B.D.; et al. Evaluation of a combination adherence strategy to support HIV antiretroviral therapy for pregnancy and breastfeeding in Malawi: A pilot randomized clinical trial. *PLoS ONE* **2025**, *20*, e0319735. https://doi.org/10.1371/journal.pone.0319735.

51. Dai, L.; Yu, X.; Shao, Y.; Wang, Y.; Li, Z.; Ye, J.; Bai, S.; Guo, X.; Wang, J.; Su, B.; et al. Effect of a multi-dimensional case management model on antiretroviral therapy-related outcomes among people living with HIV in Beijing, China. *BMC Infect. Dis.* **2020**, *20*, 1–9. https://doi.org/10.1186/s12879-020-05219-9.
52. Venter, W.D.F.; Fischer, A.; Lalla-Edward, S.T.; Coleman, J.; Chan, V.L.; Shubber, Z.; Phatsoane, M.; Gorgens, M.; Stewart-Isherwood, L.; Carmona, S.; et al. Improving Linkage to and Retention in Care in Newly Diagnosed HIV-Positive Patients Using Smartphones in South Africa: Randomized Controlled Trial. *JMIR Mhealth Uhealth* **2019**, *7*, e12652. https://doi.org/10.2196/12652.
53. Fayorsey, R.N.; Wang, C.; Chege, D.; Reidy, W.; Syengo, M.; Owino, S.O.; Koech, E.; Sirengo, M.; Hawken, M.P.; Abrams, E.J. Study evaluated an HIV-care intervention in Kenya. *J. Acquir Immune Defic. Syndr.* **2019**, *80*, 56–63. https://doi.org/10.1097/QAI.0000000000001882.
54. Lamb, M.R.; El-Sadr, W.M.; Geng, E.; Nash, D. Study of HIV clinics in sub-Saharan Africa. *PLoS ONE* **2012**, *7*, e38443. https://doi.org/10.1371/journal.pone.0038443.
55. Steward, W.T.; Agnew, E.; de Kadt, J.; Ratlhagana, M.J.; Sumitani, J.; Gilmore, H.J.; Grignon, J.; Shade, S.B.; Tumbo, J.; Barnhart, S.; et al. Impact of SMS and peer navigation on retention in HIV care among adults in South Africa: Results of a three-arm cluster randomized controlled trial. *J. Int. AIDS Soc.* **2021**, *24*, e25774. https://doi.org/10.1002/jia2.25774.
56. Hlongwa, M.; Cornell, M.; Malone, S.; Pitsillides, P.; Little, K.; Hasen, N. Uptake and Short-Term Retention in HIV Treatment Among Men in South Africa: The Coach Mpilo Pilot Project. *Glob. Health Sci. Pract.* **2022**, *10*, e2100498. https://doi.org/10.9745/GHSP-D-21-00498.
57. Elul, B.; Lamb, M.R.; Lahuerta, M.; Abacassamo, F.; Ahoua, L.; Kujawski, S.A.; Tomo, M.; Jani, I. A combination intervention strategy to improve linkage to and retention in HIV care following diagnosis in Mozambique: A cluster-randomized study. *PLoS Med.* **2017**, *14*, e1002433. https://doi.org/10.1371/journal.pmed.1002433.
58. Ruria, E.C.; Masaba, R.; Kose, J.; Woelk, G.; Mwangi, E.; Matu, L.; Ng'eNo, H.; Bikeri, B.; Rakhmanina, N. Optimizing linkage to care and initiation and retention on treatment of adolescents with newly diagnosed HIV infection. *AIDS* **2017**, *31*, S253–S260. https://doi.org/10.1097/QAD.0000000000001538.
59. Clouse, K.; Hanrahan, C.F.; Bassett, J.; Fox, M.P.; Sanne, I.; Van Rie, A. Impact of systematic HIV testing on case finding and retention in care at a primary care clinic in South Africa. *Trop. Med. Int. Health* **2014**, *19*, 1411–1419. https://doi.org/10.1111/tmi.12387.
60. Knight, L.C.; Van Rooyen, H.; Humphries, H.; Barnabas, R.V.; Celum, C. Empowering patients to link to care and treatment: Qualitative findings about the role of a home-based HIV counselling, testing and linkage intervention in South Africa. *AIDS Care* **2015**, *27*, 1162–1167. https://doi.org/10.1080/09540121.2015.1035633.
61. Fabian, K.E.; Muanido, A.I.; Cumbe, V.F.J.M.; Mukunta, C.; Manaca, N.; Dorsey, S.; Hammett, W.H.; Wagenaar, B.H. Integrating a Transdiagnostic Psychological Intervention Into Routine HIV Care: A Mixed-Methods Evaluation of the Common Elements Treatment Approach in Mozambique. *JAIDS J. Acquir. Immune Defic. Syndr.* **2022**, *89*, 274–281. https://doi.org/10.1097/QAI.0000000000002863.
62. Brownrigg, B.; Taylor, D.; Phan, F.; Sandstra, I.; Stimpson, R.; Barrios, R.; Lester, R.; Ogilvie, G. Improving linkage to HIV care at low-threshold STI/HIV testing sites: An evaluation of the Immediate Staging Pilot Project in Vancouver, British Columbia. *Can. J. Public Health* **2017**, *108*, e79–e84. https://doi.org/10.17269/cjph.108.5753.
63. de Bruin, M.; Hospers, H.J.; van Breukelen, G.J.P.; Kok, G.; Koevoets, W.M.; Prins, J.M. Electronic monitoring-based counseling to enhance adherence among HIV-infected patients: A randomized controlled trial. *Health Psychol.* **2010**, *29*, 421–428. https://doi.org/10.1037/a0020335.
64. Lubega, M.; Tumwesigye, N.M.; Kadobera, D.; Marrone, G.; Wabwire-Mangen, F.; Peterson, S.; Reynolds, S.J.; Ekström, A.M. Effect of community support agents on retention of people living with HIV in pre-antiretroviral care: A randomized controlled trial in eastern Uganda. *JAIDS* **2015**, *70*, e36–e43. https://doi.org/10.1097/QAI.0000000000000723.
65. Graham, S.M.; Micheni, M.; Chirro, O.; Nzioka, J.; Secor, A.M.; Mugo, P.M.; Kombo, B.; van der Elst, E.M.; Operario, D.; Amico, K.R.; et al. A randomized controlled trial of the Shikamana intervention to promote antiretroviral therapy adherence among gay, bisexual, and other men who have sex with men in Kenya. *AIDS Behav.* **2020**, *24*, 2206–2219. https://doi.org/10.1007/s10461-020-02786-5.
66. Kalichman, S.C.; Mathews, C.; Banas, E.; Kalichman, M.O. Stigma management intervention to improve antiretroviral therapy adherence: Phase-I test of concept trial, Cape Town South Africa. *Glob. Public Health* **2019**, *14*, 1059–1074. https://doi.org/10.1080/17441692.2018.1552307.

67. Sarna, A.; Saraswati, L.R.; Okal, J.; Matheka, J.; Owuor, D.; Singh, R.J.; Reynolds, N.; Kalibala, S. Cell Phone Counseling Improves Retention of Mothers with HIV Infection in Care and Infant HIV Testing in Kisumu, Kenya: A Randomized Controlled Study. *Glob. Health Sci. Pract.* **2019**, *7*, 171–188. https://doi.org/10.9745/GHSP-D-18-00241.
68. Hickey, M.D.; Ouma, G.B.; Mattah, B.; Pederson, B.; DesLauriers, N.R.; Mohamed, P.; Obanda, J.; Odhiambo, A.; Njoroge, B.; Otieno, L.; et al. The Kanyakla study: Randomized controlled trial of a microclinic social network intervention for promoting engagement and retention in HIV care in rural western Kenya. *PLoS ONE* **2021**, *16*, e0255945. https://doi.org/10.1371/journal.pone.0255945.

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