

RECRUITMENT METHODS AND RETENTION IN RESEARCH STUDIES OF HARD-TO-REACH COMMUNITIES MARGINALISED DUE TO DISCRIMINATION, AND SOCIAL STIGMATIZATION: A SYSTEMATIC REVIEW

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ABSTRACT

OBJECTIVES

Recruiting hard-to-reach and marginalized populations into health-related research studies can be challenging. This systematic review aimed to synthesize evidence on the identification and effectiveness of different recruitment and retention methods for marginalized communities.

METHODOLOGY

Seven databases (PubMed, MEDLINE, EMBASE, Web of Science, Scopus, PsycINFO, and Proquest (Including Google Scholar for grey literature)) were searched from January 1950 to June 2022 for studies recruiting marginalized groups and detailing recruitment and retention methods. Study details, population, recruitment and retention methods, outcomes, and limitations were extracted. The frequency of recruitment and retention methods was tallied, and narrative synthesis was conducted.

RESULTS

Of the 101 studies included, thirty-one studies met the inclusion criteria, covering populations including lesbian, gay, bisexual, and transgender (LGBT), racial and ethnic minorities, immigrants, and low socioeconomic groups. The most common recruitment methods were respondent-driven sampling (n=9), social media/online advertising (n=8), snowball sampling (n=7), and community outreach (n=6). Recruitment rates ranged from 2% to 91%, where reported.

CONCLUSION

Engaging minority communities involved direct community outreach methods such as presentations, health fairs, and in-person contact. Common retention strategies included financial incentives, culturally competent staff, and active engagement, yet no single method consistently proved most effective. Utilising a combination of tailored sampling approaches can mitigate the limitations inherent in individual methods. Enhanced reporting on recruitment and retention rates is essential for future studies.

KEYWORDS: Hard-to-Reach, Gender Minorities, Ethnic Minorities, Discrimination, Social Stigmatization, Recruitment, Retention

INTRODUCTION

Gender and sexual minorities, including lesbian, gay, bisexual, transgender, and intersex (LGBTI) individuals, comprise an estimated 10% of the global population: 3% identify as gay, lesbian, or homosexual; 4% as bisexual; 1% as pansexual or omniseual; 1% as asexual; and 1% as "other."¹ Global estimates also suggest that 10 to 20 percent of the world's population belongs to ethnic minorities.² These groups face distinct health disparities and barriers to healthcare access as a result of the collective impact of Discrimination, structural inequities, and stigma.³ According to a 2017 World Bank survey, one in every three LGBTI people in five Western Balkan countries and two European

Union member states has experienced physical and/or sexual violence or been threatened with violence in the last five years.⁴ Furthermore, the global prevalence of suicidal thoughts in the transgender population is 50% over their lifetime, with a 29% prevalence of suicide attempts.⁵ Men who have sex with men (MSM) are also disproportionately affected, with a 26-fold higher prevalence of HIV and other health disparities than the general population.⁶ In the United States, racial and ethnic minorities, such as Black populations, experience an overall mortality rate that is 24% higher than that of White populations, with non-Hispanic Black mortality approximately 40% higher at age 65 compared to non-Hispanic Whites.^{7,8} Discriminatory laws and socio-cultural norms further marginalise gender, sexual, and

ethnic minorities, limiting their access to healthcare, schooling, employment, housing, and other domains, resulting in violence, Discrimination, and socioeconomic disadvantage.^{9,10} These disparities extend beyond high-income countries to low- and middle-income countries (LMICs), where marginalised groups such as women, girls, transgender individuals, and ethnic minorities experience limited access to healthcare and social services.^{11,12,13,14} The adoption of the Sustainable Development Goals (SDGs) by 193 United Nations member countries in 2015 emphasised the goal of fighting poverty and inequality while also promoting inclusive development, "leaving no one behind".¹⁵ Despite these goals, gender, sexual, and ethnic minorities have had limited access to data or research about their lives to inform policies, legislation, programmes, and investments aimed at advancing their inclusion and respect for their rights.^{16,17} Only 5% of the limited global funding for LGBTI issues is currently allocated to research, which is insufficient to meet the growing knowledge needs.¹⁶ The demand for such knowledge outweighs the current supply, particularly in the Global South, where data is critical for LGBTI individuals' human rights and development. Research has shown that understanding and addressing the health and social disparities faced by marginalised groups requires comprehensive and inclusive research practices.^{16,17,18} Throughout history, experiences with Discrimination and stigma have created severe mistrust and scepticism among gender and sexual minorities in research participation. For instance, from 1923 to 1981, the state of Oregon sterilised people who were accused of committing "crimes against nature" (a euphemism for same-sex sexual activity) without their consent.¹⁹ Furthermore, until 1973, the American Psychiatric Association's Diagnostic and Statistical Manual (DSM) pathologized homosexuality, thus exacerbating the stigma faced by these individuals.¹⁹ Unethical practices like these, combined with those faced by ethnic minorities, such as the exploitation of Black men in the USPHS Tuskegee Untreated Syphilis study, where participants were misled about receiving treatment for "bad blood" without their informed consent.²⁰ To ensure that marginalised populations contribute meaningfully to health research, effective recruitment and retention strategies must be thoroughly understood. These strategies must address both the general challenges of research participation, such as time constraints and logistical barriers, and the specific barriers faced by marginalised communities. The diversity of marginalised groups, including race, ethnicity, sexual orientation, gender identity, immigration status, and socioeconomic status, requires tailored approaches that account for each community's unique needs and preferences.^{21,22} Despite the

importance of including marginalised populations in research, there are few reviews on the effectiveness of recruitment and retention strategies across diverse marginalised groups, and these reviews are often focused on specific populations or interventions, thus limiting the generalisability of their findings.^{23,24,25,26,27} Furthermore, inconsistency in reporting outcomes across studies has restricted efforts to compare strategies effectively. This systematic review aims to address these gaps by synthesising existing evidence on recruitment and retention methods to identify adaptable strategies for diverse settings, thereby supporting the achievement of SDG 3 targets on health and equity, particularly in combating communicable diseases, and contributing to SDG 10 by reducing global inequalities.^{28,29} By examining findings from various populations and contexts, the review seeks to guide the development of more effective and inclusive practices, thereby improving the quality and equity of health research.

METHODOLOGY

This systematic review synthesised evidence on recruitment and retention methods for marginalised groups who are often underrepresented in research due to social stigmatisation or Discrimination. The review questions were: What recruitment methods have been used for hard-to-reach marginalised communities? Which methods have higher recruitment and retention rates? This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.³⁰ The protocol was registered with PROSPERO (CRD42022356754). A comprehensive literature search was conducted across seven databases: PubMed, MEDLINE, EMBASE, Web of Science, Scopus, PsycINFO, and ProQuest for grey literature. The search covered publications from the date of inception to June 2022. We used a combination of keywords and MeSH terms, focusing on the recruitment and retention methodology for marginalised, hard-to-reach populations (Supplementary file). A manual reference search of included studies was also conducted. Studies were included based on the following criteria: they focused on recruiting marginalised populations (e.g., racial/ethnic minorities, sexual and gender minorities, immigrants, low socioeconomic status groups), provided detailed descriptions of recruitment and retention methods, were published in English, and were peer-reviewed articles and grey literature. Studies that did not specify recruitment or retention strategies, were unrelated to health research, or focused solely on clinical interventions without addressing recruitment or retention were excluded. Records were screened by title/abstract and full-text review. A standardised form

in Microsoft Office Excel was created by extracting information about the study's specifics, population, recruitment and retention strategies, sample size, results, and restrictions. The online systematic review tool Rayyan (<https://www.rayyan.ai/>) was used to manage and screen all the papers effectively. SA, SU, and FK were responsible for adding or updating paper records in Rayyan, identifying and removing duplicates, and resolving issues with study selection. RZ, SAJ, FK, and SS independently assessed titles and abstracts and conducted full-text screening. BA rechecked the full-text screening and resolved conflicts, and then two independent authors, ZeK, FA, SAJ, and Z, extracted all papers in Microsoft Office Excel. As this review focuses on retention and recruitment methods rather than evaluating interventions, the quality of individual studies was not assessed. Descriptive statistics were performed using Stata 18 in order to summarise the characteristics of the included studies and the frequency of different recruitment and retention methods. Due to heterogeneity in study designs and reported outcomes, a qualitative synthesis was prioritised over a meta-analysis to capture the diverse strategies effectively.

Table 1: Descriptive Statistics of the Included Studies (n=31)

Variable	n(%)
Country	
USA	18(58.0%)
UK	02(6.5%)
Nigeria	01(3.2%)
Canada	01(3.2%)
Botswana	01(3.2%)
Mexico	01(3.2%)
Netherlands	03(9.7%)
Thailand	01(3.2%)
Cambodia	01(3.2%)
Swaziland	01(3.2%)
Australia	01(3.2%)
Study Design	
Quantitative	25(80.6%)
Qualitative	05(16.7%)
Not Clear	01(2.7%)
Study Type	
Observational	19(61.3%)
Exploratory	01(3.2%)
Interventional	03(9.7%)
Cross-sectional survey	03(9.7%)
Community-based participatory research (CBPR)	01(3.2%)
Randomised Controlled Trial	02(6.5%)
Not reported	02(6.4%)
Study Population	
LGBT	19(61.3%)
Ethnic Minorities	09(29.0%)
Religious Minorities	02(6.5%)
Not reported	01(3.2%)

* Only for those papers that reported

RESULTS

The search yielded 101 records, of which 31 studies met the inclusion criteria.

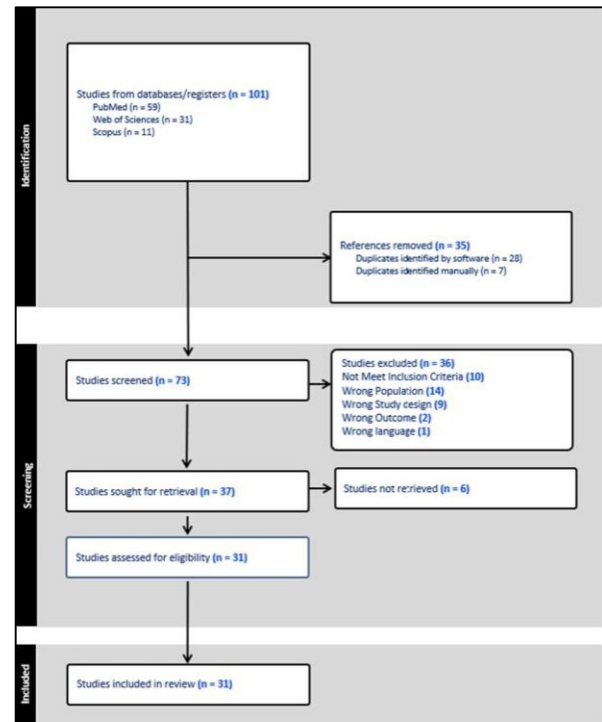


Figure 1: PRISMA Flow Diagram

The included studies were published between 2000 and 2022 and conducted mainly in the USA (n=18), with others from Australia, Canada, Mexico, Thailand, Nigeria, and European countries. Study designs included cross-sectional surveys (n=3), interventions (n=3), qualitative research (n=5), observational (n=18), and randomised controlled trials (n=2). Studies focused on LGBT populations (n=16), racial/ethnic minorities (n=15), immigrants/non-native language speakers (n=6), low socioeconomic status groups (n=3), and other hard-to-reach groups like homeless youth and sex workers (n=9). Some studies included multiple marginalised populations. (Supplementary file Table A) The systematic review included 31 studies with a total of 31,246 participants. The majority of participants were trans male individuals, representing 71.2% of the sample (n=22,250). Trans female participants constituted only 10.2% of the sample (n=3,188). This significant imbalance suggests that research has focused more on trans-male than on trans-female populations. Most studies were conducted in North America and Europe, with over half from the USA (54.8%, n=17) and a few from Asia, Africa, South America, or Australia. Study designs were predominantly quantitative (80.6%, n=25), with minimal qualitative

research (16.7%, n=5). Observational studies were most common (61.3%, n=19), followed by cross-sectional surveys (9.7%, n=3) and randomised controlled trials (6.5%, n=2). Interventional and community-based

participatory research was rare. Study populations centred on LGBT groups (61.3%, n=19), with less emphasis on ethnic minorities (29.0%, n=9) and religious minorities (6.5%, n=2).

Table 2: Qualitative Synthesis

Outcomes	Theme	Sub Theme
Main Outcomes		
Marginalised Groups	Racial/ethnic minorities (African Americans, Hispanics/Latinos, Asians)	African Americans had lower retention in depression treatment (MenTra 11) ³¹ Compared participation of Mexican Americans and non-Hispanic Whites (MenTra 14) ³² Hard-to-reach minority parents (MenTra 37) ³³
	Sexual and gender minorities (gay/bisexual men, transgender individuals)	Young transgender women (MenTra 1) ³⁴ Mostly MSM, a small number of transgender women (MenTra 33) ³⁵ Focused on gay, bisexual, and other MSM (MenTra 36) ³⁶
	Immigrants/non-English speakers	Spanish-speaking immigrants (MenTra 45) ³⁷
	Sex workers	Female sex workers and their partners (MenTra 39) ³⁸
Recruitment Pathways	Direct community outreach (presentations, health fairs, in-person contact)	Community outreach for recruitment (MenTra 15) ⁴⁰ In-person outreach at relevant venues (MenTra 9) ³⁹ Presentations and partner referrals (MenTra 32) ⁴² Outreach through health fairs (MenTra 20) ⁴¹
	Referrals through community organisations and internal social networks	Snowball sampling through social networks (MenTra 29) ⁴³ Focused on Indirect recruitment via radio, Internet (MenTra 15) ⁴⁰ Referral by community agencies and participants (MenTra 38) ⁴⁴
	Advertising (print, radio, online, social media)	Print ads, online/social media (MenTra 9) ³⁹ Web and Facebook ads (MenTra 45) ³⁷ Radio advertising (MenTra 15) ⁴⁰
	Respondent-driven sampling (RDS)	The use of RDS and direct recruitment (MenTra 1, 2, 21) ^{34,45,46}
	Venue-based sampling	The use of venue-based sampling (MenTra 33) ³⁵
	Snowball sampling	Use of snowball sampling (MenTra 3, 37) ^{33,47}
	Household/location probability sampling	Use of census-based area probability sampling (MenTra 14) ³²
	Leveraging social media influencers Culturally adapted models ("home party" intervention)	Proposed use of influencers for recruitment (MenTra 47) ⁵³
	Culturally adapted models ("home party" intervention)	Tested a "home party" intervention (MenTra 37) ³³
Number Recruited	Ranged from 15 to 13,752 across studies	Ranged from 15 to 13,752 across studies (MenTra 20 and MenTra 48) ^{41,49}
	Hidden populations tended to have <100 due to difficulty accessing	Hidden populations tended to have <100 due to difficulty accessing (MenTra 3, MenTra 29, MenTra 41) ^{43,47,48}
Retention Methods	Financial incentives/compensation	Provided referral fees and compensation for completing surveys and returning for results (MenTra 39) ³⁸
	Culturally competent providers and staff	Having staff diversity, friends, and cultural expertise aided retention (MenTra 17) ⁵⁰
Additional outcome		
Costs and Remuneration	Some monetary incentives are provided in hard-to-reach community studies	Provided financial compensation and referral fees (MenTra 39) ³⁸

Marginalised Groups

A predominant theme was the focus on diverse marginalised groups, including racial/ethnic minorities, sexual and gender minorities, immigrants/non-English speakers, and sex workers. As examples, several studies specifically focused on racial/ethnic groups such as African Americans, Hispanics/Latinos, and Asians.^{31,32,33} Others targeted sexual and gender minorities like gay/bisexual men, transgender women, and non-heterosexual women.^{34,35,36} One study recruited Spanish-speaking immigrants, while another engaged female sex workers and their partners.^{37,38}

Recruitment Pathways

In terms of recruitment pathways, a complex array of approaches emerged across the studies involving direct community outreach, referrals, advertising, respondent-driven sampling, and other innovative methods. Direct community outreach through presentations, health fairs, and in-person contact was commonly used to engage minority communities.^{39,40,41,42} Referrals via trusted community organisations and internal social networks, such as snowball sampling, helped overcome distrust and anonymity barriers.^{40,43,44} Diverse advertising across print, radio, online, and social media provided a

broad reach.^{37,39,40} Respondent-driven sampling accessed hidden networks.^{34,45,46} Other approaches, like venue-based sampling, snowball sampling, and culturally adapted models like the "home party", were less frequent but provided unique advantages.^{33,35,47}

Recruitment Methods

The most commonly used recruitment methods were respondent-driven sampling (n=9), social media/online advertising (n=8), snowball sampling (n=7), community outreach (n=6), and advertising via posters, radio, etc. (n=5). Others included direct mail, influencers, health registries, and door-to-door recruitment. Many studies used a combination of approaches (n=19).

Number Recruited

Sample sizes varied extensively from 15 to over 13,000 participants. However, hard-to-reach groups posed recruitment challenges, yielding samples of fewer than 100.^{41,43,48,49}

Retention Methods

For retaining marginalised groups, studies highlighted financial incentives, culturally appropriate staff, and active engagement.^{38,50}

Costs and Remuneration

Minimal data was provided on study costs and compensation. Where reported, monetary incentives aided recruitment in difficult-to-access communities.³⁸

Outcomes

Unfortunately, the studies did not consistently report details on retention methods, recruitment and retention rates, recruitment costs, or remuneration. Recruitment rates when reported ranged from 02-91%, with social media (18-91%) and influencers having higher rates than traditional print advertisements (02-03%). However, rates were infrequently and inconsistently reported across studies. No single recruitment method emerged as clearly superior. Respondent-driven sampling reached more hidden groups like minority MSM over time, but had limitations like the exclusion of specific subgroups.^{34,51} Social media enabled a broad reach at a lower cost but had biases around digital access and literacy. Venue-based sampling reached different MSM subgroups more than RDS.³⁵ Snowball sampling provided unique access but was prone to selection bias based on existing social networks.⁴⁷ Thus, combining methods helped overcome the limitations of individual approaches.⁵² Using community insiders and influencers showed promise for tailored outreach.⁵³ Overall, recruitment techniques must be tailored to the target population and research aims. In summary, a combination of multifaceted, culturally adapted recruitment methods is commonly required to engage diverse marginalised and hidden populations.

Risk of Bias

As this review focuses on retention and recruitment methods rather than evaluating interventions, individual study quality was not assessed.

DISCUSSION

This review synthesised evidence on the effectiveness of different recruitment methods for marginalised groups. Using multiple complementary recruitment strategies emerged as a practical approach, balancing the strengths and limitations of each method. However, there was heterogeneity in techniques across studies and inconsistent reporting of recruitment rates. More rigorous reporting of recruitment methodology and outcomes is needed. Limitations of this review include its narrative format and the inclusion of only English-language studies. Future research should explore optimal combinations of recruitment methods for reaching vulnerable hidden populations.

Recruitment Strategies and Their Effectiveness

Traditional Strategies Have Limitations in Recruiting Minorities

Several studies have demonstrated that conventional recruitment approaches, such as flyers, print advertising, and mass mailings, have significant limitations in engaging minority populations. For instance, a randomised trial in the US found that direct mailings including flyers and personalised letters yielded only a 02-10% response rate among Hispanic employees.⁵⁴ Similarly, a multi-method campaign predominantly utilising flyers and presentations reached only 21% of eligible low-income African American and Latina women, and the final sample significantly overrepresented higher-educated and older participants.⁵⁵ Compared with active community outreach and peer referral, online advertising resulted in lower attendance rates in a multipronged campaign targeting high-risk minority MSM.⁵⁶ While more straightforward to implement, conventional promotional strategies appear limited in optimising reach and representativeness when engaging stigmatised or hard-to-reach groups.

Interpersonal Referral Networks Effectively Recruit Minorities

In contrast to broad-reach mass advertising, networks of interpersonal referrals facilitated by community members emerged as an optimal strategy for minority recruitment. Active referral was substantially more effective than passive methods for enrolling African Americans and Latinos in a US community-based research study, generating 79% of contacts.⁴⁴ The personal nature and word-of-mouth promotion through trusted community partners helped overcome distrust of

research. Similarly, an HIV prevention study successfully recruited hard-to-reach minority MSM primarily through friend referrals, which also yielded higher retention than online advertising.⁵⁶ Among hidden populations like transgender individuals and substance users, snowball sampling through participants' social networks was indispensable for accessing sufficient samples.⁴⁷

Targeted Community Outreach and Partnerships Facilitate Minority Recruitment

Active outreach tailored to minority communities also emerged as an effective strategy across studies, particularly when partnering with community organisations. In-person outreach at relevant venues enabled representative recruitment of minority MSM for an HIV prevalence study, while a household sampling method under-recruited non-Hispanic whites.⁵⁷ Community-led health fairs and outreach by trusted organisations generated high interest and enrollment among African Americans and Latinos for a community-based research study.⁴⁴

Social Media Enables Access to Hidden Populations

The interactive nature of social media facilitated engaging hard-to-reach minorities like transgender individuals and immigrant groups. Facebook enabled accessing geographically dispersed samples of hidden transgender populations with greater diversity than conventional methods, though participants still tended to be younger.⁵⁸ By comparison, Facebook generated high interest, but traditional promotional methods yielded extremely low results when recruiting Turkish immigrants for a Dutch trial.⁵⁹ Overall, social media can facilitate reaching hidden populations when thoughtfully tailored while proactively addressing access barriers.

Respondent-Driven Sampling: Controversial for Minority Representativeness

Several studies recruited minority populations through respondent-driven sampling (RDS), a chain referral technique involving waves of peer recruitment originating from diverse seeds.⁶⁰ However, critics argue RDS may not improve representativeness beyond convenience samples for groups with strong community ties.⁶¹

Multipronged Recruitment Likely Required for Diverse Minorities

Given differing limitations, combining sampling approaches appeared optimal to diversify recruitment. Blending RDS, community outreach, and social media reduced bias from any single method when engaging minority MSM.⁶² Similarly, combining RDS with online advertising reduced sample variability compared with RDS alone among young transgender women, though limitations remained.⁶³ Hence, concurrent diverse techniques allow capitalising on the strengths of each.

Innovative Minority-Focused Strategies Show Promise

Beyond established techniques, a few studies piloted innovative recruitment models focused on minority priorities and preferences. "Home parties" discussing substance use were acceptable to hard-to-reach minority parents and enabled open parent-child dialogue following the group sessions.⁶⁴ The informal, relatable environment addressed barriers like distrust of authorities. Though small in scale, this culturally adapted model appears promising. Capitalising on altruism and communalism intrinsic in many minority cultures, framing research as benefiting one's community increased willingness to participate among African Americans and Latinos.⁴⁴ Hence, co-designing studies around minority priorities could enhance engagement.

Factors Influencing Minorities' Recruitment and Retention

Mistrust of Research and Discrimination Deter Participation

Mistrust of research and the medical establishment broadly, often stemming from past unethical practices, poses a significant barrier to stigmatised minority groups.⁶⁵ Distrust readily fuels conspiracy beliefs, and perceptions research might be intrusive or risky rather than beneficial. Discrimination also reduced research participation intentions among ethnoracial minorities, mediated by eroded trust.⁶⁵ Hence, past marginalisation corrodes minorities' research confidence.

Cultural insiders helped ensure resonant framing.

Among transgender individuals, affiliation with transgender-led community organisations conducting the research increased willingness to participate, underlining the importance of cultural competence.⁶⁶ Studies perceived as respecting cultural norms around sexual identity, gender expression, and racial diversity were also rated as more appealing.⁶⁶ Hence, cultural synergy and tailoring are instrumental for minority engagement. Conversely, where alignment was lacking, deterrence occurred. A HPV vaccine trial recruiting minority MSM struggled due to incongruence with cultural norms regarding circumcision requirements and sexual communication.⁶⁷ Similarly, Latina immigrants expressed reluctance to participate in research if recruitment messaging lacked cultural or linguistic tailoring.⁶⁸ Disregarding cultural preferences clearly impedes minority inclusion.

Altruism and Communalism Boost Engagement Among Minorities

Aligning with communal cultural orientations common among many minority groups, prosocial benefits to one's community and altruistic values expanded appeal for research participation.⁴⁴ Hispanic adults who declined participation in a dietary intervention study frequently cited lack of direct benefit as the deterrent,

suggesting insufficient community-oriented framing.⁵⁴ Programs designed collaboratively to address community-identified needs could overcome this barrier. Among MSM and transgender women, altruism relating to benefits for one's community also dominated motivations for research participation, exceeding incentives or personal benefits.⁶⁶ Researchers can leverage communalism by demonstrating potential value to minority populations when inviting participation.

Incentives Have Mixed Impact on Minority Recruitment

The impact of financial incentives on minority recruitment was mixed. While an influential factor, higher incentives only modestly increased MSM's willingness to participate and did not improve response rates among Latina women contacted for an online survey.⁶⁶ However, incentives enabled reaching more marginalised subgroups by sustaining RDS peer referral chains.⁶⁹

Minority Retention: Importance of Cultural Alignment and Ongoing Engagement

Among studies examining retention, cultural competence, and community partnerships, these elements again emerged as vital. An HIV prevention program engaging minority MSM retained 78% at 18 months follow-up, which researchers attributed partly to staff diversity and cultural expertise.⁵⁶ Conversely, depressed minorities reported lower retention in mental health treatment compared to whites, with retention correlating positively with specialty care from providers who may have greater cultural competence.⁷⁰ Hence, culturally informed programs and providers optimise retention. Maintaining ongoing community and participant engagement also improved retention among minority women enrolled in a health empowerment intervention.⁵⁵

CONCLUSIONS

This review highlights that effective recruitment and retention of marginalised communities in health research require a multifaceted approach. Direct community outreach, including presentations, health fairs, and in-person contact, proved essential for engaging minority groups. Retention strategies such as financial incentives, culturally competent staff, and active participant engagement were commonly employed, though no single method consistently emerged as the most effective. Our findings suggest that combining multiple recruitment methods aiming at the specific characteristics of the target population is necessary to overcome the limitations of individual approaches. Methods such as respondent-driven sampling, social media, and snowball sampling varied in their success depending on the context and

population. The review signifies the need for more rigorous and consistent reporting on recruitment and retention rates across studies for better comparison and understanding of the effectiveness of different strategies. Future research should focus on identifying optimal combinations of recruitment and retention methods to ensure diverse and representative participation in health studies, ultimately helping to address health disparities and improve health outcomes for marginalised communities.

CONFLICT OF INTEREST: None

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SUPPLEMENTARY DOCUMENTS:

Table A: Study Characteristics of Included Studies

Author, Year	Country	Study Design	Study Type	Total Number of Participants	Study Population	Recruitment Method
Arayasirikul et al. (2016) ¹	USA	Quantitative	Observational	300	LGBT and Ethnic Minorities	Respondent-driven sampling technique (RDS)
Beyrer et al. (2021) ²	USA	Quantitative (Cross-Sectional)	Observational	1305	LGBT, Religious and Ethnic Minorities	Respondent-driven sampling technique (RDS)
Browne, Kath. (2005) ³	UK	Quantitative	Observational	28	LGBT and Ethnic Minorities	Snowball Sampling techniques
Bush, J. and Blackwell, C. W. (2022) ⁴	USA	Quantitative	Observational	56	LGBT and Ethnic Minorities	Social Media
Ellman et al. (2015) ⁵	USA	Quantitative (retrospective analysis)	Observational	96	LGBT and Ethnic Minorities	Social Media
Fortuna, L. R.; Alegria, M. and Gao, S. (2010) ⁶	USA	Quantitative	Observational	564	Ethnic Minorities	Survey Method
Gonzales et al. (2022) ⁷	USA	Quantitative	Observational	996	Ethnic Minorities	Probability Sampling Technique
Green et al. (2013) ⁸	USA	Quantitative	Observational	608	Ethnic Minorities	Direct (existing studies, public databases, community outreach) and indirect (radio, Internet, email)
Harding et al. (2015) ⁹	UK	Quantitative (Cross-Sectional)	Observational	554	LGBT	Web-based
Hatfield et al. (2010) ¹⁰	USA	Quantitative	Observational	889	LGBT and Ethnic Minorities	Social Media
Hui et al. (2016) ¹¹	USA	Quantitative	Exploratory	15	Ethnic Minorities	Social Media
Keshinro et al. (2016) ¹²	Nigeria	Quantitative	Observational	862	LGBT	Respondent-driven sampling technique (RDS)
Kiernan et al. (2000) ¹³	USA	Quantitative Experimental	Interventional	561	Religious Minorities	Social Media
Lachowsky et al. (2016) ¹⁴	Canada	Quantitative	Observational	719	LGBT	Respondent-driven sampling technique (RDS)
Lee et al. (2017) ¹⁵	USA	Quantitative	Interventional (Randomised controlled trial)	410	Religious and Ethnic Minorities	Community outreach
Loutfi et al. (2020) ¹⁶	Botswana	Quantitative	Observational	192	Ethnic Minorities	Snowball sampling technique
Mitchell, J. W. 2014 ¹⁷	USA	Quantitative	Observational	550	LGBT	Social Media
Nichols et al. (2004) ¹⁸	USA	Quantitative	Observational	1222	Ethnic Minorities	Social Media
Pines et al. (2021) ¹⁹	Mexico	Quantitative	Observational	3792	LGBT	Respondent-driven sampling technique (RDS)
Richards, M. A. (2020) ²⁰	USA	Quantitative	Observational	Not Reported	LGBT	Not reported
Riper, H.; Bolier, L. and Elling, A. (2005) ²¹	Netherland	Quantitative	Intervention development and pilot testing	177	LGBT	Snowball Sampling technique
Sankare et al. (2015) ²²	USA	Quantitative Cohort Study	Community-based participatory research (CBPR)	206	LGBT and Ethnic Minorities	Community outreach
Shah et al. (2011) ²³	Thailand	Quantitative	Observational	816	Hard to reach clients of Female sex workers	Respondent-driven sampling technique (RDS)
Smith, P. L. (2017) ²⁴	USA	Qualitative	Observational	12	LGBT and Ethnic Minorities	Social Media

Sok et al. 2020 ²⁵	Cambodia	Quantitative	Cross-sectional survey	1375	LGBT	Peer-based social network recruitment
Stahlman et al. (2016) ²⁶	Swaziland	Quantitative	Cross-sectional	962	LGBT	Respondent-driven sampling technique(RDS)
Tsaltzkan et al. (2022) ²⁷	USA	Quantitative	Observational	131	Ethnic Minorities	Social Media
Unlu Ince et al. (2014) ²⁸	Netherland	Quantitative	Randomised controlled trial	96	Ethnic Minorities	Social Media
Wentzell et al. (2021) ²⁹	USA	Not Reported	Not Reported	Not reported	Hard to reach population	Social Media
Zablotska et al. (2014) ³⁰	Australia	Quantitative	Observational	13752	LGBT	Respondent-driven sampling technique (RDS)
Zea, M. C. (2010) ³¹	USA	Qualitative	Commentary	Not reported	LGBT and Ethnic Minorities	Not reported

MenTra String:

Econlit <1886 to December 22, 2022>		
Embase <1974 to 2023 January 06>		
Ovid MEDLINE(R) ALL <1946 to January 06, 2023>		
APA PsycInfo <1806 to January Week 1 2023>		
1	"sexual dissiden*.tw.	28
2	LGBT.tw.	7,932
3	LGBTQ.tw.	6,775
4	LGBTQia.tw.	473
5	Lesbian*.tw.	36,831
6	Gay*.tw.	57,763
7	bisexual.tw.	37,402
8	homosexual*.tw.	45,151
9	Queer.tw.	10,782
10	"gender minor*".tw.	5,000
11	"sexual minor*".tw.	14,724
12	transgender*.tw.	34,330
13	transsexual*.tw.	8,259
14	"ethnic minor*".tw.	47,870
15	"racial minor*".tw.	6,558
16	"religious minor*".tw.	651
17	"non heterosexual".tw.	1,316
18	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17	203,286
19	"hard to reach".tw.	7,120
20	18 OR 19	210,019

21	Recruit*.tw.	1,272,715
22	induct*.tw.	1,411,900
23	includ*.tw.	13,141,419
24	involv*.tw.	6,495,384
25	engag*.tw.	809,651
26	enrol*.tw.	1,331,458
27	participat*.tw.	1,867,842
28	retain*.tw.	557,307
29	retention.tw.	518,386
30	21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29	22,444,318
31	20 AND 30	98,124
32	research.tw.	5,698,174
33	"research study".tw.	42,589
34	"social research".tw.	5,760
35	"psychological research".tw.	15,264
36	"health research".tw.	52,138
37	"community based research".tw.	2,702
38	"behavioral research".tw.	5,856
39	32 OR 33 OR 34 OR 35 OR 36 OR 37 OR 38	5,698,174
40	31 AND 39	31,847
41	"recruitment method".tw.	1,247
42	"retention method".tw.	800
43	41 OR 42	2,046
44	20 AND 39 AND 43	59
45	20 AND 43	101

AUTHORS CONTRIBUTION

1. **Saima Aleem** - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval
2. **Bilal Ahmad Khan** - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval
3. **Zala** - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval
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13. **Zeeshan Kibria** - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval
14. **Zohaib Khan** - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval

The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.



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