

Table 1 Characteristics of included studies and summary of findings

Authors and year of publication	Study population	n	Setting	Study design/Methods	Main focus	Description of intervention	Theory/ framework	Mhealth approach	Stigma type	Key findings
Barry <i>et al.</i> 2018	HIV-positive, negative, and status-unknown Young, black, gay, bisexual, and other MSM (ages 18-30, M =24.3)	48	Southeastern US	Qualitative	Parent trial focused on reducing condomless anal intercourse	HealthMpowerment (HMP)	Resilience Framework used to analyze data	Internet and mobile phone-based intervention	Sexual minority, race/ethnicity, and HIV-related stigma	Dynamic interpersonal resilience processes shared in response to stigma, discrimination, and life challenges
Bauermeister <i>et al.</i> 2019	HIV-positive, negative, and status-unknown Young, black, gay, bisexual, and other MSM (ages 18-30, M = not provided; 55% between 18-24)	238	Southeastern US	Secondary analysis Qualitative coding of posts generated on the intervention website during parent RCT HLM analysis to test whether engaging in stigma-related content was associated with changes in stigma-related scores	Parent trial focused on reducing condomless anal intercourse Changes in stigma-related scores	HealthMpowerment (HMP) Anonymous online supportive community designed to reduce stigma and empower participants. Includes the Forum (where participants could communicate), Ask Dr. W. (participants could post anonymous questions to be answered by infectious disease doctor), and Getting Real (participants could share and comment on multimedia)	Stigma domains coded based on prior foundational HIV-stigma work	Internet and mobile phone-based intervention	Quant: Stewart's subscale on felt-normative stigma towards PLWH Qual: coded experiencing stigma, anticipated stigma, internalized stigma, and challenging stigma	YBMSM who discussed experiencing HIV stigma in the forums reported decreases in perceived HIV stigma over time YBMSM whose forum posts indicated anticipated HIV stigma reported increases in HIV stigma over time
Christensen <i>et al.</i> 2013	HIV-negative Self-identified African American, Latino or White MSM, who had had UAI with a non-primary/casual partner in the past three months (ages 18-24, M =21.3)	921	US national sample	Online RCT tested the effectiveness of SOLVE compared to WLC	Reducing unprotected anal intercourse (UAI)	SOLVE Socially Optimized Learning in Virtual Environments (SOLVE) Virtual world simulating obstacles to safer sex. Participants customize an avatar and make decisions for the avatar, receiving feedback linked to real-life consequences. Goal is to reduce shame associated with sexual stigma by confirming desires are normal	Theory of Planned Behavior and Social Cognitive Theory	Web-delivered, downloadable simulation video game	Sexual shame, conceptualized as a manifestation of sexual stigma	Participants in the SOLVE treatment condition reported greater reductions in shame, which in turn predicted reductions in risky sexual behavior at follow-up
Mimiaga <i>et al.</i> 2019	HIV-positive Youth with self-reported ART adherence difficulty (ages 16-24, M =19)	14	Boston, MA	Pilot RCT comparing Positive STEPS vs. SOC	ART Adherence measured using MEMS	Positive STEPS Positive Strategies to Enhance Problem-solving Skills (Positive STEPS); Combining individual counseling (5 customizable session) with daily text messages reminders and video vignettes	Social cognitive theory	Daily text messages reminders and video vignettes	Stigma described in intro as conceptually important but not measured	Change in ART adherence 90% significantly higher vs. SOC High retention for the intervention sessions, 100% intervention participants rated as acceptable
O'Donnell <i>et al.</i> 2009	Targets men who have not previously tested or HIV status unknown (open/inclusive to PLWH) Young African American and other Black men (54% between 18-21; 25% between 22-25; 20% between 26-30) Primary audience for KIU is non-gay-identified men (but open to those who have sex with men)	116	Brooklyn, NY	CBPR approach to develop Keep it Up (KIU) Pilot testing of KIU	Health screening and behavioral prevention	Keep it Up (KIU) 90-minute intervention including social marketing, computerized behavioral learning module, HIV testing and testing for other diseases, personalized risk reduction plan	Social marketing principles, diffusion of innovation; social-cognitive theories; and gender role, gender identity and sexual script theories	Computerized behavioral learning module "mounted on laptop computers in private spaces" Video segments drawn a priori from the Safe in the City intervention/ some reshot to be reflected of target population	Goal of KIU was reducing stigma and reaching a population that bears a disproportionate burden of HIV/AIDS and other health problems	96% agreed that the module "showed realistic ways for men to protect their sexual health" 95% said it was "interesting and entertaining"
Refugio <i>et al.</i> 2019	Target MSM without HIV Young MSM of color (ages 18-25, M =22)	25	San Francisco, CA	One-arm Pilot with 25 uninfected YMSM	PrEP initiation	PrEPTECH 180 days of a telehealth-based initiation program for PrEP (telemedicine visits, home delivery of Truvada and STI testing kits). Website included GPS lab locator, automated medication/kit delivery, customizable PrEP reminders through text or email	No specific theory noted A multidisciplinary team from Youth + Tech + Health developed the website prototype using an evidence-based, youth-centered approach	Telehealth-based initiation program for PrEP Study website included GPS lab locator, automated medication/kit delivery, customizable PrEP reminders through text or email	PrEP Stigma "often stemming from assumptions of increased risk-taking behaviors while on PrEP"	At least 75% felt that PrEPTECH was confidential, fast, convenient, and easy to use Less than 15% personally experienced PrEP stigma during the study Median time to PrEP initiation was 46 days
Schnall <i>et al.</i> 2018	Targeting racially and ethnically diverse sexual minority youth Specifically targeting very young MSM (ages 14-18, M =17)	40	Chicago, IL; Birmingham, AL; New York, NY; and Seattle, WA	Expert panel to adapt intervention (n=8) In-depth interviews (n=40) Weekly team meetings	HIV risk reduction Parent study aimed to reduce sexual behavior while under the influence of substances and decrease unprotected anal sex while under the influence of substances	MyPEEPS Mobile Male Youth Pursuing Education, Empowerment & Prevention around Sexuality (MyPEEPS) Adapted the MyPEEPS intervention—an evidence-based, group-level intervention—to individual-level delivery by a mobile application	Based on social-personal framework, which builds on social learning theory and adds psychosocial (e.g., affect dysregulation) and contextual risk factors (e.g., family, peer, and partner relationships) related to youth risk-taking	A mobile response-driven web-based platform, accessible by smartphone or other web-enabled devices	Expert panel recommended adapting the intervention to add stigma content (specifically how to handle content on "outness" and coming out)	Expert panel recommended changes: (I) biomedical interventions, (II) salience of intervention content, (III) age group relevance, (IV) technical components, and (V) stigma content Panel recommended focus "on activating self-reflection about how social stigma may influence personal sexual health decisions"
Stephenson <i>et al.</i> 2017	Transgender and gender nonconforming youth (TY) (ages 15-24)	200	Across the United States	Protocol Paper Pilot RCT, randomized 1:1 to control arm (HIV self-testing only) or intervention arm (video-based counseling in conjunction with HIV self-testing)	Primary outcome will be the proportion of TY who tested for HIV at least once in the six-month follow-up period; Also looking at sexual risk-behaviors, and linkage to care for newly-diagnosed HIV-positive TY	Project Moxie HIV prevention intervention that pairs the use of HIV self-testing (home-based testing) with remote video-based counseling and support from a trained, gender-affirming counselor	No specific theory noted Motivational interviewing used to ascertain reasons (e.g., structural, lack of information/misinformation on HIV testing) why the participant has not tested for HIV in the past 12 months	HIV test counseling offered remotely via a HIPAA-compliant video-chat session (telehealth) Participants also receive one OraQuick test, condoms, lubricant, and earbuds via mail	Transphobia will be assessed using subscales from the Gender Minority Stress and Resilience Scale (GMSRS) The Gender-Related Rejection and Gender-Related Victimization subscales of the GMSRS measures enacted stigma. Shame subscale of the Transgender Identity Scale will be used to assess internalized transphobia	Project Moxie was launched in June 2017 and recruitment was ongoing when paper was published
Stephenson <i>et al.</i> 2019	Binary and nonbinary transgender youth (TY) (ages 15-24; 32.7% 15-17; 32.1% 18-20; 35.2% 21-24)	202	Across the United States	Pilot RCT randomized 2:1 to Project Moxie Intervention or condom of only home-based HIV self-testing	Focus of pilot was testing the feasibility of recruiting, retaining, and delivering an online HIV prevention intervention for a diverse sample of TY	Project Moxie: HIV prevention intervention that pairs the use of HIV self-testing (home-based testing) with remote video-based counseling and support from a trained, gender-affirming counselor	No specific theory noted. Motivational interviewing used to ascertain reasons (e.g., structural, lack of information/misinformation on HIV testing) why the participant has not tested for HIV in the past 12 months	HIV test counseling offered remotely via a HIPAA-compliant video-chat session (telehealth); Participants also receive one OraQuick test, condoms, lubricant, and earbuds via mail	Internalized transphobia and Anticipated stigma subscales of GMSRS reported at baseline. Changes from baseline to follow-up not reported.	126 participants randomized to intervention. 61 (49%) took part in the intervention. All 61 ordered HIV self-testing kit and participated in video-chat counseling session. Among those who participate, levels of satisfaction were high (98% for n=61). Willingness to use PrEP increase significantly from baseline (39%) to 6 months (74%)
Thomann <i>et al.</i> 2018	Gay men and other MSM and transgender women at risk for HIV (ages 21-50)	24	New York, NY	2 focus groups to assess responses to online campaign	PrEP Use	Online video campaign designed to address knowledge of PrEP; its physical and psychological side effects; and psychosocial barriers related to PrEP adherence and sex shaming	No specific theory noted	Online video campaign advertised on social and sexual networking sites, resulting in over 150,000 views and shares between November 2015 and January 2016	Stigma (from within and beyond the LGBT community) was a central theme in both focus groups. Participants suggested stigma against PrEP users was declining as PrEP use increased, but stigma remained, particularly for those not using condoms	Focus group participants demonstrated a relatively high knowledge of PrEP, although considerable concern remained about side effects, particularly among Black participants
Willis <i>et al.</i> 2018	Young people (ages 15-24, M =19.25)	138	Recruited national sample with additional recruitment done by attending comic-related conferences in Atlanta, GA; Miami, FL; New York, NY; Los Angeles, CA; and Washington, DC	15 focus groups to pilot (one-group, pretest-immediate-posttest design) of motion comic series	HIV/STD-related knowledge, attitudes, beliefs, and behavioral intentions	A three-episode HIV/STD-focused motion comic series to improve HIV/STD-related knowledge, attitudes, beliefs, and behavioral intentions among young people	Health Belief Model; Goal of this intervention was to raise awareness among young people about their risk for and the seriousness of contracting HIV infection and other STDs	Motion comic 38-minute, three-episode motion comic	Based on feedback from young people, storylines were created that addressed various topics including HIV/STD stigma. HIV stigma was operationalized by seven items derived from existing HIV stigma scales that measured negative attitudes toward people living with HIV	Significant decrease in HIV stigma from pre- to post viewing (P<0.001). Increases in both HIV knowledge (P=0.002) and behavioral intentions to engage in safe sex (P<0.001)