

# Sexual Health Interventions Inclusive of Sexual Minority Youth: A Systematic Review

By

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## Abstract

*Background:* Adolescent sexuality has shifted in the last several decades to be understood as a normative developmental process where teenagers engage in different behaviors as an exploration in pursuit of identity, self-understanding, and the formation of their sexual self-concept<sup>1</sup>. Despite this shift, sexual minority youth (SMY, i.e., lesbian, gay, bisexual, queer and questioning individuals ages 13 through 18 years old) are at heightened risk for engaging in sexual risk behaviors and experiencing negative sexual health outcomes such as sexual victimization and sexually transmitted infections<sup>2,3</sup>.

*Objectives:* The first goal of this review was to systematically scan the literature on sexual health interventions inclusive of sexual minority youth (ages 10-19 years old) in the United States, and understand the evidence for the impact they have on intrapersonal and interpersonal outcomes. The second goal of this review was to identify intervention components that contribute to the acceptability of sexual health interventions among sexual minority youth.

*Data Sources:* For this systematic review, a search was conducted in PubMed, Web of Science, CINAHL and PsycInfo of studies published through October 2020.

*Study Selection:* Two thousand nine hundred and eighty-one articles were screened and 91 full-text articles were assessed for eligibility. Seventy-six full-text articles were excluded for reasons including non-targeted outcomes, focus on the adult population, non-interventional study design, not a US-based sample and lack of analysis of sexual minority youth, leaving 13 studies included in the qualitative synthesis.

*Main Outcomes and Measures:* Intrapersonal, or psychological outcomes including knowledge, attitudes, intentions and norms were assessed, as well as interpersonal, or behavioral outcomes including health care use, communication, negotiation and sexual behaviors.

*Results:* Of the thirteen studies included in the review-- nine were experimental randomized control trials, three were nonexperimental (two exploratory analyses and one pre-posttest change design) and one was a quasi-experimental process evaluation. Nine of the thirteen studies targeted sexual minority youth, and four studies consisted of both heterosexual and sexual minority youth in the sample.

*Conclusions:* Findings show that there are promising sexual health interventions that can help work towards promoting positive sexual health behaviors and reducing negative sexual health outcomes among SMY. Interventions included in this review had the strongest impact on improving sexual health outcomes related to knowledge and reports of self-efficacy. This topic is still in an early phase of research and additional, longitudinal research should be conducted to understand the longer-term impact of these interventions on sexual health behaviors and outcomes on sexual minority youth.

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## Introduction

The last few decades have seen a shift in the way adolescent sexuality is viewed. Sexual health experts have moved away from assuming adolescent sexuality is inevitably linked to dangerous outcomes, and instead recognize that sexuality is a central part of being human, as well as a normative part of adolescent development<sup>4,5</sup>. Normative sexual development acknowledges the idea that sexuality is not just about whether one does or does not engage in sexual intercourse, but includes a range of sexual behaviors, attitudes and emotions that are explored as part of development. This shift calls for moving away from framing sexuality exclusively in terms of risk to a more comprehensive approach to healthy sexual development that includes risk management, experiences of pleasure, romantic relationships and the importance of agency in sexual decision making<sup>5,6</sup>. Part of this shift acknowledges the developmental task of forming one's sexuality identity, with research showing that sexual identity, sexual attraction and sexual orientation change over time, and adolescence is a period where teenagers engage in different behaviors as an exploration in pursuit of identity and self-understanding<sup>5,1</sup>.

This shift in how adolescent researchers view sexuality development has also begun to recognize and normalize additional identities other than heterosexual. Sexual minority youth (SMY, i.e., lesbian, gay, bisexual, queer and questioning individuals) make up 11.2 percent of US high school students between the ages of 13 and 18 years old<sup>7</sup>. Sexual minority youth are a population at a heightened risk for nearly all sexual risk behaviors measured by the Centers for Disease Control compared to their heterosexual peers<sup>8,9,2</sup>. Sexual risk behaviors include engaging in unprotected sexual intercourse, engaging in sexual activity under the influence of alcohol or drugs, and not using any pregnancy prevention method when having sex<sup>7</sup>. In addition to these generalized risks, sexual minority youth are at a greater risk than their heterosexual peers for sexual victimization including forced sex, as well as negative sexual health outcomes such as human immunodeficiency virus (HIV) infection and

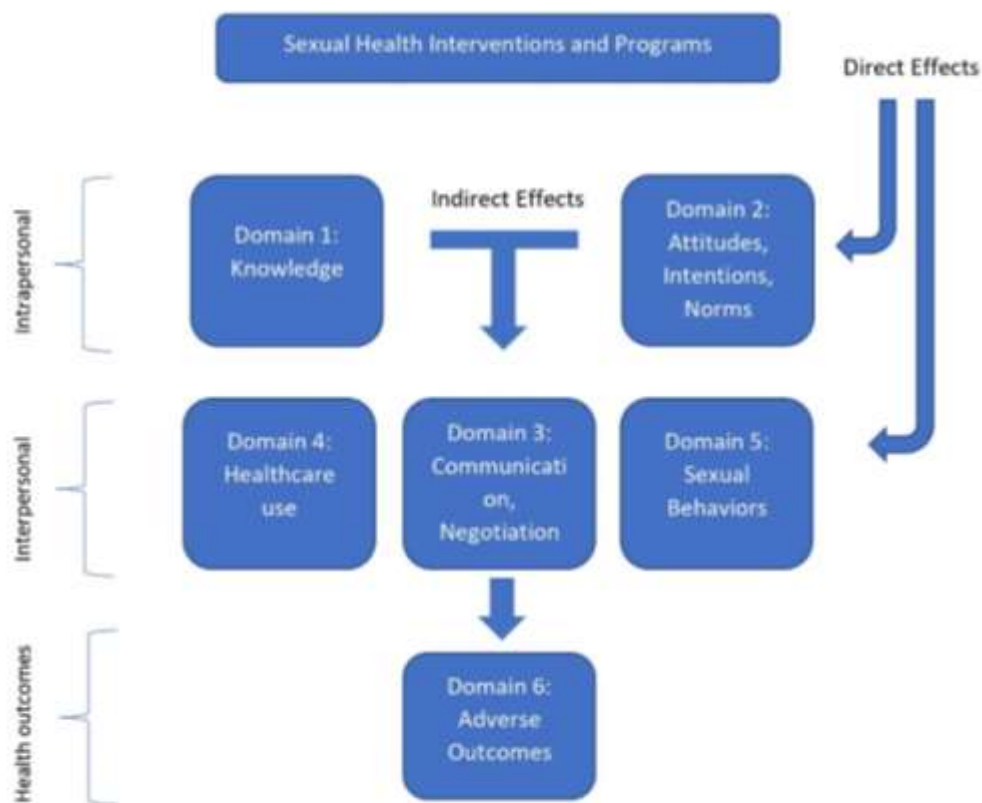
other sexually transmitted infections (STIs) and pregnancy<sup>7,3</sup>. These disparities suggest that there is a lack of sexual health information and resources available for sexual minority youth<sup>10</sup>. Minority stress, or the stressors that are related to one's minority identities that stem from prejudice and discrimination, influences health outcomes<sup>11</sup>. The disparities in health outcomes that sexual minority youth face are said to be attributable at least partly to minority stress<sup>12</sup>.

Sexual health interventions are a common way to promote positive sexual development, address sexual health, and prevent unplanned/teen pregnancy, STIs and HIV/AIDS among adolescents<sup>13</sup>. Due to a number of factors, including stigma, against the sexual minority population, policies at the federal, state and local level, and a lack of funding for research in this area, there is limited knowledge around existing sexual health interventions and their impact on sexual minority adolescents<sup>14,13,15</sup>. Much of the research on sexual minority youth has been focused on understanding their risk factors for negative sexual health outcomes, while less focus has been placed on understanding factors that improve or promote sexual health outcomes and reduce minority stress<sup>14</sup>.

Hogben, Ford, Becasen and Brown (2015) developed six domains of sexual health interventions and programs based on the Centers for Disease Control's 2010 consultation on sexual health and public health<sup>16,17</sup>. *Figure 1* illustrates the relationship between sexual health intervention programs and the six domains identified by Hogben, et al.<sup>16</sup>, which are divided into the intrapersonal (within self) and the interpersonal (between self and others) realms. The figure shows how sexual health interventions directly affect knowledge, attitudes, intentions and norms of intervention recipients, as well as health care use, communication, negotiation and sexual behaviors. These domains have indirect effects on one another, and in turn impact adverse health outcomes of intervention recipients, for example, unintended pregnancy and sexually transmitted infections<sup>16,17</sup>. These six domains serve as a structure for this review. The first goal of this review was to systematically scan the literature on sexual health interventions inclusive of sexual minority youth (ages 10-19 years old) in the United States, and

understand the impact interventions have on intrapersonal and interpersonal outcomes. The second goal of this review was to identify intervention components that contribute to the acceptability of sexual health interventions among sexual minority youth.

Figure 1: Six domains of sexual health interventions and programs<sup>16</sup>



## Methods

### Search and Information Sources

This paper followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) reporting guidelines<sup>18</sup>. Four searches were conducted separately in PubMed, Web of Science, CINAHL and PsycInfo in October 2020. *Table 1* shows the search terms used in each of the database

searches. This search strategy yielded 2,981 results after filtering for full text journal articles available in English and published after the year 2000. No additional articles that met inclusion criteria were included in this review.

*Table 1: Search Terms Used to Complete Electronic Search Strategy*

<b>Keyword</b>	<b>Search terms used</b>
Sexual minority	<i>lesbian OR lesbians OR gay OR homosexual OR homosexuals OR bisexual OR bisexuals OR queer OR questioning OR asexual OR sexual minority OR sexual minorities OR SMY OR lgbt OR lgbtq OR lgbtqia OR lgbt+ OR lgbtq+ OR lgbtqia+ OR pansexual OR "same gender loving" OR "same-gender loving" OR sgl OR "Sexual and Gender Minorities"[Mesh]</i>
Youth	<i>teen*[TIAB] OR youth*[TIAB] OR adolescen*[TIAB] OR juvenile*[TIAB] OR young adult*[TIAB] OR young person*[TIAB] OR young individual*[TIAB] OR young people*[TIAB] OR young population*[TIAB] OR young man[TIAB] OR young men[TIAB] OR young woman[TIAB] OR young women[TIAB] OR youngster*[TIAB] OR first-grader*[TIAB] OR second-grader*[TIAB] OR third-grader*[TIAB] OR fourth-grader*[TIAB] OR fifth-grader*[TIAB] OR sixth-grader*[TIAB] OR seventh-grader*[TIAB] OR high school* OR college* OR secondary school*[TIAB] OR secondary education*[TIAB] OR high school*[TIAB] OR high education[TIAB] OR adolescent[MH] OR young adult[MH]</i>
Sexual health intervention	<i>"Sex Education"[Mesh] OR sexual health education OR sexual education OR sex education OR sex education OR reproductive health education OR sex ed</i>

## Inclusion and Exclusion Criteria

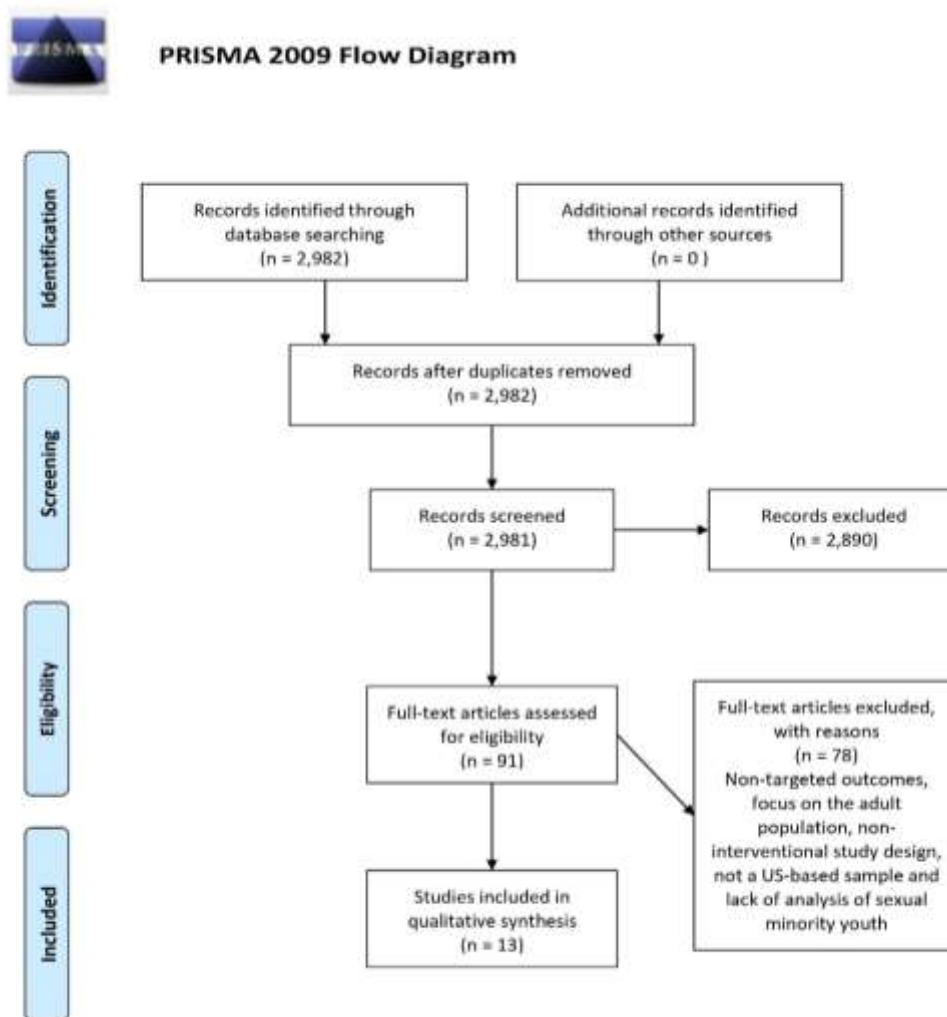
From the 2,981 studies identified, studies were retained if (a) the article linked inputs to outcomes in at least one of the sexual health outcomes mentioned above, (b) the study population was adolescents between the ages of 15 and 24 years old (studies whose population were 18+ were excluded), (c) sexual minority youth were included in the analysis, and (d) the study population was drawn from the United States.

## Results

### Study Selection

Two thousand nine hundred and eighty-one articles were screened and 91 full-text articles were assessed for eligibility. Seventy-six full-text articles were excluded for reasons including non-targeted outcomes, focus on the adult population, non-interventional study design, not a US-based sample and lack of analysis of sexual minority youth, leaving 13 studies included in the qualitative synthesis (see Figure 2).

Figure 2: Study Selection Flow Chart<sup>18</sup>





## Study Characteristics

Among the studies selected for final review, nine were experimental randomized control trials, three were nonexperimental (two exploratory analyses and one pre-posttest change design) and one was a quasi-experimental process evaluation. Nine of the thirteen studies targeted sexual minority youth, and four studies consisted of both heterosexual and sexual minority youth in the sample. Study characteristics and key findings are illustrated in *Table 2*.

*Table 2: Impacts of Sexual Health Interventions on Sexual Minority Youth*

Source	Sample & Study Design	Purpose of Study	Intervention Description	Outcome Measures	Summary of Findings
Ybarra et al., 2014 <sup>19</sup>	N= 75 14-18 year old gay, bisexual and queer males  Study design: Nonexperimental qualitative exploratory design	Purpose of study was to analyze feedback from participants about how their participation in national, online focus groups (FG) about gay, bisexual and queer sexual health related topics resulted in behavioral and attitudinal changes.	Moderator-led, focus group with discussion boards conducted online in an asynchronous bulletin board over 3 consecutive days.	Primary outcomes: <ul style="list-style-type: none"> <li>Attitudes and opinions of an HIV prevention program being developed</li> </ul>	Themes identified: <ul style="list-style-type: none"> <li>Gained a sense of community</li> <li>Enjoyed participating</li> <li>Felt supported in the focus group</li> <li>Gained an ability to talk about sex or sexuality</li> <li>Felt inspired to get involved in LGBTQ community programming</li> </ul>
Mustanski et al., 2015 <sup>20</sup>	N= 202 LGBTQ+ youth aged 16-20 years old  Study design: nonexperimental pre-post change design (follow up at two weeks postintervention)	The purpose of the study was to determine the feasibility of recruiting and enrolling LGBT youth in same-sex relationships into an online sexual health intervention. Researchers also evaluated the acceptability of &	The Queer Sex Ed intervention, online intervention designed to promote comprehensive sexual health of LGBT youth.	Primary outcomes: <ul style="list-style-type: none"> <li>Sexual orientation identity and self-acceptance</li> <li>Sexual health knowledge (e.g. sexual functioning)</li> <li>Relationship variables (e.g. communication skills)</li> <li>Safer sex (e.g. sexual assertiveness)</li> </ul>	Changes in Sexual Health Outcomes from pre to two weeks posttest <ul style="list-style-type: none"> <li>Sexual orientation identity and self-acceptance <ul style="list-style-type: none"> <li>Coming out self-efficacy: <math>z=3.60^{***}</math>; <math>d=0.10</math></li> <li>Internalized homophobia: <math>z=2.01^*</math>; <math>d=0.06</math></li> <li>Sense of belonging: <math>z=3.30^{**}</math>; <math>d=0.06</math></li> <li>Connectedness to the LGBT Community: <math>z=3.13^{**}</math>; <math>d=0.09</math></li> </ul> </li> <li>Sexual health knowledge <ul style="list-style-type: none"> <li>Sexual Functioning: <math>z=7.13^{***}</math>; <math>d=0.27</math></li> <li>HIV Knowledge: <math>z=7.03^{***}</math>; <math>d=0.21</math></li> <li>STD Knowledge: <math>z=8.13^{***}</math>; <math>d=0.34</math></li> <li>Continuum of Risk: <math>z=5.94^{***}</math>; <math>d=0.28</math></li> </ul> </li> </ul>

		engagement with the intervention.			<ul style="list-style-type: none"> <li>Relationship variables <ul style="list-style-type: none"> <li>Communication Skills: <math>z=2.73^{**}</math>; <math>d=0.08</math></li> <li>Sexual Agreement Self-Efficacy: <math>z=1.82</math>; <math>d=0.04</math></li> <li>Justification of Violence: <math>z=2.93^{**}</math>; <math>d=0.05</math></li> </ul> </li> <li>Safer sex <ul style="list-style-type: none"> <li>Sexual Assertiveness: <math>z=4.23^{***}</math>; <math>d=0.11</math></li> <li>Contraceptive Methods Knowledge: <math>z=9.68^{***}</math>; <math>d=0.39</math></li> </ul> </li> </ul> <p><math>*p &lt; 0.05</math>. <math>**p &lt; 0.01</math>. <math>***p &lt; 0.001</math>.</p>
Hidalgo et al., 2015 <sup>21</sup>	<p>N= 101 Men who have sex with men; age 16-20 years old</p> <p>Study design: RCT (follow up at 6-week and 12-week postintervention)</p>	The purpose of the pilot study was to determine initial efficacy, feasibility, and acceptability of a group-based, primary prevention intervention designed to reduce HIV risk behavior in ethnically diverse groups of young MSM aged 16–20.	Male Youth Pursuing Empowerment, Education and Prevention around Sexuality (MyPEEPS) is a group-level intervention to reduce sexual risk behaviors among young MSM by educating participants on sexual health information and risk reduction strategies.	<p>Primary outcomes:</p> <ul style="list-style-type: none"> <li>Total # of sex partners</li> <li>Total # of unprotected anal sex partners</li> <li># of unprotected sex acts</li> <li>Sex under the influence of alcohol/drugs</li> </ul> <p>Secondary outcomes:</p> <ul style="list-style-type: none"> <li>Self-Efficacy for safer sex</li> <li>Situational temptation for unsafe sex</li> <li>Condom use errors</li> <li>Health-related partner verbal communication</li> <li>Internalized homophobia</li> <li>Intervention acceptability</li> </ul>	<p>Overall follow-up period effect estimates (95% CI)-primary outcomes:</p> <ul style="list-style-type: none"> <li>Total # of sex partners: 0.96; (0.52–1.79)</li> <li>Total # of unprotected anal sex partners: 1.11; (0.42–2.91)</li> <li># of unprotected anal sex acts: 0.37; (0.10–1.44)</li> <li>Sex under the influence of alcohol/drugs: 0.35; (0.12–0.99)*</li> <li>Unprotected sex under the influence of alcohol/drugs: 0.23; (0.05–1.15)**</li> </ul> <p>Overall follow-up period effect estimates (95% CI)-secondary outcomes:</p> <ul style="list-style-type: none"> <li>Self-efficacy for safe sex (6 weeks vs baseline estimate): 1.17 (-0.51–2.86)</li> <li>Situational temptation for safer sex: 1.17; (-0.51–2.86)</li> <li>Condom use errors: -0.10; (-0.32–0.11)</li> <li>Health-related partner communication: 0.09; (-4.92–5.11)</li> <li>Internalized homophobia: -0.44; (-6.39–5.51)</li> </ul> <p><math>*p &lt; 0.05</math>; <math>**p &lt; 0.10</math></p> <p>Intervention acceptability</p> <ul style="list-style-type: none"> <li>Participants rated MyPEEPS as moderately acceptable (mean=24.7; SD=13.6; range: 8–48)</li> </ul>
Bauermeister, et al., 2015 <sup>22</sup>	N= 130 cisgender males aged 15-24 in Southeast Michigan	The study aimed to assess the feasibility, acceptability and preliminary	Get Connected! is a one-time, online intervention for young men who	<p>Primary Outcome:</p> <ul style="list-style-type: none"> <li>HIV/STI Testing Behaviors <ul style="list-style-type: none"> <li>whether they made an appointment to</li> </ul> </li> </ul>	<p>HIV/STI Testing Behaviors</p> <ul style="list-style-type: none"> <li>One-third of participants reported making an appointment to get tested for HIV or STIs (32.4 % of those in the full intervention condition vs. 27.8 % of those in the control condition; <math>X^2=0.23</math>; not sig.).</li> </ul>

	<p>Study design: Pilot randomized control trial (RCT) (follow up at 30-days postintervention)</p>	<p>efficacy of Get Connected!, an online intervention focused on encouraging HIV/STI testing among YMSM.</p>	<p>have sex with men (YMSM) that provides tailored sexual health education based on baseline data related to prior HIV and STI testing experiences and motivations.</p> <p>Participants were randomized into either a tailored experimental condition, or a non-tailored control condition that consisted only of an online HIV/STI testing provider directory page.</p>	<p>get tested for HIV/STIs</p> <ul style="list-style-type: none"> <li>whether they had tested for HIV/STIs</li> <li>whether they had received treatment, if necessary</li> </ul> <p>Secondary outcomes:</p> <ul style="list-style-type: none"> <li>Sexual behaviors in the prior 30 days</li> <li>Perceived barriers to getting tested</li> <li>Self-efficacy related to testing</li> </ul>	<ul style="list-style-type: none"> <li>30 participants reported having tested for HIV/STIs at follow-up (32.4% of those in the full intervention condition vs. 22.2% of those in the control condition; <math>X^2=1.18</math>; <math>d=0.34</math>; not sig.).</li> </ul> <p>Change in Sexual Behaviors in the Prior 30 Days</p> <ul style="list-style-type: none"> <li># of male sexual partners <ul style="list-style-type: none"> <li>t-test= 2.26*, differential gain t test= 0.41, <math>d=0.21</math></li> </ul> </li> <li># of receptive anal intercourse partners <ul style="list-style-type: none"> <li>t test= 2.43*, differential gain t test= 0.08, <math>d=0.08</math></li> </ul> </li> <li># of unprotected receptive anal intercourse partners <ul style="list-style-type: none"> <li>t test= 2.90*, differential gain t test= 0.01, <math>d=0.02</math></li> </ul> </li> <li># of insertive anal intercourse partners <ul style="list-style-type: none"> <li>t test= 1.99*, differential gain t test=1.51, <math>d=0.31</math></li> </ul> </li> <li># of unprotected insertive anal intercourse <ul style="list-style-type: none"> <li>t test= 1.68, differential gain t test= 1.25, <math>d=0.26</math></li> </ul> </li> </ul> <p><i>*p&lt;0.05; no mean differences over time were observed across treatment conditions</i></p> <p>Perceived Barriers to Testing</p> <ul style="list-style-type: none"> <li>My friends don't get tested for STIs <ul style="list-style-type: none"> <li>t test= 3.96***, differential gain t test=-0.004, <math>d=-0.001</math></li> </ul> </li> <li>Getting tested for STIs feels urgent <ul style="list-style-type: none"> <li>t test= -2.76**, differential gain t test=0.64, <math>d=0.30</math></li> </ul> </li> <li>I'm scared/nervous about finding out that I have an STI <ul style="list-style-type: none"> <li>t test= 2.88**, differential gain t test=-0.10, <math>d=-0.04</math></li> </ul> </li> </ul> <p>Self-efficacy Related to Testing</p> <ul style="list-style-type: none"> <li>Tell your partner you want him to get tested for HIV <ul style="list-style-type: none"> <li>t test= 2.73**, differential gain t test=0.03**, <math>d=0.50</math></li> </ul> </li> <li>Convince your partner to get an HIV test prior to anal intercourse with each other</li> </ul>
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					<ul style="list-style-type: none"> <li>○ t test= 2.63**, differential gain t test=0.71**, d=0.64</li> <li>• Persuade your partner to go with you to get an HIV test <ul style="list-style-type: none"> <li>○ t test= 1.51, differential gain t test=0.67**, d=0.63</li> </ul> </li> <li>• Tell your partner you want him to get tested for STIs <ul style="list-style-type: none"> <li>○ t test= 2.44*, differential gain t test=0.38, d=0.33</li> </ul> </li> <li>• Convince your partner to get an STI test prior to anal intercourse with each other <ul style="list-style-type: none"> <li>○ t test= 4.59***, differential gain t test=0.32<sup>a</sup>, d=0.37</li> </ul> </li> <li>• Persuade your partner to go with you to get a STI test <ul style="list-style-type: none"> <li>○ t test= 2.01*, differential gain t test=0.39<sup>a</sup>, d=0.39</li> </ul> </li> </ul> <p><sup>a</sup><i>p</i>&lt;0.10; *<i>p</i>&lt;0.05; **<i>p</i>&lt;0.01; ***<i>p</i>&lt;0.001</p>
Ybarra et al., 2017 <sup>23</sup>	<p>N= 302 cisgender males ages 14-18 years old who identify as gay, bisexual, and/or queer; recruited nationally</p> <p>Study design: Pilot RCT (outcomes assessed at end of intervention and 90-day follow up postintervention)</p>	The purpose of the study was to report the behavioral outcomes from the pilot RCT.	Guy2Guy is a mobile phone-based program using text messages to deliver educational and skill-oriented information	<p>Primary outcomes:</p> <ul style="list-style-type: none"> <li>• Number of condom-less sex acts (CSAs) at 90-days postintervention</li> <li>• Abstinence at 90-days postintervention</li> </ul> <p>Secondary outcomes:</p> <ul style="list-style-type: none"> <li>• # of CSAs among sexually active youth (end of intervention and at 90-day postintervention)</li> <li>• Abstinence among sexually active youth (end of intervention and at 90-days postintervention)</li> <li>• HIV testing among sexually experienced youth (end of intervention and at 90-days postintervention)</li> </ul>	<p>Primary outcomes:</p> <ul style="list-style-type: none"> <li>• Number of CSAs at 90 days postintervention: aIRR= 1.02 (0.51, 2.04)</li> <li>• Abstinence at 90 days postintervention: aOR= 0.63 (0.36, 1.12)</li> </ul> <p>Secondary outcomes (at Intervention end):</p> <ul style="list-style-type: none"> <li>• Number of CSAs among sexually experienced youth: aIRR= 0.60 (0.22, 1.68)</li> <li>• Abstinence among sexually experienced youth: aOR= 0.93 (0.46, 1.88)</li> <li>• HIV testing among sexually experienced youth: aOR= 3.39 (1.52, 7.58)*</li> </ul> <p>Secondary outcomes (at 90 days postintervention):</p> <ul style="list-style-type: none"> <li>• Number of CSAs among sexually experienced youth: aIRR= 0.95 (0.45, 2.02)</li> <li>• Abstinence among sexually experienced youth: aOR= 0.48 (0.23, 0.997)*</li> <li>• HIV testing among sexually experienced youth: aOR= 3.42 (1.65, 7.09)*</li> </ul> <p>*<i>p</i> &lt; 0.05</p>

Horvath & Bauermeister, 2017 <sup>24</sup>	<p>N= 130 total participants between the ages of 15 and 24 years old (median age= 21 years old)</p> <p>Study design: RCT (Follow up at 30 days postintervention)</p>	<p>The purpose of the study was to assess whether young men who have sex with men's acceptability with the online Get Connected! intervention and subsequent sexual health decision making were influenced by their baseline eHealth literacy (high vs. low competency) and intervention tailoring (tailored or nontailored intervention condition).</p>	<p>Get Connected! is an online intervention developed to increase HIV/STI testing among gay, bisexual, and other men who have sex with men (MSM).</p>	<p>Primary outcome:</p> <ul style="list-style-type: none"> <li>HIV and STI testing</li> </ul> <p>Other outcomes:</p> <ul style="list-style-type: none"> <li>Acceptability</li> </ul>	<p>Tailoring and eHealth Literacy on Intervention Acceptability</p> <ul style="list-style-type: none"> <li>Tailored Intervention with Low Literacy <ul style="list-style-type: none"> <li>Overall Satisfaction: <math>b=-0.07</math>; <math>SE= 0.20</math></li> <li>Information Quality: <math>b=-0.49^{**}</math>; <math>SE=0.17</math></li> <li>System Quality: <math>b=-0.54^{*}</math>; <math>SE=0.18</math></li> <li>Perceived Usefulness: <math>b=-0.21</math>; <math>SE=0.24</math></li> </ul> </li> <li>Nontailored Control with Low Literacy <ul style="list-style-type: none"> <li>Overall Satisfaction: <math>b=-0.31</math>; <math>SE= 0.25</math></li> <li>Information Quality: <math>b=-0.68^{**}</math>; <math>SE=0.22</math></li> <li>System Quality: <math>b=-0.41</math>; <math>b=0.23</math></li> <li>Perceived Usefulness: <math>b=-0.42</math>; <math>SE=0.31</math></li> </ul> </li> <li>Nontailored Control with High Literacy <ul style="list-style-type: none"> <li>Overall Satisfaction: <math>b=-0.31</math>; <math>SE= 0.21</math></li> <li>Information Quality: <math>b=-0.42^{*}</math>; <math>SE=0.19</math></li> <li>System Quality: <math>b=-0.17</math>; <math>b=0.20</math></li> <li>Perceived Usefulness: <math>b=-0.33</math>; <math>SE=0.27</math></li> </ul> </li> </ul> <p><math>*p &lt; 0.05</math>. <math>**p &lt; 0.01</math>. <math>***p &lt; 0.001</math></p> <p>Tailoring and eHealth Literacy on Sexual Health Decision Making</p> <ul style="list-style-type: none"> <li>Tailored Intervention with Low Literacy <ul style="list-style-type: none"> <li>Evaluate personal risk for HIV/STIs: <math>b= 0.09</math>; <math>SE=0.28</math></li> <li>Educate others about HIV/STIs: <math>b= 0.18</math>; <math>SE= 0.26</math></li> <li>Decide whether to get tested for HIV: <math>b= 0.21</math>; <math>SE= 0.26</math></li> <li>Decide whether to get tested for STIs: <math>b= 0.28</math>; <math>SE=0.27</math></li> </ul> </li> <li>Nontailored Control with Low Literacy <ul style="list-style-type: none"> <li>Evaluate personal risk for HIV/STIs: <math>b= -0.88^{*}</math>; <math>SE=0.34</math></li> <li>Educate others about HIV/STIs: <math>b= -1.08^{***}</math>; <math>SE= 0.31</math></li> <li>Decide whether to get tested for HIV: <math>b= -0.80^{*}</math>; <math>SE= 0.32</math></li> <li>Decide whether to get tested for STIs: <math>b= -0.75^{*}</math>; <math>SE=0.32</math></li> </ul> </li> <li>Nontailored Control with High Literacy <ul style="list-style-type: none"> <li>Evaluate personal risk for HIV/STIs: <math>b= 0.12</math>; <math>SE=0.29</math></li> </ul> </li> </ul>
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					<ul style="list-style-type: none"> <li>○ Educate others about HIV/STIs: <math>b = -0.23</math>; <math>SE = 0.27</math></li> <li>○ Decide whether to get tested for HIV: <math>b = 0.05</math>; <math>SE = 0.28</math></li> <li>○ Decide whether to get tested for STIs: <math>b = -0.28</math>; <math>SE = 0.27</math></li> </ul> <p><i>*<math>p &lt; 0.05</math>. **<math>p &lt; 0.01</math>. ***<math>p &lt; 0.001</math>.</i></p>
Boyce et al., 2018 <sup>25</sup>	<p>Program reached 3,762 students across 21 high schools in South Bronx, NY over three years.</p> <p>Study design: quasi-experimental pre- and post-test process evaluation (group-level)</p>	To evaluate the reach, fidelity, teacher feedback, and student satisfaction associated with the creation and delivery of an LGBT-inclusive version of the Reducing the Risk curriculum.	LGBT supplement to accompany an evidence-based intervention curriculum for middle and high schoolers, Reduce the Risk.	<ul style="list-style-type: none"> <li>• Knowledge of puberty</li> <li>• Knowledge of STI prevention</li> <li>• Knowledge of pregnancy prevention</li> <li>• Knowledge of HIV transmission</li> <li>• Knowledge of clinic services</li> </ul>	<p>Within each domain assessed, the change score from pre- to posttest was equal or higher for students in classes that received the LGBT supplement.</p> <ol style="list-style-type: none"> <li>1. Knowledge of puberty <ul style="list-style-type: none"> <li>○ change score= 8***, <math>d = 0.69</math></li> </ul> </li> <li>2. Knowledge of STI prevention <ul style="list-style-type: none"> <li>○ change score= 4***, <math>d = 0.45</math></li> </ul> </li> <li>3. Knowledge of pregnancy prevention <ul style="list-style-type: none"> <li>○ change score= 14***, <math>d = 1.24</math></li> </ul> </li> <li>4. Knowledge of HIV transmission <ul style="list-style-type: none"> <li>○ change score= 15***, <math>d = 1.36</math></li> </ul> </li> <li>5. Knowledge of clinic services <ul style="list-style-type: none"> <li>○ change score= 9***, <math>d = 0.80</math></li> </ul> </li> </ol> <p><i>***Difference between pre and posttest score is significant at <math>p &lt; 0.001</math>, based on paired t tests.</i></p>
Whiteley, Brown, Curtis, Ryoo, Beausoleil, 2018 <sup>26</sup>	<p>N= 60 ethnically and sexually diverse youth aged 15-24 years old (mean age = 18.6 years)</p> <p>Study design: Pilot RCT (follow up at 12 weeks postintervention)</p>	The purpose of the study was to test the efficacy of an HIV/STI Internet intervention using free, publicly available online material for racial/ethnic and sexual minority youth.	Internet intervention that includes links to interactive websites on topics related to sexual health education, influence of peer norms, and dangers of substance use.	<p>Primary outcomes:</p> <ul style="list-style-type: none"> <li>• Occurrence of unprotected vaginal and anal sex acts (USAs) in the last 3 months</li> </ul> <p>Secondary outcomes:</p> <ul style="list-style-type: none"> <li>• Use of alcohol or other drugs before or at the time of sex</li> <li>• HIV-Related Knowledge</li> <li>• Self-Efficacy for HIV Prevention</li> </ul>	<p>Unprotected vaginal/anal sex: <math>aOR = 7.77^*</math></p> <p>Alcohol or drug use before sex: <math>aOR = 3.12</math></p> <p>HIV-Related Knowledge: ANCOVA <math>F = 0.589</math></p> <p>HIV Self-efficacy: ANCOVA <math>F = 5.71^*</math></p> <p><i>*<math>p &lt; 0.05</math></i></p>
Ybarra et al., 2019 <sup>27</sup>	N=302 sexual minority boys age 14-18 years old total	The purpose of the study was to examine the program's	Guy2Guy is a mobile phone-based program using text	<p>Primary outcomes:</p> <ul style="list-style-type: none"> <li>• Acceptability</li> <li>• Feasibility</li> </ul>	<p>Acceptability</p> <ul style="list-style-type: none"> <li>• General likeability <ul style="list-style-type: none"> <li>○ 81.8% liked the quiz questions required to move up a "level"</li> </ul> </li> </ul>

	Intervention group n= 132  Study design: Mixed methods exploratory research study	feasibility and acceptability and explore participants' feedback about program content and components.	messages to deliver educational and skill-oriented information.		<ul style="list-style-type: none"> <li>○ 69.7% liked the on-demand advice feature on predetermined STI testing, relationship and coming out topics</li> <li>• Rating of program components <ul style="list-style-type: none"> <li>○ 84.9% rated text message content as the top component of the intervention</li> </ul> </li> <li>• Specific feedback about program components <ul style="list-style-type: none"> <li>○ 81.1% said the advice component of the intervention had topics that “spoke to issues that teens like me are going through”</li> <li>○ 78% said the quiz questions “made it easier to remember things in the intervention”</li> </ul> </li> </ul> Feasibility <ul style="list-style-type: none"> <li>• 3-month retention: 94% (n=283)</li> </ul>
Widman et al., 2019 <sup>28</sup>	N= 226 youth ages of 15 and 18 (M = 16.25; SD = 0.76).  21% identified as sexual minority  Study design: RCT	Purpose of study was to evaluate the feasibility, acceptability, and preliminary efficacy of HEART for Teens among all youth, and by gender and sexual orientation.	HEART for Teens (Health Education and Relationship Training) is an online, sexual health education program for adolescents.	Primary outcomes: <ul style="list-style-type: none"> <li>• Acceptability compared by sexual orientation</li> <li>• Communication intentions</li> <li>• Condom intentions</li> <li>• HIV/STD Knowledge</li> <li>• Self- efficacy (e.g. Communication self-efficacy and condom use self-efficacy)</li> <li>• Condom attitudes</li> <li>• Condom norms</li> <li>• Sexual assertiveness</li> </ul>	<ul style="list-style-type: none"> <li>• Acceptability <ul style="list-style-type: none"> <li>○ Liked program: <math>\chi^2 = 0.08</math></li> <li>○ Learned new things: <math>\chi^2 = 2.57</math></li> <li>○ Program kept attention: <math>\chi^2 = 0.85</math></li> <li>○ Will use information in the future: <math>\chi^2 = 0.15</math></li> </ul> </li> <li>• Communication intentions: <math>b = 0.55 (0.13)^{***}</math>; <math>d = 0.57</math></li> <li>• Condom intentions: <math>b = 0.30 (0.13)^*</math>; <math>d = 0.24</math></li> <li>• HIV/STD Knowledge: <math>b = 1.95 (0.21)^{***}</math>; <math>d = 1.27</math></li> <li>• Condom Attitudes: <math>b = 0.50 (0.11)^{***}</math>; <math>d = 0.55</math></li> <li>• Condom norms: <math>b = 0.44 (0.14)^{**}</math>; <math>d = 0.41</math></li> <li>• Self-efficacy: <math>b = 0.14 (0.06)^*</math>; <math>d = 0.23</math></li> <li>• Sexual assertiveness: <math>b = 0.25 (0.11)^*</math>; <math>d = 0.29</math></li> </ul> <p><math>*p &lt; 0.05</math>. <math>**p &lt; 0.01</math>. <math>***p &lt; 0.001</math>.</p>
Kuhns et al., 2020 <sup>29</sup>	Sexual minority cisgender young men aged 13-18 years old (goal to recruit n=700 participants total)	The primary objective of the study was to test the efficacy of the MyPEEPS Mobile intervention to reduce sexual risk for HIV acquisition and promote health behavior among young	MyPEEPS Mobile is an intervention adapted from a group-based HIV prevention curriculum (MyPEEPS group-level), for diverse YMSM, ages 16–20 years old.	Primary outcomes: <ul style="list-style-type: none"> <li>• # of male anal sex partners</li> <li>• frequency of sex acts with male partners (with and without condoms)</li> <li>• sex under the influence of substances</li> <li>• uptake of pre-and post-exposure prophylaxis (PrEP, PEP)</li> </ul>	*study has not yet been conducted



	Study design: RCT (follow up at 3-, 6-, and 9- month postintervention; additional follow up at 12- month for delayed intervention group)	sexual minority men.		Secondary outcomes: <ul style="list-style-type: none"> <li>HIV and STI testing at 3-, 6- and 9-month follow-up.</li> </ul>	
Decker et al., 2020 <sup>30</sup>	<p>N= 1260 adolescents aged 13-19 years old in Fresno County, CA. Median age= 15.7 years</p> <p>15.79% (194/1229) identify as LGBTQ</p> <p>Study design: cluster RCT (follow up at 3- and 9-months postintervention)</p>	The purpose of this study is to assess the effectiveness of In the Know (ITK), a program integrating in-person and technology-based sexual health education for underserved adolescents.	The intervention focuses on 3 main areas: sexual health and contraceptive use, healthy relationships, and educational and career success. It includes an in-person, classroom component, along with a web-based component to complement and reinforce key content.	<p>Primary outcomes</p> <ul style="list-style-type: none"> <li>Condom/contraceptive use at 3-month follow-up</li> <li>Abstinence in the past 3 months</li> <li>Use of any clinical health services in the past 3 months</li> </ul> <p>Secondary outcomes:</p> <ul style="list-style-type: none"> <li>Number of sexual partners in the past 3 months</li> <li>Knowledge of local clinical sexual health services</li> </ul> <p>Other outcomes:</p> <ul style="list-style-type: none"> <li>Healthy relationship skills (e.g. self-efficacy to refuse sex, self-efficacy to ask partner for HIV/STI testing)</li> <li>Career and educational success (e.g. current school enrollment and participation in job training or vocational programs)</li> <li>Goal-setting skills</li> </ul>	*research study currently in progress

Mustanski et al., 2020 <sup>31</sup>	<p>The trial has enrolled 1285 adolescent men who have sex with men (AMSM) aged 13 to 18 years, with a target enrollment of 1,878.</p> <p>Study design: hybrid type 1, sequential multiple assignment RCT</p>	<p>The purpose of the study is to test the effectiveness of the SMART program in reducing sexual risk behavior and promoting sexual health. Researchers also plan to test the effectiveness of SMART across subgroups of participants.</p>	<p>SMART is a suite of stepped-care eHealth interventions, consisting of a universal intervention offered to all participants regardless of HIV risk. Second and third selective interventions are offered to those who report HIV risk intentions or behaviors following primary intervention, and considered most at-risk for negative sexual health outcomes.</p>	<p>Primary outcomes:</p> <ul style="list-style-type: none"> <li>• Condom-less anal sex</li> <li>• Self-efficacy/intentions to use condoms</li> <li>• HIV testing</li> </ul> <p>Secondary outcomes:</p> <ul style="list-style-type: none"> <li>• HIV knowledge</li> <li>• Motivation to use condoms</li> <li>• Condom use norms</li> <li>• Condom use negotiation</li> <li>• Condom errors</li> </ul> <p>Other outcomes:</p> <ul style="list-style-type: none"> <li>• Substance use</li> <li>• PrEP (knowledge, current and past 3-month use, adherence, motivation to start, and reasons for discontinuation)</li> </ul> <p>Implementation outcomes:</p> <ul style="list-style-type: none"> <li>• Reach</li> <li>• Effectiveness</li> <li>• Cost</li> <li>• Ongoing delivery</li> <li>• Program sustainment</li> <li>• Implementation readiness</li> <li>• Barriers</li> <li>• Facilitators</li> <li>• Integration</li> </ul>	<p>*not yet assessed but provides principal findings and analytic plan</p>
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## Intrapersonal

### Knowledge

Of the 13 studies included in this review, there were six studies that evaluated, or plan to evaluate, sexual health knowledge among the population of SMY targeted in the study.<sup>20,28,25,26,31,30</sup> Mustanski et al.'s<sup>20</sup> Queer Sex Ed, an online intervention designed to promote comprehensive sexual health of lesbian, gay, bisexual and transgender youth, reported that among the 17 outcomes measured, the largest effect sizes were related to knowledge around sexual functioning, HIV and STIs, and contraceptives (z-score ranged from 5.94 to 9.68; all five measures were statistically significant with  $p < 0.001$  and effect sizes ranged from 0.21 to 0.39). Widman et al.<sup>28</sup> found statistically significant results for HIV/STI knowledge among HEART for Teens intervention participants compared to the control group ( $b(SE) = 1.95(0.21)$ ;  $p < 0.001$ ;  $d = 1.27$ ). The study population included both heterosexual and sexual minority youth, and when examining intervention effects between groups, researchers found no statistically significant differences in knowledge based on sexual orientation. Boyce et al.<sup>25</sup> focused on the evaluation of an LGBT-inclusive supplement that accompanied an evidence-based heterosexual focused sexual health curriculum, Reduce the Risk. The curriculum with the LGBT-inclusive supplement was implemented across public high schools among a sexually diverse group of students. Boyce et al. assessed improvement in five areas of knowledge (puberty, STI prevention, pregnancy prevention, HIV transmission and clinic services) using a pre- and post-test design, all of which showed statistically significant improvements (change score ranged from 8-15, all measures were statistically significant with  $p < 0.001$ , and effect size ranged from 0.45 to 1.36). It's important to note that the group that received the Reducing the Risk curriculum, but not the LGBT supplement, also showed statistically significant improvements in all categories of knowledge, but those that received the supplement showed greater statistical significance in knowledge related to puberty, STI prevention and clinic services, than the group that did not receive the LGBT supplement. This is an interesting finding given that the topics are fairly

relevant to all participants, regardless of sexual identity, and may suggest that content tailored and/or inclusive to a range of sexual identities benefits all students, regardless of sexual identity<sup>25</sup>.

Whiteley et al.<sup>26</sup> assessed HIV knowledge among a group of sexually diverse youth who participated in a free, publicly available HIV/STI Internet Intervention using a randomized control trial study design. Links to interactive websites that includes games, quizzes and videos were emailed to participants. Whiteley et al. noted that no statistically significant differences between groups in change in HIV knowledge were found ( $F=0.59$ ). Two interventions are currently being assessed to evaluate the impact they have on HIV knowledge<sup>31</sup> and knowledge of local clinical sexual health services<sup>30</sup>. Mustanski et al.'s SMART program, is a stepped-care eHealth intervention for adolescent men who have sex with men ages 13 to 18 years old, and Decker et al.'s In the Know, is a hybrid, in-person and technology-based sexual health education intervention for underserved adolescents with sixteen percent of the study population identifying as SMY. Once evaluation has been completed, the In the Know intervention and the SMART eHealth intervention both have the potential to add to the literature base of sexual health interventions for adolescents that are effective at increasing sexual health knowledge either related to HIV and accessing clinical sexual health services<sup>30,31</sup>.

## Attitudes, Norms & Self-Efficacy

### *Attitudes*

#### Internalized Homophobia

Internalized homophobia, or the direction of negative social attitudes towards the self, has a negative impact on sexual minority folks' mental health and well-being, and there is also some evidence that it may contribute to risky sexual behavior among sexual minority males<sup>32,33</sup>. Internalized homophobia was assessed by Mustanski et al.<sup>20</sup> and Hidalgo et al.<sup>21</sup> Mustanski et al. found a small but statistically significant effect size in a reduction in attitudes related to internalized homophobia when

assessing changes at two weeks post-intervention ( $d = 0.06$ ;  $p < 0.05$ ), although Hidalgo et al. did not find any statistically significant changes in attitudes related to homophobia at either 6-weeks or 12-weeks postintervention (overall effect =  $-0.44$ ; 95% CI =  $(-6.39-5.51)$ )<sup>20,21</sup>. There are a few reasons that this difference in findings could have occurred. Effects could have differed due to the different formats of the interventions—Hidalgo et al.'s MyPEEPS intervention utilized an in-person group-level format, whereas Mustanski et al.'s Queer Sex Ed intervention utilized an online approach. Additionally, the difference in effects could have been in part due to the fact that Mustanski et al.'s Queer Sex Ed intervention followed up with participants at two-weeks postintervention, whereas Hidalgo et al. followed up at six- and twelve-weeks postintervention. It is recommended that Mustanski et al. examine intervention effects for Queer Sex Ed at six- and twelve-week follow-up to more effectively compare the two intervention effects.

Mustanski et al.<sup>20</sup> assessed additional attitudes related to sexual identity including participants' sense of belonging as well as connectedness to the LGBT community, and found statistically significant improvements in both outcomes ( $z = 3.30$ ;  $p < 0.01$ ;  $d = 0.06$ , and  $z = 3.13$ ;  $p < 0.01$ ;  $d = 0.09$ ), suggesting that the intervention is effective at improving sexual identity attitudes among sexual minority youth.

#### Condom Attitudes

Widman et al.<sup>28</sup> was the only study in the review to assess condom attitudes, and found a statistically significant improvement in condom attitudes among HEART for Teens intervention participants at post-test compared to the control group ( $b(SE) = 0.50(0.11)$ ;  $d = 0.55$ ;  $p < 0.001$ ).

#### *Norms*

Similar to attitudes, norms are also a determinant of behavior, but while attitudes refer to the degree in which a person has a positive or negative viewpoint of a specific behavior, norms are defined as the perceived social pressure to perform a specific behavior<sup>34</sup>. Subjective peer norms, including

norms related to condom use, have repeatedly been found to be a protective factor for sexual risk behavior among heterosexual adolescents and young men who have sex with men (YMSM)<sup>35-36</sup>. Widman et al.<sup>28</sup> was the only study to include condom norms as a measure when assessing their HEART for Teens intervention. Findings showed that the intervention had a statistically significant impact in improving condom norms among intervention participants, regardless of sexual orientation ( $b(SE)=0.44, (0.14); p=0.001; b= 0.41$ ). Mustanski et al.<sup>31</sup> include a measure on condom use norms, but because the intervention is in the process of evaluation, authors have not yet reported on the effect the eHealth intervention has on promoting condom use norms. Given that only two interventions assessed, or plan to assess, condom norms, there appears to be a need for future research to include condom norms in interventions and evaluation.

### *Self-Efficacy*

Five studies assessed outcomes related to self-efficacy, including self-efficacy to get HIV or STI testing, self-efficacy to come out as a sexual minority and self-efficacy to participate in or refuse sex.<sup>20,26,22,28,21</sup> Mustanski et al.<sup>20</sup> analyzed coming out self-efficacy as well as sexual agreement self-efficacy when testing their online intervention, Queer Sex Ed. Results for coming out self-efficacy were statistically significant ( $p < 0.001$ ; effect size  $d = 0.10$ ), while results for sexual agreement self-efficacy were not statistically significant ( $p = 0.07$ ; effect size  $= 0.04$ ). Whiteley et al.<sup>26</sup> found significant improvement in reported self-efficacy for HIV prevention at follow-up for participants in the Internet Intervention compared to the control group ( $F [1,58] = 5.71, p = 0.021$ ). Bauermeister et al.'s<sup>22</sup> Get Connected!, a tailored, online intervention for YMSM, found improvements in multiple factors of self-efficacy related to testing among the group of YMSM in the tailored condition compared to the test locator-only group. Significant self-efficacy measures included self-efficacy to delay sex until a partner received HIV testing ( $p < 0.01, t = 2.63$ ), self-efficacy to communicate with a partner to get tested for HIV ( $p < 0.01, t = 2.73$ ), and self-efficacy to persuade a partner to get tested together ( $p < 0.01, t = 1.51$ ). Safer

sex self-efficacy for participants in Widman et al.'s<sup>28</sup> HEART for Teens intervention group was statistically significant ( $b(SE)=0.14(0.06)$ ;  $p=0.031$ ;  $d=0.23$ ). There were no statistically significant differences based on sexual orientation showing that this intervention was effective for both heterosexual and sexual minority youth.

Although self-efficacy for safer sex was not statistically significant among Hidalgo et al.'s<sup>21</sup> MyPEEPS group-level curriculum intervention group compared to the control group ( $p=0.65$ ), trends were headed in the expected direction with the intervention group showing greater self-efficacy for safer sex at six weeks post intervention. Mustanski et al.'s<sup>31</sup> SMART program, a stepped-care eHealth intervention for adolescent men who have sex with men (AMSM), is currently in the process of assessing the effectiveness of the program in increasing condom self-efficacy. If successful, the SMART intervention may add to the literature base of sexual health interventions for sexual minority adolescents effective at increasing intentions to use condoms. Decker et al.'s<sup>30</sup> hybrid sexual health education intervention for underserved adolescents, In the Know, includes outcome measures to assess self-efficacy to refuse sex and self-efficacy to ask partner for HIV/STI testing. If successful, In the Know could add to the literature base of sexual health interventions effective at increasing self-efficacy to ask a partner for HIV/STI testing. Additionally, if successful, In the Know, could also be one of the only sexual health interventions that currently shows a significant impact on adolescent self-efficacy to refuse sex.

## Interpersonal

### Negotiation and Communication

Four studies included outcomes related to communication, with three studies noting significant results.<sup>20,28,19,21</sup> Mustanski et al.<sup>20</sup> assessed communication on two different constructs, one focused on relationship variables and the other on safer sex. Using a healthy relationships measurement construct, Mustanski et al. assessed participant's confidence in creating and adhering to sexual agreement, and

found significant effects when comparing pre- and post-test data among Queer Sex Ed participants ( $z=2.73$ ;  $p<0.01$ ;  $d=0.08$ ).

Mustanski et al.<sup>20</sup> measured the effect of Queer Sex Ed on sexual assertiveness among participants, and found significant effects in improving this outcome ( $z= 4.23$ ;  $p<0.001$ ;  $d= 0.11$ ). Sexual assertiveness is an essential skill to effectively communicate sexual beliefs and desires with partners, as well as to refuse unwanted sexual coercion, especially for sexual minority youth who are at an increased risk for sexual violence victimization<sup>37</sup>. Widman et al.<sup>28</sup> also included a measure to assess sexual assertiveness among HEART for Teens intervention participants, and found that the intervention had significant findings in improving this outcome ( $b(SE)=0.25(0.11)$ ;  $p=0.023$ ;  $d=0.29$ ). Additionally, Widman et al.<sup>28</sup> assessed sexual communication intentions and reported a statistically significant increase among the HEART for Teens intervention group compared to the control group ( $b(SE)=0.55(0.13)$ ;  $p<0.001$ ;  $d=0.57$ ), with no statistically significant difference by sexual orientation.

Ybarra et al.<sup>19</sup> utilized moderator-led, online focus groups male sexual minority youth to examine how this method of sexual health intervention could potentially impact behavioral and attitudinal changes. Researchers assessed qualitative responses to four exit interview questions and reduced themes to five axial codes, one of which being that participants gained an ability to talk about sex or sexuality. Some participants indicated that the online focus group/discussion format made them feel more comfortable talking about sex, sexual health or sexuality, and some even expressed a new desire to advocate and raise awareness about sexual health with their peers. This theme shows that online moderator-led focus groups may be an effective mechanism to promote sexual communication skills among sexual minority youth, but more research should be conducted to better understand this effect, especially given that this is the first evidence for online focus groups as an intervention for HIV preventive behaviors.



Hidalgo et al.'s<sup>21</sup> MyPEEPS group-level intervention for adolescent men who have sex with men assessed participants' assertive safer-sex related communication, but did not find any statistically significant differences between the intervention and control groups ( $p=0.07$ ). The authors mention that the control group exhibited greater baseline health protective communication than participants in the intervention group, which could contribute to a level of bias in the outcome.

#### HIV and STI Testing

Five studies in the review contained outcomes for HIV and STI testing behaviors.<sup>23, 22,24,29,31</sup> Ybarra et al.'s<sup>23</sup> mHealth program that uses text messages to deliver sexual health education and skill-oriented information to cisgender, sexual minority male ages 14 through 18 years old, found a significant change in HIV testing behavior among intervention participants. At the end of the intervention, the intervention group was significantly more likely to report getting an HIV test compared to the control group (aOR= 3.42;  $p<0.001$ ). At 90-days postintervention, twice as many intervention participants reported getting tested for HIV compared to control participants (55% vs 28%; aOR = 3.42,  $p=0.001$ ). It is important to note that the HIV testing outcome was only analyzed among youth who were sexually experienced at baseline (50.4%;  $n=69$ ).

Bauermeister et al.<sup>22</sup> analyzed self-efficacy to get HIV testing as well as HIV testing and diagnoses when assessing their Get Connected! eHealth intervention for YMSM. At baseline, 70.8 percent of participants reported being HIV-negative, with the median time since their last HIV test being six months. Of the participants who completed the 30-day follow-up assessment ( $n=104$ ), 31 percent ( $n=32$ ) of participants reported having been tested for HIV and/or STIs, of which 32.4 percent ( $n=22$ ) were from the intervention condition ( $\chi^2=1.18$ ; not significant). No outcomes were statistically significant, but the effect size was 0.34, which the authors felt suggested preliminary efficacy for the intervention<sup>22</sup>. Horvath and Baumeister<sup>24</sup> assessed the impact of intervention tailoring on HIV/STI

testing behaviors by comparing a tailored version of the Get Connected! intervention to a nontailored version of Get Connected!. Compared to participants in the tailored intervention group, participants in the nontailored control condition were less likely to report deciding to get tested for HIV and STIs at 30-day follow up, but findings were not significant (HIV testing-  $b(SE) = 0.21(0.26)$  vs  $-0.80(0.32)$  and STI testing-  $b(SE) = 0.28(0.27)$  vs  $-0.75(0.32)$ ).

Kuhns et al.<sup>29</sup> adapted a group-based HIV prevention curriculum to develop the MyPEEPS mobile intervention-- an mHealth sexual health intervention to promote health behavior and reduce sexual risk for HIV among racially and ethnically diverse sexual minority men ages 13 through 18 years old. MyPEEPS mobile intervention has not yet undergone evaluation, but Kuhns et al. provide a study protocol to test the efficacy of the intervention in promoting HIV and STI testing among the identified population. Mustanski et al.<sup>31</sup> also plan to assess impact on HIV and STI testing behaviors by evaluating their SMART intervention, a suite of stepped-care eHealth interventions for youth. If successful, the MyPEEPS mobile intervention and the SMART intervention could add to the literature base of effective sexual health interventions for sexual minority youth aimed at promoting health behavior.

## Sexual Behavior

Six studies included at least one measure related to sexual behavior including abstinence, number of sex partners, CSA's and sex under the influence of alcohol or drugs.<sup>23,30,21,26,29,31</sup>

### *Abstinence*

At 90-days postintervention, Ybarra et al.<sup>23</sup> evaluated differences in abstinence between Guy2Guy intervention and control groups and did not find a significant difference in abstinence between the groups ( $\chi^2 = 0.09$ ;  $p = 0.77$ ). Ybarra et al. also evaluated abstinence among participants who reported being sexually active at baseline and found that sexually experienced participants at baseline were significantly less likely to report abstinence at 90-day postintervention compared with the sexually

experienced control group (aOR = 0.48; p= 0.05). Authors point to the sex-positive messaging in Guy2Guy, which was used to address fears around painful anal sex mentioned in focus groups used to assist in developing the intervention, and how this may have negatively impacted the abstinence outcome. While this finding may leave some folks concerned that the intervention might promote engaging in sexual behavior, researchers note that the number of CSAs were unchanged across as well as within the intervention group, suggesting that the intervention does not promote risky sexual behavior<sup>23</sup>. Decker et al.'s<sup>30</sup> In the Know, the intervention for underserved adolescents, is the only other intervention that included an outcome related to abstaining from sexual behavior, and is currently in the process of evaluation.

*Number of Sex Partners and frequency of sex acts (with and without a condom)*

When used effectively and consistently, condoms are the only way to protect sexually active people from HIV and STIs, therefore a common sexual behavior outcome monitored in sexual health intervention efficacy is the number of condom-less sex acts<sup>38</sup>. Hidalgo et al.<sup>21</sup> did not find any statistically significant differences in variables examining unprotected sex, or number of unprotected anal sex acts with a male between the intervention and control group at 6-weeks (OR=1.09; 95% CI=(0.35-3.41); OR=0.48, 95% CI=(0.10–2.18)) or at 12-week follow up (OR=1.06, 95% CI=(0.36–3.10); OR=0.61, 95% CI=(0.13–2.96)) when assessing the MyPEEPS intervention. Ybarra et al.'s<sup>23</sup> Guy2Guy mHealth intervention also did not find any significant differences in CSA's between intervention and control group at 90-days postintervention (t(151)= -1.44; p=0.15). The characteristics of the sample are a concern given the young age of the sample and the small sample size of sexually active youth.

Whiteley et al.<sup>26</sup> provides the only currently available study to find a significant reduction in CSA's at three month follow up (12.5 vs. 47.6%, aOR= 7.77; p<0.05) when assessing their publicly available internet intervention<sup>26</sup>. Kuhns et al.<sup>29</sup> and Mustanski et al.<sup>31</sup> include measures in their research

protocols to assess the impact their intervention has on participants' number of sex partners with and without a condom.

#### *Sex under the influence of alcohol or drugs*

Three studies included sex under the influence of alcohol and/or drugs as an outcome<sup>26,21,29</sup>. Whiteley et al.<sup>26</sup> found that participants in their intervention showed a slight reduction in alcohol and/or drug use during sex at post-intervention, but the findings were not statistically significant (aOR= 3.12). Hidalgo et al.<sup>21</sup> reported a reduction in any sex under the influence of alcohol or drugs at 6-weeks and 12-weeks postintervention when assessing their MyPEEPS group-level intervention. When combining both time points to estimate effects for the overall follow-up period, Hidalgo et al. found results to be statistically significant, indicating that the pilot intervention was successful in reducing sex under the influence of alcohol or drugs among participants (OR= 0.35; 95% CI= 0.12-0.99,  $p<0.05$ ). When combining both time points to estimate effects on reduction in the occurrence of unprotected sex under the influence of alcohol and/or drugs, results were not statistically significant (OR= 0.23; 95% CI= (0.05–1.15)). These findings indicate that while the intervention shows promise for reducing sex under the influence of substances, those who chose to engage in sexual activity under the influence did not change their behaviors related to condom use. Kuhns et al.<sup>29</sup> have not yet evaluated the MyPEEPS mobile intervention impact on sex under the influence of substances<sup>29</sup>. Because this intervention is adapted from the MyPEEPS group-level curriculum mentioned above, it will be interesting to see how adapting the content to a mobile version influences effects on sexual activity under the influence of alcohol and/or drugs.

## Adverse Health Outcomes

### HIV and/or STI Diagnosis

No studies in the review included outcomes measures of intervention impact on HIV and/or STI diagnosis. There also were no measures of unintended pregnancy. These questions were sometimes asked at the beginning of a study to get a baseline understanding of the population, but behaviors and attitudes towards HIV/STI testing were more commonly measured as an outcome rather than an actual diagnosis of HIV or an STI.

### Factors that Impact Acceptability

Acceptability refers to how well an intervention will be received by, and the extent to which the intervention meets the needs of the target population<sup>39</sup>. In addition to identifying effective sexual health interventions for sexual minority youth, this review also sought to identify studies that examined intervention acceptability among sexual minority youth. Six of the studies included in the review evaluated intervention acceptability either qualitatively or quantitatively, or both.<sup>28,27,20,22,25,21</sup> When asked if they liked the program, Widman et al.<sup>28</sup> found that 81 percent of sexual minority youth that participated in HEART for Teens agreed (difference between heterosexual vs sexual minority youth was not statistically significant;  $\chi^2=0.08$ ;  $p=0.79$ ). Ybarra et al.<sup>27</sup> found that among participants of the Guy2Guy intervention, 93 percent indicated that they liked the program, with the highest rated component being the content delivered via text message, suggesting that incorporating the use of text messages is one mechanism to facilitate sexual health education to sexual minority youth<sup>27</sup>. Participants of Mustanski et al.'s<sup>20</sup> Queer Sex Ed intervention gave an average rating of 4.2 out of five stars for intervention content ( $SD=0.56$ ), indicating that they liked the inclusion of relationships skills and sexual functioning content. Bauermeister et al.<sup>22</sup> found that participants of the GetConnected! intervention group were significantly more likely to agree that the intervention provided them accurate information

compared to the control group who only received test-locator information ( $t$  test=2.99;  $d$ =0.55;  $p$ <0.01). Among those involved in Boyce et al.'s<sup>25</sup> study, 70 percent of participants that received the LGBT supplement indicated the lessons were good or great compared to 57 percent of participants who only received the Reduce the Risk intervention but not the LGBT supplement ( $p$ =0.0006). Hidalgo et al.<sup>21</sup> found that intervention participants rated the MyPEEPS program as moderately acceptable (mean= 24.7;  $SD$ = 13.6; range= 8-48), with 55 percent agreeing that the program was helpful. Qualitative themes related to relational aspects of the intervention (e.g., meeting others, friendly facilitators) showed that social support and opportunities to engage with others with similar identities could be important factors to include in sexual health interventions<sup>14</sup>.

## Discussion

### Summary of Evidence

While there remains much work to be done when it comes to eliminating the sexual health disparities that sexual minority youth face, this review shows that there are promising sexual health interventions that can help work towards this goal. The purpose of this review was to identify sexual health interventions developed for, or inclusive of, sexual minority youth and understand the impact they have on intrapersonal and interpersonal domains. Consistent with previous findings, the interventions included in this review had the strongest impact on improving sexual health outcomes related to knowledge and reports of self-efficacy<sup>20,40</sup>.

Most interventions that assessed individual-level outcomes also assessed interpersonal, behavioral outcomes, although there were fewer significant findings related to this level of intervention. An interesting finding is that interventions that found a statistically significant impact on communication skills were eHealth-based and had some type of interactive format such as a quiz or another opportunity to apply what they learned, suggesting that an opportunity to apply what has been taught is an

important component to impacting communication behaviors. For example, Widman et al.'s<sup>28</sup> HEART for Teens intervention had a component where participants received a prompt and were asked to record themselves verbally refusing sex using the skills they've learned. Ybarra et al.'s<sup>23</sup> Guy2Guy intervention used "level up questions" where participants received a text message quiz question related to that week's content and if they answered it correctly they would move up a level.

This review did not identify any interventions that positively impacted adverse health outcomes. Given that study participants are underage and the sample sizes of sexually experienced youth tend to be small, it is understandable why changes in health outcomes would be less likely to be identified. Additionally, the studies in the review did not assess intervention effects past 90-days postintervention. Future studies should examine the longitudinal impact these interventions have on adverse health outcomes for sexual minority youth<sup>14</sup>.

There were significant associations for interventions that included heterosexual and sexual minority youth in the sample, suggesting that one way to address sexual health disparities is to ensure that the material is inclusive of all identities (e.g., being mindful of the terms being used, "partner" vs. "boyfriend" or "girlfriend"; examples of same sex couples). Interventions with the most significant effects tended to be taken from existing evidence-based interventions and adapted to be inclusive of sexual minority youth, or tailored to be specific to a sub-set of sexual minority youth. One way forward would be to systematically adapt interventions that have demonstrated efficacy to be more inclusive, rather than developing an intervention from scratch.

The review also identified three studies currently under evaluation, or planning to be evaluated, to assess their impact on sexual minority youth.<sup>29-31</sup> This is promising given the lack of available evidence on this topic for this population, and suggests that there are increasing efforts being made to be more inclusive of, and better understand the sexual health needs of sexual minority youth.

The second goal of this review was to identify intervention components that contribute to the acceptability of sexual health interventions among sexual minority youth. Studies with high acceptability were interventions that included some or all components electronically, suggesting that computerized, online and/or mobile-phone based sexual health interventions may be a beneficial method to deliver sexual health content. Mustanski et al.<sup>20</sup> had participants select their top sexual health goal and found that female-born participants selected improving communication with their partner as their top goal, and male-born participants selected getting an HIV test as their top goal. This finding suggests the importance of incorporating communication skills and information related to HIV and STI testing in sexual health interventions. It also suggests that there may be different priorities by sex and gender, highlighting the sociocultural differences that exist within adolescents, including within sub-groups of sexual minority youth. Additional research is needed to understand if tailoring an intervention to be inclusive of sexual minority youth alone is effective in impacting change, or if it would be more effective to tailor interventions to specific sexual orientations (e.g., lesbian or bisexual adolescents) and gender identities<sup>41</sup>.

## Limitations

It is important to note that several limitations exist within as well as across the studies included in this review. Almost all studies were subject to some type of bias that impacted internal or external validity, including sampling bias and/or systematic errors such as selection bias and information bias. Sampling bias could have occurred in studies with specific inclusion criteria, which would lead to a lack of generalizability to other populations. External validity is another limitation that needs to be considered. For example, there were several studies in which the intervention was specifically for cisgender males such as Get Connected!, Ybarra et al.'s moderator-led focus group intervention, Guy2Guy and MyPEEPS (group-level curriculum and mHealth intervention).<sup>22,24,19,23,27,21,29</sup> Because the



samples were limited demographically, results cannot be generalized beyond the sample included in the study. This points to a need for interventions to be tailored to or inclusive of other sexual minority folks such as sexual minority females and gender non-conforming youth to understand intervention effects among these groups<sup>14</sup>.

Recruitment methods are subject to selection bias— for example, many studies that used an electronic or mobile method of delivery recruited from social media sites such as Facebook and Instagram. While mHealth studies appear to be an effective way to engage sexual minority youth, they tend to require participants to own their own cell phone and have unlimited text messaging which limits who can participate in the intervention<sup>24,27</sup>. Attrition bias was also a concern for studies that lost a significant number of participants during follow up such as Hidalgo et al.'s study<sup>21</sup>, who lost about 25 percent of their original sample in follow up.

A main limitation of sexual health behavior research is that it is contingent on self-report data, which is subject to social desirability bias given the stigma associated with sexual health behaviors, especially among sexual minority populations<sup>21</sup>. This is important to keep in mind when analyzing self-report data, and future studies should incorporate methods to reduce the bias associated with self-reporting sexual behaviors if possible. For example, for the Guy2Guy Pilot study, Ybarra et al.<sup>23</sup> blinded both the intervention and control group to attempt to distribute bias evenly across groups. They also used time-anchored responses, responses anchored to specific partners, and utilized a short period of recall to promote reliability in self-report data<sup>42</sup>. There is a need for additional research to evaluate the accuracy of methods to reduce bias associated with self-report data, but studies have shown that anonymity, self-administration and computerized/electronic methods of assessment may reduce social desirability bias<sup>42</sup>.

Most studies included in the review utilized a randomized control trial study design with a few studies blinding the intervention and control groups and/or the researchers in order to lower the risk of bias when analyzing results. For the studies that did not utilize a randomized control trial study design, it is difficult to assess if changes in outcomes were due to the intervention or other outside factors. For example, Mustanski et al.'s<sup>20</sup> *Queer Sex Ed* had several statistically significant findings but researchers utilized a nonexperimental pre-posttest change design and so while the findings are promising, the next step will be to test the intervention utilizing an experimental study design with a control group. Additionally, Boyce et al.<sup>25</sup> utilized a group-level pre-posttest process evaluation design, and so while researchers showed that replicating an evidence-based program to be inclusive of sexual minority youth is feasible, they were not able to evaluate the impact of the intervention on sexual health outcomes.

Limitations related to the process of the systematic review are also important to mention. The review was conducted by one person and so there is a chance that some articles that met inclusion criteria may have been missed. There also were some studies that appeared in the search that seemed promising, but that were not accessible to the reviewer and therefore excluded from the final selection.

## Conclusion

Sexual minority youth experience elevated rates of adverse sexual health outcomes compared to their heterosexual peers. While sexual health interventions are one way to promote sexual health and reduce sexual risk behaviors, they tend to be developed for and evaluated with heterosexual, cisgender youth. Little is known about what sexual health interventions exist that are effective at reducing sexual risk behaviors and outcomes, and promoting positive sexual health development for sexual minority youth. The purpose of this review was twofold: (1) to examine the literature to identify US-based sexual health interventions that either target or include sexual minority youth in the sample, and to understand the impact they have on individual and interpersonal outcomes, and (2) to identify

intervention components that contribute to the acceptability of sexual health interventions among sexual minority youth. Findings from this review indicate that there are several sexual health interventions available for implementation in online and group settings that are effective at improving knowledge and self-efficacy. However, information about reducing sexual risk behavior and health outcomes and thereby promoting sexual health among sexual minority youth, is still lacking. This topic is still in an early phase of research and additional, longitudinal research should be conducted to understand the longer-term impact of these interventions on sexual health behaviors and outcomes.

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