Effects of a school-based sexuality education program on peer educators: the Teen PEP model

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Abstract
This study evaluated the impact of the Teen Prevention Education Program (Teen PEP), a peer-led sexuality education program designed to prevent unintended pregnancy and sexually transmitted infections (STIs) including HIV among high school students. The study design was a quasi-experimental, nonrandomized design conducted from May 2007 to May 2008. The sample consisted of 96 intervention (i.e. Teen PEP peer educators) and 61 comparison students from five high schools in New Jersey. Baseline and 12-month follow-up surveys were conducted. Summary statistics were generated and multiple regression analyses were conducted. In the primary intent-to-treat analyses, and secondary non-intent-to-treat analyses, Teen PEP peer educators (versus comparison students) reported significantly greater opportunities to practice sexual risk reduction skills and higher intentions to talk with friends, parents, and sex partners about sex and birth control, set boundaries with sex partners, and ask a partner to be tested for STIs including HIV. In addition in the secondary analysis, Teen PEP peer educators (as compared with the comparison students) had significantly higher scores on knowledge of sexual health issues and ability to refuse risky sexual situations. School-based sexuality education programs offering comprehensive training to peer educators may improve sexual risk behavior knowledge, attitudes and behaviors among high school students.

Introduction
Adolescents are more concerned about sex and sexual health than any other health issue in their lives [1]. Adolescence is a time period of sexual health development including the development of sexual identity, self-esteem and sexual responsibility [2]. For some, adolescence is also a time period of sexual initiation, pressure to initiate sexual activity and sexual experimentation [2]. In a nationally representative survey of US high school students, for example, almost half (47%) of students reported ever having sexual intercourse [3]. The importance that adolescents place on sex and sexual health, the significance of the developmental period and the fact that for many, sexual initiation occurs during adolescence suggests that adolescence is a critical time period to influence the development of a healthy sexual future.

Evidence suggests that adolescents need additional support in obtaining knowledge, skills and behaviors that may promote healthy sexual development. An analysis of data from the 2011 National Youth Risk Behavior Survey found that 21% of US female high school students did not use contraception at first intercourse and nearly one-third of all high school students did not use a condom the last time they engaged in sexual intercourse [3]. One in four sexually active high school students reports using alcohol or drugs during their most recent sexual encounter [3]. In addition, many adolescents have limited knowledge about basic sexually
transmitted infection (STI) including HIV transmission facts. Thirty-nine percent of 18- to 29-year olds from a US nationally representative survey reported that they believed a person can spread HIV by sharing a glass, kissing, or touching a toilet seat [1].

School health education classes provide one avenue through which to promote the development of healthy sexual futures. Schools represent an institution that is regularly attended by many adolescents and is designed to teach both information and skills. Given the interaction and natural exchange of information among peers particularly in school, peers groups in school settings may also represent an opportunity to promote the development of healthy sexual futures. Supporting evidence suggests that adolescents may be more likely to change their attitudes and behaviors, if they believe that the messenger, such as a peer educator, faces similar concerns and pressures [3–7].

Peer education programs have demonstrated success in changing sexual health knowledge, attitudes and health behaviors [5, 7–14]. Peer education programs include programs that train students to disseminate accurate information, model responsible behaviors, and provide their peers with the skills and motivation to promote healthy sexual behavior [4–6, 15]. A few studies among adolescents have investigated the effects of training on peer educators themselves [16–20]. For example, one well-designed study evaluating the impact of a community-based HIV/AIDS peer leadership prevention program showed that over a 9-month period peer leaders had increased HIV/AIDS knowledge versus a comparison group [16]. Furthermore, the differences were sustained and enhanced over time [16]. There have been, however, not very many studies and the other studies have had small sample sizes [18, 20], been focused on rural populations, and have had inconsistent findings [19].

This study evaluates the impact of a statewide, school-based, comprehensive sexual health program on peer educators and a matched comparison group. Developed in 1995, the Teen Prevention Education Program (Teen PEP) (http://www.state.nj.us/health/aids/teenpep.shtml), trains junior and senior high school students, through a structured year-long course, to conduct a series of informational and skill-building workshops with groups of younger peers. The current evaluation included a primary intent-to-treat analysis to determine the impact of Teen PEP based on the original assignment to intervention versus comparison group and a secondary efficacy analysis, i.e. non-intent-to-treat analysis, to determine the impact based on receipt of the intervention.

Program description
Teen PEP is a school-based, comprehensive sexual health program that utilizes peer-to-peer education to increase students’ knowledge, skills and behaviors associated with the reduction of unintended pregnancy, STIs and HIV. The Teen PEP model is grounded in a multi-theoretical approach and includes constructs from the social learning theory [21], the health belief model [22] and the principles of youth leadership development [23]. Teen PEP is implemented in high schools as a health course and includes characteristics cited as important for effective programs [10]. Schools implementing Teen PEP work closely with the program developers for 2 years and are then able to sustain the program with less intensive support beyond the initial 2-year period.

There are two main phases to Teen PEP including planning and implementation. The planning phase occurs in the first year where a school stakeholder team focuses on building the infrastructure to support program implementation. The infrastructure includes: (i) generating support and obtaining curriculum approval from administrators, parents, faculty and other relevant groups; (ii) scheduling the Teen PEP course into the school day; and (iii) selecting a team of two adult advisors to teach the course. Adult advisors receive over 60 h of interactive and comprehensive training by the program developers.

During the implementation phase in the second year and beyond, 15–20 junior/senior students representative of the student body are enrolled in a daily, year-long Teen PEP course for which they earn course credit. These students become Teen
PEP educators. Junior and senior students are recruited because the Teen PEP involves mentoring younger students, i.e. freshman and sophomore students. The Teen PEP course is team-taught by the adult advisors, who use an activity-based facilitation model and a structured 16-unit curriculum. In turn, peer educators conduct a series of five structured workshops with the younger students.

### Methods

#### Study design

This study employed a quasi-experimental, matched comparison group design and was conducted from May 2007 to May 2008. Five of 40 (13%) schools implementing Teen PEP in New Jersey high schools participated in the study. The five schools were selected based on their demonstrated fidelity to the Teen PEP intervention. Demonstrated fidelity was defined by the following criteria: (i) the Teen PEP course is offered as a year-long course for credit, (ii) two trained adult advisors co-facilitate the Teen PEP course using the Teen PEP curriculum, (iii) peer educator groups participate in an initial 3-day overnight retreat, and (iv) peer educators conduct a series of five workshop topics with a consistent group of younger peers. In addition, schools were selected to be representative of the Teen PEP network, which includes urban and suburban schools across the state of New Jersey, serving students of a broad range of ethnicities. This study was approved by the Johns Hopkins University Institutional Review Board.

#### Participant recruitment

The opportunity to apply for participation to be a Teen PEP educator was open to all students in the spring prior to their junior and/or senior year. Students were made aware of the opportunity through posters displayed through the school building, announcements and presentations to classrooms. Trained Teen PEP adult advisors conducted recruitment. Students desiring to become peer educators were required to complete a written application, which gathered their contact information, volunteer activities, parent permission and commitment to attend required program events in addition to the Teen PEP course (overnight retreat, annual conference). Students were asked to share why they wanted to become a peer educator, their ideas about what teenagers needed to know about sexual health, and how their friends would describe them. Although they did not have to hold leadership positions in their school or community, students were also asked about involvement in leadership roles (i.e. holding office in clubs, participating in sports teams or other extracurricular activities, involvement in coordinating in school and out of school projects) and this was defined as demonstrated leadership. Students who submitted completed applications were invited to participate in a group interview with 10–15 other applicants. The group interview assessed the extent to which individual applicants could work well with a group, communicate ideas to others, demonstrate compassion toward others, actively listen and show enthusiasm for the topic. Students with favorable group interview evaluations by the adult advisors were invited to participate in an individual interview. Individual interviews assessed an applicant’s leadership potential such as the ability to organize and inspire others, ability to follow through on commitments, capacity for self-awareness and to be self-reflective, and ability to connect with others in meaningful ways. Additional questions included an applicant’s perspective on teamwork and being a role model, ability to handle sensitive topics and impact the program might have on their current responsibilities and obligations.

A total of 244 students were screened for Teen PEP and 69% (168) were interviewed by adult advisors (Fig. 1). Among the 168, one hundred and four students were selected for the program. After selection of the Teen PEP educators, adult advisors from each of the five intervention schools identified and selected a separate set of students (n = 64; approximately 13 from each school) were selected as a comparison group. The comparison group of students was selected based on their similarity to Teen PEP students. Similarity was defined based on characteristics such as age, gender, race/ethnicity, academic performance, school attendance.
and demonstrated leadership or leadership potential. Ninety-two percent (96/104) of the Teen PEP peer educators completed the baseline survey and 100% (96/96) completed the 12-month follow-up survey. Hundred percent (64/64) of the comparison students completed the baseline survey and 95% (61/64) completed the 12-month follow-up survey. Thus, a total of 157 students were included in the primary intent-to-treat analyses. For the secondary efficacy analysis, 15% (14/96) of the Teen PEP peer educators did not receive the intervention and thus were re-assigned for the efficacy analysis to the comparison group. A total of 157 students were included in the secondary analysis.

Intervention

Selected peer educators (intervention students) were enrolled into Teen PEP and participated in an initial 3-day, overnight retreat between May and September 2007. The retreat focused on team-building, group development, communication and active listening skills, and basic sexual health information. After the retreat in September 2007, peer educators began their classroom training. The Teen PEP course focused on a variety of topics including teamwork, presentation and facilitation skills, puberty, postponing sexual involvement, birth control methods, the prevention of STIs and HIV, dating violence and date rape prevention, sexual harassment prevention, the impact of alcohol and other drugs on sexual decision-making, and homophobia reduction. The course closed with a celebration activity to acknowledge the contributions of each peer educator. In total, students received over 140 h of comprehensive training and preparation for their role as peer educators and conducted a series of five structured workshops with a younger group of peers.

In four schools, Teen PEP was implemented as a daily class that met for approximately 45 min each school day. In the fifth school, peer educators met daily for a period of approximately 80 min each day.

Measures

Participants completed confidential paper and pencil surveys at baseline and 12-month follow-up. The surveys included demographic characteristics, sexual behavior and knowledge. The measures are described below.

Demographic variables

(i) Gender (male, female), (ii) age (continuous) and (iii) race (Caucasian, African American, Asian and Other).

Sexual activity and behavior

(i) Sexual activity ever (yes, no) and of those sexually active, (ii) age at first sex (continuous), (iii) method of birth control at last sex (no method, birth control pills, condoms and other including Depo Provera, withdrawal, diaphragm, spermicide foam/jelly, female condom), (iv) condom use frequency in the last month (never, some of the time, half of the time, most of the time, always; recoded as less than always, always), (v) birth control use (never, some of the time, half of the time, most of the time, always; recoded as less than always,
always), (vi) visited a healthcare professional (yes, no), (vii) ever STI/HIV tested (yes, no), and (viii) STI ever (yes, no).

**Knowledge**

Using a 22-item index, we measured knowledge of sexual health issues related to how to prevent a pregnancy, prevention of STIs and HIV. Questions included true or false, ‘A sexually active girl can become pregnant if she forgets to take her birth control pills for 2 days in a row’, multiple choice, ‘To use a condom the correct way a person must …’ (circle all that apply) and open-ended questions, ‘Place the behaviors below in order of least risky to most risky for getting HIV …’. For each individual, we averaged the items to create an overall score called ‘knowledge’. Higher scores indicated a greater level of knowledge.

**Parental communication**

Students’ attitudes toward the importance of talking with parents about sexual health issues were measured using six items with a Likert scale response format ranging from 1 (strongly disagree) to 4 (strongly agree) [24, 25]. The final scale with six items had good reliability (Cronbach’s alpha = 0.86).

**Self-efficacy**

Students’ evaluations of their ability to refuse risky sexual situations when pressured by a partner were measured using an 11-item scale (If someone I liked a lot wanted me to have sex, I am sure I could say ‘no’ if I was not ready, if my partner refused to use condoms, I could refuse to have sex …) [25]. Likert scale responses were coded 1 (strongly disagree) to 4 (strongly agree). The final scale including 10 items had excellent reliability (Cronbach’s alpha = 0.92).

**Decision-making**

Participants’ ability to make responsible decisions and to think ahead about their decisions was measured via nine items although only four were retained for the final scale [26]. Items asked participants to indicate how often they think about the consequences of sexual decisions, gather the necessary information before making a sexual decision, or make spontaneous decisions. Responses ranged from 1 (never) to 4 (very often). The final scale had a poor reliability (Cronbach’s alpha = 0.59). Because of the poor reliability of this scale, we did not proceed with analyses regarding decision-making.

**Clarity of values around sexual behavior**

The degree to which participants are unclear about their personal rules and values regarding their sexual behavior was measured via five items on a four-point Likert scale where 1 indicated strongly disagree and 4 indicated strongly agree [26]. Higher scores indicated less clarity. This scale had a questionable reliability (Cronbach’s alpha = 0.60). Because of the questionable reliability of this scale, we did not proceed with analyses regarding clarity of values.

**Sexual health information**

Five items assessed the degree to which participants were learning relevant sexual health information in school. Specifically, participants indicated how much they agreed with statements like, ‘I have received enough information in school to make good decisions about my sexual behavior and I have received enough information in school on how to prevent pregnancy …’. Responses ranged from 1 (strongly disagree) to 4 (strongly agree). After factor analysis, one item was dropped and the final four items had a good reliability (Cronbach’s alpha = 0.83).

**Opportunity to practice skills**

Three items informed by the social learning theory measured participant’s assessment of the opportunities to practice risk reduction behaviors such as putting on a condom or negotiating for condom use with a partner. Likert scale responses ranged from 1 (strongly disagree) to 4 (strongly agree). This scale had a good reliability (Cronbach’s alpha = 0.87).
**Intentions**

Participant’s intentions to implement behaviors associated with reduced risk of pregnancy, STIs and HIV were assessed via 11 items. Participants indicated how likely they would be to talk with friends, partners, and parents about sex and protection, obtain reliable birth control, insist on condom use, or refuse a sexual situation. Responses were on a four-point Likert scale, where 1 was not likely at all and 4 was very likely. The scale had an acceptable reliability (Cronbach’s alpha = 0.75).

**Statistical analyses**

All statistical analyses were conducted using SPSS [27] and STATA [28]. The analytic approach had several steps culminating in regression analyses. The final regression analyses utilized an intent-to-treat, effectiveness approach as the primary analysis and an efficacy approach as the secondary analysis.

We used confirmatory factor analysis to examine the measurement properties of the measured variables and confirm scales for each measured variable. We then conducted reliability analyses on each identified scale to test the internal consistency.

Initial bivariate analyses, using t-tests and chi-square tests where appropriate, were conducted to test for equivalency in baseline characteristics between the intervention and comparison group assignments. Conservatively, any significant differences (P < 0.10) were adjusted for in the final models. For the primary analyses, we conducted bivariate and adjusted and unadjusted multiple linear regression models to examine whether the Teen PEP peer educators (i.e. intervention group) differed on selected outcomes compared with the comparison group. Next, in a secondary efficacy analysis (i.e. non-intent-to-treat approach), individuals who were non-compliant to the intervention (students who were unable to be scheduled into the Teen PEP course) were re-assigned to the comparison group and additional bivariate and adjusted and unadjusted multiple linear regression models were conducted. All regression models accounted for clustering of students within schools. The potential correlation in outcomes between individuals in the same school was accounted for by clustered robust standard errors. [29]. In regression analyses, two requirements were used for statistical significance including a confidence interval (CI) that did not include zero and a P-value of <0.05.

**Results**

**Study population**

At the start of the program, participants were on average 16 years of age [standard deviation (SD) 0.78] and 70% (117) of participants were female (Table I). Thirty-nine percent (65) of participants self-identified as Caucasian and 32% (53) as African American. Less than half [41% (65)] of participants reported ever having sex. Among those reporting having sex, the average age of sexual debut was 15 years (SD 1.44), 75% (48) reported using a condom at last sex, 53% [31] reported always using condoms during sex in the last month, and 41% (24) reported always using birth control in the last month. Thirty-three percent (50) reported ever visiting a healthcare professional, 16% (25) reported having been tested for STIs including HIV, and 2% (3) reported ever having an STI.

Comparing the participants to the larger student bodies of the five schools, we identified some differences. As is common in many evaluation programs and research studies, there were more female participants (70%) in the program as compared with the larger student body (52%). The distribution of race was similar between participants and the larger student body of the five schools except for Asians and Other. Overall in the larger student body, there were 43% Caucasian, 21% African American, 6% Asian and 30% Other as compared with the following percentages for the participants, 39%, 32%, 18% and 12%.

**Bivariate and multiple regression analyses**

Analyses to test for equivalency of the baseline characteristics identified three significant differences between the Teen PEP (i.e. intervention) and comparison groups (Tables I and II). The Teen PEP group (M = 16.15, SD 0.82) had slightly younger
participants ($P$-value < 0.10) than the comparison group ($M = 16.39, SD 0.68$). Additionally, the Teen PEP group had higher scores on the knowledge scale and intention scale as compared with the comparison group [1.14 (SD 0.18) versus 1.07 (SD 0.25), respectively, $P$-value = 0.03; 2.24 (SD 0.45) versus 1.91 (SD 0.52), respectively, $P$-value = 0.00].

In the primary analyses, the summary statistics and separate unadjusted linear regression models suggest that Teen PEP peer educators (as compared with the comparison group) had higher scores on all the outcome measures, and significantly higher scores on knowledge [Beta coefficient ($\beta$) 0.15; 95% CI 0.01, 0.28; $P$-value = 0.04], sexual health information ($\beta$ 0.50; 95% CI 0.07, 0.94; $P$-value = 0.03), opportunity to practice risk reduction skills ($\beta$ 0.82; 95% CI 0.38, 1.24; $P$-value = 0.01), and higher intentions to talk with friends, parents, and sex partners about sex and birth control, set boundaries with sex partners, and ask a partner to be tested for STIs including HIV (i.e. intentions) ($\beta$ 0.42; 95% CI 0.24, 0.61; $P$-value = 0.00) (Table III). In multiple linear regression models adjusting for age, knowledge, intentions and the clustering of students within schools, the Teen PEP peer educators (as compared with the comparison group) had higher scores on all the outcome measures. Teen PEP peer educators (versus comparison students) reported significantly greater opportunities to practice skills ($\beta$ 0.72; 95% CI 0.34, 1.09; $P$-value = 0.01) and higher intentions ($\beta$ 0.21; 95% CI 0.01, 0.41; $P$-value = 0.04). (Table III).

### Table I. Baseline characteristics of high school youth participants in the Teen PEP intervention program by group assignment—Teen PEP versus Comparison Group, New Jersey, 2007–08 ($n = 160^a$

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Teen PEP ($n = 96$)</th>
<th>Comparison ($n = 64$)</th>
<th>Total</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD)</td>
<td>16.15 (0.82)</td>
<td>16.39 (0.68)</td>
<td>16.24 (0.78)</td>
<td>0.06</td>
</tr>
<tr>
<td>Gender, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>28 (27)</td>
<td>23 (36)</td>
<td>51 (30)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>76 (73)</td>
<td>41 (64)</td>
<td>117 (70)</td>
<td>0.22</td>
</tr>
<tr>
<td>Race, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>46 (44)</td>
<td>19 (30)</td>
<td>65 (39)</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>30 (29)</td>
<td>23 (36)</td>
<td>53 (32)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>17 (16)</td>
<td>13 (20)</td>
<td>30 (18)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>11 (10)</td>
<td>9 (5)</td>
<td>20 (12)</td>
<td>0.43</td>
</tr>
<tr>
<td>Sexual activity and behaviors, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sexual Activity, ever</td>
<td>38 (40)</td>
<td>27 (43)</td>
<td>65 (41)</td>
<td>0.68</td>
</tr>
<tr>
<td>Age at first sex</td>
<td>15.08 (1.44)</td>
<td>14.56 (2.31)</td>
<td>14.86 (1.85)</td>
<td>0.27</td>
</tr>
<tr>
<td>Method of birth control at last sex, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No method</td>
<td>3 (11)</td>
<td>4 (10)</td>
<td>7 (10)</td>
<td>0.86</td>
</tr>
<tr>
<td>Birth control pills</td>
<td>4 (11)</td>
<td>1 (4)</td>
<td>5 (8)</td>
<td>0.33</td>
</tr>
<tr>
<td>Condoms</td>
<td>29 (76)</td>
<td>19 (73)</td>
<td>48 (75)</td>
<td>0.77</td>
</tr>
<tr>
<td>Other</td>
<td>9 (0)</td>
<td>5 (0)</td>
<td>14 (0)</td>
<td></td>
</tr>
<tr>
<td>Frequency in the last month, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condom use, always</td>
<td>17 (47)</td>
<td>14 (61)</td>
<td>31 (53)</td>
<td>0.88</td>
</tr>
<tr>
<td>Birth control, always</td>
<td>15 (43)</td>
<td>9 (38)</td>
<td>24 (41)</td>
<td>0.82</td>
</tr>
<tr>
<td>Occurrence of activity ever, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visited a healthcare professional</td>
<td>34 (37)</td>
<td>16 (27)</td>
<td>50 (33)</td>
<td>0.19</td>
</tr>
<tr>
<td>STI/HIV tested</td>
<td>18 (19)</td>
<td>7 (11)</td>
<td>25 (16)</td>
<td>0.20</td>
</tr>
<tr>
<td>Had an STI</td>
<td>3 (4)</td>
<td>0 (0)</td>
<td>3 (2)</td>
<td>0.14</td>
</tr>
</tbody>
</table>

$^a$Eight individuals from the Teen PEP educator group were missing baseline data and items in bold are significant at $P < 0.05$. 

Effects of a school-based sexuality education
In the secondary efficacy analyses, the unadjusted and adjusted findings were very similar to those in the primary intent-to-treat analyses with a few notable exceptions (see Table IV). Namely, in multiple linear regression models adjusting for age, knowledge, intentions and the clustering of students within schools, the Teen PEP peer educators (as compared with the comparison group) had significantly higher scores on the knowledge, ($\beta$ 0.13; 95% CI 0.01, 0.25; $P$-value = 0.04) and self-efficacy scales ($\beta$ 0.28; 95% CI 0.04, 0.51; $P$-value = 0.03).

**Discussion**

The results of this Teen PEP evaluation study highlight and affirm the role school-based peer leadership programs may play in efforts to promote the development of healthy sexual futures for adolescents. Teen PEP was found to be effective in changing critical mediators to behavior change among a sample of peer educators as compared with a similar group of students. In the primary and secondary analyses, Teen PEP peer educators (versus comparison students) reported significantly greater opportunities to practice sexual risk reduction skills and higher intentions to talk with friends, parents, and sex partners about sex and birth control, set boundaries with sex partners, and ask a partner to be tested for STIs including HIV. In addition, in the secondary analysis Teen PEP peer educators (versus comparison students) had significantly higher scores on knowledge of sexual health issues and ability to refuse risky sexual situations. These findings

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**Table II. Means and standard deviations of baseline sexual health outcomes of high school youth participants in the Teen PEP intervention program by group assignment—Teen PEP versus comparison group, New Jersey, 2007–08 (N = 160)**

<table>
<thead>
<tr>
<th>Outcome measures at baseline</th>
<th>Teen PEP</th>
<th>Comparison</th>
<th>Total</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>1.14 (0.18)</td>
<td>1.07 (0.25)</td>
<td>1.11 (0.22)</td>
<td><strong>0.03</strong></td>
</tr>
<tr>
<td>Parental communication</td>
<td>0.77 (0.62)</td>
<td>0.68 (0.57)</td>
<td>0.74 (0.60)</td>
<td>0.35</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>2.36 (0.63)</td>
<td>2.26 (0.64)</td>
<td>2.32 (0.63)</td>
<td>0.35</td>
</tr>
<tr>
<td>Sexual health information</td>
<td>2.19 (0.69)</td>
<td>2.10 (0.65)</td>
<td>2.16 (0.67)</td>
<td>0.42</td>
</tr>
<tr>
<td>Opportunity to practice skills</td>
<td>1.64 (0.88)</td>
<td>1.53 (0.98)</td>
<td>1.60 (0.92)</td>
<td>0.45</td>
</tr>
<tr>
<td>Intentions</td>
<td>2.24 (0.45)</td>
<td>1.91 (0.52)</td>
<td>2.11 (0.51)</td>
<td><strong>0.00</strong></td>
</tr>
</tbody>
</table>

*Eight individuals from the Teen PEP educator group were missing baseline data and items in bold are significant at $p < 0.05$.

**Table III. Separate linear regression models measuring the effectiveness of the Teen PEP intervention program at 12-month follow-up on sexual health outcomes among high school youth, New Jersey, 2007–08 (N = 157)**

<table>
<thead>
<tr>
<th>Outcomes measures at 12-month Follow-up</th>
<th>Teen PEP</th>
<th>Comparison</th>
<th>95% Confidence</th>
<th>$P$-value</th>
<th>Adjusted coefficient</th>
<th>95% Confidence</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>1.32 (0.17)</td>
<td>1.17 (0.24)</td>
<td><strong>0.01, 0.28</strong></td>
<td><strong>0.04</strong></td>
<td>0.10</td>
<td>−0.03, 0.24</td>
<td>0.10</td>
</tr>
<tr>
<td>Parental communication</td>
<td>0.80 (0.56)</td>
<td>0.56 (0.57)</td>
<td>−0.05, 0.52</td>
<td>0.08</td>
<td>0.12</td>
<td>−0.30, 0.55</td>
<td>0.46</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>2.43 (0.51)</td>
<td>2.12 (0.55)</td>
<td><strong>0.16, 0.47</strong></td>
<td><strong>0.01</strong></td>
<td>0.19</td>
<td>−0.02, 0.41</td>
<td>0.06</td>
</tr>
<tr>
<td>Sexual health information</td>
<td>2.72 (0.45)</td>
<td>2.22 (0.71)</td>
<td><strong>0.07, 0.94</strong></td>
<td><strong>0.03</strong></td>
<td>0.44</td>
<td>0.02, 0.89</td>
<td>0.06</td>
</tr>
<tr>
<td>Opportunity to practice skills</td>
<td>2.51 (0.56)</td>
<td>1.69 (0.88)</td>
<td><strong>0.38, 1.24</strong></td>
<td><strong>0.01</strong></td>
<td>0.72</td>
<td><strong>0.34, 1.09</strong></td>
<td><strong>0.01</strong></td>
</tr>
<tr>
<td>Intentions</td>
<td>2.39 (0.43)</td>
<td>1.96 (0.60)</td>
<td><strong>0.24, 0.61</strong></td>
<td><strong>0.00</strong></td>
<td>0.21</td>
<td><strong>0.01, 0.41</strong></td>
<td><strong>0.04</strong></td>
</tr>
</tbody>
</table>

*Each row represents a separate linear regression model with the outcome variables indicated on the left and items in bold are significant at $P < 0.05$. *All models account for clustering by school. *Adjusted for covariates significantly different ($P$-value < 0.10) by group assignment at baseline including age, knowledge and intentions.
suggest that Teen PEP educators may have developed the confidence to avoid high-risk sexual behaviors.

These results confirm the findings from a few other studies among adolescent students finding that peer education programs have a positive impact on peer educators themselves [16, 18, 20]. This evaluation of Teen PEP adds to the literature as a well-designed study with a comparison group and a population that was drawn from both suburban and urban adolescents. In addition, the results of this study support the value of peer-led comprehensive sexuality education programs integrated within the context of a school day. Because the intervention is implemented over the course of a school year or semester, curriculum activities provide multiple opportunities for skill practice, fostering a greater sense of confidence in one’s ability to use protective measures. The intensity of the Teen PEP course resulted in developing highly trained peer educators who were prepared to deliver credible, reliable prevention messages to their peers. These findings also support research indicating that adolescent peer educators benefit most from their training when they have sufficient time to participate in activities and apply their learning [16]. Although Teen PEP also assessed behavior change, <40% of the sample reported being sexually active within the past 3 months. Thus, determining differences between the Teen PEP and comparison group on sexual risk behaviors was more difficult due to small sample sizes.

There were limitations to this research. The quasi-experimental study design prevented us from being able to control for all threats to internal validity. One concern is related to the equivalence of the intervention and comparison group. Matching comparison students to a highly selected group of peer educators was difficult and statistically significant differences resulted between the groups. At baseline, comparison group students were slightly older, were less knowledgeable on sexual health topics, and had fewer intentions of implementing behaviors associated with risk reduction. Although these differences are important, our results controlled for these factors and still demonstrated significant differences resulted between the groups. At baseline, comparison group students were slightly older, were less knowledgeable on sexual health topics, and had fewer intentions of implementing behaviors associated with risk reduction. Although these differences are important, our results controlled for these factors and still demonstrated significant differences. Another concern is related to the dosage of the intervention across sites. One school was able to implement the intervention for a considerably longer period of time, and thus peer educators (intervention students) from that site had a higher dosage of the intervention. However, all students, at a minimum, completed all required components of the intervention. Our analyses did not reveal any significant difference among students by intervention dosage. Another limitation is that we did not collect information to ascertain whether cross-contamination was an issue. Finally, outcome data were collected based on self-report surveys and potential self-report biases cannot be ruled out. However, the research team took every

### Table IV. Separate linear regression models measuring the efficacy of the Teen PEP intervention program at 12-month follow-up on sexual health outcomes among high school youth, New Jersey, 2007–08 (*n* = 157)*a,b*

<table>
<thead>
<tr>
<th>Outcomes measures at 12 month Follow-up</th>
<th>Teen PEP (n = 82) Mean (SD)</th>
<th>Comparison (n = 75) Mean (SD)</th>
<th>Regression coefficient</th>
<th>95% Confidence interval</th>
<th>P-value</th>
<th>Adjusted coefficient</th>
<th>95% Confidence interval</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>1.34 (0.14)</td>
<td>1.17 (0.24)</td>
<td>0.17</td>
<td>0.04, 0.31</td>
<td>0.02</td>
<td>0.13</td>
<td>0.01, 0.25</td>
<td>0.04</td>
</tr>
<tr>
<td>Parental communication</td>
<td>0.84 (0.55)</td>
<td>0.57 (0.56)</td>
<td>0.27</td>
<td>0.08, 0.46</td>
<td>0.02</td>
<td>0.18</td>
<td>−0.12, 0.48</td>
<td>0.17</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>2.47 (0.45)</td>
<td>2.13 (0.59)</td>
<td>0.34</td>
<td>0.14, 0.54</td>
<td>0.01</td>
<td>0.28</td>
<td>0.04, 0.51</td>
<td>0.03</td>
</tr>
<tr>
<td>Sexual health information</td>
<td>2.76 (0.44)</td>
<td>2.27 (0.67)</td>
<td>0.49</td>
<td>0.05, 0.93</td>
<td>0.04</td>
<td>0.40</td>
<td>−0.04, 0.85</td>
<td>0.07</td>
</tr>
<tr>
<td>Opportunity to practice skills</td>
<td>2.57 (0.52)</td>
<td>1.79 (0.87)</td>
<td>0.78</td>
<td>0.47, 1.09</td>
<td>0.00</td>
<td>0.69</td>
<td>0.43, 0.95</td>
<td>0.00</td>
</tr>
<tr>
<td>Intentions</td>
<td>2.42 (0.41)</td>
<td>2.00 (0.58)</td>
<td>0.42</td>
<td>0.27, 0.57</td>
<td>0.00</td>
<td>0.25</td>
<td>0.08, 0.42</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*a* Each row represents a separate linear regression model with the outcome variables indicated on the left and items in bold are significant at *P* < 0.05. *b* All models account for clustering by school. *c* Adjusted for covariates significantly different (*P*-value < 0.10) by group assignment at baseline including age, knowledge and intentions.
measure to ensure that students had a private environment to complete the questionnaire, and provided formal assurances of confidentiality and emphasized the use of unique identifiers that would prevent others outside of the research team from linking surveys to any specific individual.

In spite of these limitations, as a result of their participation in Teen PEP peer educators included in this study developed the confidence necessary to avoid high-risk sexual behaviors. Further, the program provided peer educators with information that informed their sexual decisions and increased their intentions to communicate about sexual health issues and set appropriate boundaries with potential partners. Sustaining Teen PEPs may allow for persistence of these outcomes and lead to reductions in sexual risk-taking behaviors; this remains to be evaluated in future research. In addition, future research should assess Teen PEP peer educators in other contextual settings, measure the program’s impact on younger aged students reached in health education classes, and use valid and reliable assessment methods to determine if peer educators apply their new knowledge and skills to real life situations. Investigators should also evaluate these factors over time to determine the degree to which the potential benefits of Teen PEP are lasting and generalizable.

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Conflict of interest statement

None declared.

References