Preventing and Controlling Sexually Transmitted Infections in the United States

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The National Academies of
SCIENCES • ENGINEERING • MEDICINE

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In 1990, the U.S. 2000 Objectives target was 4 cases per 100,000 population. However, 34 states reported rates that were below the revised national Healthy People 2000 objective; 13 states reported fewer than five cases.
The National Plan to Eliminate Syphilis from the United States

October 1999

Division of STD Prevention

National Center for HIV, STD, and TB Prevention

Centers for Disease Control and Prevention

Primary prevention activities, such as interventions to reduce risky sexual activity or increase condom use, play a critical role in syphilis elimination. These activities, as they have been carried out by HIV prevention programs, have already contributed to the current decline in syphilis rates in the U.S. Efforts should be made
Answering your questions.
Over the last decade, for whom and under what conditions or in what settings have we seen efficacious interventions to reduce risk or prevent STI or HIV risk in groups with the highest burden of infection?
Multiple interventions for STI priority populations have demonstrated efficacy at multiple levels.
Interventions targeting African American heterosexual men in the United States.

Sexual risks OR = .79

Incident STI OR = .74
Interventions targeting Latinas in the United States.

Sexual risks OR = .52

Incident STI OR = .65
Interventions targeting people living with HIV.

Overall effect-size = -0.20, 95% CI = -0.30 - -0.10
One-Shot Interventions

Meta-analysis of 29 single-session interventions tested in randomized trials reporting STI outcomes.

Overall 35% reduction in STI incidence (OR = 0.65, 95%CI=0.55-0.77)
Odds ratios representing reductions in STI/HIV incident infections reported from selected meta-analyses ordered from most efficacious to least efficacious.

<table>
<thead>
<tr>
<th>Source</th>
<th>Study</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Behavioral intervention meta-analyses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Johnson</td>
<td>Interventions for adolescents</td>
<td>1.72</td>
<td>1.39, 2.17 (k = 19)</td>
</tr>
<tr>
<td>Eaton</td>
<td>Single-session interventions</td>
<td>1.59</td>
<td>1.37, 1.87 (k = 19)</td>
</tr>
<tr>
<td>Charania</td>
<td>Structural level condom distribution interventions</td>
<td>1.45</td>
<td>1.10, 1.89 (k = 5)</td>
</tr>
<tr>
<td>Herbst</td>
<td>Interventions for LatinX in the USA and Puerto Rico</td>
<td>1.45</td>
<td>1.14, 1.85 (k = 3)</td>
</tr>
<tr>
<td>Neumann</td>
<td>At-risk adults in the USA</td>
<td>1.35</td>
<td>1.12, 1.61 (k = 6)</td>
</tr>
<tr>
<td>Crepaz</td>
<td>Interventions for African American females</td>
<td>1.23</td>
<td>1.02, 1.49 (k = 17)</td>
</tr>
<tr>
<td>Mullen</td>
<td>Adolescents in the USA</td>
<td>1.18</td>
<td>0.48, 2.86 (k = 2)</td>
</tr>
<tr>
<td>Crepaz</td>
<td>Interventions for African Americans and LatinX</td>
<td>1.17</td>
<td>1.00, 1.37 (k = 13)</td>
</tr>
<tr>
<td>Johnson</td>
<td>Interventions for African Americans</td>
<td>1.14</td>
<td>1.19, 1.22 (k = 14)</td>
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<tr>
<td><strong>Biomedical HIV prevention</strong></td>
<td></td>
<td></td>
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<tr>
<td>Auvert</td>
<td>Male circumcision</td>
<td>2.34</td>
<td>1.81, 2.87</td>
</tr>
<tr>
<td>Bailey</td>
<td>Male circumcision</td>
<td>2.17</td>
<td>1.66, 2.68</td>
</tr>
<tr>
<td>Gray</td>
<td>Male circumcision</td>
<td>2.03</td>
<td>1.52, 2.54</td>
</tr>
<tr>
<td>Grant</td>
<td>HIV Pre-exposure prophylaxis</td>
<td>1.82</td>
<td>1.41, 2.23</td>
</tr>
</tbody>
</table>
45 Evidence-Based Behavioral Interventions for HIV/STI Prevention
Intervention to Reduce HIV Risks and Sero-adaptive Strategies

• Post-HIV testing intervention
• One-on-one, peer counselor delivered, 40 minutes

• Think Twice  (Eaton, 2011, AJPH, 2018, Sex Transm Infections)
  • Graphic novel
  • Sexual sociogram
  • Real world, personalized, reasonable plan
  • Can be mobile delivered
Seession-Constructed Partner-Socio-Gram

Eaton, 2018, Am J Public Health
<table>
<thead>
<tr>
<th></th>
<th>Experimental condition (N=300)</th>
<th></th>
<th>Control condition (N=297)</th>
<th></th>
<th>Main effect intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Per cent</td>
<td>N</td>
<td>Per cent</td>
<td></td>
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<tr>
<td>Symptoms of STI</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>3-month</td>
<td>17</td>
<td>6.3</td>
<td>26</td>
<td>10.2</td>
<td></td>
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<tr>
<td>6-month</td>
<td>19</td>
<td>7.5</td>
<td>25</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>12-month</td>
<td>14</td>
<td>5.7</td>
<td>22</td>
<td>8.7</td>
<td></td>
</tr>
<tr>
<td>Lab diagnosed gonorrhea/chlamydia (urine)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-month</td>
<td><strong>4</strong></td>
<td><strong>1.5</strong></td>
<td><strong>12</strong></td>
<td><strong>4.9</strong></td>
<td>2.44 (1)</td>
</tr>
<tr>
<td>6-month</td>
<td>5</td>
<td>2.1</td>
<td>6</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>12-month</td>
<td>6</td>
<td>2.6</td>
<td>9</td>
<td>3.9</td>
<td></td>
</tr>
<tr>
<td>Lab diagnosed gonorrhea/chlamydia (rectal)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-month</td>
<td>26</td>
<td>10</td>
<td>15</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>6-month</td>
<td>16</td>
<td>6.7</td>
<td>12</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>12-month</td>
<td>19</td>
<td>8.2</td>
<td>17</td>
<td>7.3</td>
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</tbody>
</table>
THINK TWICE
Best Evidence – Risk Reduction

INTERVENTION DESCRIPTION

Target Population
- Men who have sex with men (MSM)

Goals of Intervention
- Increase knowledge about serosorting for HIV/STI prevention
- Develop a tailored risk reduction strategy for each participant

Brief Description
Think Twice is an individual-level, single session intervention. It focuses on highlighting misbeliefs about selecting sex partners; shaping accurate beliefs and perceptions of risk about the use of serosorting for HIV/STI prevention; and determining a practical, risk-reduction strategy tailored to each participant. A graphic novel is used to convey messages about serosorting. The counselor uses the story to identify behaviors and situations that may lead to becoming HIV infected. Guided by the conflict theory of decision-making, the counselor and participant work together to identify ways that the story character can...
Clinical trials, implementation studies, and cost-effectiveness research support the effectiveness of behavioral interventions to prevent STI/HIV
The CDC has prioritized behavioral interventions for STI/HIV prevention that are cost-effective using their Prevention Benefit Index.

Collins et al., 2019, AIDS & Behav
Over the last decade, for whom and under what conditions or in what settings have we seen efficacious interventions to reduce risk or prevent STI or HIV risk in groups with the highest burden of infection?

Interventions delivered in single session counseling, typically of 40-60 min. in STI clinics, community agencies, social services, jails, schools, etc. demonstrate increased condom use, reductions in condomless vaginal and anal sex, reduced STI incidence with diverse US populations.
What are the key elements of effective interventions?
There are a lot of theoretical mediators of effective behavioral STI/HIV prevention interventions. Which are most critical depends on targeted outcomes.
Information Motivation Behavioral Skills Model

Information

Motivation

Behavioral Skills

Risk Reduction

Disease Prevention
Behavioral skills and constructs underlying skills (e.g., self-efficacy) are the active ingredients for impacting STI/HIV risk reduction.

Table 3  IMB moderators for overall sexual risk outcome

<table>
<thead>
<tr>
<th>IMB moderators for overall sexual risk outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Information alone</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>Behavior skills alone</td>
</tr>
<tr>
<td>Info + Motivational</td>
</tr>
<tr>
<td>Info + Behavior Skills</td>
</tr>
<tr>
<td>Motivational + Behavior Skills</td>
</tr>
<tr>
<td>Info + Motivation + Behavior Skills</td>
</tr>
</tbody>
</table>

Sagherian et al., 2016, Ann Behav Med
What outcomes should we expect from briefer and more extensive interventions?
Interventions delivered to at-risk individuals & couples

Least Intensive

Informational Brochures & Videos

Text Messaging

Interactive Text Messaging

Single-Session Counseling

Single-Session Groups

Multiple-Session Counseling

Multiple-Session Groups

Most Intensive
Interventions delivered to at-risk individuals & couples

- Least Intensive
  - Informational Brochures & Videos
  - Text Messaging
  - Interactive Text Counseling

- Most Intensive
  - Multiple-Session Counseling
  - Multiple-Session Groups
  - Single-Session Counseling
  - Single-Session Groups

Social Context—Networks—Settings
Text Messaging for STI prevention – screening & testing

1.1.7 Uptake of STI/HIV prevention or treatment testing

<table>
<thead>
<tr>
<th>Study</th>
<th>Total Events (n)</th>
<th>Uptake</th>
<th>% Total Uptake</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>de Tolly 2012 (11)</td>
<td>38 194</td>
<td>22 187</td>
<td>14.8%</td>
<td>1.83 [1.03, 3.23]</td>
</tr>
<tr>
<td>Downing 2013 (12)</td>
<td>9 32</td>
<td>2 32</td>
<td>1.8%</td>
<td>5.87 [1.16, 29.83]</td>
</tr>
<tr>
<td>Dryden-Peterson 2015 (13)</td>
<td>100 169</td>
<td>79 156</td>
<td>24.9%</td>
<td>1.41 [0.91, 2.19]</td>
</tr>
<tr>
<td>Lim 2012 (14)</td>
<td>34 217</td>
<td>30 242</td>
<td>17.1%</td>
<td>1.31 [0.77, 2.23]</td>
</tr>
<tr>
<td>Mugo 2016 (15)</td>
<td>117 199</td>
<td>85 207</td>
<td>30.6%</td>
<td>2.05 [1.38, 3.04]</td>
</tr>
<tr>
<td>Odeny 2014 (16)</td>
<td>172 187</td>
<td>154 181</td>
<td>10.8%</td>
<td>2.01 [1.03, 3.92]</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>998 1005</td>
<td>100%</td>
<td></td>
<td>1.73 [1.39, 2.15]</td>
</tr>
</tbody>
</table>

Total events: 470 372

Heterogeneity: Tau² = 0.00; Chi² = 4.96, df = 5 (P = 0.42); I² = 0%

Test for overall effect: Z = 4.91 (P < 0.00001)

Taylor et al., 2019, Systematic Reviews
Text Messaging for STI prevention – increased condom use

1.1.2 Condom use

<table>
<thead>
<tr>
<th>Study</th>
<th>Events</th>
<th>Controls</th>
<th>Total</th>
<th>Overall (%)</th>
<th>OR with 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lim 2012 (4)</td>
<td>23</td>
<td>217</td>
<td>240</td>
<td>82.7%</td>
<td>0.68 (0.39, 1.19)</td>
</tr>
<tr>
<td>Suffoletto 2013 (5)</td>
<td>5</td>
<td>15</td>
<td>20</td>
<td>17.3%</td>
<td>1.60 (0.37, 6.96)</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td></td>
<td></td>
<td>363</td>
<td>100.0%</td>
<td>0.79 (0.42, 1.49)</td>
</tr>
</tbody>
</table>

Total events: 238

Heterogeneity: $\tau^2 = 0.05$; $\chi^2 = 1.14$, df = 1 ($P = 0.28$); $I^2 = 13$

Test for overall effect: $Z = 0.74$ ($P = 0.46$)
Interventions delivered to at-risk individuals & couples

- Single-Session Counseling
- Single-Session Groups
- Interactive Text Counseling
- Text Messaging
- Informational Brochures & Videos

Least Intensive to Most Intensive
Single-session individual and group counseling interventions demonstrate sexual risk reduction and STI reduction outcomes.
Meta-analyses have generally not found group-delivered interventions to differ from individually-delivered interventions.
Interventions delivered to at-risk individuals & couples

Least Intensive

Social Context—Networks—Settings

Most Intensive
Multiple-session individual and group-delivered interventions were tested extensively with efficacy. But were abandoned due to issues of feasibility and perceived cost, despite evidence for cost-effectiveness.
Unlike a vaccine or surgical procedure, persistent behavior change requires ongoing support and motivation.

For STI/HIV, 6-12 months of consistent condom use can prevent an outbreak.

Koblin et al., 2004, Lancet
Interventions delivered to at-risk individuals & couples

- Least Intensive
  - Informational Brochures & Videos
  - Text Messaging
- Interactive Text Counseling
- Single-Session Counseling
  - Single-Session Groups
- Multiple-Session Counseling
  - Multiple-Session Groups

Social Context—Networks—Settings
Fig 3. Forest plot showing odds of a more favourable outcome for intervention groups compared with controls for outcomes reported at > 6 months to ≤ 12 months (sexual health outcome measures). The blue denotes significant effect in favour of the Intervention group. The grey denotes non-significant. The red denotes significant effect in the favour of the control group. CI, confidence interval.

What outcomes should we expect from briefer vs more extensive interventions?

Passive information and messaging increase discrete individual behavior (screening/testing uptake, appointment keeping).

Brief counseling impacts complex and socially interdependent behaviors (condom use, partner selection, safer sex practices, substance use).

Network interventions influence perceived social norms that foster and sustain behavior change.
Not everybody needs the same intensity of intervention: Differentiated STI Prevention

Coordinated Prevention Program of Stepped-Up Interventions delivered to targeted ‘hotspot’ networks / communities
Infusing resources to locations with greatest STI burden

- Informational Brochures & Videos
- Text Messaging
- Interactive Text Messaging
- Single-Session Counseling
- Multiple-Session Counseling

Infusing resources to locations with greatest STI burden

- Information – Motivational Messages
- Behavioral Skills
- Relapse Prevention

- Risk-Associated Venues
- Mental Health, Substance use, Social Service Clients
- HIV Testing, Substance use Treatment Facilities, Jails, First-Time STI Client
- Repeat STI Client
What new/innovative strategies are needed to intervene with African American and Latin/x YMSM and transgender individuals who have a high burden of STIs?
We cannot wait to end institutionalized racism, homophobia, transphobia, & STI/HIV stigma so we have to work around them.
We can home test
Home STI & HIV testing can and should be embedded in evidence-based mobile-delivered behavioral interventions to revolutionize STI detection, treatment & prevention.
Self/Home STI Testing

Black men who have sex with men in Atlanta
710/800 89% returned
3% GC/CT urine
12% GC/CT rectal

Eaton, 2019, in process

Men who have sex with men in Chicago, Atlanta, & New York
1001/1076 (93%) returned
3.2% GC/CT urine
5.0% GC/CT rectal

Mustanski et al., 2018, Am J Prev Med

National sample of men who have sex with men
1071/1268 (84%) returned
1.7% GC/CT urine
5.3% GC/CT rectal

Grov et al., 2016, Sex Transm Diseases
Web-based STI testing and e-prescription treatment is feasible, acceptable, and cost-effective.

Blake et al., 2015, Sex Transm Dis
If we can home test and treat, we can also home counsel
Digitizing & Customizing

Effective Interventions
HIV Prevention That Works

45 Evidence-Based Behavioral Interventions for HIV/STI Prevention
Interventions that capitalize on technology for broad delivery, targeting networks, & removing barriers.
HAVE FUN. STAY SAFE. KEEP IT UP 2.0
Guys like us face a number of issues when we meet or hook up with people online.

Let's go "behind the profiles" and see what situations that the following guys might run into...

These situations get sexually explicit, so make sure you're viewing this in a private place.

If the guy I'm hooking up with was HIV positive, I'm sure he'd say something. But he's got condoms in any case, just to be sure.
KEEP IT UP! 2.0
Best Evidence – Risk Reduction

INTERVENTION DESCRIPTION

Target Population
- HIV-negative young men who have sex with men (MSM)

Goals of Intervention
- Reduce incident sexually transmitted infections (STIs)
- Reduce condomless anal sex

Brief Description
Keep It Up! 2.0 is an online and interactive individual-level intervention. It is delivered via computers or tablets, and uses a variety of content (e.g., videos, interactive animation, and games) to increase HIV knowledge, motivate and teach safer behaviors, and instill self-efficacy for HIV prevention strategies. The intervention consists of seven modules based on a particular setting or situation relevant to YMSM. The modules include developmentally appropriate behavior change content. For example, a soap opera-style video following diverse YMSM highlights the risks of assuming a partner’s HIV status and monogamy in relationships. The importance of HIV testing, skills for negotiating condom use, and the
Summary

The National Institutes of Health (NIMH, NIDA, NIAAA, NICHD) invested heavily in developing and rigorously testing behavioral STI/HIV prevention interventions.

The CDC established entire infrastructure to evaluate evidence for efficacy, test effectiveness, package, disseminate, and train frontline providers. That scale-up effort stalled in 2015 and appears all but ended in 2017.

No longer linking risk reduction counseling to HIV testing has created enormous missed opportunities for STI prevention.
President Barack Obama, July 13, 2010

“The question is not whether we know what to do, but whether we will do it.”