How can new technologies and social media improve HIV prevention for gay and bisexual men?

May 8th, 2015
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Rollins School of Public Health
Presentation Plan

- HIV in MSM Atlanta: A public health crisis
- Tools and scale: what do we know?
- HealthMindr: A comprehensive prevention app for MSM
HIV in MSM in Atlanta: A Public Health Crisis
Team and funders

- Co-Investigators
  - Hannah Cooper
  - Carlos del Rio
  - Ralph DiClemente
  - Paula Frew
  - Colleen F. Kelley
  - Mark Mulligan
  - John Peterson (GSU)
  - Eli Rosenberg
  - Laura F. Salazar (GSU)
  - Travis Sanchez
  - Gina Wingood

- Dedicated team of staff:
  - Project coordinators
  - Recruiters
  - Event staff
  - Retention specialists
  - Data managers, analysts

- NIH Project Officers

Support by National Institutes of Health #:
- R01-MH085600
- R01-HD067111
- P30-AI050409
Bronfenbrenner’s Ecological Model

MACROSYSTEM
- Racism
- Homophobia
- Anti-HIV Stigma

EXOSYSTEM
- Poverty Rates
- Insurance Coverage
- Prevalence of Same-Sex Households
- Crime Rate
- Public Transportation Systems
- Service Environment (Colocation of Providers)

MICROSYSTEM
- Network
  - Sexual Networks
  - Peer Norms
  - Social Networks
  - Families
  - Faith Communities
- Dyadic
  - Partner Traits
  - Partner Treatment Status
  - Support of Family Members
  - Power Dynamics
- Individual
  - Demographics
  - Internalized Homophobia
  - Drug Use
  - Condom Use Skills / Efficacy / Errors
  - SES: Income, Health Insurance
  - Access to Healthcare
  - Mistrust of Medical Providers
  - Transportation Access
  - Incarceration
Study Design

• Recruitment
  • MSM community venues and Facebook

• Eligibility
  • Black and white, non-Hispanic
  • Currently living in Atlanta MSA
  • Ages 18 – 39 (earlier recruits had no upper limit)
  • Sexually active with men, not in a main partnership
  • NOT HIV-status-dependent

• Procedures
  • Testing: HIV, Chlamydia, Gonorrhea, Syphilis
  • Extensive self-admin computer questionnaire

• Enrollment Numbers
  • 803 men took part in baseline
    • 30% were prevalent HIV-positive at baseline
  • 562 HIV-negative MSM enrolled in prospective
    • 79% retained in study at 24 months
Key Findings:
HIV/STI prevalence at baseline
### Participants at Enrollment


<table>
<thead>
<tr>
<th></th>
<th>Black MSM (n = 454)</th>
<th>White MSM (n = 349)</th>
<th>p-value *</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–19</td>
<td>6.0 (27)</td>
<td>4.6 (16)</td>
<td>0.01</td>
</tr>
<tr>
<td>20–24</td>
<td>34.4 (156)</td>
<td>26.1 (91)</td>
<td></td>
</tr>
<tr>
<td>25–29</td>
<td>30.2 (137)</td>
<td>30.1 (105)</td>
<td></td>
</tr>
<tr>
<td>30–39</td>
<td>27.5 (125)</td>
<td>34.7 (121)</td>
<td></td>
</tr>
<tr>
<td>40+</td>
<td>2.0 (9)</td>
<td>4.6 (16)</td>
<td></td>
</tr>
<tr>
<td><strong>Sexual identity</strong></td>
<td></td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Homosexual/gay</td>
<td>77.8 (350)</td>
<td>93.1 (325)</td>
<td></td>
</tr>
<tr>
<td>Bisexual</td>
<td>18.9 (85)</td>
<td>5.2 (18)</td>
<td></td>
</tr>
<tr>
<td>Heterosexual/straight</td>
<td>0.2 (1)</td>
<td>0.6 (2)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>3.1 (14)</td>
<td>1.1 (4)</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>College, post-graduate, or professional school</td>
<td>29.9 (135)</td>
<td>54.0 (188)</td>
<td></td>
</tr>
<tr>
<td>Some college, associate’s degree, and/or technical school</td>
<td>44.6 (201)</td>
<td>35.6 (124)</td>
<td></td>
</tr>
<tr>
<td>High school or GED</td>
<td>22.0 (99)</td>
<td>9.8 (34)</td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>3.5 (16)</td>
<td>0.6 (2)</td>
<td></td>
</tr>
<tr>
<td><strong>Poverty, currently</strong></td>
<td></td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Employed, currently</td>
<td>71.0 (318/448)</td>
<td>80.2 (280/349)</td>
<td>0.003</td>
</tr>
<tr>
<td>Health Insurance, currently</td>
<td>48.9 (215/440)</td>
<td>72.9 (253/347)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Homeless, current</td>
<td>3.8 (17/449)</td>
<td>0.6 (2/348)</td>
<td>0.004</td>
</tr>
<tr>
<td>Homeless, previous 12 months</td>
<td>14.9 (67/451)</td>
<td>6.9 (24/347)</td>
<td>0.0005</td>
</tr>
<tr>
<td>Arrested, previous 12 months</td>
<td>12.4 (56/453)</td>
<td>8.6 (30/349)</td>
<td>0.09</td>
</tr>
</tbody>
</table>
HIV Prevalence, by Race and Age


Black MSM: 44%

White MSM: 13%
Comparisons of Factors by Race


Compared to white MSM, black MSM reported:

• Fewer sexual partners and sex risks
• Less drug use
• A higher degree of same-race partnering
• Similar ages of partners
• Less pre-sexual discussion of HIV status
• Lower socioeconomic status (poverty, employment, insurance)
• Living in more disadvantaged census tracts
‘Community viral load’ does not capture disparities in HIV exposure between groups because it does not incorporate HIV prevalence.

- No difference in CVL or PVL between black and white MSM

Synthesized data on disparities in HIV prevalence, viral load with racial-patterns in sexual partnering

- Calculated prevalence of HIV viremia: 25% of BMSM vs. 8% of WMSM had HIV VL>400 copies/ml
- Racially concordant partnerships: BMSM 71%; WMSM 70%

Despite similar levels of sexual risk behavior (partner # and unprotected anal sex), BMSM have higher chance of encountering an HIV-infected and unsuppressed partner

- WMSM reach 50% chance with 7 partners
- BMSM reach 50% chance with just 3 partners
• Driven largely by differences in HIV prevalence.

• However, differences in HIV care continuum will also contribute.
Among MSM living in high poverty areas, black MSM reported greater gay stigma than white MSM.

Black MSM living with HIV were highly concentrated in areas of both high stigma and high poverty.

White MSM living with HIV were concentrated primarily in areas of low stigma and low poverty.
Key Findings:
Validity studies
Lack of Awareness of HIV Status
Sanchez et al – OFID 2014

- For those who tested HIV+ but who self-report most recent HIV test being +, examined laboratory testing and HIV case surveillance match
- Substantial number of black MSM had detectable ARVs and > ½ had a previous surveillance case report
- Adjusting for either laboratory testing or surveillance case match made racial disparity in lack of awareness of HIV status no longer significant
Validation of Self-reported Drug Use
White et al – J Drug and Alcohol Dependence 2014

Compared self-reported drug use (past 12m) to urine drug screening (max 30 days)

Self-report of marijuana and cocaine use is significantly less sensitive among black MSM than white MSM

Table 6
Summary of associations between drug use indicators and race (black vs. white) among a sample of men who have sex with men in Atlanta, GA, 2010–2012.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Self-reported use</th>
<th>Urine-detected use</th>
<th>Sensitivity of self-reporta</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black/white PR</td>
<td>95% CI</td>
<td>Black/white PR</td>
</tr>
<tr>
<td>Marijuana</td>
<td>0.68, 0.82</td>
<td>1.39</td>
<td>0.71, 0.82</td>
</tr>
<tr>
<td>Unadjusted</td>
<td>0.59, 0.73</td>
<td>0.96</td>
<td>0.71, 0.84</td>
</tr>
<tr>
<td>Adjusted</td>
<td></td>
<td>1.46</td>
<td>0.65, 0.93</td>
</tr>
<tr>
<td>Cocaine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unadjusted</td>
<td>0.20, 0.46</td>
<td>1.06</td>
<td>0.42, 1.00</td>
</tr>
<tr>
<td>Ages 18–24</td>
<td>0.43, 0.66</td>
<td>0.59, 1.91</td>
<td></td>
</tr>
<tr>
<td>Ages 25–34</td>
<td>0.93, 1.86</td>
<td>0.59, 1.91</td>
<td></td>
</tr>
<tr>
<td>Ages 35+</td>
<td>0.13, 0.33</td>
<td>0.59, 1.91</td>
<td></td>
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</tbody>
</table>
Condom failures, incomplete use, errors
Hernandez-Romieu et al – STI 2014

• BMSM more likely to use condom as insertive partner in previous 6 months.
• Yet 31% of BMSM vs. 43% of WMSM users had fully effective condom use
  • No failures (breakage, slippage), no incomplete use
• 53% of BMSM and 21% of WMSM used oiled-based lubricant with condoms in previous 6 months
  • 62% vs. 32% among 18 – 24 year olds

• Conclude:
  • Misclassification of protected AI
  • Need for condom education remains
Key Findings:
HIV/STI incidence studies
## STI Incidence

<table>
<thead>
<tr>
<th></th>
<th>BMSM Infections</th>
<th>BMSM Rate (% / year)</th>
<th>WMSM Infections</th>
<th>WMSM Rate (% / year)</th>
<th>Rate Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urethral Chlamydia</td>
<td>17</td>
<td>4.7</td>
<td>14</td>
<td>3.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Urethral Gonorrhea</td>
<td>8</td>
<td>2.2</td>
<td>1</td>
<td>0.2</td>
<td>10.3</td>
</tr>
<tr>
<td>Rectal Chlamydia</td>
<td>34</td>
<td>10.8</td>
<td>22</td>
<td>5.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Rectal Gonorrhea</td>
<td>30</td>
<td>9.4</td>
<td>15</td>
<td>3.7</td>
<td>2.6</td>
</tr>
<tr>
<td>Syphilis</td>
<td>22</td>
<td>6.1</td>
<td>0</td>
<td>0.0</td>
<td>(\infty)</td>
</tr>
</tbody>
</table>
## HIV Incidence

<table>
<thead>
<tr>
<th></th>
<th>Black MSM</th>
<th>White MSM</th>
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</thead>
<tbody>
<tr>
<td><strong>Overall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incidence rate</td>
<td>6.5% / year</td>
<td>1.7% / year</td>
</tr>
<tr>
<td>New HIV infections</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>% HIV-positive at end of study</td>
<td>11.3%</td>
<td>3.6%</td>
</tr>
<tr>
<td><strong>Age 18 – 24</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incidence rate</td>
<td>10.9% / year</td>
<td>0.9% / year</td>
</tr>
<tr>
<td>New HIV infections</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>% HIV-positive at end of study</td>
<td>16.6%</td>
<td>1.6%</td>
</tr>
<tr>
<td><strong>Age 25+</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incidence rate</td>
<td>3.6% / year</td>
<td>1.9% / year</td>
</tr>
<tr>
<td>New HIV infections</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>% HIV-positive at end of study</td>
<td>6.0%</td>
<td>4.5%</td>
</tr>
</tbody>
</table>
Mediation analysis to explain HIV incidence disparity

Effects of Rectal STI on HIV incidence?

- Unadjusted HR: 3.7 (1.4, 9.4)

- Adjusted, weighted HR: 2.8 (1.2, 6.4)
  - Estimates ‘causal’ effect of rectal STI on HIV incidence
  - Adjustment for behavioral confounders attenuates the association by 24%

- Population attributable fraction: 14.6% (6.8, 31.4)
  - Despite significant ‘causal’ HR, rectal STI only mildly contribute to HIV incidence in the population.
  - PAF driven by both HR and STI incidence

Vaughan et al 2015, BMC Medical Research Methodology
Kelley et al 2015, AIDS Res Human Retrov
Tools and Scale: What Do We Know?
Estimated percent of new HIV infections among MSM prevented by three prevention approaches, four countries

Source: Sullivan et al, Lancet 2012
HIV infections estimated to be averted by PrEP, reduction in UAI, and early ARV treatment in a stochastic simulation model of HIV transmissions among MSM in Africa.

Source: Brookmeyer et al, PLoS ONE 2014
HIV infections estimated to be averted by PrEP, reduction in UAI, increased HIV testing, and early ARV treatment in a stochastic simulation model of HIV transmissions among MSM in Africa.

Source: Brookmeyer et al, PLoS ONE 2014
To make modest impacts on HIV transmissions among MSM, we will need to achieve 30-50% coverage of multiple interventions.

So how are we doing?
Estimated Efficacy of Interventions and Estimated Uptake among MSM, US

![Bar chart showing efficacy and uptake for different interventions among MSM, US. The interventions include TasP, nPEP, PreP, Condom Use, IDI, and GLI. The chart indicates varying levels of efficacy and uptake across these interventions.]
What are the strategies?

• Integrate services into medical care (HIV testing)
• Increase use of self-service screenings and referral (app example) **example today
• Convert intervention materials to self-service formats (Keep It Up)
• Diversify modes (testing technologies, PrEP monitoring)
Theoretical basis for HealthMindr: Social Cognitive Theory

**Goal Setting:**
“I have chosen a plan to test regularly for HIV that works for me”

**Self-efficacy:**
“I can make and achieve a plan to test for HIV regularly”

**Outcome expectations:**
“If I adhere to my plan to test for HIV regularly, I will be able to stay healthier and protect my partners”

**Self-regulation:**
“I can see that I stuck with my plan, and reminders helped me to achieve this”

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**Behaviors**

**HIV Prevention:**
- Regular HIV testing
- Regular PrEP assessments
- Regular nPEP assessments
- Consistent/correct condom use
- Adherence to PrEP and nPEP

**HIV Care**
- Retention in HIV Care
- Adherence to ART

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**Goal Setting:**
“I have chosen a plan to adhere to ART”

**Self-efficacy:**
“I can make and achieve a plan to adhere to my ART regimen”

**Outcome expectations:**
“IF I adhere to my plan for ART, I can stay healthier and reduce my changes of transmitting HIV to others”.

**Self-regulation:**
“I can see that I have achieved viral suppression and reminders have helped me to achieve this”
Acknowledgements

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• Alexandra Ricca
• Cory Woodyatt
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• Sean Young
• Amy Nunn

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