HIV/AIDS Among MSM

The Epidemiology and Surveillance Research Agenda

Global Consultation on MSM and HIV/AIDS Research
September 28th, 2008

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Professor of Epidemiology
Johns Hopkins Bloomberg School of Public Health
Themes

- HIV epidemiology and surveillance are the bases of informed responses to the pandemic

- MSM epidemics are underway in high, middle and low income countries in 2008—these men are markedly under-studied and under-resourced

- Many MSM epidemics are occurring in “hidden” contexts of discrimination, stigma, criminalization, rights abrogation and limited HIV surveillance

- There are new tools and approaches to improved epi and surveillance for HIV among MSM to better inform prevention, treatment, and care
Outline

The Pandemic in 2008
US and Europe
Low and Middle income countries

Research in Epidemiology and Surveillance
Sampling hard to reach populations
Venue-based
RDS
Internet
Recency assays
Molecular epidemiology

Ways Forward
The Pandemic in 2008

US and Western Europe
Estimates for US new infections in 2006
- 56,300 incident infections ((95% CI 48 200-64 500)
- Used 22 state data with BED/STARHS and an extended back calculation model
- 73% are in men
- 53% are in MSM
- For Black and Latino MSM, 52% of new infections are in 13-29 yr olds: White MSM peak age is 30-39 yrs olds (35%)

Black HIV/AIDS Rates
- 45% are in Blacks— some 13% of US population
- 64% of Black HIV cases are in men: 62% of those are in Black MSM

“Recent data indicate that in the past year, 80% of MSM have not been reached by the intensive interventions we know to be effective.”
Figure 1: Estimated Number of New HIV Infections by Transmission Category, Extended Back-Calculation Model, United States, 1977-2006

Note: MSM refers to men who have sex with men; IDU refers to injection drug users.
Figure 2: Estimated Number* of New HIV Infections among MSM, by Race/Ethnicity and Age Group, United States, 2006

*Incidence estimates are adjusted for reporting delays and reclassification of cases reported without information regarding an HIV transmission category, but not for underreporting.
† Might be of any race. Note: MSM refers to men who have sex with men.
Estimated Number of HIV/AIDS Cases among Men Who Have Sex with Men, Aged 13–24 years, by Race/Ethnicity 2001–2006—33 States

Note. The data have been adjusted for reporting delay and cases without risk factor information were proportionally redistributed.

HIV Prevalence rates in 4 EU Countries: MSM and General Adult prevalence rates, 2007

Sources:
The Pandemic in 2008

Low and Middle Income Countries
HIV prevalence among MSM in Selected settings

Global systematic search of HIV prevalence studies among MSM in low and middle-income countries

01-01-2000 to 01-09-2008

N > 50
Includes IAS 2008
<table>
<thead>
<tr>
<th>Country</th>
<th>Sample Size</th>
<th>MSM Prevalence</th>
<th>Population Prevalence</th>
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<tbody>
<tr>
<td>Ecuador</td>
<td>916</td>
<td>15.1 (12.8-17.4)</td>
<td>0.3%</td>
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<td>Peru</td>
<td>19352</td>
<td>12.5 (12.1-13.0)</td>
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<tr>
<td>Bolivia</td>
<td>520</td>
<td>21.2 (17.6-24.7)</td>
<td>0.1%</td>
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<tr>
<td>Uruguay</td>
<td>736</td>
<td>18.9 (16.1-21.7)</td>
<td>0.4%</td>
</tr>
<tr>
<td>Argentina</td>
<td>2410</td>
<td>12.1 (10.8-13.4)</td>
<td>0.4%</td>
</tr>
<tr>
<td>Colombia</td>
<td>1274</td>
<td>19.4 (17.2-21.6)</td>
<td>0.5%</td>
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<td>Paraguay</td>
<td>92</td>
<td>13.0 (6.2-19.9)</td>
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<td>Brazil</td>
<td>2114</td>
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<tr>
<td>Honduras</td>
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<tr>
<td>Panama</td>
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<td>10.6 (6.7-14.6)</td>
<td>0.8%</td>
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<tr>
<td>Guatemala</td>
<td>165</td>
<td>11.5 (6.7-16.4)</td>
<td>0.7%</td>
</tr>
<tr>
<td>El Salvador</td>
<td>293</td>
<td>7.9 (4.8-10.9)</td>
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<td>Nicaragua</td>
<td>162</td>
<td>9.3 (4.8-13.7)</td>
<td>0.2%</td>
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<td>Mexico</td>
<td>9422</td>
<td>25.6 (24.8-26.5)</td>
<td>0.3%</td>
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<tr>
<td>Puerto Rico</td>
<td>685</td>
<td>6.0 (4.2-7.7)</td>
<td>n/a</td>
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<tr>
<td>Trinidad and Tobago</td>
<td>235</td>
<td>20.4 (15.3-25.6)</td>
<td>1.5%</td>
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<tr>
<td><strong>Jamaica</strong></td>
<td><strong>201</strong></td>
<td><strong>31.8 (25.4-38.3)</strong></td>
<td><strong>1.4%</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>39994</strong></td>
<td><strong>15.9 (15.6-16.3)</strong></td>
<td><strong>0.80%</strong></td>
</tr>
<tr>
<td>Country</td>
<td>Sample Size</td>
<td>MSM Prevalence</td>
<td>Population Prevalence</td>
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</tr>
<tr>
<td>Senegal</td>
<td>943</td>
<td>21.6 (19.0-24.3)%</td>
<td>0.9%</td>
</tr>
<tr>
<td>South Africa</td>
<td>574</td>
<td>15.3 (12.4-18.3)</td>
<td>15.9%</td>
</tr>
<tr>
<td>Zambia</td>
<td>641</td>
<td>32.9 (29.3-36.6)</td>
<td>15.7%</td>
</tr>
<tr>
<td>Kenya</td>
<td>1125</td>
<td>15.6 (13.5-17.7)</td>
<td>7.5%</td>
</tr>
<tr>
<td>Tanzania</td>
<td>509</td>
<td>12.4 (9.5-15.2)</td>
<td>5.9%</td>
</tr>
<tr>
<td>Malawi</td>
<td>201</td>
<td>21.4 (15.7-27.1)</td>
<td>11.5%</td>
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<tr>
<td>Nigeria</td>
<td>1961</td>
<td>13.5 (12.0-15.)</td>
<td>2.9%</td>
</tr>
<tr>
<td>Sudan</td>
<td>1119</td>
<td>8.8 (7.1-10.4)</td>
<td>1.3%</td>
</tr>
<tr>
<td>Egypt</td>
<td>340</td>
<td>5.3 (2.9-7.7)</td>
<td>0.02%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>7413</strong></td>
<td><strong>15.7 (14.9-16.5)</strong></td>
<td><strong>5.0%</strong></td>
</tr>
</tbody>
</table>
MSM in Malawi in 2008

- National program has no MSM component
- Homosexuality illegal
- No “open” venue for MSM/Gay/Bisexual men
- Police harassment of MSM common
- HIV prevention and education efforts limited to one NGO—active only in urban areas
- No water-based lubricants available in country
- No data on prevalence, risks, for MSM
HIV Prevalence Study of MSM in Malawi, 2008 (CEDEP, OSISA, JHU)

- **Background:** First evaluation of HIV among MSM in Malawi

- **Methods**
  - Community-based study of 200 MSM with LGBT rights partner
  - Anonymous snowball sampling, oral EIAs

- **Results**
  - HIV Prevalence 21.4 %
    - Odds Ratio for HIV infection among MSM is 2.08 (95% CI 1.49-3.02)
    - 28.6% (56/196) were in a stable relationship with a man,
    - 21.9% (43/196) were married or had a girlfriend,
    - 25.5% had ongoing concurrent relationships with a man and a woman.

- **Risk Factors for HIV Infection**
  - Not always wearing condoms (p<0.01)
  - Used the internet to find male partner (p=0.07)
  - Having received money for anal intercourse (p=0.08)
<table>
<thead>
<tr>
<th>Country</th>
<th>Sample Size</th>
<th>MSM Prevalence</th>
<th>Population Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thailand</td>
<td>7550</td>
<td>22.4 (21.4-23.3)</td>
<td>1.2%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>575</td>
<td>2.8 (1.4-4.1)</td>
<td>0.4%</td>
</tr>
<tr>
<td>Laos</td>
<td>540</td>
<td>5.4 (3.5-7.2)</td>
<td>0.1%</td>
</tr>
<tr>
<td>Cambodia</td>
<td>754</td>
<td>7.8 (5.9-9.7)</td>
<td>0.8%</td>
</tr>
<tr>
<td>China</td>
<td>8373</td>
<td>2.7 (2.3-3.0)</td>
<td>0.1%</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1829</td>
<td>7.3 (6.0-8.5)</td>
<td>n/a</td>
</tr>
<tr>
<td>Indonesia</td>
<td>770</td>
<td>9.0 (6.9-11.0)</td>
<td>0.2%</td>
</tr>
<tr>
<td>East Timor</td>
<td>110</td>
<td>1.0 (0.0-2.6)</td>
<td>n/a</td>
</tr>
<tr>
<td>India</td>
<td>4295</td>
<td>15.2 (14.1-16.2)</td>
<td>0.3%</td>
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<tr>
<td>Nepal</td>
<td>358</td>
<td>4.8 (2.6-7.0)</td>
<td>0.4%</td>
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<tr>
<td>Total</td>
<td>25154</td>
<td>11.5 (11.1-11.9)</td>
<td>0.2%</td>
</tr>
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</table>
Laos- hidden epidemic among MSM in 2007

Background
- First ever analysis of the HIV epidemic amongst MSM in Laos

Methods
- 540 MSM recruited using venue-day-time Sampling, hand-held computers, oral EIAs

Results
- HIV Prevalence 5.6 %
  - More than 50 times prevalence of the general adult population
  - In last 3 months, 39.4% reported sex with women
  - Low reported condom use with partners (14.4%-24.2%)

# FSU and Eastern Europe

<table>
<thead>
<tr>
<th>Country</th>
<th>Sample Size</th>
<th>MSM Prevalence</th>
<th>Population Prevalence</th>
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</thead>
<tbody>
<tr>
<td>Czech Republic</td>
<td>379</td>
<td>0.5 (0.0-1.3)</td>
<td>0.0%</td>
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<td>Poland</td>
<td>424</td>
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<td>0.1%</td>
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<td>Serbia</td>
<td>277</td>
<td>8.7 (5.4-12.0)</td>
<td>0.1%</td>
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<td>Slovenia</td>
<td>79</td>
<td>2.5 (0.0-6.0)</td>
<td>0.0%</td>
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<td>Armenia</td>
<td>108</td>
<td>0.9 (0.0-2.7)</td>
<td>0.1%</td>
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<tr>
<td>Belarus</td>
<td>170</td>
<td>0 (0.0-0.0)</td>
<td>0.2%</td>
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<td>Georgia</td>
<td>113</td>
<td>5.3 (1.2-9.4)</td>
<td>0.1%</td>
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<tr>
<td>Kazakhstan</td>
<td>100</td>
<td>0 (0.0-0.0)</td>
<td>0.1%</td>
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<td>Kyrgyzstan</td>
<td>101</td>
<td>0 (0.0-0.0)</td>
<td>0.1%</td>
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<tr>
<td>Lithuania</td>
<td>79</td>
<td>0 (0.0-0.0)</td>
<td>0.1%</td>
</tr>
<tr>
<td>Moldova</td>
<td>118</td>
<td>1.7 (0.0-4.0)</td>
<td>0.2%</td>
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<td>Russia</td>
<td>7062</td>
<td>1.0 (0.7-1.2)</td>
<td>0.8%</td>
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<tr>
<td><strong>Russia (CB)</strong></td>
<td><strong>401</strong></td>
<td><strong>5.7 (3.5-8.0)</strong></td>
<td><strong>0.8%</strong></td>
</tr>
<tr>
<td>Total</td>
<td><strong>9010</strong></td>
<td><strong>1.4 (1.2-1.7)</strong></td>
<td><strong>0.2%</strong></td>
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</table>
Elevated Risk for HIV Infection among MSM in Low and Middle Income Countries 2000-2006: A Systematic Review

Stefan Baral, Sifakis F, Cleghorn F, Beyrer C.

*PLoS Medicine*,
Dec. 1, 2007
Results

Total of 83 publications from 38 countries on HIV in MSM

US Bureau of Census and UNAIDS data to estimate general population levels of HIV in adults aged 15-49

Total sample: 63,538 individual men

Pooled OR for HIV infection in MSM: 19.3

In very low HIV Prevalence settings (<1/1000 adults with HIV)
   Pooled OR for MSM was 58.4

In high prevalence settings (> 1/20 infected)
   Pooled OR for MSM was 9.6
# Systematic Review of HIV among MSM in Low and Middle Income Countries

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Countries</th>
<th>Odds Ratios</th>
<th>95% Confidence Interval</th>
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<tbody>
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<td>Americas</td>
<td>15</td>
<td>33.3</td>
<td>32.3-34.2</td>
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<td>Asia</td>
<td>7</td>
<td>18.7</td>
<td>17.7-19.7</td>
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<td>Eastern Europe</td>
<td>12</td>
<td>1.3</td>
<td>1.06-1.6</td>
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<td>Africa</td>
<td>4</td>
<td>3.8</td>
<td>3.3-4.3</td>
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### Prevalence Level

<table>
<thead>
<tr>
<th>Prevalence Level</th>
<th>Number of Countries</th>
<th>Odds Ratios</th>
<th>95% Confidence Interval</th>
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<tr>
<td>Very Low Prevalence Countries</td>
<td>23</td>
<td>58.4</td>
<td>56.3-60.6</td>
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<tr>
<td>Low Prevalence</td>
<td>8</td>
<td>14.1</td>
<td>13.9-14.9</td>
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<tr>
<td>Medium/High Prevalence</td>
<td>7</td>
<td>9.6</td>
<td>9.0-10.2</td>
</tr>
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Advances in Surveillance

Sampling hard to reach populations
Venue-Time sampling

- Probability based
- Hidden populations congregate at specific locations and times
  - SW—brothels, street corners
  - MSM—bars, saunas, cruising areas
  - IDU—shooting galleries

- Method:
  1. Formative mapping of sites and times
  2. Site list used to create sampling frame
  3. Data gathered from individuals at site during predefined, randomly chosen time interval
HIV prevalence among MSM, Bangkok, Thailand 2003 – 2005, by recruitment venue

% HIV infected

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<tbody>
<tr>
<td>Entertainment</td>
<td>17.3</td>
<td>28.3</td>
<td>23</td>
<td>13</td>
<td>23</td>
<td>17.3</td>
<td>28.3</td>
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<tr>
<td>Sauna</td>
<td>16.9</td>
<td>31.9</td>
<td>23</td>
<td>13</td>
<td>23</td>
<td>16.9</td>
<td>31.9</td>
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<td>Park</td>
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<td>29.6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>22</td>
<td>29.6</td>
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</table>

Source: Van Griensven, et al, MMWR. 2006
Respondent driven sampling

- An advance on snowball sampling

- Distinctions:
  - probability sampling
  - greater external validity

Wide use for MSM in hidden contexts

Concerns about homophily, external validity
A model of Internet topology using k-shell decomposition

Internet and risk – evidence

• Liau, et al, 2006: a meta-analysis of 22 studies

• 40.2% of MSM had sought sex partners online

• 30.3% had sex with partners they found online

• High risk sexual behavior significantly more likely among MSM who sought partners online than those who did not
  • Pooled OR 1.68 (95% CI: 1.18 –2.40)

Liau et al, 2006
Internet sampling

- Non-probability
  - Open, unrestricted surveys
  - Opt-in panels
    - Useful for recruiting members of small groups

Major inferential assumptions: internet users are rep. of general population; web survey recruits are rep. of internet users

- Probability
  - Active internet users
  - Alternative methods to identify and select
Biologically based methods

Recency assays
Molecular Epidemiology
Biological Assays of Recency

- STARHS
- BED
- Avidity – Affinity Index
- Pooled PCR
- Algorithmic approaches
Recent creation of large databases of viral sequences

Phylogenetics: analyse evolutionary relationships between genetic sequences

Clustering of sequences ~ marker of transmission

Combine with epidemiological data allows assessment of factors contributing to spread of HIV
# Acute HIV infection and clustering

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Country</th>
<th>Clustering of primary infections</th>
<th>Number</th>
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</thead>
<tbody>
<tr>
<td>Yerly</td>
<td>2001</td>
<td>Switzerland</td>
<td>29%</td>
<td>197</td>
</tr>
<tr>
<td>Pao</td>
<td>2005</td>
<td>UK</td>
<td>35%</td>
<td>103</td>
</tr>
<tr>
<td>Brenner</td>
<td>2007</td>
<td>Canada</td>
<td>49%</td>
<td>593</td>
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</table>

Molecular surveillance: City of London

Episodic transmission of HIV revealed by molecular phylodynamics

Figure 2. HIV Transmission Clusters Defined by Genetic Distance

Lewis, PLOS Medicine, 2008
What can these studies tell us?

– Offer valuable insights into how HIV spreads through populations

– This will help focus prevention strategies by answering the following questions:

  – Is acute HIV infection driving transmission?
  – What is the role of concurrency and sexual networks?
  – What is the effect on antiretroviral therapy on transmission?
  – How do drug resistant mutations spread through populations?
What can these studies tell us?

- Answering questions to focus HIV prevention:

  - Acute HIV infection
  - Undiagnosed infection
  - Sexual networks
  - STIs
  - Viral Load
  - ARVs
Ways forward

We need to optimize new behavioral and biologic approaches to HIV surveillance and sampling for MSM.

Better incidence data on our epidemics could lead to better policies and programs.

Much of the world still unmapped for MSM in 2008.

Where molecular methods are feasible—they may be key to informing advances in prevention.
Acknowledgements

Eleanor Gouws (UNAIDS)
Hans-Peter Kohler (Networks in Malawi)
Andrew Leigh Brown (HIV bursts)
Alena Perskyina
Frits van Griensven
Jorge Saavedra
Jose Antonio Izazola (UNAIDS)

Johns Hopkins

Stefan Baral
Kiran Joshi
Frank Sifakis
Darshan Sudarshi

Fogarty International Center, NIDA, IAS, OSI, CEDEP-Malawi, AIDS Infoshare Russia