Reaching A Mobile Target: Using Probability Sampling and Heckman-type Selection Models to Estimate HIV Risk among Mexican Migrants

Xiao Zhang
University of Wisconsin-Madison
Department of Population Health Sciences
34th SBM annual meeting, March 23 2013
Study Aims

• Generate estimates of HIV behavioral risk factors for Mexican Migrants

• Test, and if necessary correct, for non-response bias
Mexican Migrants and HIV Infection

- Mexican migrants in the U.S. are at increased risk for HIV infection
- Risk attributed to individual, contextual, and structural factors including:
  - Low HIV prevention knowledge
  - Limited condom use
  - Altered family and community-based social controls
  - Social and geographic isolation
  - Limited access to health care
Limitations of Previous Research

• Studies on HIV risk among Mexican migrants mostly used small, local, non-probability samples

• Research is challenged by:
  • Mobile & geographically widespread population
  • Lack of a reliable denominator
  • Reluctance among unauthorized migrants in the U.S.
  • Limited representativeness of migrants in sending communities
  • Dynamic, circular nature of migration
A “New” Methodological Approach
Migration Flows

- Southbound
- Deported
- Border
- Northbound
Recruitment Flow Chart

Approached
N=17415

- Not screened
  N=757

- Screened
  N=16658

  - Eligible
    N=6594

  - Not eligible
    N=10064

- Refused
  N=3197

  - Consented
    N=3397

    - Completed questionnaire
      N=3279

    - Left questionnaire incomplete
      N=118

Overall response rate: 49.7%

- Southbound: 44.2%
- Border: 51.3%
- Northbound: 39.0%
- Deported: 96.6%
Heckman Method

• To test and correct for non-participation bias
• Two simultaneous equations
  1) model participation
  2) model outcome of interest
• Allowing the error terms from both equations to be correlated
Participation

• Participation rate is higher among
  1) Bus station and deportation facility
  2) Morning shifts
  3) Younger, male, unmarried, higher education respondents
  4) Interviewed by female interviewers
## Sociodemographics Profile

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), Mean (SD)</td>
<td>34.4 (11.7)</td>
</tr>
<tr>
<td>Male, %</td>
<td>86.3</td>
</tr>
<tr>
<td>Born in Mexico, %</td>
<td>99.2</td>
</tr>
<tr>
<td>Regarded US as primary place of residence, %</td>
<td>66.2</td>
</tr>
<tr>
<td>Ethnic minority, %</td>
<td>4.2</td>
</tr>
<tr>
<td>≥ High school or higher, %</td>
<td>35.6</td>
</tr>
<tr>
<td>Married/cohabiting, %</td>
<td>52.7</td>
</tr>
</tbody>
</table>
HIV-Related Risk Behaviors

A: men

B: women

- Multiple sexual partners
- Sex with sex workers or casual partners
- Unprotected sex with sex workers or casual partners
- Anal sex with same-sex partner
## Multiple Sex Partners

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Independent Probit</th>
<th>P</th>
<th>Modified Heckman</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time spent in the U.S. last 12 months</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;= 24 hours</td>
<td>Reference</td>
<td></td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>&gt;24 hours, &lt; 6 mos.</td>
<td>0.1503</td>
<td>0.037</td>
<td>0.1489</td>
<td>0.039</td>
</tr>
<tr>
<td>&gt;=6 mos., &lt; 12 mos.</td>
<td>0.0223</td>
<td>0.793</td>
<td>0.0179</td>
<td>0.833</td>
</tr>
<tr>
<td>12 months</td>
<td>-0.1176</td>
<td>0.170</td>
<td>-0.1172</td>
<td>0.171</td>
</tr>
<tr>
<td><strong>Lifetime history of STIs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Reference</td>
<td></td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.1504</td>
<td>0.004</td>
<td>0.1524</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Last 12-month sex under the influence of alcohol</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Reference</td>
<td></td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.6581</td>
<td>&lt;0.001</td>
<td>0.6537</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Last 12-month sex under the influence of other substances</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Reference</td>
<td></td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.4628</td>
<td>&lt;0.001</td>
<td>0.4728</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Rho: 0.071, p=0.306

*Both models were controlled for sociodemographic factors and time spent in the U.S. during lifetime.*
### Unprotected sex with risky partners

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Independent Probit</th>
<th>P</th>
<th>Modified Heckman</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifetime history of STIs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• No</td>
<td>Reference</td>
<td>0.1521</td>
<td>Reference</td>
<td>0.1506</td>
</tr>
<tr>
<td>• Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last 12-month sex under the influence of alcohol</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• No</td>
<td>Reference</td>
<td>0.5006</td>
<td>Reference</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>• Yes</td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Last 12-month sex under the influence of other substances</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• No</td>
<td>Reference</td>
<td>0.6250</td>
<td>Reference</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>• Yes</td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Rho: -0.050, p=0.522

*Both models were controlled for sociodemographic factors, time spent in the U.S. during lifetime and last 12 months.
Summary

• High risk for HIV infection among migrants travelling through the U.S. – Mexico border
• No significant evidence of selective participation
• Binational prevention and efforts targeting this mobile, hard-to-reach population are needed
Acknowledgement

• Dr. Martinez-Donate
• Dr. Rangel
• Dr. Hovell
• Dr. Sipan
• Dr. Magis-Rodriguez
• Dr. Gonzalez-Fagoaga
THANK YOU!

QUESTIONS AND COMMENTS?
Heckman Method

• To test and correct for non-participation bias

• $Y_{1i} = \beta_1'X_{1i} + \varepsilon_{1i}$  Substantive equation

• $Y_{2i} = \beta_2'X_{2i} + \varepsilon_{2i}$  Selection equation

• $\varepsilon_{j} \sim N(0,1)$, with correlation $[\varepsilon_{1i}, \varepsilon_{2i}] = \rho$