Appendix 1
<table>
<thead>
<tr>
<th>For Whom?</th>
<th>For What Purpose?</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researchers</td>
<td>Theory and Causality</td>
<td>Basic Research and Experimentation</td>
</tr>
<tr>
<td></td>
<td>• Understanding underlying mechanisms</td>
<td>• Research on behavioral and social causes</td>
</tr>
<tr>
<td></td>
<td>• Establishing cause and effect relationships</td>
<td>• Experimental models preferred</td>
</tr>
<tr>
<td></td>
<td>• Contributing to basic research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Developing theory</td>
<td></td>
</tr>
<tr>
<td>Decision Makers</td>
<td>Decision-making and Accountability</td>
<td>Problem Solutions with Measurable Results</td>
</tr>
<tr>
<td>(funders, public authorities)</td>
<td>• Determining the usefulness, acceptability, cost, feasibility, and generalizability of a project in order to facilitate decision-making and promote accountability</td>
<td>• Analysis of the problem</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Monitoring of project activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Measurable outputs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cost-effectiveness analyses</td>
</tr>
<tr>
<td>Community-Based Organizations</td>
<td>Improving Practice</td>
<td>Feedback</td>
</tr>
<tr>
<td></td>
<td>• Connection between HIV and the larger social and political situation of the target group</td>
<td>• Needs assessment of the target group</td>
</tr>
<tr>
<td></td>
<td>• Feedback about project implementation for the purpose of improving services</td>
<td>• Feedback from the target group regarding services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Process evaluations</td>
</tr>
<tr>
<td>Target Group</td>
<td>Empowerment</td>
<td>Participation in Service Development and Implementation</td>
</tr>
<tr>
<td></td>
<td>• Determining the usefulness of the project in terms of helping members deal with the disease in their everyday lives</td>
<td>• Participative research in which the target group takes part in interpreting and appropriating the results</td>
</tr>
<tr>
<td></td>
<td>• Increasing autonomy and empowerment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ensuring the project is responsive to the target group’s needs and interests</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1**

**Stakeholder Interests and Research Priorities**

Based on Van de Ven & Aggleton (1999) and Manderscheid (1996)
Figure 2

Literature Search Strategy

Electronic Databases

9/98 & 3/00
Using: WinSPIRS
Database Description: PsychLit is an international database for the social and behavioral sciences; social work abstracts is a database of predominantly American social work literature; sociofile is an international database for the social sciences
Search Terms: (HIV or AIDS) and PREVENTION and (EVALUAT* or ASSESS* or OUTCOME* or EFFECTIV*)
Reasoning: All of the above terms were included after experimenting with using each term singly, discovering that articles assessing HIV programs were not included using one of these terms as an umbrella term. A problem in the data bases is not having an efficient and uniform way of identifying all evaluation research. 1980 was chosen as the start year, given the history of the HIV epidemic (Note: Not all databases start exactly at 1980, resulting in differing spans of years in the search).

9/98 & 3/00
Using: SilverPlatter
Data Bases: Psyndex (1977-Dec 1999)
Database Description: German language psychological and behavioral literature
Search Terms: (HIV or AIDS) and (PREVENTION or PRAEVENTION) and (EVALUAT* or ASSESS* or OUTCOME* or EFFECTIV* or Auswertung)
Reasoning: Database constructed like PsychLit; added German terms to increase hits

9/98 & 3/99
Using: WinSPIRS & NLM Interface
Database Description: International database of health science literature
Search Terms: (HIV-INFECTIONS-PREVENTION-AND-CONTROL in MESH) and ((INTERVENTION-STUDIES in MESH) or (OUTCOME-AND-PROCESS-ASSESSMENT-HEALTH-CARE in MESH) or (PROGRAM-EVALUATION in MESH) or (PILOT-PROJECTS in MESH) or (OUTCOME-ASSESSMENT-HEALTHCARE in MESH))
and (HIV-INFECTIONS-PREVENTION-AND-CONTROL in MESH) and ((EVALUATION-STUDIES in MESH) or (FOLLOW-UP-STUDIES in MESH))
Reasoning: Conducted a preliminary search using the search criteria as within the Psychlit, etc. data bases, yielding a large number of articles not relevant to the topic of interest. Examined the relevant listings, noting the topics in the Mesh field, also noting exclusion criterion of "not needle exchange programs in mesh" screened out most drug-related titles. Search had to be separated into two separate searches because the search line would not take such a long string. Although the mesh terms provide for a more efficient search, there is a considerable problem in including so many
equivalent terms to designate evaluation research. As above 1980 chosen as the start year, given the history of the HIV epidemic.

3/99
Using: NLM Interface
Data Bases: AIDSline (1980-3/22/99)
Database Description: International database of health science literature related to HIV/AIDS
Search Terms: (PREVENTION-AND-CONTROL) and ((INTERVENTION-STUDIES) or (OUTCOME-AND-PROCESS-ASSESSMENT-HEALTH-CARE) or (PROGRAM-EVALUATION) or (PILOT-PROJECTS) or (OUTCOME-ASSESSMENT-HEALTHCARE) or (EVALUATION-STUDIES) or (FOLLOW-UP-STUDIES)); Excluding Medline listings
Reasoning: Same rationale as for Medline, given that the architecture of both databases is the same; was unable to exclude needle-sharing categorically, as this is not possible in the NLM interface.

3/99
Using: WHO homepage publications search interface
Data Bases: 1. WHO publications: Covering over 700 formal WHO publications organized by subject category
2. WHO technical documents database.
3. Full-text search for publications issued since 1950
Database Description: (see above)
Search Terms: HIV prevention evaluation
Reasoning: Experimentation revealed the terms in combination produced the most relevant list.

3/99
Using: NLM Interface
Data Bases: Healthstar (1975-3/29/99)
Database Description: International health sciences database
Search Terms: (HIV-PREVENTION) and ((INTERVENTION-STUDIES) or (OUTCOME-AND-PROCESS-ASSESSMENT-HEALTH-CARE) or (PROGRAM-EVALUATION) or (PILOT-PROJECTS) or (OUTCOME-ASSESSMENT-HEALTHCARE) or (EVALUATION-STUDIES) or (FOLLOW-UP-STUDIES)); Excluding Medline listings
Reasoning: Same rationale as for Medline, given that the architecture of both databases is the same; was unable to exclude needle-sharing categorically, as this is not possible in the NLM interface; for whatever reason, HIV-DISEASES-PREVENTION-AND-CONTROL was too restrictive, not producing any hits, so expanded to HIV-PREVENTION.

3/99
Using: CESSDA Integrated Data Catalogue interface
Data Bases: CESSDA Integrated Data Catalogue
Database Description: International social sciences database
Search Terms: HIV Prevention
Reasoning: Through experimentation found that HIV Prevention Evaluation was too restrictive, and HIV was too broad.
4/99
Using: USAID Development Exchange Clearinghouse interface
Data Bases: USAID Development Exchange Clearinghouse
Database
Description: All publications based on projects funded by USAID
Search Terms: HIV Prevention Evaluation
Reasoning: Through experimentation found that HIV Prevention Evaluation was appropriate.

4/00
Using: CRIPS
Data Bases: CRIPS archive
Database
Description: Archive of all articles and reports on HIV/AIDS produced in France
Search Terms: “Evaluation” in abstract
Reasoning: To focus on articles addressing evaluation issues.

Other Sources

Researchers were contacted in the following countries:

- United Kingdom
- Switzerland
- USA
- France
- Australia
- Canada
- Germany

The following organizations were also contacted:

- UNAIDS
- USAID
- Population Council
- International AIDS/HIV Alliance
- National Council for International Health (US)
- International Family Health
Figure 3

Literature Search Criteria

Focus:
Outcome and process evaluations of community-based prevention for the sexual transmission of HIV

Excluded were studies about:

- transmission through drug use
- studies which describe an intervention without offering process or outcome data
- school-based (including college-based) interventions
- indirect data reporting
- effectiveness/efficacy trials of barrier methods of contraception, STD prevention
- interventions at the population level (e.g. national media campaigns)
- basic epidemiological research on causes of risk behavior, patterns of transmission, behavioral topics, etc.
- interventions at work sites
- occupational transmission/prevention
- interventions for in-patient populations
- contact/partner tracing/notification
- counseling and testing as prevention
- education/performance evaluations for professionals/workers who work with target group
- probability models of particular population-based approaches (e.g. condom vs. reduction in total number of partners)
- perinatal transmission
- transmission by blood transfusion/blood supply
- prevention through mass screening

Included were:

- All studies dealing with process or outcome evaluations of prevention programs in the NGO sector which did not fall into one of the above categories; not all of these programs were initiated by NGOs, but were done in a community-based context by or in close cooperation with NGOs
- Theoretical/philosophical pieces as background material, particularly those dealing with issues specific to the evaluation of HIV prevention programs
Figure 4
Model of Breast Cancer Etiology
(N. Krieger 1989)
Table 2. Evolution of world views related to coronary heart disease (CHD) among Coalfields men.

<table>
<thead>
<tr>
<th>EXTERNAL INFLUENCES</th>
<th>SOCIAL ATTRACTIONS</th>
<th>AREAS OF CHANGE</th>
<th>SOCIAL ATTRACTIONS</th>
<th>EXTERNAL INFLUENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late 19th century: Cultural Symbols, Fatalism/Hedonism</td>
<td>→</td>
<td>Insider-Outsider Solidarity</td>
<td>←</td>
<td>Late 19th century: Social &amp; Geographical Isolation</td>
</tr>
<tr>
<td>Male Solidarity &quot;Larrkin&quot; Response</td>
<td>←</td>
<td>&quot;Respectible&quot; Response</td>
<td>←</td>
<td>←</td>
</tr>
<tr>
<td>1970's Decline in Mining, High Unemployment</td>
<td>→</td>
<td>Gender Relationships</td>
<td>←</td>
<td>1970's Feminism, Health Promotion</td>
</tr>
<tr>
<td>Groups Resistant to Health Messages</td>
<td>←</td>
<td>Groups Receptive to Health Messages</td>
<td>←</td>
<td>←</td>
</tr>
<tr>
<td>1980's Ecological Paradigm, Decline in Trade Unions</td>
<td>→</td>
<td>Different Views of Risk</td>
<td>←</td>
<td>1980's Epidemiology of Coalfields Heart Disease</td>
</tr>
<tr>
<td>Anti-Authoritarian group, Community Beliefs</td>
<td>←</td>
<td>Healthy Heartbeat Group, Individual Responsibility for Health</td>
<td>←</td>
<td>←</td>
</tr>
<tr>
<td>Community Activation</td>
<td>←</td>
<td>←</td>
<td>←</td>
<td>←</td>
</tr>
</tbody>
</table>

"Larrkin Heart" World View: Elevated CHD

"Healthy Heart" World View: CHD Declining

Figure 5

Model of Prevention Dynamics Among Coal Miners
(Albrecht et al. 1998)
<table>
<thead>
<tr>
<th></th>
<th>Health problem/ Problem boundary</th>
<th>Teamwork/ Collaboration</th>
<th>Role of conceptual framework</th>
<th>How knowledge is applied</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single disciplinary</strong></td>
<td>The health problem is what a single discipline thinks it to be</td>
<td>None.</td>
<td>Arises from a single discipline.</td>
<td>Production of ’specialised’ knowledge and reductionistic accounts of problems or interventions.</td>
</tr>
<tr>
<td><strong>Multidisciplinary</strong></td>
<td>The health problem is what several disciplines working independently think it to be; hard disciplinary boundaries are placed around the problem facets.</td>
<td>None or limited; disciplines work independently on distinct facets of a broadly conceptualised problem.</td>
<td>Mutually exclusive conceptualisations juxtaposed and broadly cumulative.</td>
<td>Interventions suggested by isolated, discipline-specific problem explanations.</td>
</tr>
<tr>
<td><strong>Interdisciplinary</strong></td>
<td>The health problem is what several disciplines working together agree it may be. Aspects of the problem from disciplines not included may be ignored. The health problem is defined by the totality of ’soft’ boundaries between the various disciplines working together.</td>
<td>Collaboration using limited knowledge bases. Different disciplines address inter-connected aspects of specifically defined health problem, mainly bringing to bear their own theories and conceptual frameworks.</td>
<td>Isolated explanations of a problem from a limited number of disciplines are assembled and connections among them are sought.</td>
<td>Interventions sensitive to an explanation of the health problem informed by understanding the connections among participating disciplines.</td>
</tr>
<tr>
<td><strong>Transdisciplinary</strong></td>
<td>Problem is defined as part of an open, dynamic system operating at multiple levels. Problem broadly expands to include all relevant disciplinary insights.</td>
<td>Open ended collaboration. All disciplinary insights required to define the problem are assembled.</td>
<td>Common conceptual framework is sought which will be useable by any discipline, achieving a new insight about the problem.</td>
<td>Interventions with the greatest possibility of success follow from a synthesis of knowledge from disciplinary collaboration.</td>
</tr>
</tbody>
</table>

**Figure 6**

**Description of Transdisciplinary Research as Compared to Other Approaches**
(Albrecht et al. 1998)
Figure 2  The dynamic process of transdisciplinary thinking.

Figure 7

Transdisciplinary Thinking
(Albrecht et al. 1998)
Figure 8
A Complex Model of HIV Transmission Among Sex Workers

Mathematical Relationships Specified in the Simulation Program:
(all variables expressed in percentages)

\[
\text{Psychosocial Instability} = \text{Baseline Instability} + \\
\quad (\text{Baseline Instability} \times \text{Disadvantage}) + \\
\quad (\text{Discrimination} \times \text{Baseline Instability})
\]

\[
\text{Unsafe Sex Probability} = \text{Baseline Unsafe Sex Probability} + \\
\quad (\text{Psychosocial Instability} \times \text{Baseline Unsafe Sex Probability})
\]
Figure 9

The Historical Development of Social Simulation Approaches

(Gilbert & Troitzsch 1999)
Figure 10

The Logic of Social Science Simulations

(Gilbert & Troitzsch 1999)
Figure 11

NetLog User Interface
Growth in Prevalence in Closed System

(no migration)

Figure 12

Growth in Prevalence in the Closed System
Figure 13
Prevalence Curves
(initial sex worker prevalence 15%)
Figure 14
Prevalence Curves (initial sex worker prevalence 15%, initial client prevalence 5%)
Figure 15
Prevalence Curves
(initial sex worker prevalence 15%, initial client prevalence 15%)
Figure 16a
Prevalence Curves
(initial sex worker prevalence 15%, initial client prevalence 0, incoming sex worker prevalence 10%)
Figure 16b
Prevalence Curves
(initial sex worker prevalence 15%, initial client prevalence 0, incoming sex worker prevalence 10%)

All Runs of 5000 cycles
Figure 17a
Prevalence Curves
(initial sex worker prevalence 15%, initial client prevalence 10%, incoming sex worker prevalence 10%)
Figure 17b
Prevalence Curves (All Runs of 5000 cycles)
(initial sex worker prevalence 15%, initial client prevalence 10%, incoming sex worker prevalence 10%)
Figure 18a

**Intervention 8:**
Reducing the Level of Baseline Unsafe Sex, Discrimination, Baseline Instability, and Infectiousness
Infectivity at 1.6 for all runs, all other values set at the 75% level
Figure 18b

Intervention 8: Reducing the Level of Baseline Unsafe Sex, Discrimination, Baseline Instability, and Infectiousness

Infectivity at 1.6 for all runs, all other values set at the 50% level
Figure 19

Intervention 9: Realistic Scenario (Level of Discrimination 75%, Instability 25%, Unsafe Sex 50%, Infectivity at 1.6)
And Baseline Unsafe Sex Probability of Clients at 50% and 100%

Key: red = HIV prevalence among sex workers when maximum unsafe sex probability of clients at 50%, orange = at 100%
Figure 20

A Complex Model of Evaluation Research
Figure 21

Simple Spiral
Figure 22

Spiral With Several Strands
Figure 23
Evolving Spiral
Table 1

Comparison of Positive and Negative Sex Workers on Key Variables

Average for all sex worker agents at baseline

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disadvantage Score</td>
<td>34</td>
</tr>
<tr>
<td>Instability Score</td>
<td>80</td>
</tr>
<tr>
<td>Unsafe Sex Probability</td>
<td>70</td>
</tr>
<tr>
<td>Base Instability</td>
<td>50</td>
</tr>
<tr>
<td>Base Unsafe Sex Probability</td>
<td>50</td>
</tr>
<tr>
<td>Scene time</td>
<td>0</td>
</tr>
</tbody>
</table>

Average for sex worker agents by HIV status at time 3000 cycles (ten total runs)

<table>
<thead>
<tr>
<th>Variable</th>
<th>HIV+ Agents</th>
<th>HIV- Agents</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disadvantage Score</td>
<td>36.7 (32.8-40.9)</td>
<td>34.6 (32.6-37.4)</td>
<td>2.1</td>
</tr>
<tr>
<td>Instability Score</td>
<td>80.1 (69.6-88.9)</td>
<td>79.1 (77.4-80.8)</td>
<td>1.0</td>
</tr>
<tr>
<td>Unsafe Sex Probability</td>
<td>71.2 (62.9-78.6)</td>
<td>70.6 (65.9-76.1)</td>
<td>0.6</td>
</tr>
<tr>
<td>Base Instability</td>
<td>51.0 (45.4-59.0)</td>
<td>50.7 (48.5-52.8)</td>
<td>0.3</td>
</tr>
<tr>
<td>Base Unsafe Sex Probability</td>
<td>49.9 (44.5-60.0)</td>
<td>49.8 (46.7-53.5)</td>
<td>0.1</td>
</tr>
<tr>
<td>Scene time</td>
<td>778.9 (649.6-946.5)</td>
<td>590.6 (532.9-650.0)</td>
<td>188.3</td>
</tr>
</tbody>
</table>

Key for the second table:  
First row: mean value of all agents with same HIV status over all ten runs  
Second row: mean minimum and maximum for all runs  
Third row: range of means for all runs  
Difference: the difference between the values for positive and negative agents (columns two and three)
Table 2

Intervention 1:

Reducing the Level of Infectiousness Among HIV-Positive Sex Workers

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1.6</th>
<th>3.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>10.9 (6.9-15.9)</td>
<td>13.5 (9.6-17.5)</td>
<td>14.3 (9.8-18.4)</td>
</tr>
<tr>
<td>Linearity</td>
<td>2.64</td>
<td>2.15</td>
<td>8.6</td>
</tr>
</tbody>
</table>

Key:
The first figure in each cell is the mean value for all ten runs. The mean minimum and maximum values of all runs is in parentheses, followed by the range. The linearity values are “fitness scores” showing the average relative linearity of each category as compared to the other categories. The higher the score, the more “fit”—that is, the more linear—were the runs on the average (see Footnote 26).
Table 3

Intervention 2:

Reducing the Maximum Baseline Probability of Unsafe Sex on the Part of Sex Workers

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>25</th>
<th>50</th>
<th>75</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>13.2</td>
<td>12.9</td>
<td>12.9</td>
<td>14.5</td>
<td>14.3</td>
</tr>
<tr>
<td></td>
<td>(9.6-17.4)</td>
<td>(8.5-17.0)</td>
<td>(8.6-17.0)</td>
<td>(10.1-18.8)</td>
<td>(9.8-18.4)</td>
</tr>
<tr>
<td></td>
<td>7.8</td>
<td>8.5</td>
<td>8.4</td>
<td>8.7</td>
<td>8.6</td>
</tr>
<tr>
<td>Linearity</td>
<td>2.00</td>
<td>2.48</td>
<td>2.35</td>
<td>1.78</td>
<td></td>
</tr>
</tbody>
</table>

Key:

The first figure in each cell is the mean value for all ten runs. The mean minimum and maximum values of all runs is in parentheses, followed by the range. The linearity values are “fitness scores” showing the average relative linearity of each category as compared to the other categories. The higher the score, the more “fit”—that is, the more linear—were the runs on the average (see Footnote 26).
Table 4

Intervention 3:

Reducing the Maximum Level of Baseline Instability on the Part of Sex Workers

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>25</th>
<th>50</th>
<th>75</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>13.1</td>
<td>14.5</td>
<td>13.8</td>
<td>14.4</td>
<td>14.3</td>
</tr>
<tr>
<td></td>
<td>(9.1-17.8)</td>
<td>(9.9-18.8)</td>
<td>(9.5-18.2)</td>
<td>(10.0-19.0)</td>
<td>(9.8-18.4)</td>
</tr>
<tr>
<td></td>
<td>8.7</td>
<td>8.9</td>
<td>8.7</td>
<td>9.0</td>
<td>8.6</td>
</tr>
<tr>
<td>Linearity</td>
<td>1.93</td>
<td>1.83</td>
<td>2.18</td>
<td>1.67</td>
<td></td>
</tr>
</tbody>
</table>

Key:

The first figure in each cell is the mean value for all ten runs. The mean minimum and maximum values of all runs is in parentheses, followed by the range. The linearity values are “fitness scores” showing the average relative linearity of each category as compared to the other categories. The higher the score, the more “fit”—that is, the more linear—were the runs on the average (see Footnote 26).
### Table 5

#### Intervention 4:

**Reducing the Level of Discrimination Against the Prostitution Scene**

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>25</th>
<th>50</th>
<th>75</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>14.3</td>
<td>14.1</td>
<td>13.9</td>
<td>14.0</td>
<td>14.3</td>
</tr>
<tr>
<td></td>
<td>(9.8-18.1)</td>
<td>(9.8-17.9)</td>
<td>(10.2-18.2)</td>
<td>(10.3-17.8)</td>
<td>(9.8-18.4)</td>
</tr>
<tr>
<td></td>
<td>8.3</td>
<td>8.1</td>
<td>8.0</td>
<td>7.5</td>
<td>8.6</td>
</tr>
<tr>
<td>Linearity</td>
<td>2.54</td>
<td>2.49</td>
<td>2.89</td>
<td>3.04</td>
<td></td>
</tr>
</tbody>
</table>

Key:

The first figure in each cell is the mean value for all ten runs. The mean minimum and maximum values of all runs is in parentheses, followed by the range. The linearity values are “fitness scores” showing the average relative linearity of each category as compared to the other categories. The higher the score, the more “fit”—that is, the more linear—were the runs on the average (see Footnote 26).
Table 6

**Intervention 5:**

**Reducing the Maximum Baseline Probability of Unsafe Sex on the Part of Sex Workers** *(column values)*

and

**Reducing the Level of Infectiousness Among HIV-Positive Sex Workers** *(row values)*

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>0.25</th>
<th>0.50</th>
<th>0.75</th>
<th>100</th>
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<tbody>
<tr>
<td>3.2</td>
<td>13.2</td>
<td>12.9</td>
<td>12.9</td>
<td>14.5</td>
<td>14.3</td>
</tr>
<tr>
<td></td>
<td>(9.6-17.4)</td>
<td>(8.5-17.0)</td>
<td>(8.6-17.0)</td>
<td>(10.1-18.8)</td>
<td>(9.8-18.4)</td>
</tr>
<tr>
<td></td>
<td>7.8</td>
<td>8.5</td>
<td>8.4</td>
<td>8.7</td>
<td>8.6</td>
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<tr>
<td></td>
<td>2.00</td>
<td>2.48</td>
<td>2.35</td>
<td>1.78</td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td>11.8</td>
<td>11.5</td>
<td>12.1</td>
<td>12.3</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>(8.1-15.9)</td>
<td>(6.9-16.3)</td>
<td>(7.9-16.5)</td>
<td>(8.0-17.0)</td>
<td>(9.6-17.5)</td>
</tr>
<tr>
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</tbody>
</table>

**Key:**

The first figure in each cell is the mean value for all ten runs. The mean minimum and maximum values of all runs is in parentheses, followed by the range. The linearity values are “fitness scores” showing the average relative linearity of each category as compared to the other categories. The higher the score, the more “fit”—that is, the more linear—were the runs on the average (see Footnote 26).
Table 7

**Intervention 6:**

Reducing the Maximum Baseline Probability of Unsafe Sex on the Part of Sex Workers *(column values)*

And

Reducing the Maximum Level of Baseline Instability on the Part of Sex Workers *(row values)*

<table>
<thead>
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<td>8.7</td>
<td>8.7</td>
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</tbody>
</table>

|     | 2.47  | 2.15  | 2.60   | 2.72   |        |

**Key:**

The first figure in each cell is the mean value for all ten runs. The mean minimum and maximum values of all runs is in parentheses, followed by the range. The linearity values are “fitness scores” showing the average relative linearity of each category as compared to the other categories. The higher the score, the more “fit”—that is, the more linear—were the runs on the average (see Footnote 26).
Table 8

Intervention 7:

Reducing the Level of Discrimination (column values)
And
Reducing the Maximum Level of Baseline Instability on the Part of Sex Workers (row values)

<table>
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<tr>
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<td>14.3 (9.8-18.4)</td>
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<td>8.0</td>
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<td>8.6</td>
</tr>
<tr>
<td>75</td>
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<td>14.5 (10.1-18.8)</td>
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</tr>
<tr>
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<td>13.5 (9.2-18.0)</td>
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<td>13.8 (9.5-18.2)</td>
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Key:
The first figure in each cell is the mean value for all ten runs. The mean minimum and maximum values of all runs is in parentheses, followed by the range. The linearity values are “fitness scores” showing the average relative linearity of each category as compared to the other categories. The higher the score, the more “fit”—that is, the more linear—were the runs on the average (see Footnote 26).
Table 9

**Intervention 8:**

**Reducing the Level of Discrimination, Instability, Base Unsafe Sex Probability and Infectiousness**

Infectivity at 1.6 for all runs, all other values set at 75% then 50%

<table>
<thead>
<tr>
<th>Mean</th>
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<th>100</th>
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</thead>
<tbody>
<tr>
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<td>8.7</td>
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</tbody>
</table>

Key:

The first figure in each cell is the mean value for all ten runs. The mean minimum and maximum values of all runs is in parentheses, followed by the range. Linearity values could not be calculated for this constellation of variables given software limitations.
### Table 10

**Intervention 9:**

**Realistic Scenario**  
(Level of Discrimination 75%, Instability 25%, Unsafe Sex 50%, Infectivity at 1.6)

**And**  
**Base Unsafe Sex Probability of Clients at 50% and 100%**

<table>
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<td>(9.8-18.4)</td>
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<tr>
<td>Linearity</td>
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<td>0.85</td>
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</tr>
</tbody>
</table>

**Key:**  
The first figure in each cell is the mean value for all ten runs. The mean minimum and maximum values of all runs is in parentheses, followed by the range. The linearity values are “fitness scores” showing the average relative linearity of each category as compared to the other categories. The higher the score, the more “fit”—that is, the more linear—were the runs on the average (see Footnote 26).
Appendix 3
Prevention for Stricher

NetLogo Program

turtles-own [unsafe-base unsafe-s unsafe-f unsafe-sp unsafe-fp instable-base instable-disadvantage-base1
disadvantage-base2 disadvantage-base3 infectiousness-sp infectiousness-fp scene-time max-scene-time]

sex? infectiousness-sp? infectiousness-fp?]

globals [cycles new-on-scene-freier new-on-scene-stricher stricher-count freier-count add-new]

breeds [stricher stricher-pos freier freier-pos]

to setup
  ca
  setup-turtles
  setup-variables
  setup-plot
end

to setup-turtles
  create-stricher 234 - round (HIVstricher * 234)
  ask stricher [    set shape "person"
  set color red
  set disadvantage-base1 (random 100)
  set disadvantage-base2 (random 100)
  set disadvantage-base3 (random 100)
  if (disadvantage-base1 < 9) [set disadvantage 0.75]
  if (disadvantage-base1 > 9) and (disadvantage-base2 < 37) [set disadvantage 0.5]
  if (disadvantage-base1 > 9) and (disadvantage-base2 > 37) and (disadvantage-base3 < 81) [set disadvantage 0.25]
  set instable-base (random instability-max)
  set instable (instable-base + (instable-base * disadvantage) + ((discrim / 100) * instable-base))
  if (instable > 100) [set instable 100]
  set instable (round instable)
  set unsafe-base (random unsafe-prob-max-s)
  set unsafe-s (unsafe-base + ((instable / 100) * unsafe-base))
  if (unsafe-s > 100) [set unsafe-s 100]
  set unsafe-s (round unsafe-s)
  set scene-time 0
  set max-scene-time 30 + random 1795]
  create-stricher-pos round (HIVstricher * 234)
  ask stricher-pos [set shape "person"
  set color yellow
  set infectiousness-sp random infectivity-max-s
  set disadvantage-base1 (random 100)
  set disadvantage-base2 (random 100)
set disadvantage-base3 (random 100)
if (disadvantage-base1 < 9) [set disadvantage 0.75]
if (disadvantage-base1 > 9) and (disadvantage-base2 < 37) [set disadvantage 0.5]
if (disadvantage-base1 > 9) and (disadvantage-base2 > 37) and (disadvantage-base3 < 81) [set disadvantage 0.25]
set instable-base (random instability-max)
set instable (instable-base + (instable-base * disadvantage) + ((discrim / 100) * instable-base))
if (instable > 100) [set instable 100]
set instable (round instable)
set unsafe-base (random unsafe-prob-max-s)
set unsafe-sp (unsafe-base + ((instable / 100) * unsafe-base))
if (unsafe-sp > 100) [set unsafe-sp 100]
set scene-time 0
set max-scene-time 30 + random 1795
create-freier freier-no    - round (HIVfreier * freier-no)
ask freier [set shape "person"
set color blue
set disadvantage 0
set instable 0
set unsafe-f random unsafe-prob-max-f
set scene-time 0
set max-scene-time 30 + random 7270]
create-freier-pos round (HIVfreier * freier-no)
ask freier-pos [set shape "person"
set color white
set infectiousness-fp random infectivity-max-f
set disadvantage 0
set instable 0
set unsafe-fp random unsafe-prob-max-f
set scene-time 0
set max-scene-time 30 + random 7270]
ask turtles [    setxy (random screen-size-x) (random screen-size-y)]
end

to setup-variables
    set cycles 0
end

to setup-plot
    cp
    set-current-plot "HIV Prevalence"
    auto-plot-on
    set-plot-x-range 0 50
    set-plot-y-range 0 0.25
    set-plot-pen "all"
    plot-pen-reset
    set-plot-pen-color blue
    ppd
    set-plot-pen "freier"
plot-pen-reset
set-plot-pen-color blue
ppd
set-plot-pen "stricher"
plot-pen-reset
set-plot-pen-color red
ppd
set-plot-pen "stricher num"
plot-pen-reset
set-plot-pen-color red
ppd
set-plot-pen "freier num"
plot-pen-reset
set-plot-pen-color blue
ppd
end
to go
  move-turtles
  infect
  update-plots
  update-global-variables
  ask patches [ set infect-s? false
    set infect-f? false
    set unsafe-sp? 0
    set unsafe-fp? 0
    set infectiousness-sp? 0
    set infectiousness-fp? 0
    set sex-prob? 0
    set sex? 0 ]
  if (migration = true) [migrate]
end
to move-turtles
  ask turtles [ set heading random 360 fd 1
    set scene-time (scene-time + 1) ]
end
to infect
  ask turtles [ if (color = yellow) [set infect-s? true
    set unsafe-sp? unsafe-sp set infectiousness-sp? infectiousness-sp]
    if (color = white) [set infect-f? true
      set unsafe-fp? unsafe-fp set infectiousness-fp? infectiousness-fp]]
  ask patches [ set sex-prob? (random 100)
    if ((random 100) < sex-prob?) [set sex? true]
    ask turtles-here [if (color = blue)
      and (sex? = true) and (infect-s? = true) and ((random 100) < infectiousness-sp?)
      and (random 100) < abs ((unsafe-f - unsafe-sp?) / 2) [set color white
      set infectiousness-fp random infectivity-max-s
      set breed freier-pos]}
end
set shape "person"
set unsafe-fp unsafe-f]
ask turtles-here [if (color = red)
and (sex? = true) and (infect-s? = true) and ((random 100) < infectiousness-sp?)
and (random 100) < abs ((unsafe-s - unsafe-sp?) / 2) [set color yellow
set infectiousness-sp random infectivity-max-s
set breed stricher-pos
set shape "person"
set unsafe-sp unsafe-s]
ask turtles-here [if (color = red)
and (sex? = true) and (infect-f? = true) and ((random 100) < infectiousness-fp?)
and (random 100) < abs ((unsafe-fp? - unsafe-s) / 2) [set color yellow
set infectiousness-sp random infectivity-max-f
set breed stricher-pos
set shape "person"
set unsafe-sp unsafe-s]]
end

to migrate
ask turtles [ if (scene-time > max-scene-time) [die]]
cct-stricher new-on-scene-stricher - round (new-stricher-prev * new-on-scene-stricher)
    [set shape "person"
    set color red
    set disadvantage-base1 (random 100)
    set disadvantage-base2 (random 100)
    set disadvantage-base3 (random 100)
    if (disadvantage-base1 < 9) [set disadvantage 0.75]
    if (disadvantage-base1 > 9) and (disadvantage-base2 < 37) [set disadvantage 0.5]
    if (disadvantage-base1 > 9) and (disadvantage-base2 > 37) and (disadvantage-base3 < 81) [set disadvantage 0.25]
    set instable-base (random instability-max)
    set instable (instable-base + (instable-base * disadvantage) + ((discrim / 100) * instable-base))
    if (instable > 100) [set instable 100]
    set instable (round instable)
    set unsafe-base (random unsafe-prob-max-s)
    set unsafe-s (unsafe-base + ((instable / 100) * unsafe-base))
    if (unsafe-s > 100) [set unsafe-s 100]
    set unsafe-s (round unsafe-s)
    set scene-time 0
    set max-scene-time 30 + random 1795
    setxy (random screen-size-x) (random screen-size-y)]
cct-freier new-on-scene-freier
    [set shape "person"
    set color blue
    set disadvantage 0
    set instable 0
    set unsafe-f random unsafe-prob-max-f
    set scene-time 0
    set max-scene-time 30 + random 7270
    setxy (random screen-size-x) (random screen-size-y)]
cct-stricher-pos round (new-stricher-prev * new-on-scene-stricher)
  [set shape "person"
   set color yellow
   set infectiousness-sp random infectivity-max-s
   set disadvantage-base1 (random 100)
   set disadvantage-base2 (random 100)
   set disadvantage-base3 (random 100)
   if (disadvantage-base1 < 9) [set disadvantage 0.75]
   if (disadvantage-base1 > 9) and (disadvantage-base2 < 37) [set disadvantage 0.5]
   if (disadvantage-base1 > 9) and (disadvantage-base2 > 37) and (disadvantage-base3 < 81) [set disadvantage 0.25]
   set instable-base (random instability-max)
   set instable (instable-base + (instable-base * disadvantage) + ((discrim / 100) * instable-base))
   if (instable > 100) [set instable 100]
   set instable (round instable)
   set unsafe-base (random unsafe-prob-max-s)
   set unsafe-sp (unsafe-base + ((instable / 100) * unsafe-base))
   if (unsafe-sp > 100) [set unsafe-sp 100]
   set unsafe-sp (round unsafe-sp)
   set scene-time 0
   set max-scene-time 30 + random 1795
   setxy (random screen-size-x) (random screen-size-y)]
;cct-freier-pos round (HIVfreier * new-on-scene-freier)
  ;[set shape "person"
   ;set color white
   ;set infectiousness random infectivity-max-f
   ;set disadvantage 0
   ;set instable 0
   ;set unsafe-fp random unsafe-prob-max-f
   ;set scene-time 0
   ;set max-scene-time 30 + random 7270
   ;setxy (random screen-size-x) (random screen-size-y)]
end

to update-global-variables
  set cycles (cycles + 1)
  set stricher-count random 244
  ifelse (count turtles with [color = red or color = yellow] < stricher-count)
    [set new-on-scene-stricher random (stricher-count - (count turtles with [color = red or color = yellow])])
    [set new-on-scene-stricher 0]
  set freier-count random 215
  ifelse (count turtles with [color = blue or color = white] < freier-count)
    [set new-on-scene-freier random (freier-count - (count turtles with [color = blue or color = white])])
    [set new-on-scene-freier 0]
end

to update-plots
  set-current-plot "HIV Prevalence"
set-plot-pen "all infections"
plot (count turtles with [color = white or color = yellow] / count turtles)
set-plot-pen "freier"
plot (count turtles with [color = white] / count turtles with [color = white or color = blue])
set-plot-pen "stricher"
plot (count turtles with [color = yellow] / count turtles with [color = yellow or color = red])
;set-current-plot "Population"
;set-plot-pen "stricher num"
;plot (count turtles with [color = yellow or color = red])
;set-plot-pen "freier num"
;plot (count turtles with [color = blue or color = white])
end