

Appendix 1

For Whom?

Researchers

Decision Makers
(funders, public authorities)

Community-Based Organizations

Target Group

For What Purpose?

Theory and Causality

- Understanding underlying mechanisms
- Establishing cause and effect relationships
- Contributing to basic research
- Developing theory

Decision-making and Accountability

- Determining the usefulness, acceptability, cost, feasibility, and generalizability of a project in order to facilitate decision-making and promote accountability

Improving Practice

- Connection between HIV and the larger social and political situation of the target group
- Feedback about project implementation for the purpose of improving services

Empowerment

- Determining the usefulness of the project in terms of helping members deal with the disease in their everyday lives
- Increasing autonomy and empowerment
- Ensuring the project is responsive to the target group's needs and interests

Focus

Basic Research and Experimentation

- Research on behavioral and social causes
- Experimental models preferred

Problem Solutions with Measurable Results

- Analysis of the problem
- Monitoring of project activities
- Measurable outputs
- Cost-effectiveness analyses

Feedback

- Needs assessment of the target group
- Feedback from the target group regarding services
- Process evaluations

Participation in Service Development and Implementation

- Participative research in which the target group takes part in interpreting and appropriating the results

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

Data Bases: PsychLit (1981-Dec 1999); social work abstracts (1977-March 1998); sociofile (1974-June 1998)

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

Data Bases: Medline (1980-September 1998)

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))

37 109 NEEDLE-EXCHANGE-PROGRAMS

38 209 #36 not (NEEDLE-EXCHANGE-PROGRAMS in MESH)

and

(HIV-INFECTIONS-PREVENTION-AND-CONTROL in MESH) and ((EVALUATION-STUDIES in MESH) or (FOLLOW-UP-STUDIES in MESH))

5 109 NEEDLE-EXCHANGE-PROGRAMS

6 150 #4 not (NEEDLE-EXCHANGE-PROGRAMS 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 databse
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:

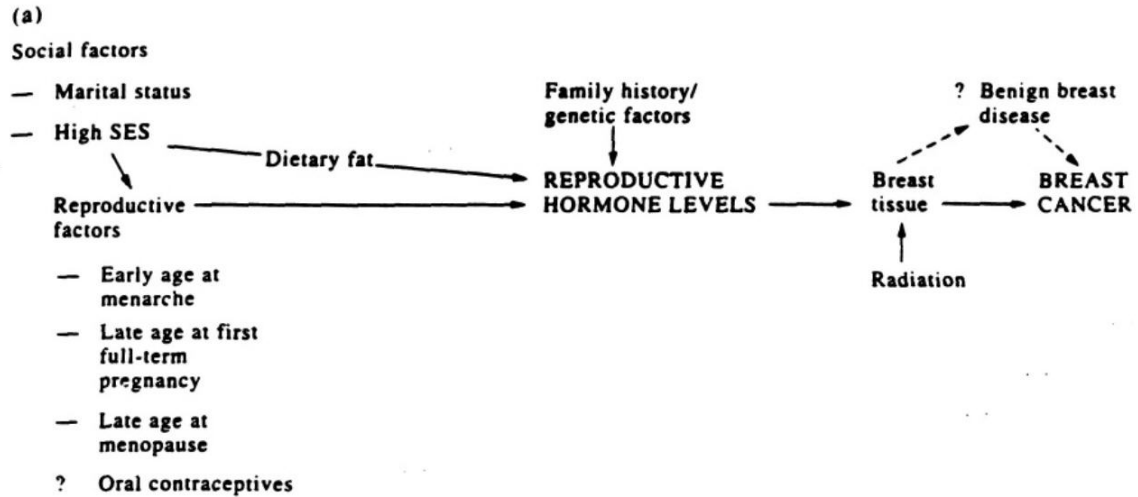
Outcome and process evaluations of community-based prevention for the sexual transmission of HIV

Excluded were studies about:

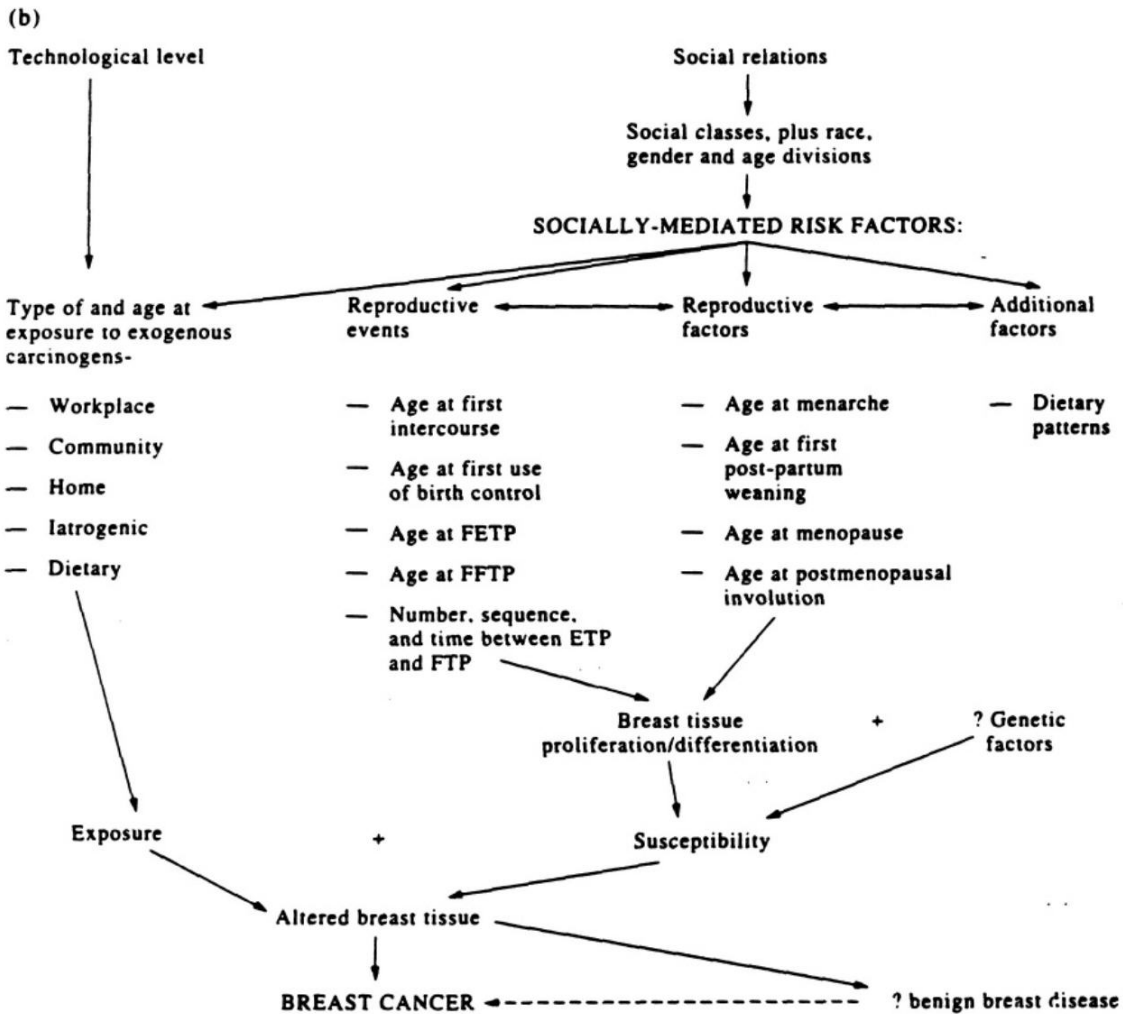
- transmission through drug use
- studies which describe an intervention without offering process or outcome data
- school-based (including college-based) interventions
- indirect data reporting
- effectiveness/efficacy trials of barrier methods of contraception, STD prevention
- interventions at the 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



Abbreviation used:
SES = socioeconomic status



Abbreviations used:

- ETP = early-terminated pregnancy
- FETP = first early-terminated pregnancy
- FFTP = first full-term pregnancy
- FTP = full-term pregnancy

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

EXTERNAL INFLUENCES	SOCIAL ATTRACTORS	AREAS OF CHANGE	SOCIAL ATTRACTORS	EXTERNAL INFLUENCES
		Pre-1940s Socio-Economic Discrimination		
Late 19th century: Cultural Symbols, Fatalism/ Hedonism	→	Insider-Outsider Solidarity	←	Late 19th century: Social & Geographical Isolation
	Male Solidarity "Larrikin" Response ↗ ↘		↘ "Respectable" Response ↗	
1970's Decline in Mining, High Unemployment	→	Gender Relationships	←	1970's Feminism, Health Promotion
	↗ Groups Resistant to Health Messages ↘		↘ Groups Receptive to Health Messages ↗	
1980's Ecological Paradigm, Decline in Trade Unions	→	Different Views of Risk	←	1980's Epidemiology of Coalfields Heart Disease
	↗ Anti- Authoritarian group, Communitarian Beliefs ↘		↘ Healthy Heartbeat Group, Individual Responsibility for Health ↗	
		Community Activation ↙ ↘		
"Larrikin Heart" World View: Elevated CHD			"Healthy Heart" World View: CHD Declining	

Figure 5

Model of Prevention Dynamics Among Coal Miners
(Albrecht et al. 1998)

	Health problem/ Problem boundary	Teamwork/ Collaboration	Role of conceptual framework	How knowledge is applied
Single disciplinary	The health problem is what a single discipline thinks it to be	None.	Arises from a single discipline.	Production of 'specialised' knowledge and reductionistic accounts of problems or interventions.
Multidisciplinary	The health problem is what several disciplines working independently think it to be; hard disciplinary boundaries are placed around the problem facets.	None or limited; disciplines work independently on distinct facets of a broadly conceptualised problem.	Mutually exclusive conceptualisations juxtaposed and broadly cumulative.	Interventions suggested by isolated, discipline-specific problem explanations.
Interdisciplinary	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.	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.	Isolated explanations of a problem from a limited number of disciplines are assembled and connections among them are sought.	Interventions sensitive to an explanation of the health problem informed by understanding the connections among participating disciplines.
Transdisciplinary	Problem is defined as part of an open, dynamic system operating at multiple levels. Problem broadly expands to include all relevant disciplinary insights.	Open ended collaboration. All disciplinary insights required to define the problem are assembled.	Common conceptual framework is sought which will be useable by any discipline, achieving a new insight about the problem.	Interventions with the greatest possibility of success follow from a synthesis of knowledge from disciplinary collaboration.

Figure 6

Description of Transdisciplinary Research as Compared to Other Approaches

(Albrecht et al. 1998)

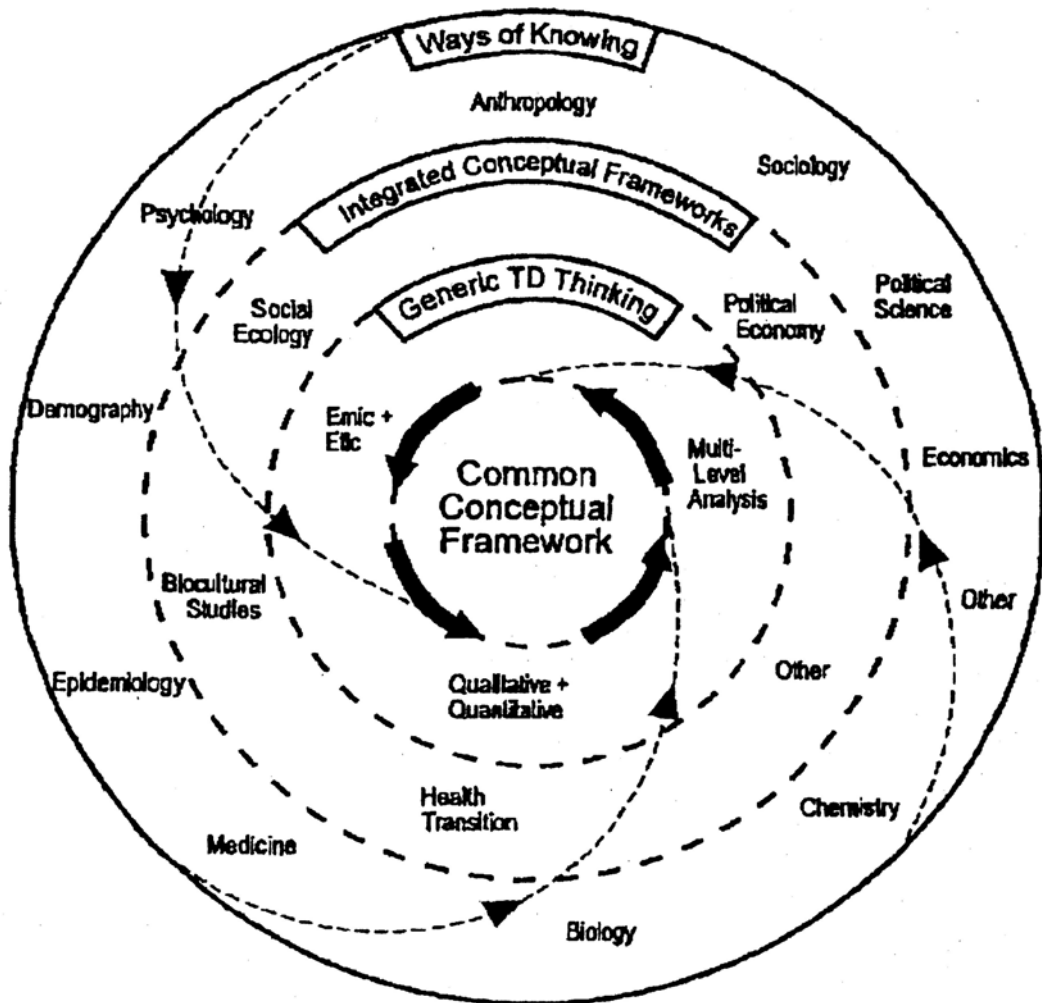
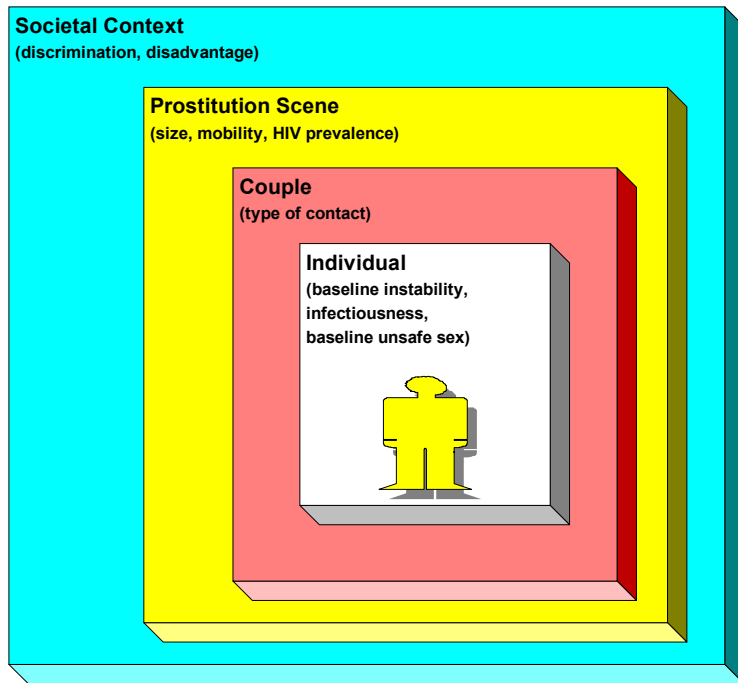


Figure 2 The dynamic process of transdisciplinary thinking.

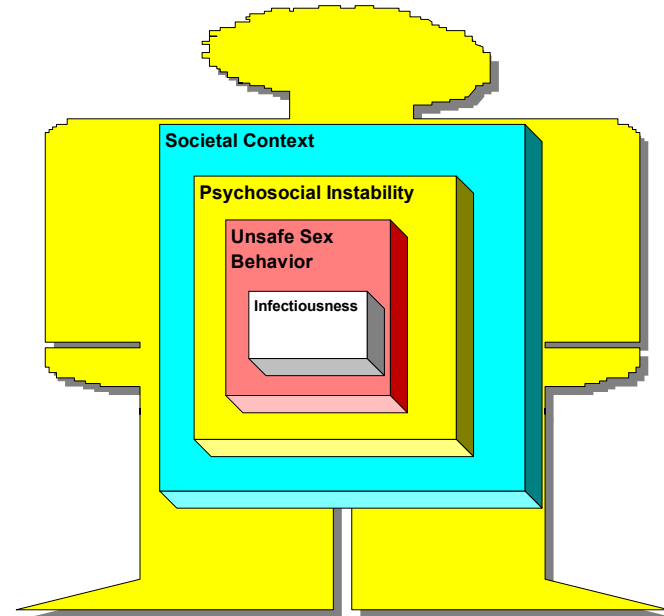
Figure 7

Transdisciplinary Thinking

(Albrecht et al. 1998)



System Level



Effects at Individual Level

Figure 8
A Complex Model of HIV Transmission Among Sex Workers

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

Psychosocial Instability	=	Baseline Instability + (Baseline Instability * Disadvantage) + (Discrimination * Baseline Instability)
Unsafe Sex Probability	=	Baseline Unsafe Sex Probability + (Psychosocial Instability * Baseline Unsafe Sex Probability)

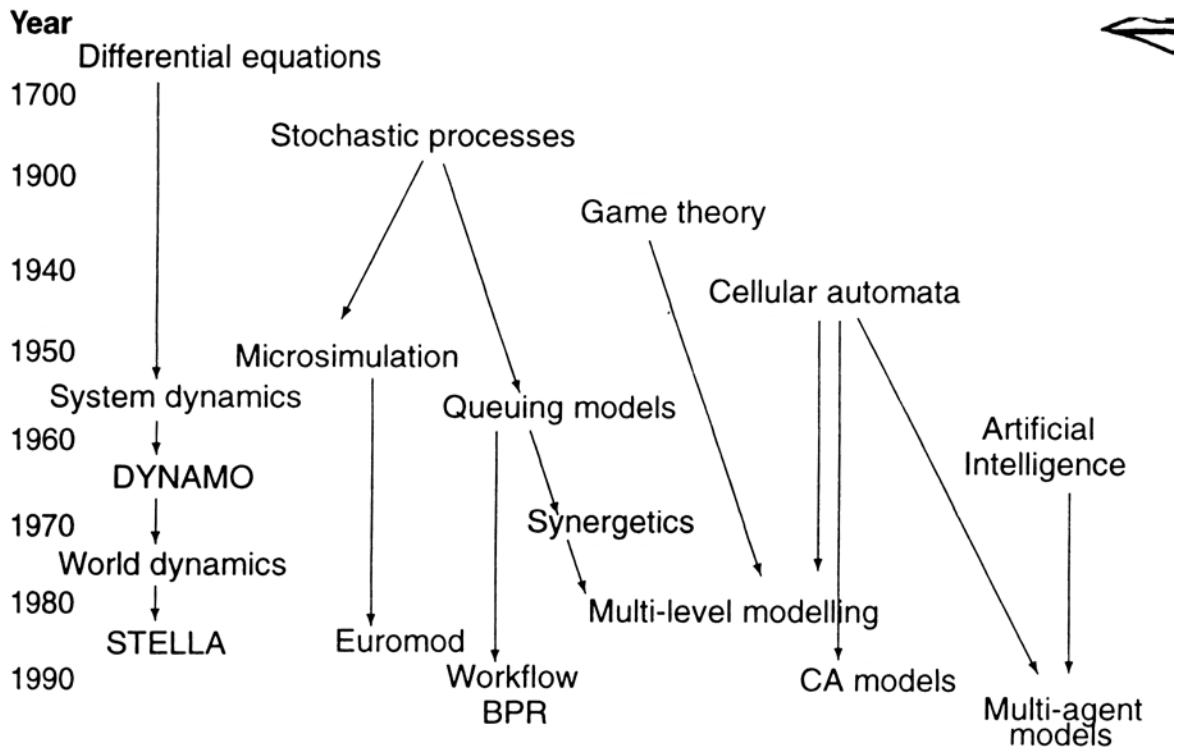


Figure 9

The Historical Development of Social Simulation Approaches

(Gilbert & Troitzsch 1999)

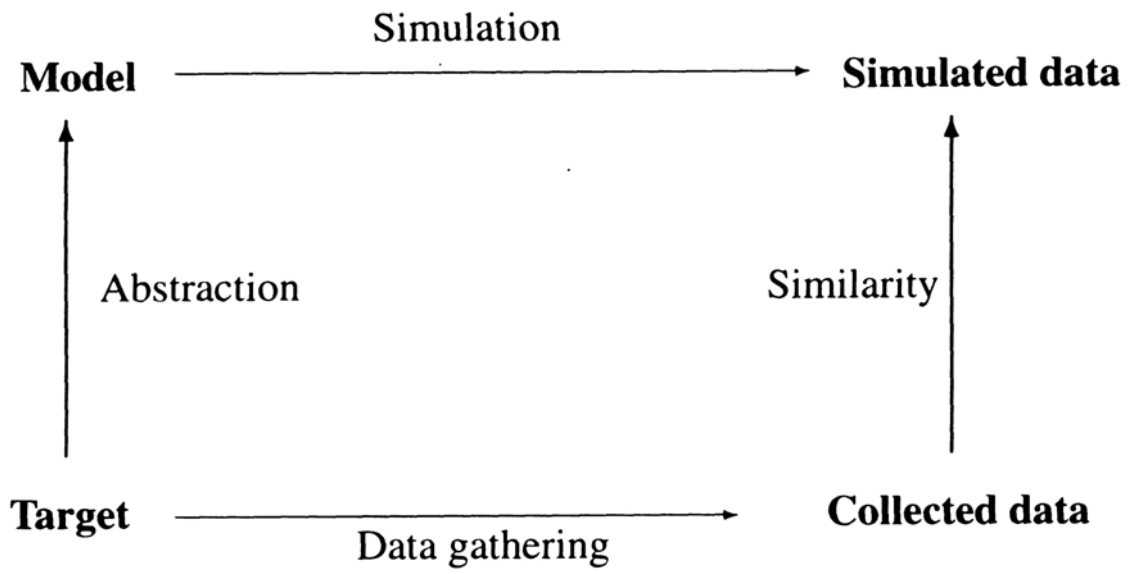


Figure 10

The Logic of Social Science Simulations

(Gilbert & Troitzsch 1999)

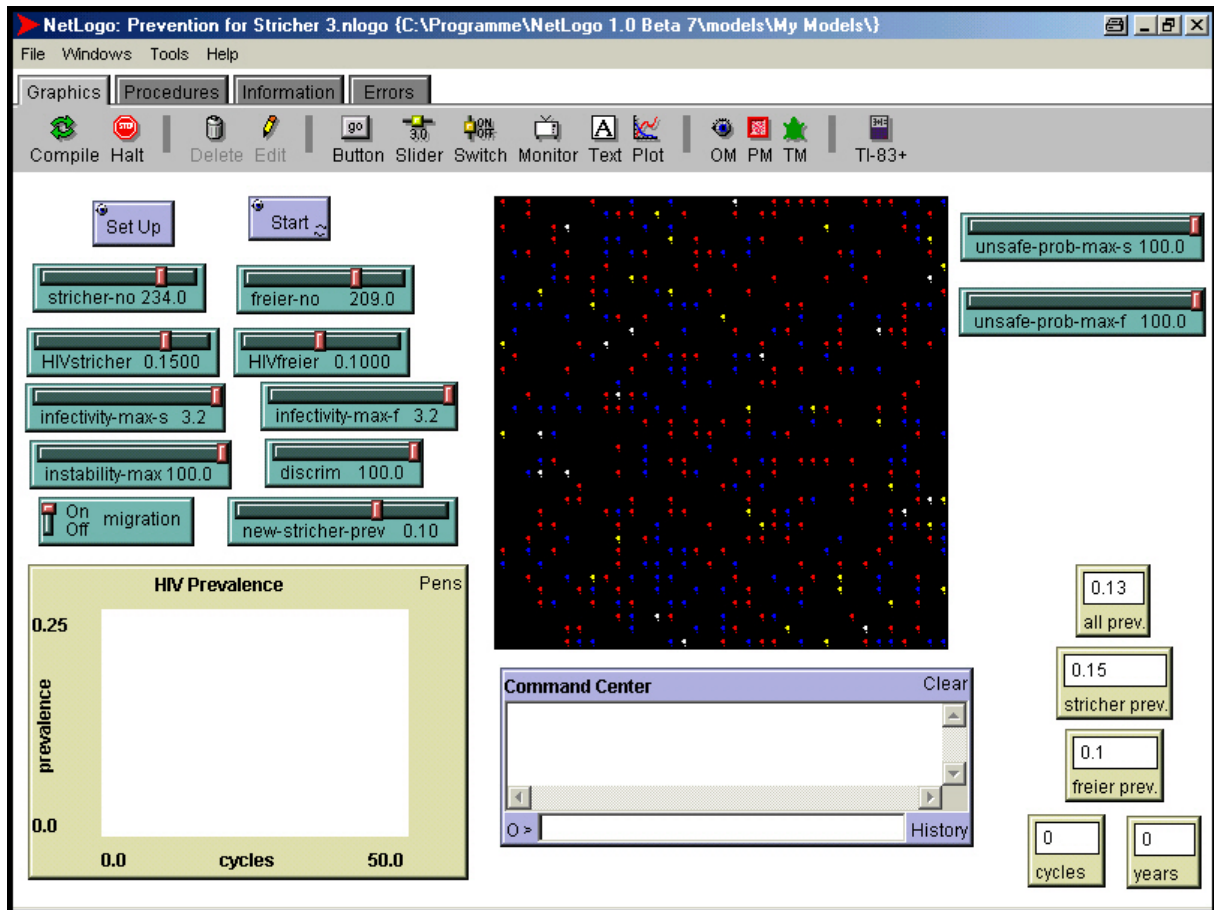


Figure 11

NetLog User Interface

Growth in Prevalence in Closed System

(no migration)

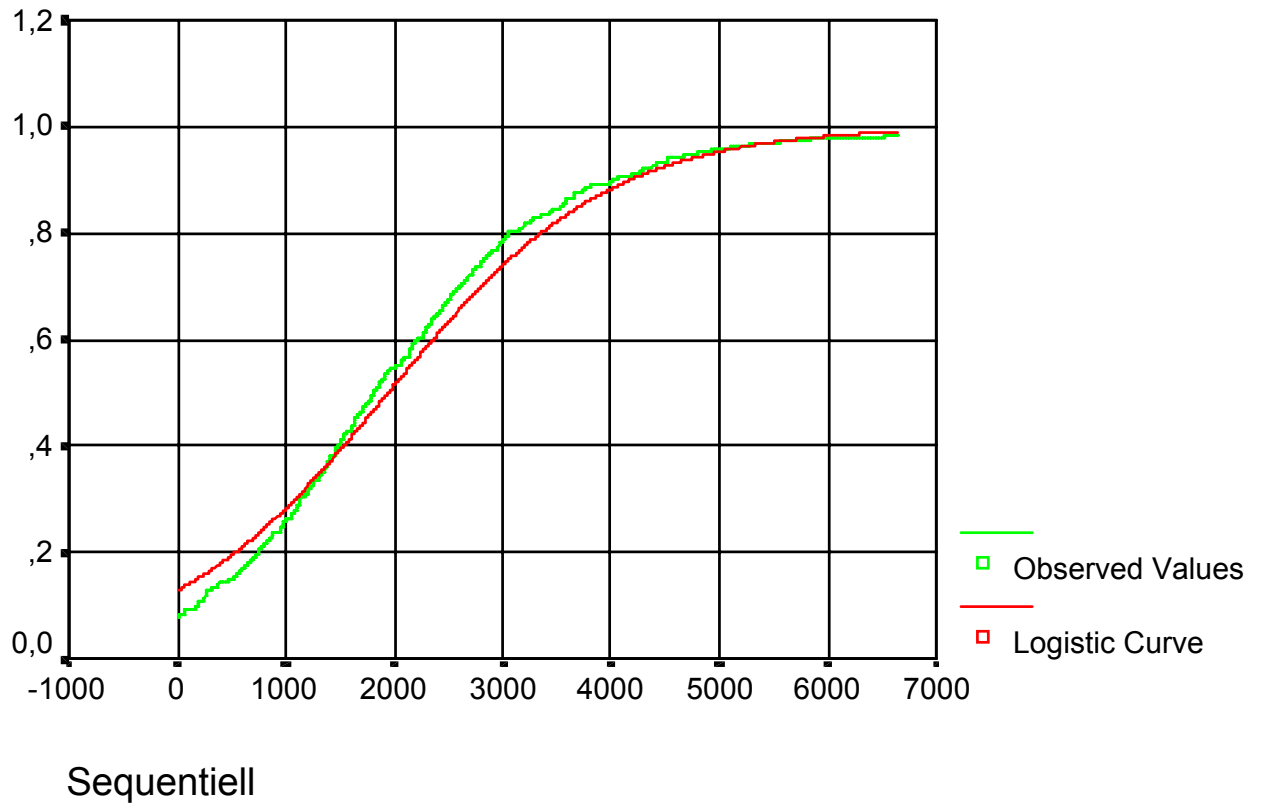


Figure 12

Growth in Prevalence in the Closed System

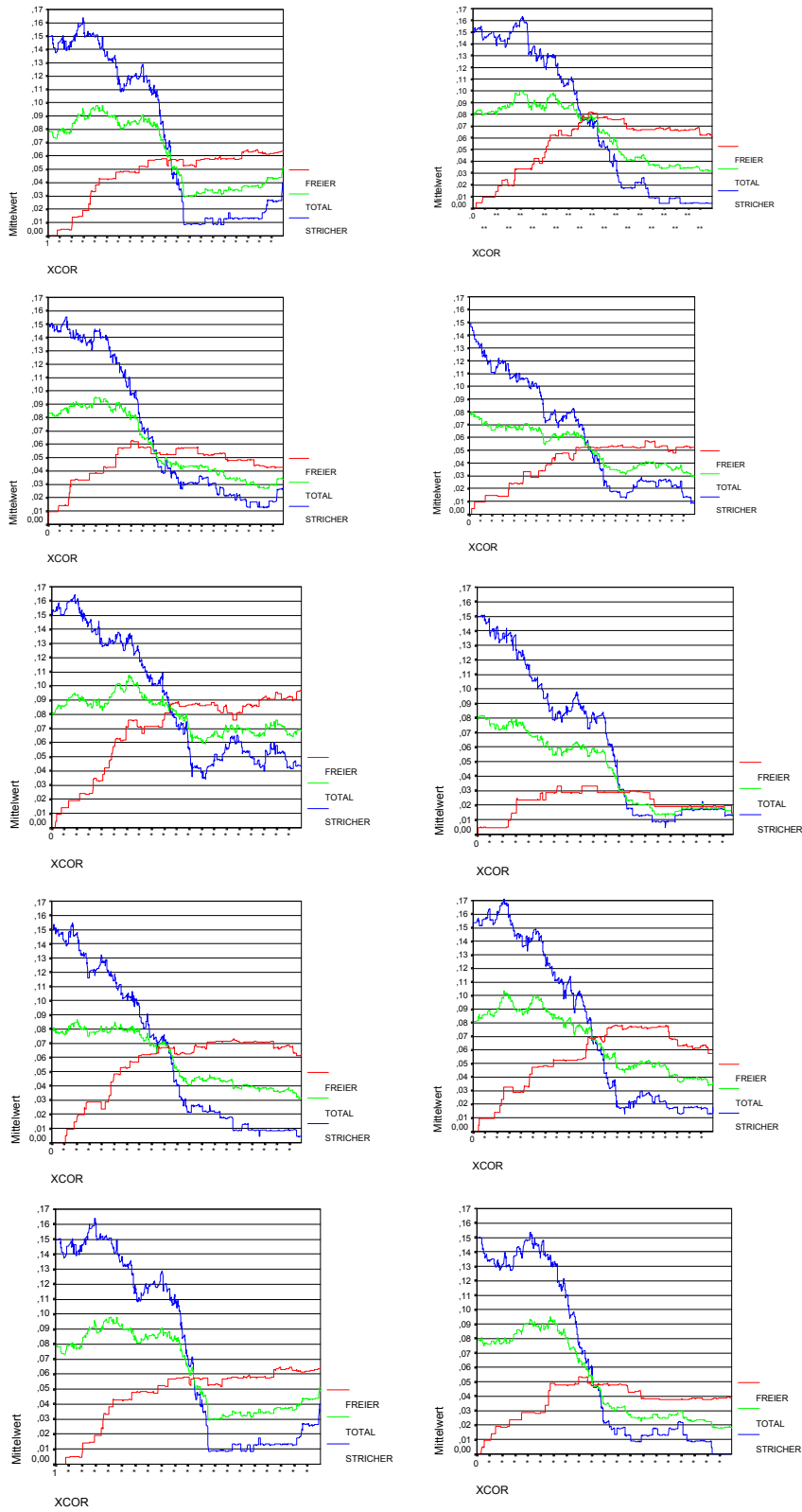


Figure 13
Prevalence Curves
 (initial sex worker prevalence 15%)

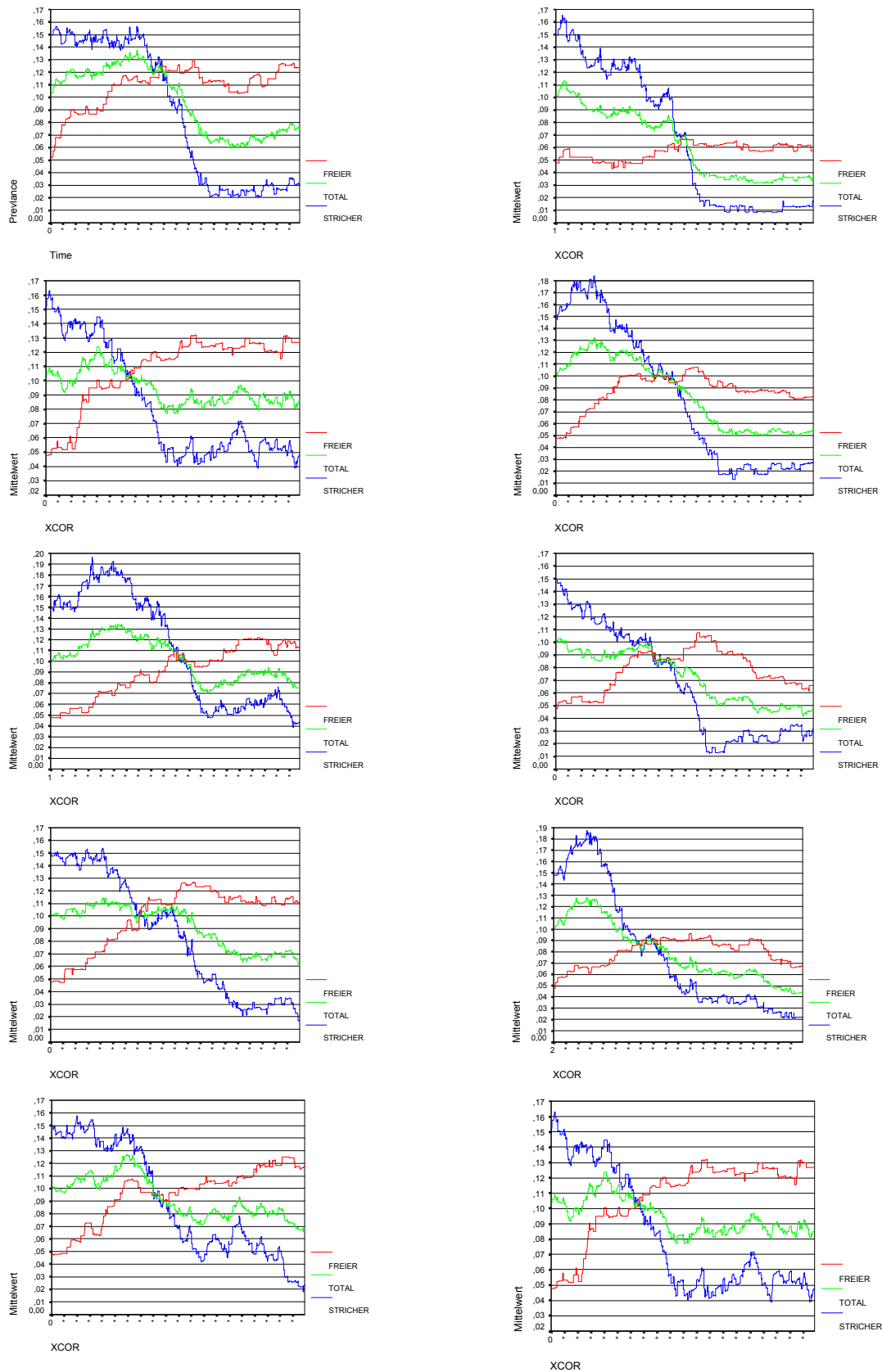


Figure 14
Prevalence Curves
 (initial sex worker prevalence 15%, initial client prevalence 5%)

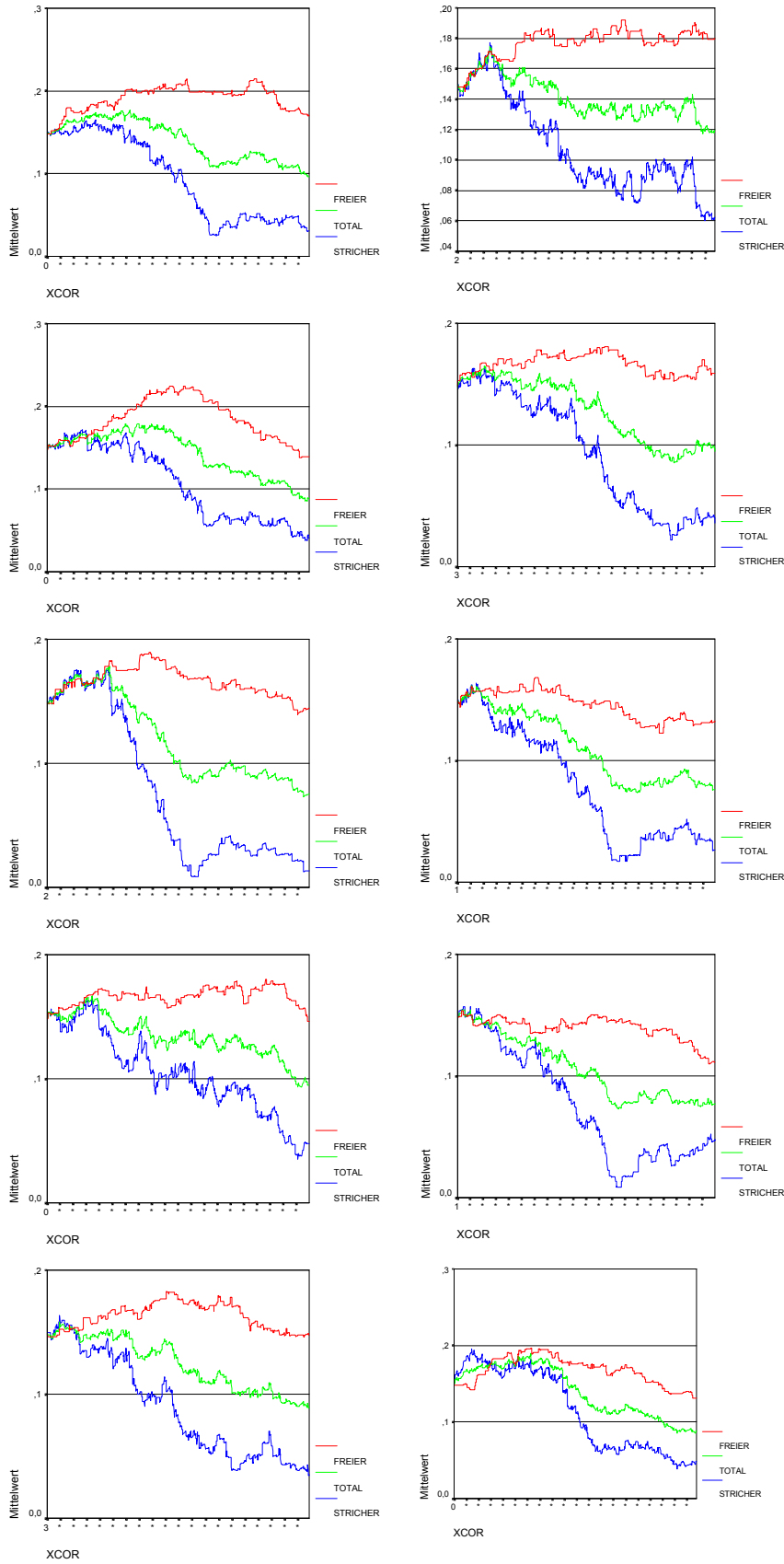
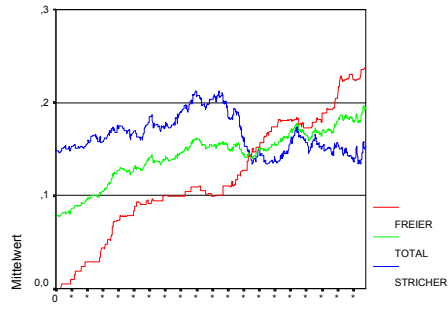
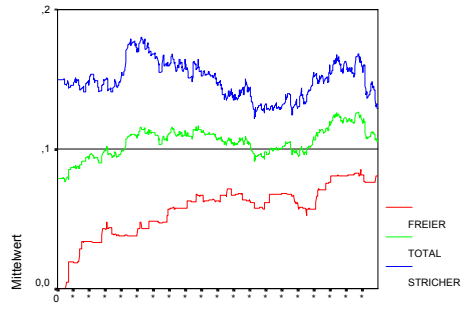


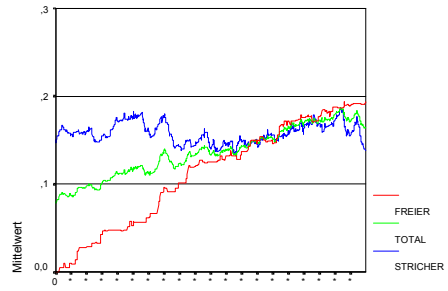
Figure 15
Prevalence Curves
 (initial sex worker prevalence 15%, initial client prevalence 15%)



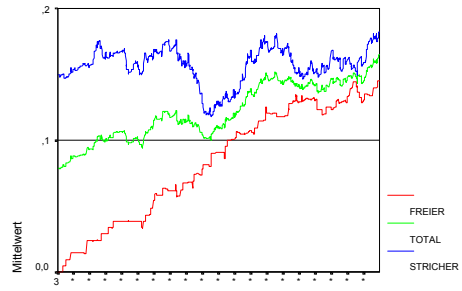
XCOR



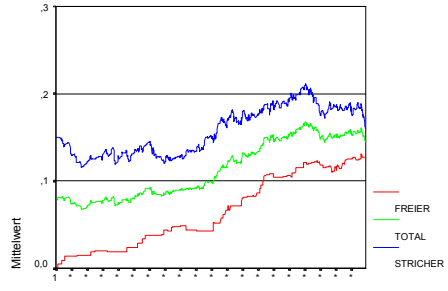
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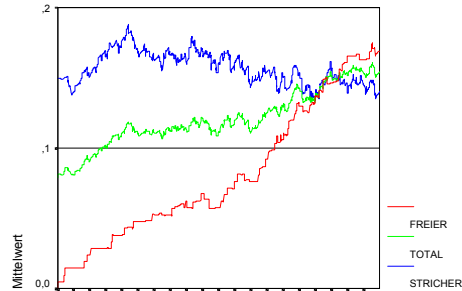
XCOR



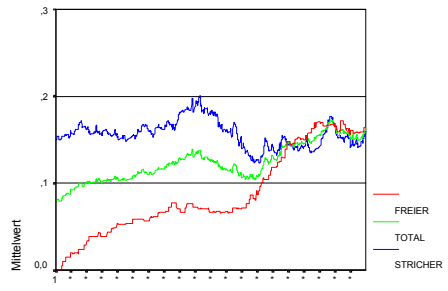
XCOR



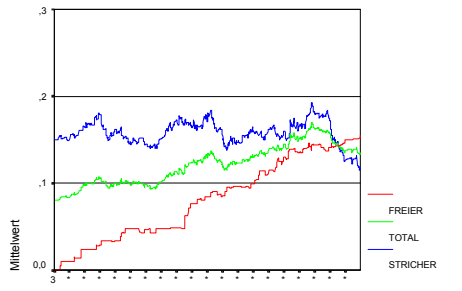
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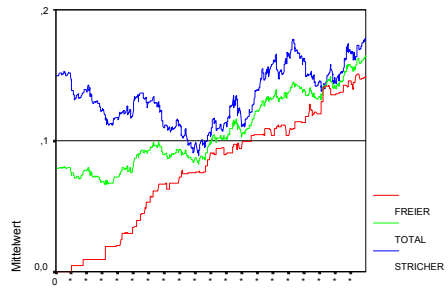
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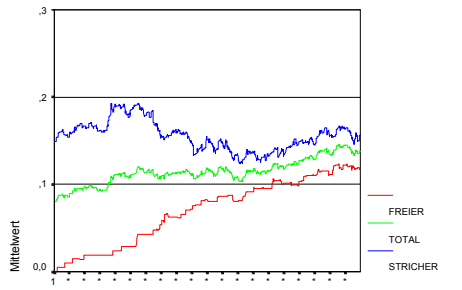
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XCOR



XCOR



XCOR

Figure 16a
Prevalence Curves

(initial sex worker prevalence 15%, initial client prevalence 0, incoming sex worker prevalence 10%)

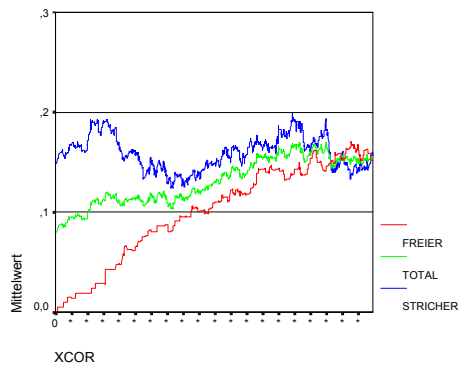
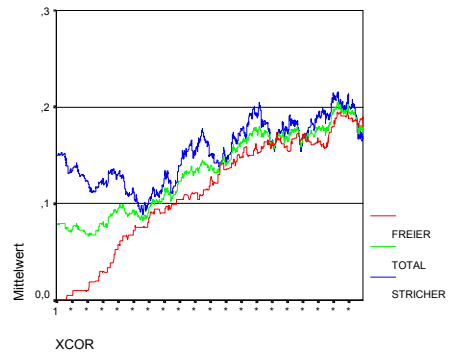
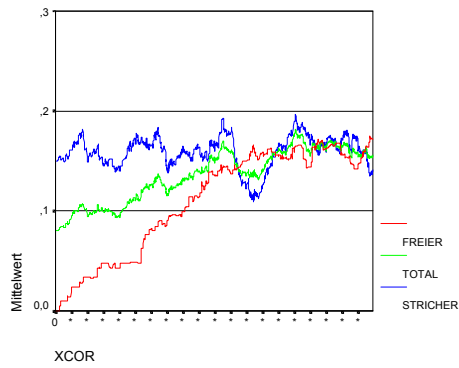
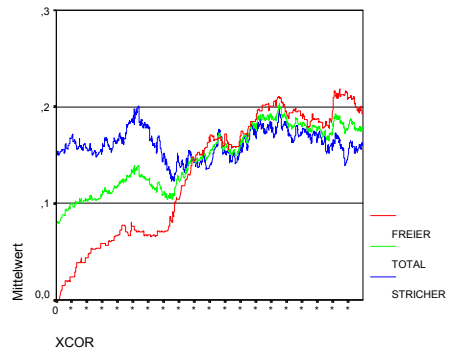
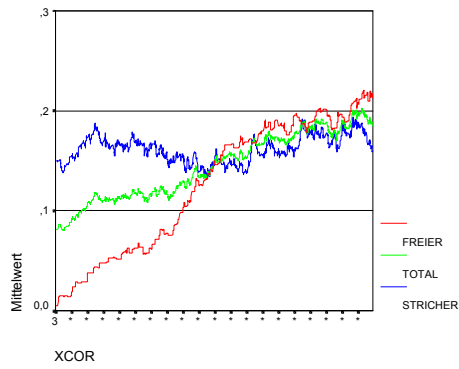


Figure 16b Prevalence Curves

(initial sex worker prevalence 15%, initial client prevalence 0, incoming sex worker prevalence 10%)

All Runs of 5000 cycles

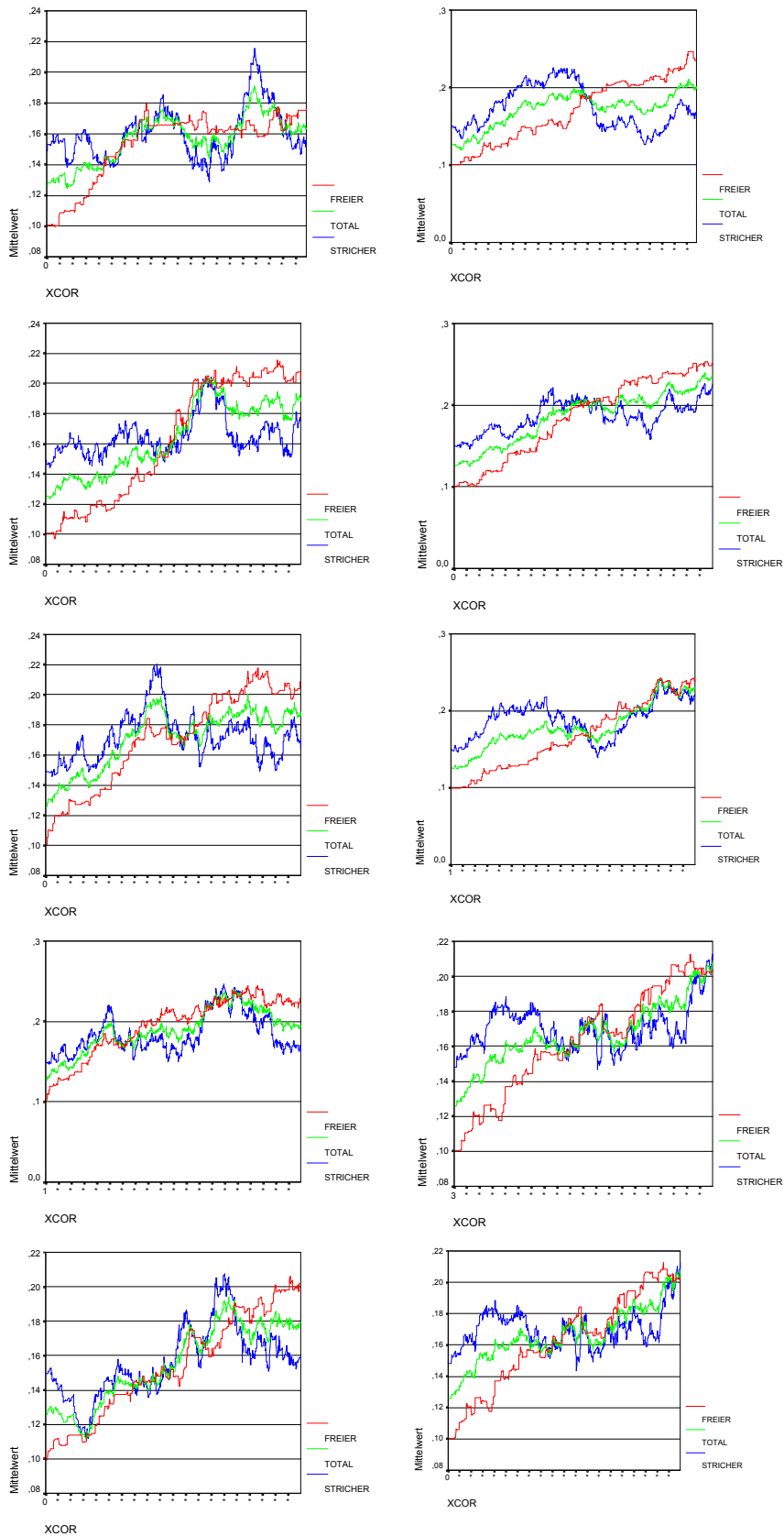


Figure 17a
Prevalence Curves

(initial sex worker prevalence 15%, initial client prevalence 10%, incoming sex worker prevalence 10%)

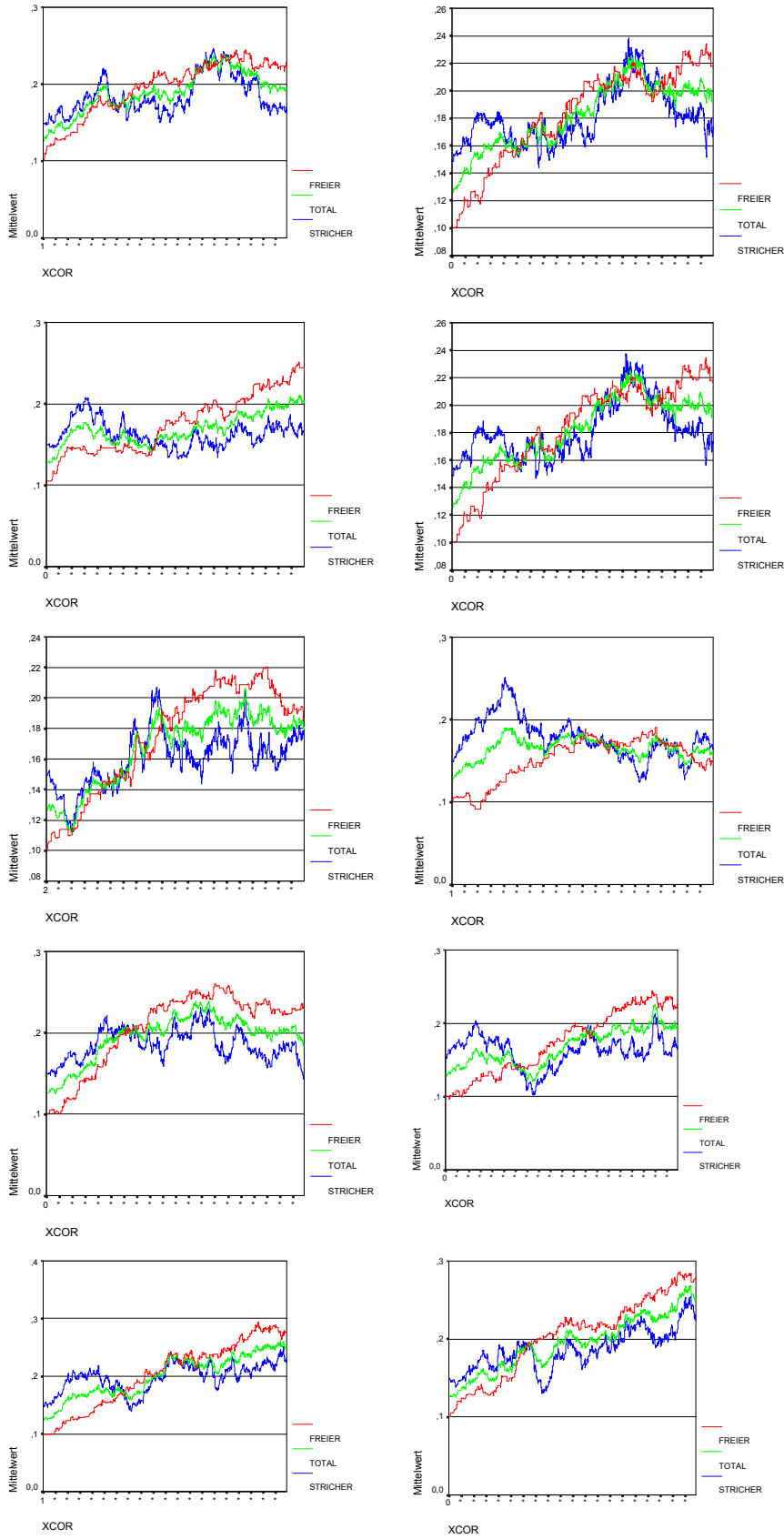


Figure 17b
Prevalence Curves (All Runs of 5000 cycles)
 (initial sex worker prevalence 15%, initial client prevalence 10%, incoming sex worker prevalence 10%)

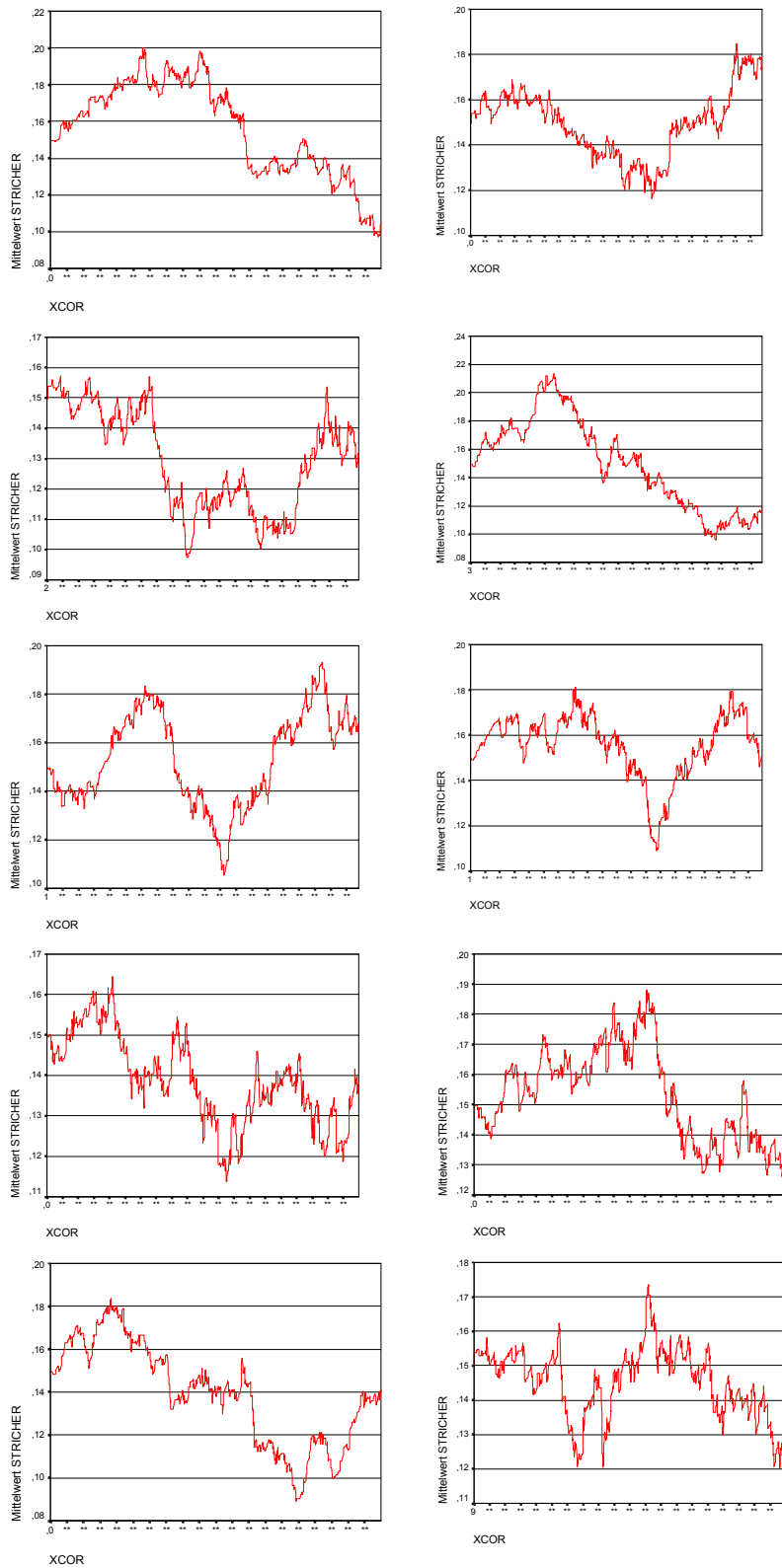


Figure 18a

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

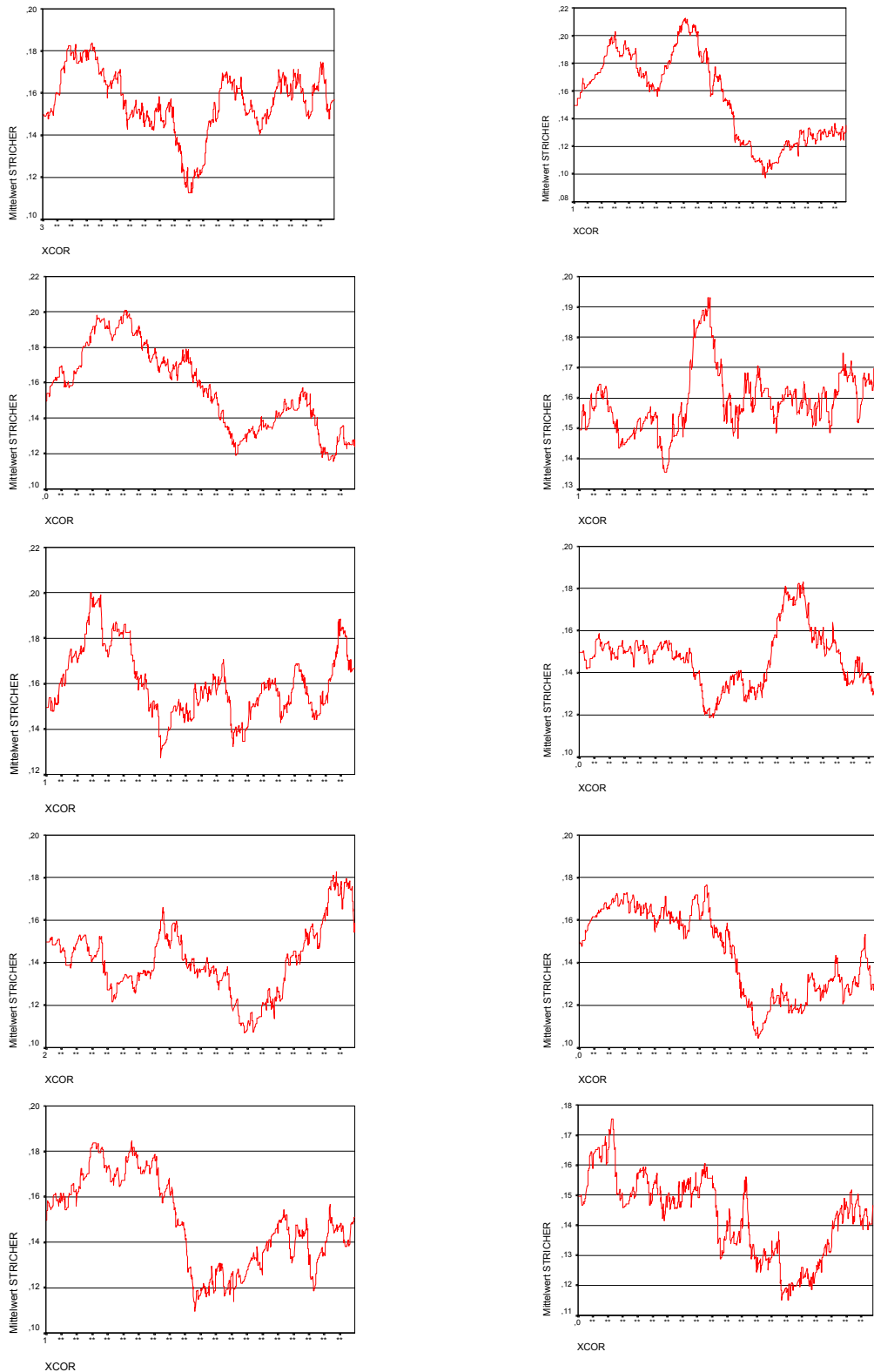


Figure 18b

**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

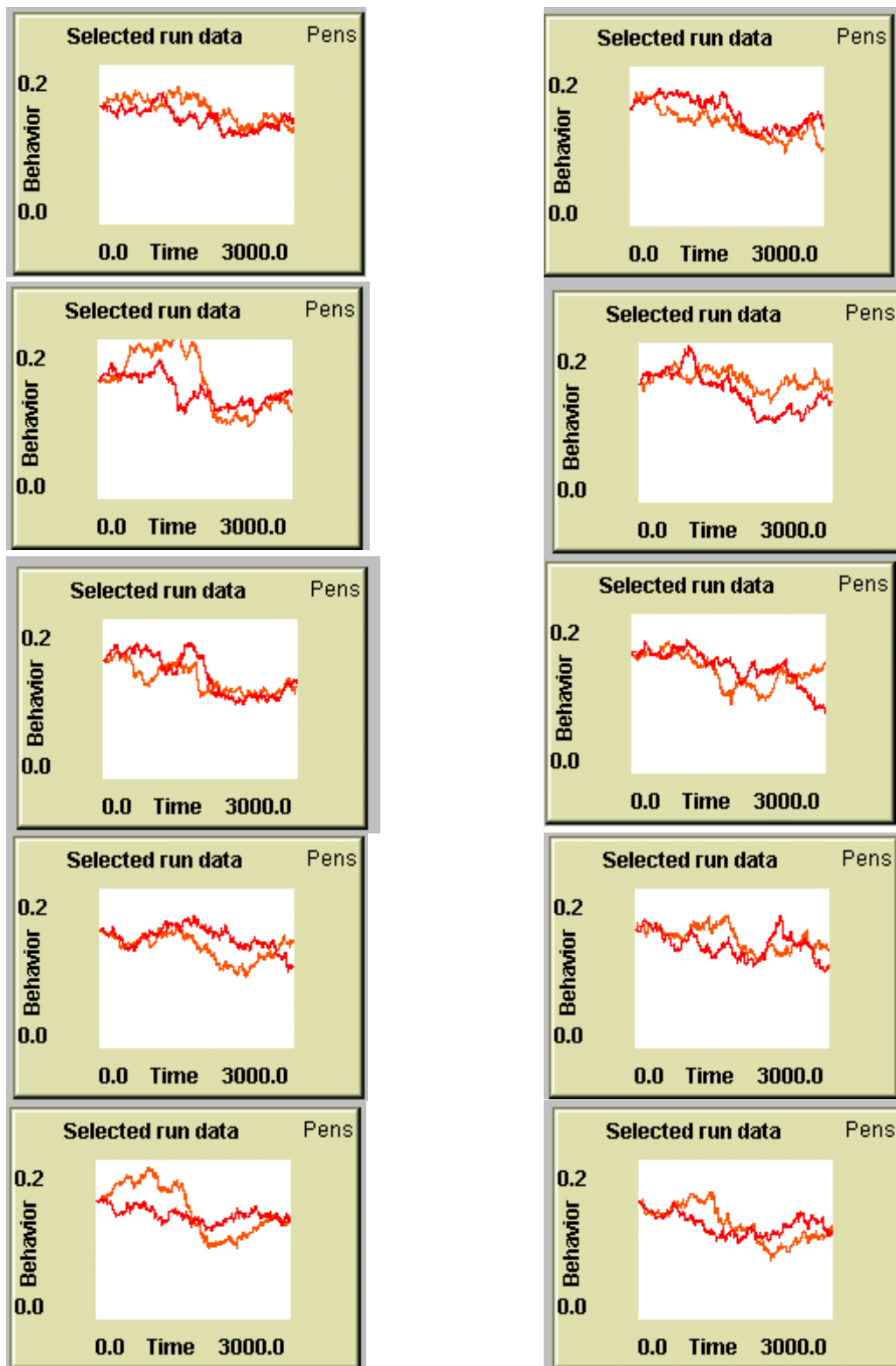


Figure 19
Intervention 9:
Realistic Scenario (Level of Discrimination 75%, Instability 25%, Unsafe Sex 50%, Infectivity at 1.6)
And Baseline Unsafe Sex Probability of Clients at 50% and 100%

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

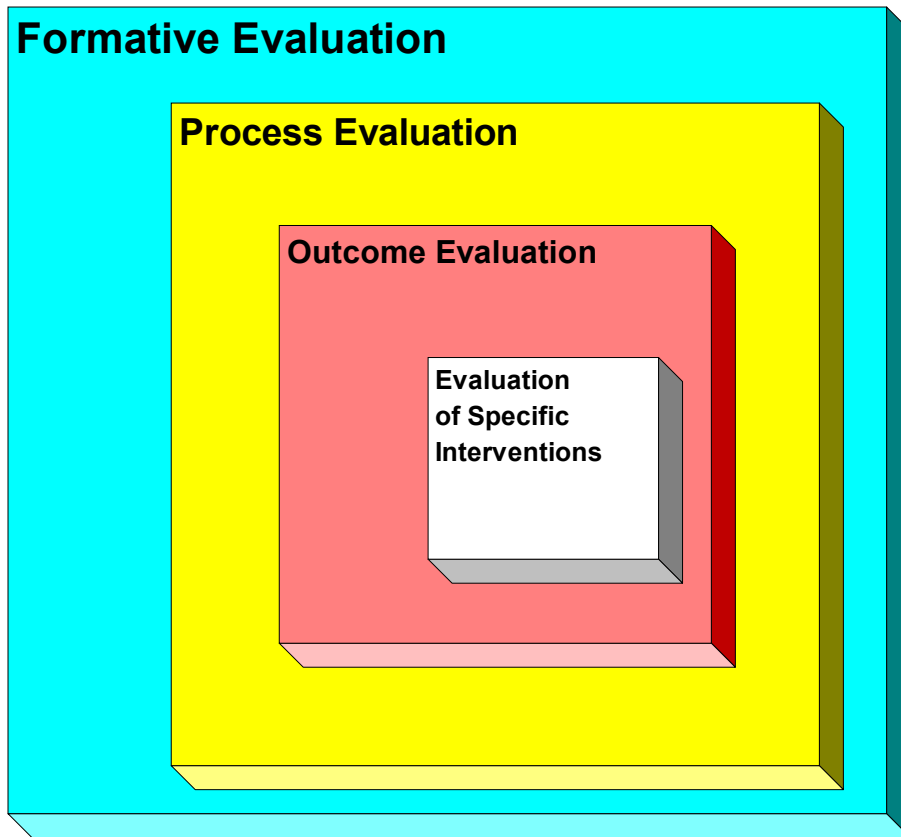


Figure 20

A Complex Model of Evaluation Research



Figure 21

Simple Spiral

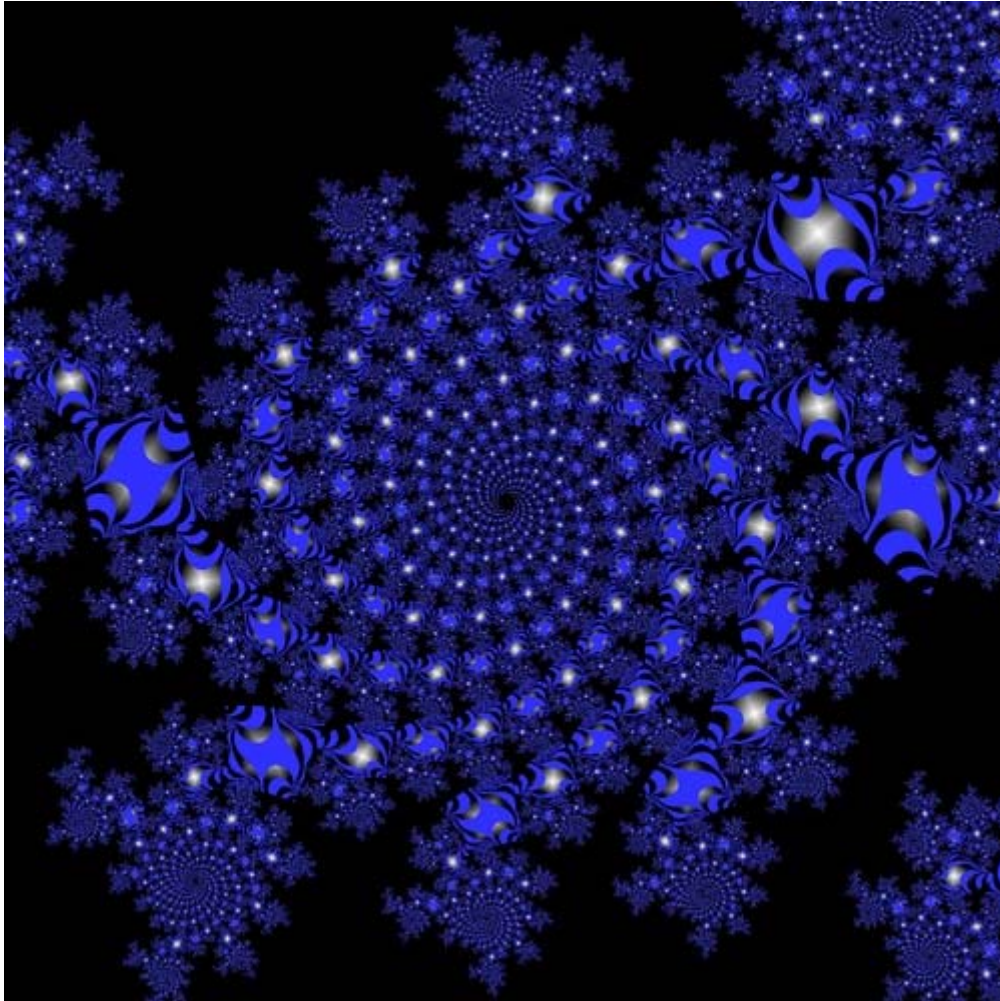


Figure 22

Spiral With Several Strands

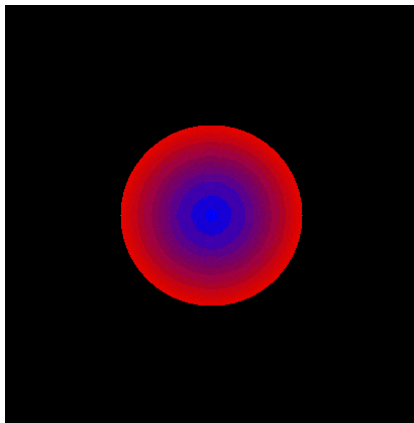
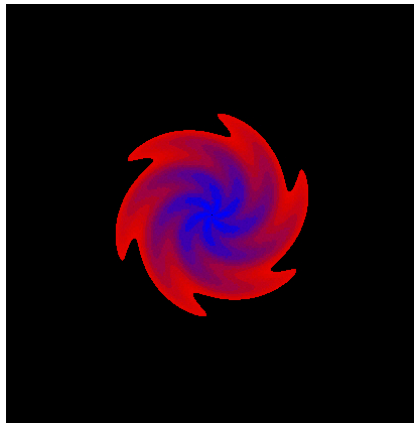
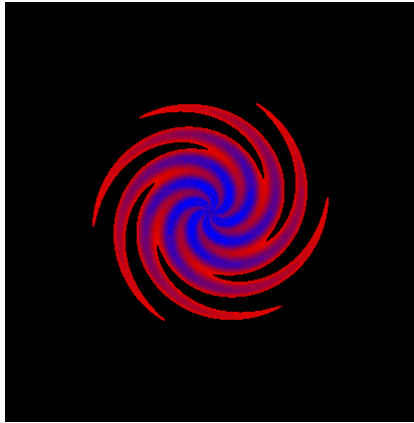


Figure 23
Evolving Spiral

Appendix 2

Table 1**Comparison of Positive and Negative Sex Workers on Key Variables**

Average for all sex worker agents at baseline

Disadvantage Score	34
Instability Score	80
Unsafe Sex Probability	70
Base Instability	50
Base Unsafe Sex Probability	50
Scene time	0

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

	Average for HIV+ Sex Worker Agents	Average for HIV- Sex Worker Agents	Difference
Disadvantage Score	36.7 (32.8-40.9) 8.1	34.6 (32.6-37.4) 4.8	2.1 3.3
Instability Score	80.1 (69.6-88.9) 19.3	79.1 (77.4-80.8) 3.4	1.0 15.9
Unsafe Sex Probability	71.2 (62.9-78.6) 15.7	70.6 (65.9-76.1) 10.2	0.6 5.5
Base Instability	51.0 (45.4-59.0) 13.6	50.7 (48.5-52.8) 4.3	0.3 9.3
Base Unsafe Sex Probability	49.9 (44.5-60.0) 15.5	49.8 (46.7-53.5) 6.8	0.1 8.7
Scene time	778.9 (649.6-946.5) 296.9	590.6 (532.9-650.0) 117.1	188.3 179.8

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

	0	1.6	3.2
Mean	10.9 (6.9-15.9)	13.5 (9.6-17.5)	14.3 (9.8-18.4)
	9	7.9	8.6
Linearity	2.64	2.15	

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

	0	25	50	75	100
Mean	13.2 (9.6-17.4) 7.8	12.9 (8.5-17.0) 8.5	12.9 (8.6-17.0) 8.4	14.5 (10.1-18.8) 8.7	14.3 (9.8-18.4) 8.6
Linearity	2.00	2.48	2.35	1.78	

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**

	0	25	50	75	100
Mean	13.1 (9.1-17.8) 8.7	14.5 (9.9-18.8) 8.9	13.8 (9.5-18.2) 8.7	14.4 (10.0-19.0) 9.0	14.3 (9.8-18.4) 8.6
Linearity	1.93	1.83	2.18	1.67	

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**

	0	25	50	75	100
Mean	14.3 (9.8-18.1) 8.3	14.1 (9.8-17.9) 8.1	13.9 (10.2-18.2) 8.0	14.0 (10.3-17.8) 7.5	14.3 (9.8-18.4) 8.6
Linearity	2.54	2.49	2.89	3.04	

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)

	0	0.25	0.50	0.75	100
3.2	13.2 (9.6-17.4) 7.8	12.9 (8.5-17.0) 8.5	12.9 (8.6-17.0) 8.4	14.5 (10.1-18.8) 8.7	14.3 (9.8-18.4) 8.6
	2.00	2.48	2.35	1.78	
1.6	11.8 (8.1-15.9) 7.8	11.5 (6.9-16.3) 9.4	12.1 (7.9-16.5) 8.6	12.3 (8.0-17.0) 9.0	13.5 (9.6-17.5) 7.9
	2.56	2.47	2.62	1.56	2.15
0	11.3 (7.3-16.2) 8.9	10.7 (6.6-15.4) 8.8	10.9 (8.3-15.4) 8.3	10.4 (6.5-15.7) 9.2	10.9 (6.9-15.9) 9
	2.55	2.28	3.14	2.48	2.64

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)

	0	25	50	75	100
100	13.2 (9.6-17.4) 7.8	12.9 (8.5-17.0) 8.5	12.9 (8.6-17.0) 8.4	14.5 (10.1-18.8) 8.7	14.3 (9.8-18.4) 8.6
75	12.4 (8.3-16.7) 8.4 2.29	12.8 (8.8-16.7) 7.9 2.16	12.8 (8.9-16.9) 8.0 2.85	14.0 (9.6-18.4) 8.8 1.42	14.4 (10.0-19.0) 9.0
50	12.9 (9.6-16.5) 6.9 2.70	12.1 (8.6-16.2) 2.33	13.7 (9.2-18.2) 2.41	13.8 (9.5-17.7) 2.19	13.8 (9.5-18.2) 8.7
25	12.8 (8.8-16.3) 2.83	12.3 (8.5-15.8) 2.55	12.7 (8.3-16.8) 2.26	13.3 (8.6-17.9) 1.75	14.5 (9.9-18.8) 8.9
0	12.9 (8.9-16.7) 2.47	12.6 (8.5-16.9) 2.15	12.7 (8.4-16.9) 2.60	12.2 (8.2-16.6) 2.72	13.1 (9.1-17.8) 8.7

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)

	0	25	50	75	100
100	14.3 (9.8-18.1) 8.3	14.1 (9.8-17.9) 8.1	13.9 (10.2-18.2) 8.0	14.0 (10.3-17.8) 7.5	14.3 (9.8-18.4) 8.6
75	14.3 (9.7-19.3) 9.6	14.5 (10.1-18.8) 8.7	13.1 (9.0-17.7) 8.7	14.5 (10.2-18.6) 8.4	14.4 (10.0-19.0) 9.0
Q	14.1 (10.2-18.1) 7.9	13.8 (9.2-18.6) 9.4	13.5 (9.2-18.0) 8.8	14.6 (10.5-18.8) 8.3	13.8 (9.5-18.2) 8.7
25	14.4 (9.7-19.1) 9.4	13.9 (9.3-17.9) 8.6	14.2 (9.4-19.1) 9.7	13.7 (9.0-18.8) 9.8	14.5 (9.9-18.8) 8.9
0	13.0 (9.1-17.3) 8.2	13.8 (10.4-17.2) 6.8	13.1 (9.2-17.2) 8.0	13.4 (8.5-18.0) 9.5	13.1 (9.1-17.8) 8.7
	2.50	2.38	2.91	2.58	
	3.17	2.39	2.92	2.77	
	2.49	2.74	2.33	2.06	
	3.25	3.60	3.06	2.50	

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%

	50	75	100
Mean	12.1 (7.6-16.3) 8.7	12.6 (8.3-17.0) 8.7	14.3 (9.8-18.4) 8.6

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%

	50	100	Baseline
Mean	11.4 (6.9-16.0) 9.1	12.0 (8.3-16.0) 7.7	14.3 (9.8-18.4) 8.6
Linearity	0.56	0.85	

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 disadvantage infectiousness-sp  
infectiousness-fp scene-time max-scene-time]
```

```
patches-own [infect-s? infect-f? unsafe-sp? unsafe-fp? sex-prob?  
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

```

```

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
```