Heterogeneity of Sexual Behavior and HIV Distribution

UMC Utrecht
Julius Center

AidsFonds

Alsina, Ema[1], Rozhnova, Ganna[1], Kretzschmar, Mirjam[1,2]
1 Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht, The Netherlands
2 Center for Infectious Disease Control, RIVM, Bilthoven, The Netherlands

Objective

To measure heterogeneity in risk behavior and determine the distribution of HIV infections according to risk behavior.

Background

Heterogeneity of sexual risk involves number of sexual contacts, condom use, and mixing between risk groups. The concentration of HIV over risk strata is determined by the type of mixing in the population[2]. Mixing pattern influences the impact of intervention strategies, such as treatment as prevention. Changes of risk behavior over time, may also have important implications for the efficacy of potential interventions.
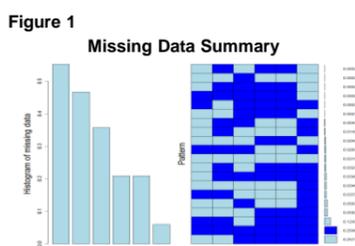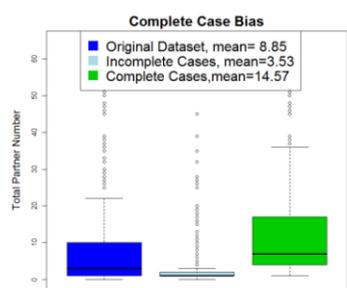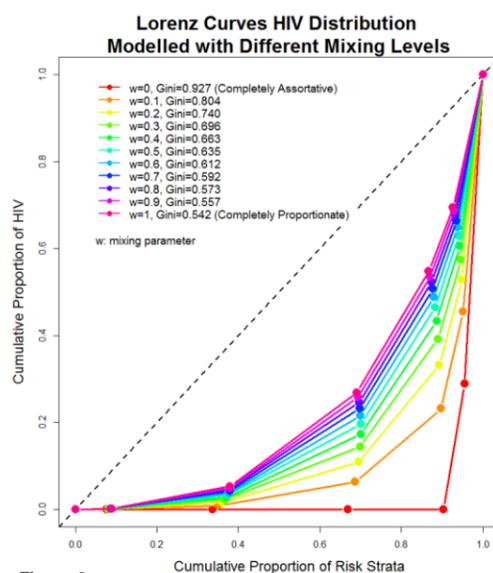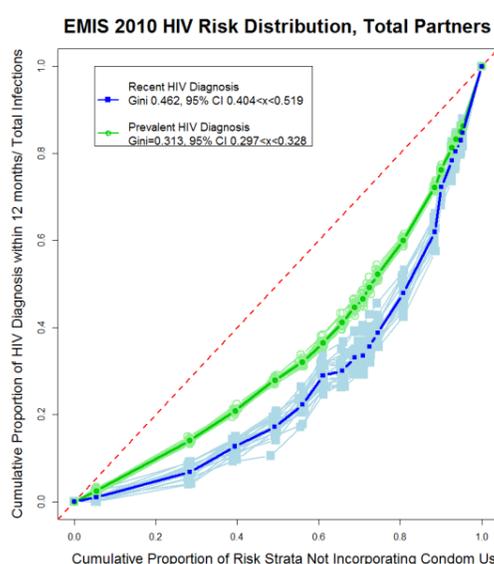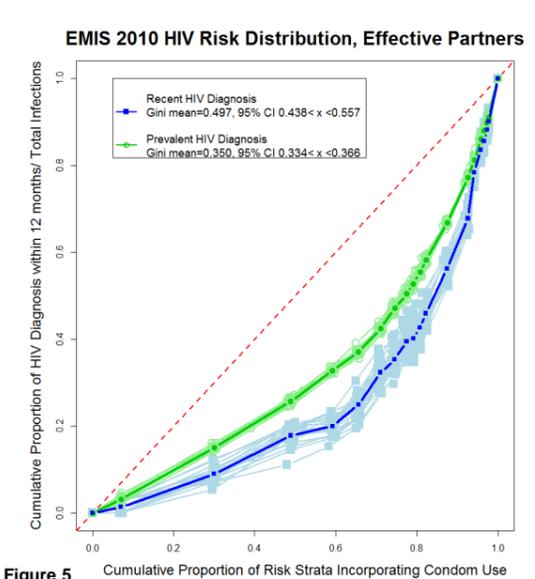

Figure 1

Figure 2

Figure 3

Materials &Methods

European MSM Internet Survey, 2010 (EMIS) [1]
• 3,787 Dutch MSM, online survey, cross-sectional, last 12 months
• self-reported HIV&STI test results, diagnosis in the last year, number of steady and casual sexual partners, condom use with casual and steady partners on 5 point qualitative scale

Multiple Imputation
• Mising Data is a common problem with survey data and can bias results. 75% of respondents have at least one missing value
• Complete case analysis introduces bias towards higher risk behavior (Figure 2)

Lorenz Curves
• Measure distribution of infections over stratified risk groups
• Gini coefficient ranges from 0 to 1 and quantifies the skewness of the Lorenz curve, higher values indicate increased concentration in high risk strata.
• Infection distribution is indicative of mixing [2] (Figure 3)

References

1. Weatherburn, Peter, et al. "The European Men-who-have-sex-with-men internet survey (EMIS): design and methods." Sexuality Research and Social Policy 10.4 (2013): 243-257.
2. Rozhnova, Ganna, et al. "Impact of Heterogeneity in Sexual Behavior on Effectiveness in Reducing HIV Transmission with Test-and-Treat Strategy." PLoS Comput Biol 12.8 (2016): e1005012.

Results

• Always condom use is significantly protective, OR 0.22 (Table 1)
• Adjusting partner number of always condom users reduces the population average partner number from 9.14 to 7.16,
• Always condom use also increases the heterogeneity of HIV distribution Gini 0.462→0.497 (Figures 5,6)
• Gini coefficients of prevalent infections are lower than recent diagnoses, for HIV and other STI (Figures 4,5,6)

Table 1

Effect Estimate of Condom Use with Casual Partners Pooled Logistic

	Odds Ratio	OR Lo 95	OR Hi 95	fmis
Never	Reference	-	-	-
Seldom	1.430	0.565	3.618	0.213
Sometimes	1.372	0.578	3.258	0.121
Mostly	0.541	0.219	1.336	0.221
Always	0.222	0.082	0.600	0.216

Figure 4

Figure 5

Figure 6

Discussion

• Self-reported inconsistent condom use in EMIS is not significantly more protective than never condom use. Using condoms due to higher perceived risk (believing partners to be HIV+) may be a confounder leading to increased risk in the seldom and sometimes condom users.
• Increased Gini coefficient after including condom use indicates that reclassification to lower risk groups was accurate.
• Risk is approximated by number of partners, but risk also varies by number of sex acts per partnership. Information on sexual frequency would be valuable for future research.
• The distribution of recent HIV infection indicates that mixing in this population is not highly assortative. Future research will quantify mixing.
• Behavior change over time could lead to the difference between the distribution of recent and total infections. Future research will focus on testing the effect of individuals changing risk level on infection distribution.

University Medical Center Utrecht