

Estimation of non-cohabiting sex partnering in sub-Saharan Africa

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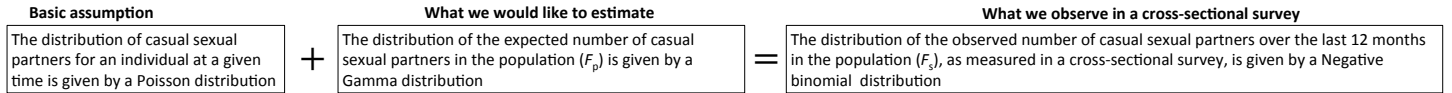
Background

- Understanding the dynamics of sexual partnership formation is key for developing a comprehensive understanding of the epidemiology of sexually transmitted infections (STIs).
- We introduce a statistical method for the estimation of the formation dynamics of casual sexual partnerships and apply this method for 25 countries in sub-Saharan Africa (SSA) by utilizing empirical nationally-representative sexual behavior data.

Methods

- We constructed a parsimonious mathematical model that describes the dynamics of casual sexual partnership formation and dissolution assuming that follows a stochastic Poisson process.
- We estimated the distribution of the expected number of casual partners (F_p) among married and unmarried male and female populations using the cross-sectional Demographic and Health Survey (DHS) data for the distribution of the observed number of casual partners over the last 12 months (F_s ; Figure 1).

Figure 1: The theoretical basis underlying the distribution of the observed number of casual partners over the last 12 months (F_s) as measured in a cross-sectional survey.



Results

- Our model showed robust fits to the empirical data for the distributions of the number of casual sexual partners as stratified by marital status and sex (Figure 2a shows an example). For a few countries, the number of casual partners reported by unmarried males and females showed a peak in frequency at 1 that remained uncaptured by the model (Figure 2b shows an example).
- We observed generally considerable heterogeneities in casual partnership formation across countries (Figures 3a & 3b):
 - The median across all country-specific means for F_p was larger among unmarried males and females compared to their married counterparts (Figure 3a).
 - The median across all country-specific variances for F_p was higher among unmarried and married males compared to their female counterparts (Figure 3b).
 - The country-specific variances of F_p among both married and unmarried females showed characteristically limited variability across countries.

Figure 2: Model goodness of fit evaluated by comparing model predictions to empirical cross-sectional sexual behavior data.

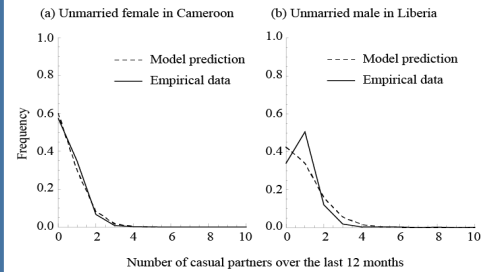
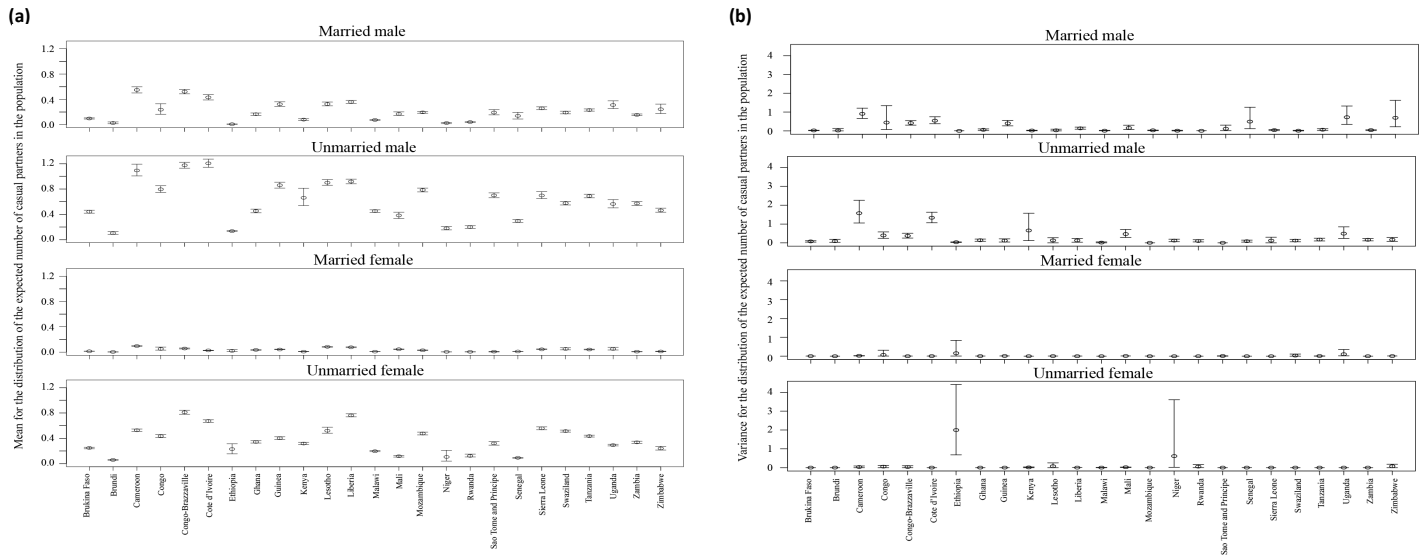


Figure 3: Estimated means and variances for the country-specific distributions of the number of casual sexual partnerships for married and unmarried male and female populations, along with their associated 95% confidence intervals, for 25 countries in sub-Saharan Africa.



Conclusion

- Our parsimonious mathematical model for the dynamics of casual sexual partnership formation and dissolution generated robust fits for nearly all countries, and revealed that casual sexual partnership formation appears to follow a simple and identifiable stochastic process.
- The robust model fits suggested the possibility of reproducing the complex sexual contact network using empirical cross-sectional sexual behavior data.
- Unmarried populations, particularly unmarried males, were identified as key for driving the heterogeneity in sexual contact networks.
- The low variance estimates for F_p among married and unmarried females suggested minimal heterogeneity in casual sexual behavior among females. These findings are not compatible with the comparable HIV prevalence levels and patterns of HIV sero-discordancy observed among males and females across SSA. The results suggest under-reporting of casual sex among females.

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