

Lecture 22: Network scale-up method to study groups most at-risk for HIV

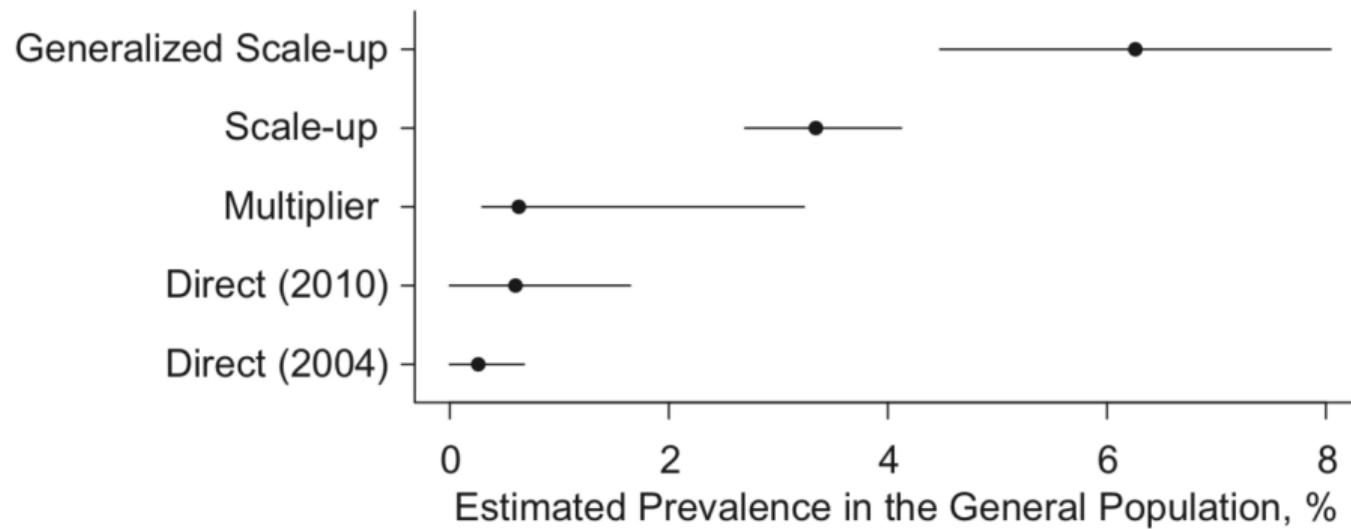
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Sociology 204: Social Networks
Princeton University

2/2 Survey experiment with blending: A network scale-up study in Rwanda



How can we improve
if we don't know how we are doing?



Source: Salganik, M.J., Fazito, D., Bertoni, N., Abdo, A.H., Mello, M.B., and Bastos, F.I. (2011) *American Journal of Epidemiology*.

How can we reliably make progress in our ability to estimate quantities that will never be known?

How can we reliably make progress in our ability to estimate quantities that will never be known?

- ▶ Theoretical
- ▶ Empirical

Network scale-up study in Rwanda

Study in Rwanda was designed to estimate the number of

- ▶ men who have sex with men
- ▶ female sex workers
- ▶ clients of female sex workers
- ▶ injection drug users

AND

to produce generalizable knowledge about the scale-up method

		Consideration of use?	
		Yes	No
Quest for fundamental understanding?	Yes	Pure basic research (Bohr)	Use-inspired basic research (Pasteur)
	No		Pure applied research (Edison)

- ▶ Why was UNAIDS excited about this study?

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- ▶ Why was the Rwandan National AIDS program excited about this study?

- ▶ Why was UNAIDS excited about this study?
- ▶ Why was the Rwandan National AIDS program excited about this study?
- ▶ Why was I excited about this study?



NUR / SPH

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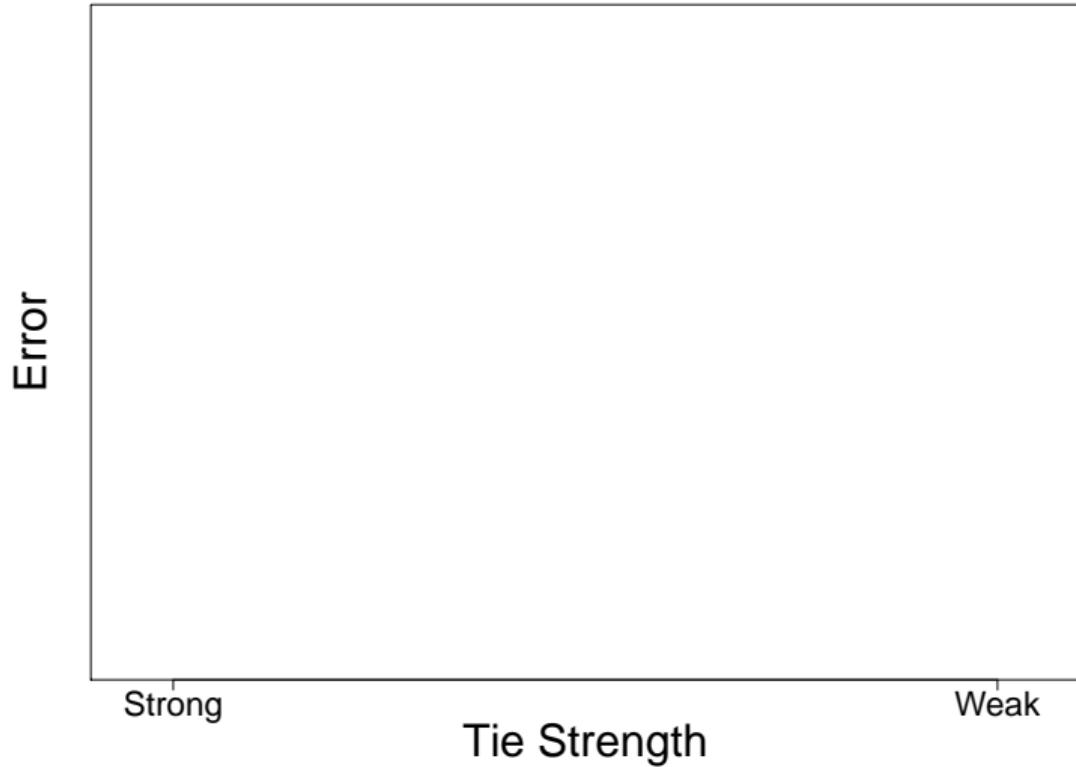


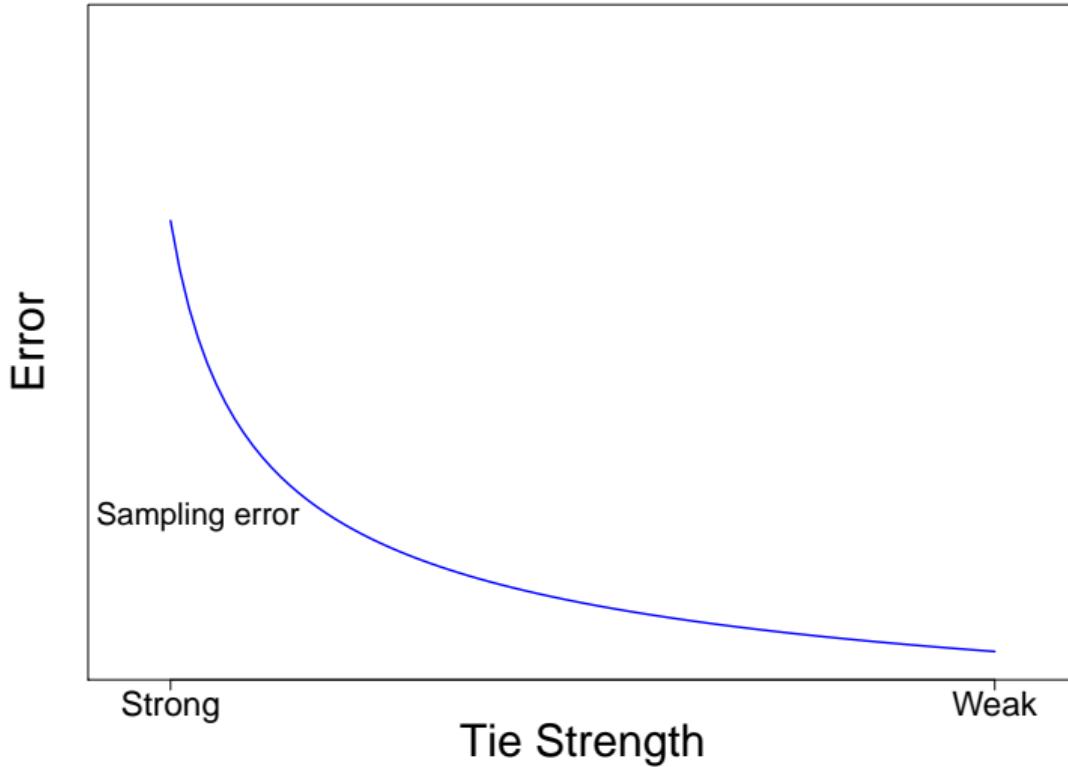


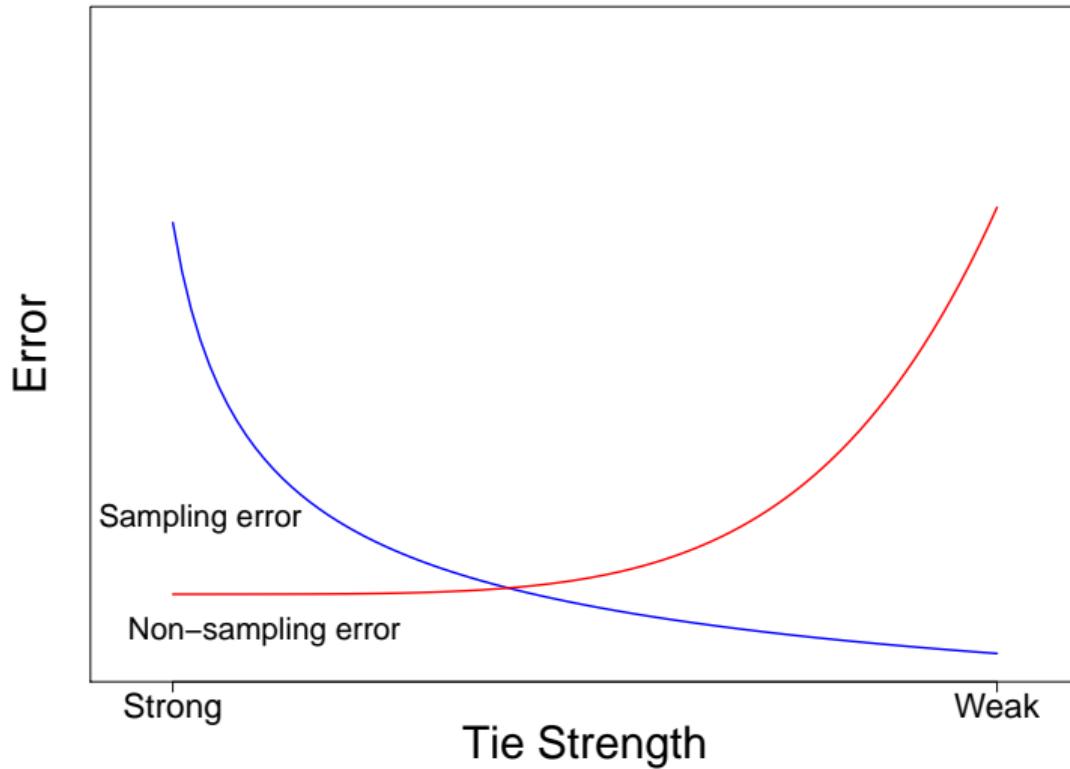


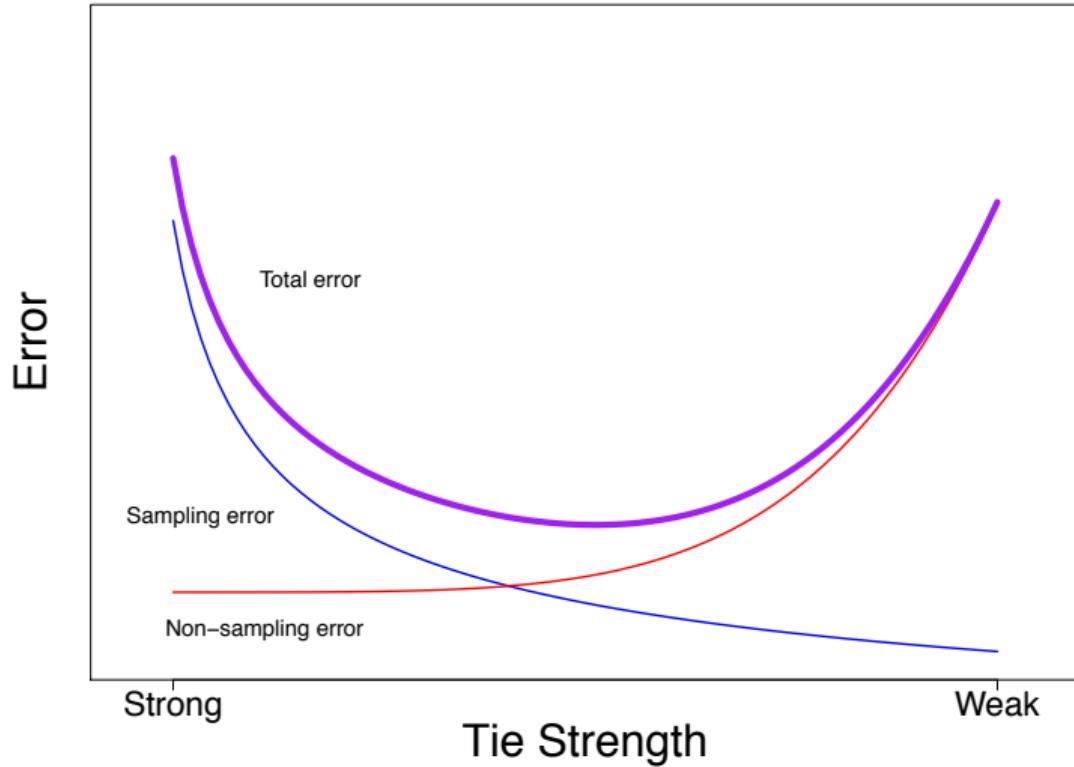


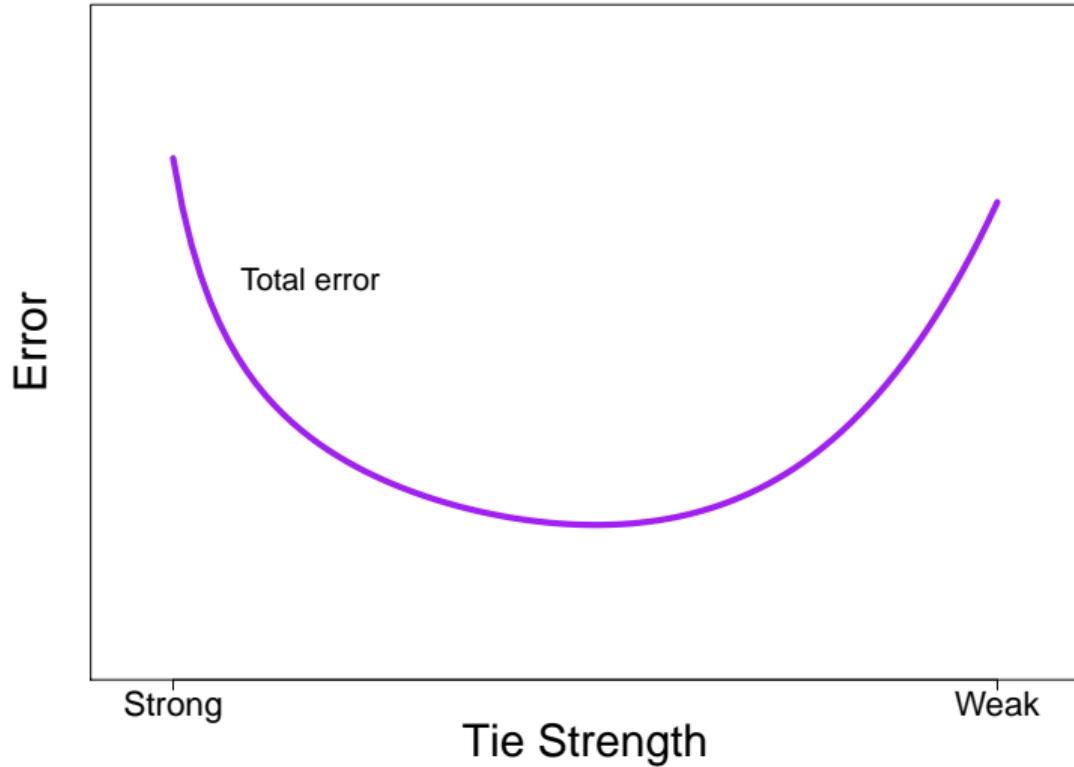












Basic definition ($n = 2,500$)

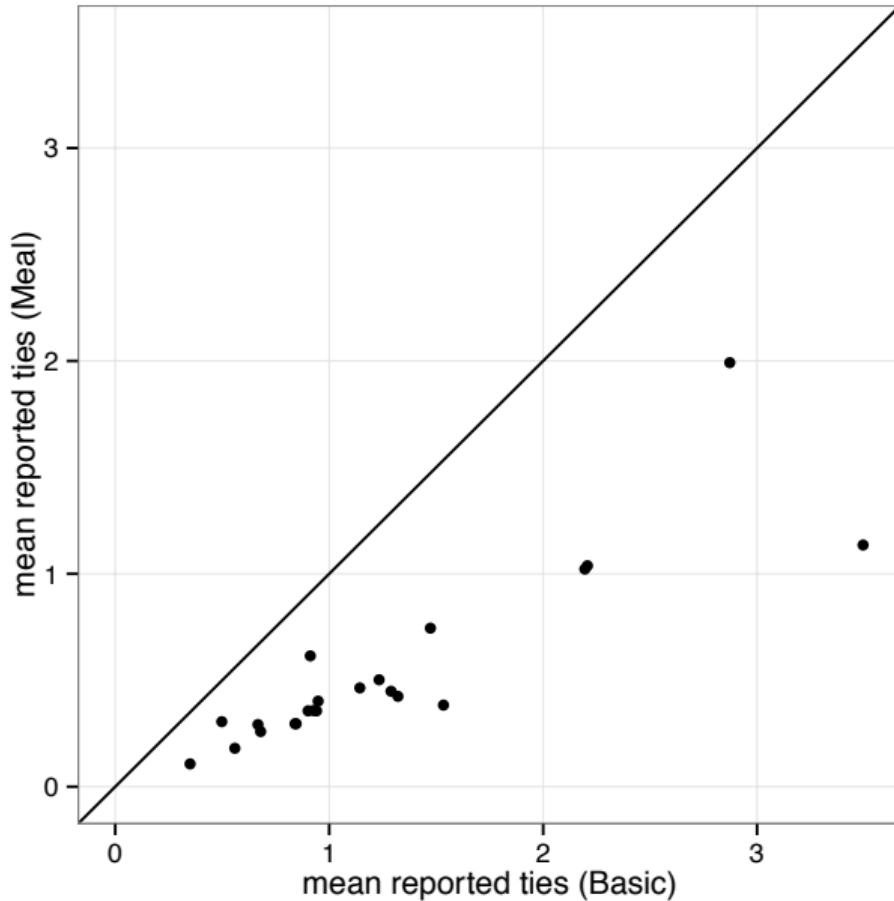
- ▶ people you know by sight and name and who also know you by sight and name
- ▶ people you have **had some contact with** in the past 12 months
- ▶ people of all ages who live in Rwanda

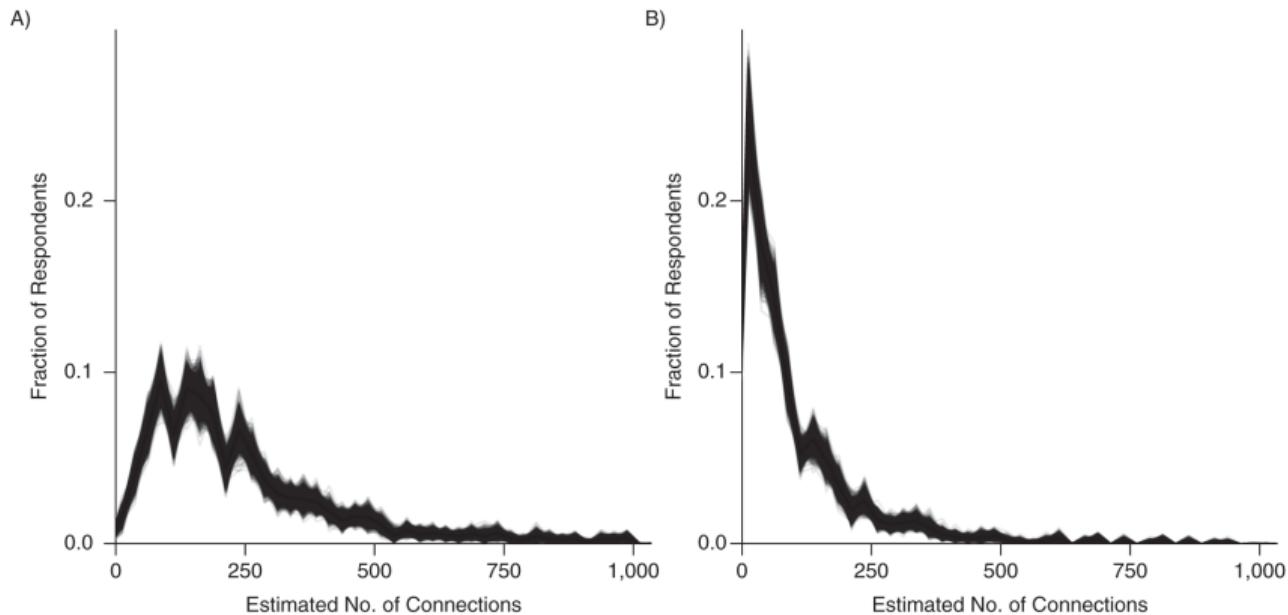
Meal definition ($n = 2,500$)

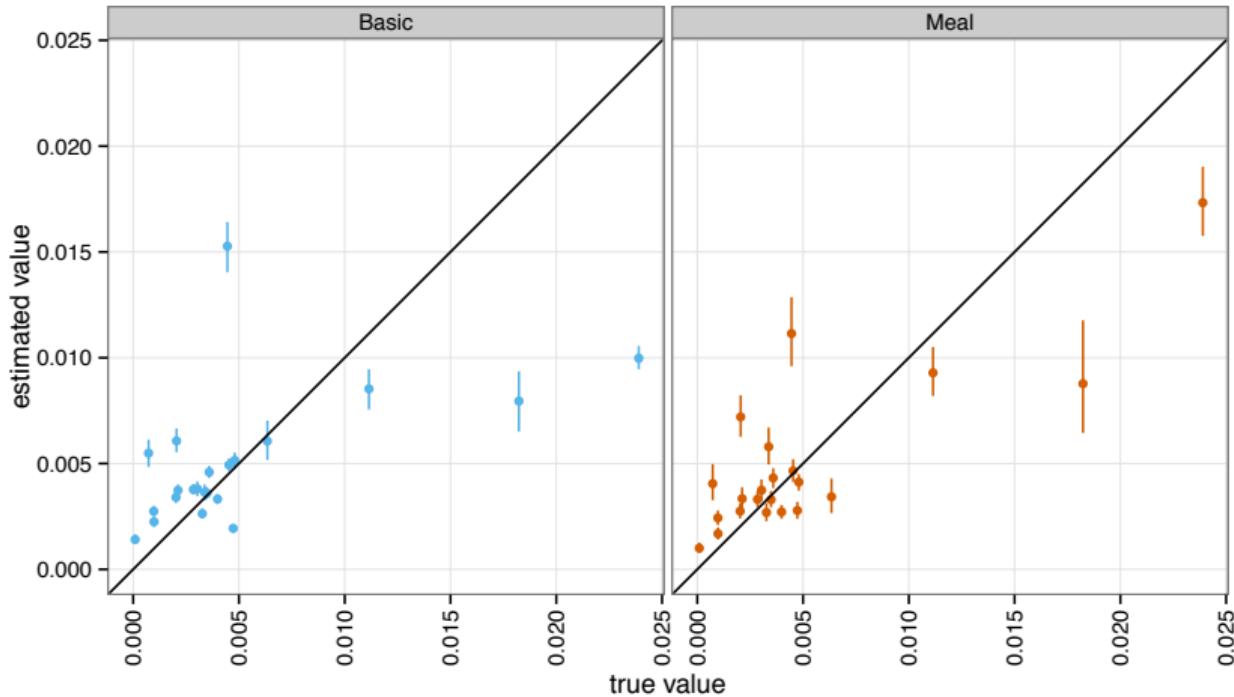
- ▶ people you know by sight and name and who also know you by sight and name
- ▶ people you have **shared a meal or drink with** in the past 12 months
- ▶ people of all ages who live in Rwanda

Priests
Nurses or Doctors
Male Community Health Worker
Widowers
Teachers
Divorced Men
Incarcerated people
Women who smoke
Muslim
Women who gave birth in the last 12 mo.

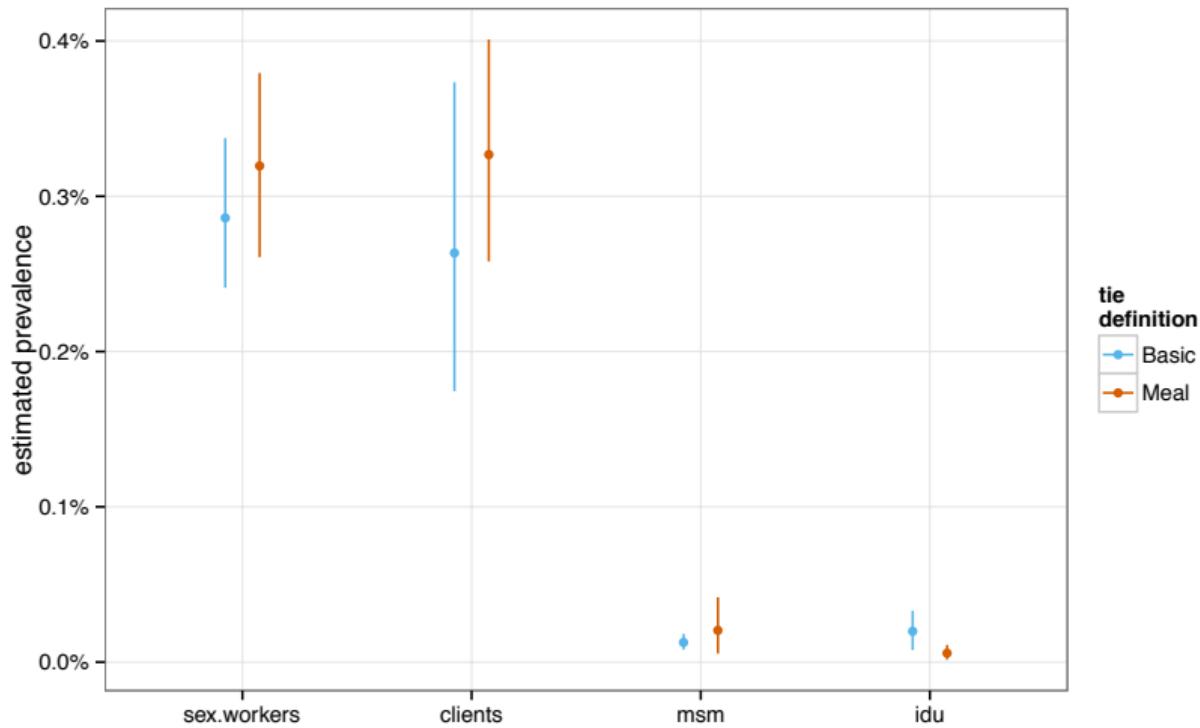
Twahirwa
Mukandekezi
Nyiraneza
Ndayambaje
Murekatete
Nsengimana
Mukandayisenga
Ndagijimana
Bizimana
Nyirahabimana
Nsabimana
Mukamana







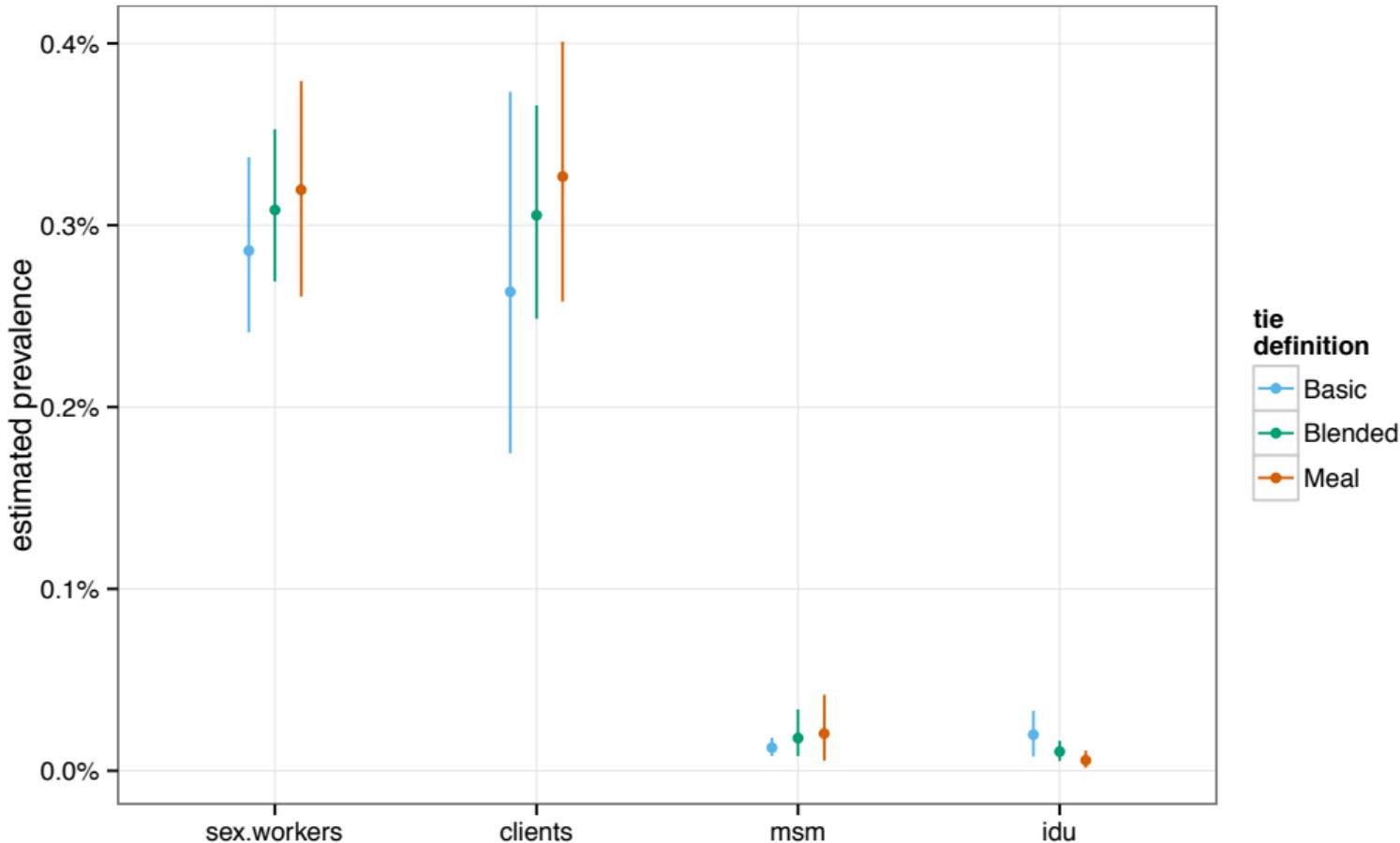
Meal definition has lower error (RMSE, MAE, MRE)



$$\hat{N}_H = w \cdot \hat{N}_{H[meal]} + (1 - w) \cdot \hat{N}_{H[basic]}$$

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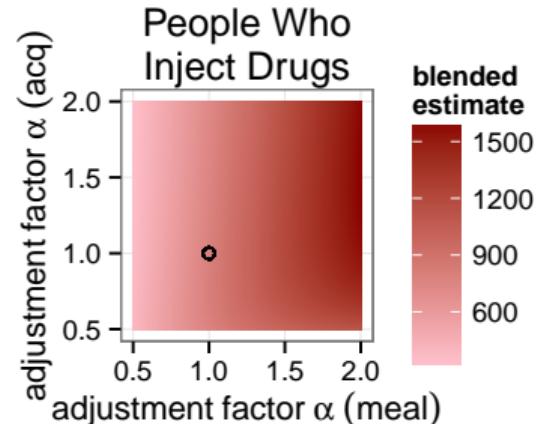
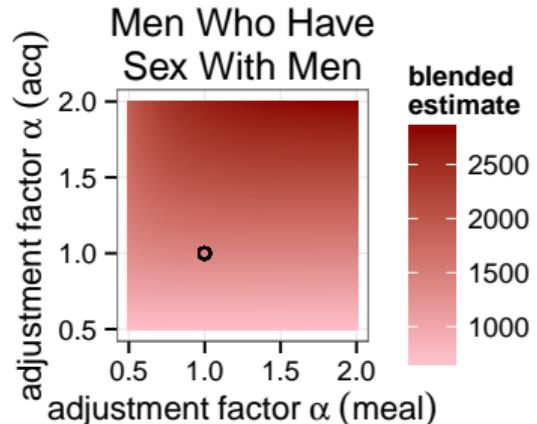
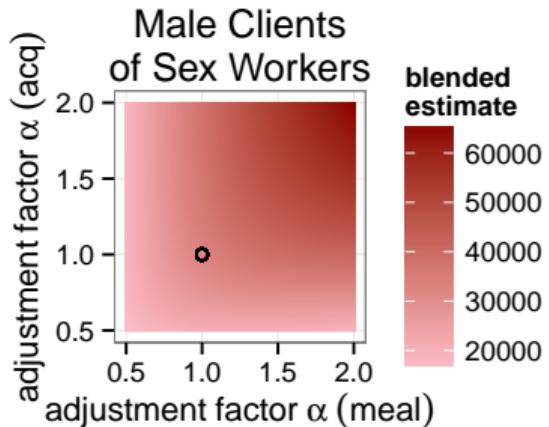
$$w = \frac{\hat{\sigma}^2_{basic}}{\hat{\sigma}^2_{basic} + \hat{\sigma}^2_{meal}}$$

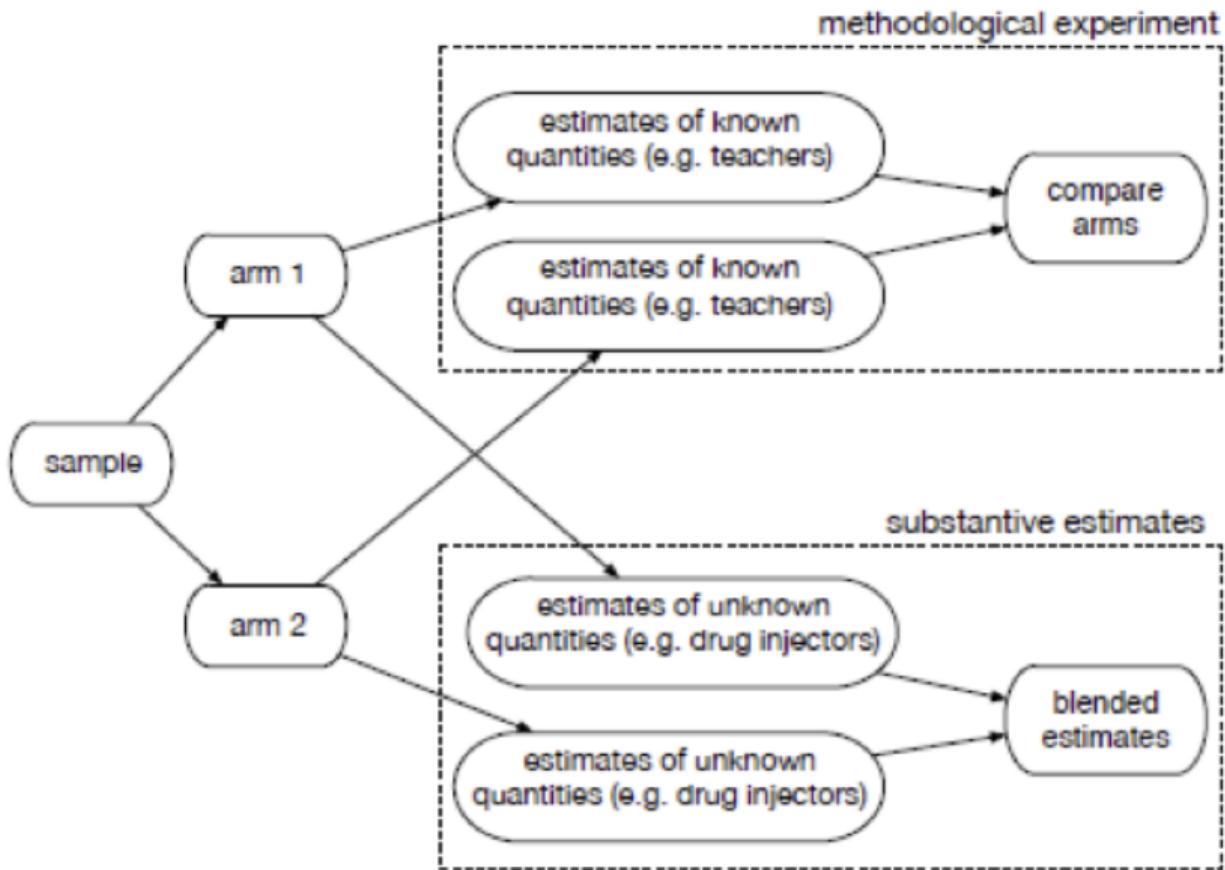


$$N_H = \alpha \hat{N}_H$$

where

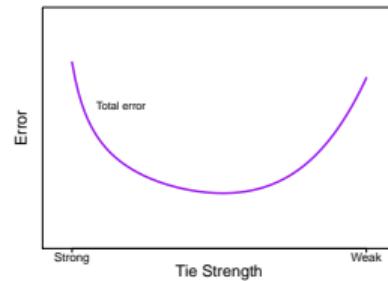
$$\alpha = \underbrace{\left(\frac{\eta_F}{\tau_F} \right)}_{\text{reporting distortions}} \times \underbrace{\left(\frac{1}{\phi_F \delta_F} \right)}_{\text{structural distortions}}$$



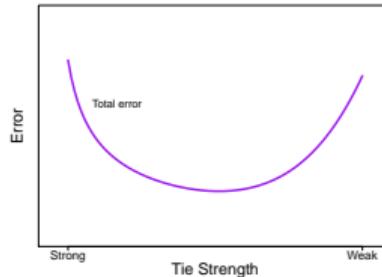


Extensions

With only two arms, we cannot demonstrate U-shaped relationship!



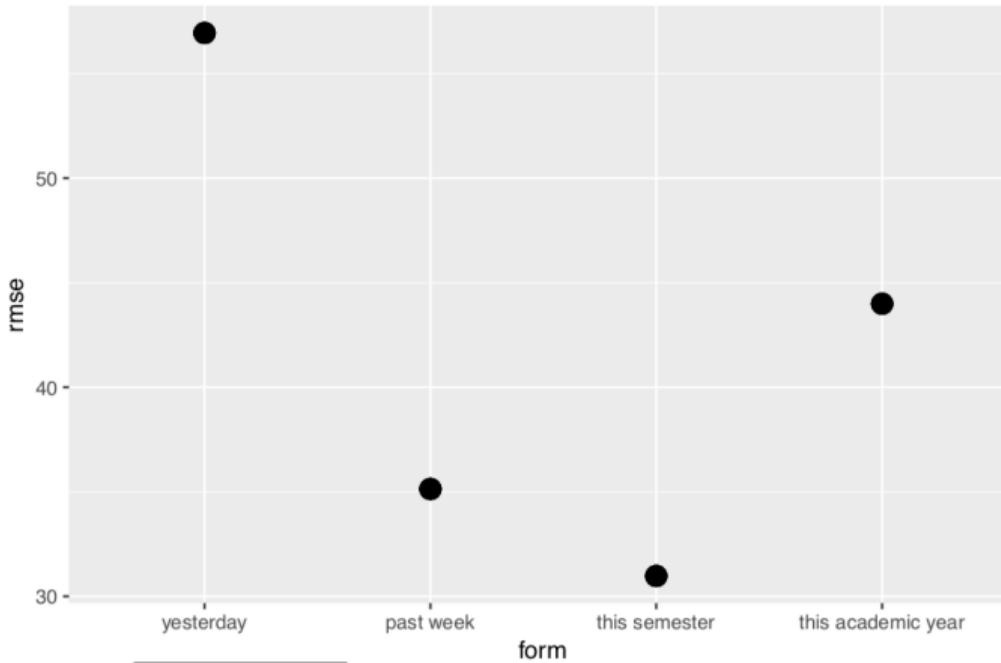
With only two arms, we cannot demonstrate U-shaped relationship!



In previous classes, we tried a survey experiment as a homework assignment in this class.

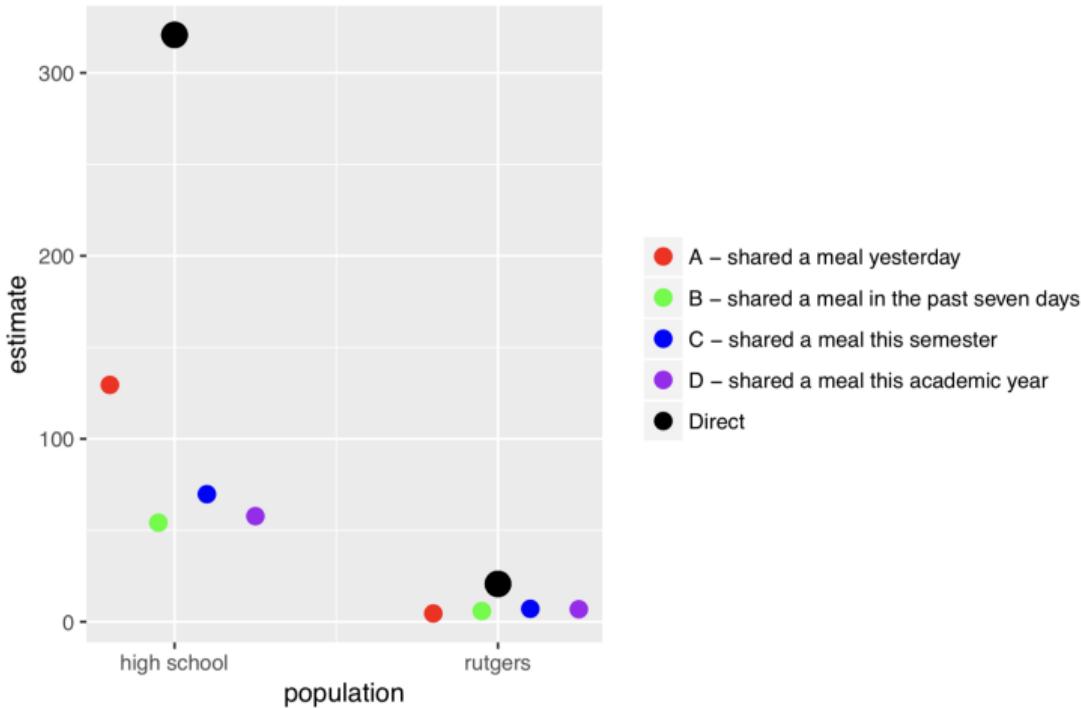
- ▶ We wanted to estimate number of people dating someone from their high school and number of people dating someone from Rutgers.
- ▶ We asked about connections to 9 groups of known size (e.g., sociology majors).
- ▶ We used 4 definitions of to know:
 1. shared a meal with yesterday
 2. shared a meal with in the past seven days
 3. shared a meal with this semester
 4. shared a meal with this academic year

Figure 8: Root Mean Squared Error, by Form



$$RMSE = \sqrt{\frac{\sum_{i=1}^n (estimate_i - actual_i)^2}{n}}$$

Figure 11: Direct and Scale–Up Estimates, by Form



- ▶ scale-up estimates might be too low because of imperfect visibility

Lecture 23: Who knows what about who?

- ▶ Salganik, M.J. et al. (2011). The game of contacts: Estimating the social visibility of groups. *Social Networks*.
- ▶ Cowan, S. (2014). Secrets and Misperceptions: The Creation of Self-Fulfilling Illusions. *Sociological Science*.