School Income Inequality and Sexually Transmitted Infections in the United States

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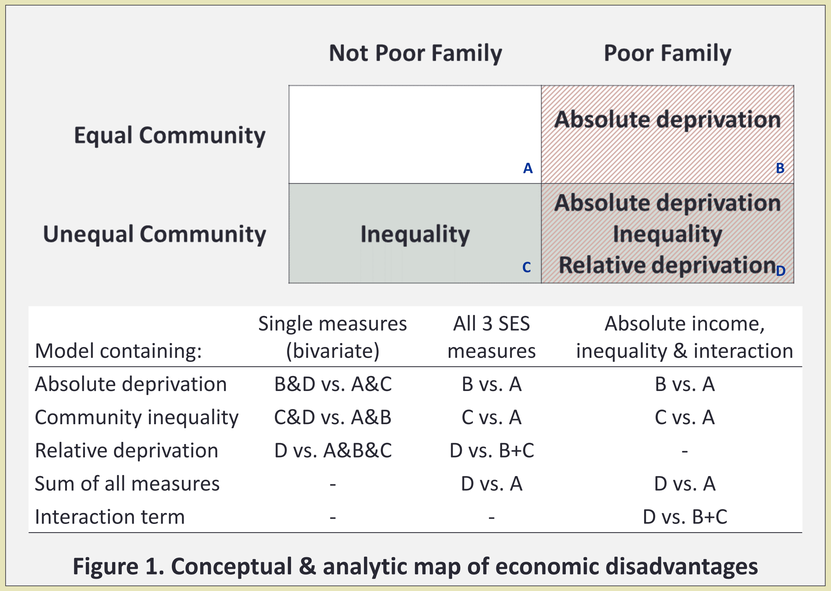
Background

- Economic inequality is associated with several health outcomes across a range of settings.[1]
- An observed association between inequality and health may reflect:
  i. **Absolute deprivation** (e.g. a lack of resources)
  ii. **Community inequality** (e.g. low social capital, social mixing)
  iii. **Relative deprivation** (e.g. social distancing).[2]
- **Social comparisons** and **risky sexual behavior** are both common in school settings.
- We therefore considered:
  - whether **income inequality** affects an individual's subsequent risk of contracting a sexually transmitted infection (**STI**), and
  - through which **mechanisms** (absolute deprivation, community inequality, relative deprivation) it might do so.

Methods

- **Dataset:** Add Health interviewed children in grades 7-12 in 1994/5 (Wave I). Re-interviewed respondents in 1996 & 2001/2 (Waves II & III)
- **Analysis:** Two-level hierarchical logistic model. 11,183 respondents (52% female; 58% White non-Hispanic, 20% Black non-Hispanic, 15% Hispanic) nested in 132 schools.
- **Outcome:** A diagnosis of **Chlamydia**, **Gonorrhea** or **Trichomoniasis**, either self-reported (Wave II or III) or laboratory-confirmed (Wave III).
- **Covariates**: Respondent-level age, sex, race/ethnicity, parental education; School-level race/ethnic composition.
- **Economic Measures:** Built on parent-reported family income at Wave I.
  i. **Absolute deprivation**: Per-capita equivalent **family income;**
  ii. **Economic inequality**: **Gini** coefficient of sampled students' family incomes at each school;
  iii. **Relative deprivation**: Family **Yitzhaki** index (reference group is other students at same school).



Model containing:	Single measures (bivariate)	All 3 SES measures	Absolute income, inequality & interaction
Absolute deprivation	B&D vs. A&C	B vs. A	B vs. A
Community inequality	C&D vs. A&B	C vs. A	C vs. A
Relative deprivation	D vs. A&B&C	D vs. B+C	-
Sum of all measures	-	D vs. A	D vs. A
Interaction term	-	-	D vs. B+C

Figure 1. Conceptual & analytic map of economic disadvantages

Primary Results

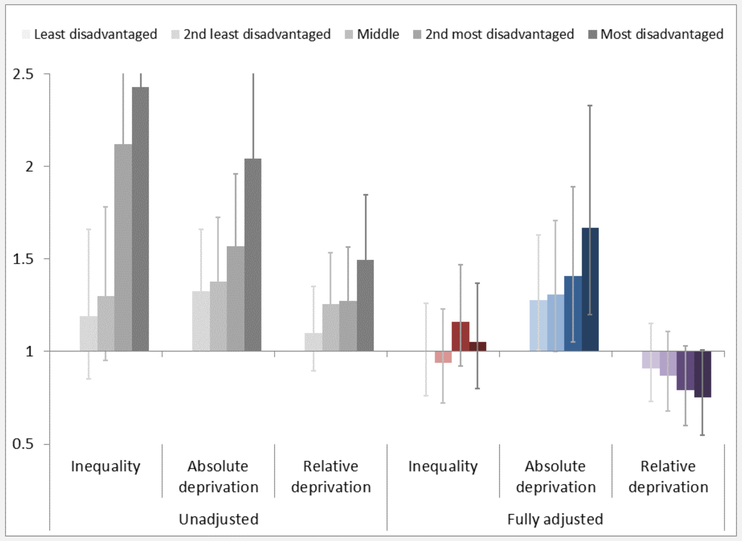


Figure 2. Odds ratios for STI diagnosis by quintiles of economic status

- All 3 SES measures are positively associated with STI diagnosis bivariately.
- **Inequality** association much **attenuated** after covariate adjustment, specifically own race/ethnicity. Remains clear predictor of risk for rich (Figure 3, left-most quintile).
- **Absolute deprivation** remains **positively** associated throughout. But effect is independent of income equality.
- **Relative deprivation** becomes **negatively** associated in presence of other SES measures, suggesting **negative multiplicative interaction** between income and inequality. This is qualitatively confirmed by the adjusted, interaction model of absolute deprivation and inequality (Figure 3): STI risk rises as relative deprivation does, but by less than expected levels based on income & inequality values (i.e. the sum of the main effects). Additionally, we note that the relative deprivation measure appears to provide greater **power** to predict than the interaction terms.

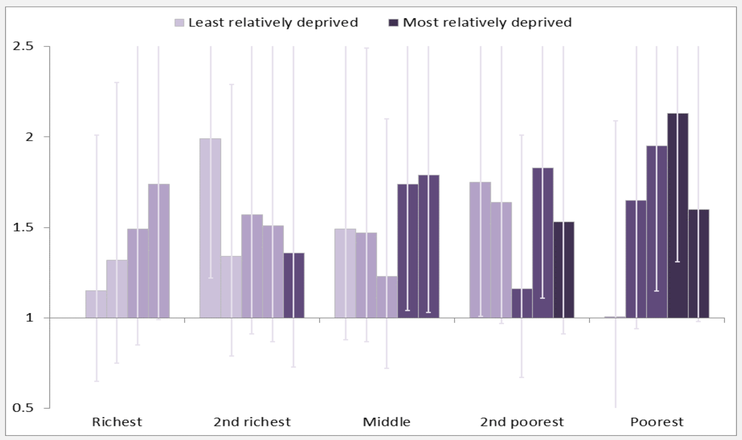


Figure 3. Odds ratios by quintiles of poverty & inequality interacted (inequality increases from left to right within each quintile of income)

Subgroup comparisons

- By **Sex**:
  - **Low income** strongly associated with STIs for **women**;
  - Inequality effect also more positive for women than men.
- By **STI**:
  - Inequality & low income most strongly associated for **Trichomoniasis**, the STI with the highest proportion of female cases.
- By **Race/ethnicity**:
  - **Inequality** relationship strongest among **Hispanics** and **Others;**
  - **Income** relationship strongest for **Black non-Hispanics**.

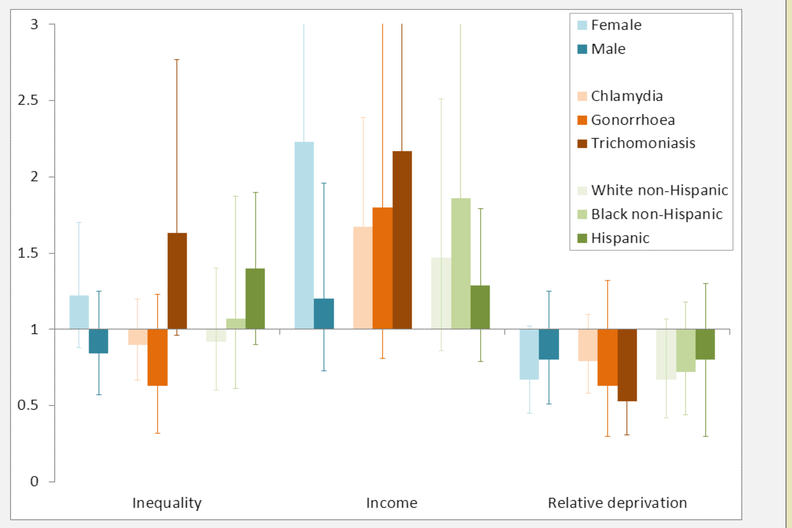


Figure 4. Odds ratios for Subgroup comparisons in adjusted models (most vs. least disadvantaged quintiles)

Discussion

- **Policy implications:** Poverty may be a valid target for those wishing to reduce STIs, particularly for women and within Black non-Hispanic populations. Higher rates in more unequal settings appear to largely reflect compositional effects due to higher-risk racial groups living in them.
- **Analytic implications:** The **Yitzhaki** index is a useful tool for decomposing the causal mechanisms that might drive an association between inequality and health; it has clear epidemiologic and empirical interpretations.
- **Future research:** This analysis represents a first pass at a quantitative effort to separate an association between inequality and health into its constituent causal mechanisms. Next steps would include:
  1. Extending the approach to **other** health **outcomes** and **settings**;
  2. Using **mediation** analysis to confirm economic, behavioural or physiological **pathways** implied by each mechanism.

Acknowledgments & References

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1.Kondo et al. BMJ 2009; 339: b4471. 2. Eibner & Evans. J Hum Res 2005; 40(3): 591-620.

	Not Poor Family	Poor Family
Equal Community		**Absolute deprivation**
Unequal Community	**Inequality**	**Absolute deprivation Inequality Relative deprivation**

Model containing:	Single measures	All 3 measures	Absolute income, inequality & interaction
Absolute deprivation	B&C vs. A&C	B vs. A	B vs. A
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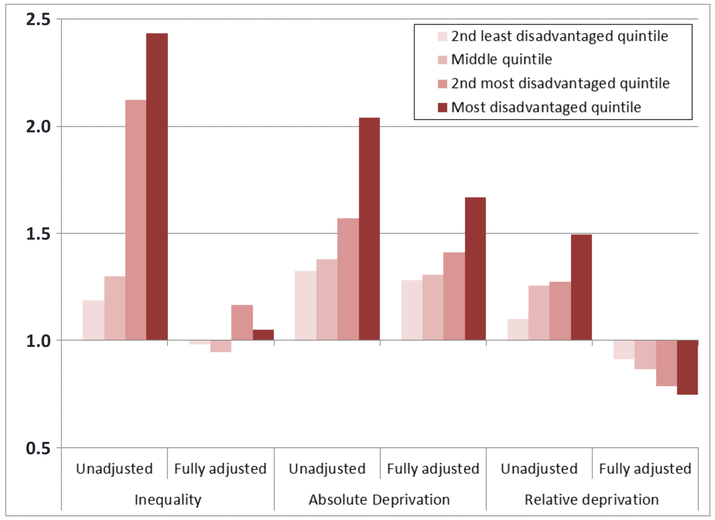
Interaction term	-	-	D vs. A



	Not Poor Family	Poor Family
Equal Community	A	**Absolute deprivation** B
Unequal Community	**Inequality** C	**Absolute deprivation Inequality Relative deprivation** D

	Richest	2nd Richest	Middle	2nd Poorest	Poorest
Most equal	1.0				
2nd most equal					
Middle					
2nd most unequal					
Most unequal					

		Per-capita income				
		Richest	2nd richest	Middle	2nd poorest	Poorest
Community inequality	Most equal	1	1.99	1.48	1.75	0.99
	2nd most equal	1.15	1.34	1.47	1.64	1.65
	Middle	1.31	1.56	1.22	1.15	1.93
	2nd most unequal	1.49	1.51	1.74	1.83	2.13
	Most unequal	1.74	1.36	1.79	1.53	1.60

Richest quintile in most equal quintile is the comparison group

Significant at the 10% level Significant at the 5% level

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