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Multiple chlamydia infection among young women: comparing the role of individual- and neighbourhood-level measures of socioeconomic status

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Abstract

Background—Young women have the highest burden of chlamydia infections, and socioeconomic disparities exist. Individual-level measures of socioeconomic status (SES) may be difficult to assess for young women. The authors examined whether neighbourhood SES provides a useful measure in comparison with individual-level SES with respect to the burden of multiple chlamydia diagnoses.

Methods—In a study of young women with chlamydia (n=233; mean age =21 years), multiple infections were assessed with self-report and follow-up testing. General estimating equations and pseudo-R² were used to assess the roles of individual-level SES (education and employment) and neighbourhood-level SES (percentage of people in census tract of residence below poverty) on multiple chlamydia diagnoses.

Results—Neither education nor employment was associated with multiple chlamydia diagnoses. Women living in high-poverty areas were significantly more likely than those living in low-poverty areas to have multiple chlamydia diagnoses (adjusted OR 3.46, 95% CI 1.18 to 10.15). This neighbourhood-level poverty measure improved model fit by 17%.

Conclusions—Neighborhood-level poverty may provide a better measure of SES than individual-level variables as a predictor of multiple chlamydia diagnoses in young women and can be useful when valid measures of individual-level SES are unavailable.

INTRODUCTION

Chlamydia trachomatis is the most common bacterial sexually transmitted infection in the USA with an estimated nearly 3 million cases annually.¹ Adolescent and young adult women have the highest rates of incident and repeat infections.^{2,3} Chlamydia is associated with numerous negative reproductive health outcomes, and reinfection with chlamydia increases the risk of negative health outcomes.³

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Competing interests None.

Ethics approval Ethics approval was provided by Yale University School of Medicine Human Investigation Committee.

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Socioeconomic disparities have been documented for chlamydia infections.⁴ However, it is difficult to measure socioeconomic status (SES) for young women, who may not have transitioned to adult roles, using education, income and occupation.⁵ Instead, neighbourhood-level SES measures may be more feasible to examine as they are available in public-use datasets (eg, US Census) and measure characteristics of environments in which people live.

The objective of this analysis was to determine whether neighbourhood-level SES provides a useful measure in comparison with individual-level SES with respect to the burden of multiple chlamydia diagnoses in a sample of young women in two Connecticut cities with a relatively high burden of chlamydia infections (1180 and 836 per 100 000) compared with state and national rates (338 and 370 per 100 000, respectively).⁶ As well as moderate levels of poverty (the proportion of population living in poverty was 24.4% and 18.4% compared with 7.9% in the state and 12.4% nationally).

METHODS

This cohort study included women diagnosed with chlamydia at family planning clinics during May 2005–August 2008. Details of this study have been described previously.⁷ Baseline surveys assessed demographic measures and past chlamydia diagnoses. Approximately 4 months after baseline, participants were retested for *C trachomatis*. Participant addresses were geocoded using ArcGIS. This study was approved by the Yale University School of Medicine Human Investigation Committee.

Individuals who did not report ever being previously diagnosed with chlamydia infection and who did not test positive for chlamydia at follow-up were classified as having a single diagnosis of chlamydia (the baseline visit diagnosis). Those who reported a previous diagnosis in her lifetime and/or tested positive at follow-up were considered to have multiple diagnoses.

Covariates shown in previous research to influence sexually transmitted infection risk include the following: race (black vs non-black), age (15–18 vs 19 years), age at first intercourse (<14 vs ≥14 years), lifetime number of sex partners (<5 vs ≥5), the number of sex partners in past 3 months (0–1 vs ≥2) and condom use in the past 30 days (<50% with any partner vs ≥50% with all partners vs no recent sex partners). Individual-level SES measures included education (in school/high school graduate vs less than high school) and employment (still in school vs currently employed vs not currently employed). Neighbourhood SES was defined as per cent of people with income below the poverty line in each census tract—geographical subdivisions that represent neighbourhoods—and was obtained from the US Census Bureau. We used previously defined categories: <5% (least disadvantaged), 5–9.9%, 10–19.9% and 20% or more in poverty.⁵

Statistical analysis

χ^2 Tests and unadjusted logit models examined the association of SES measures with multiple chlamydia diagnoses. The base model included covariates that were significant at $p < 0.20$ in bivariate analyses. Three separate adjusted models examined the association of SES measures with multiple chlamydia diagnoses, while adjusting for covariates in the base model. Generalised estimating equations were used to account for variance clustering that may occur with hierarchically structured data.⁸

A pseudo- R^2 , interpreted as the portion of variance in the outcome explained by the fitted model, was determined for the base model and each adjusted model.⁹ The relative increases in the adjusted over the base model were calculated.

RESULTS

Of 323 individuals screened, 76% (n=245) were enrolled and 97% of these had geocodable addresses. The final sample included 233 individuals represented by 78 census tracts for whom the outcome measure could be determined. The mean age was 21.2 years (range 15–42, 50.2% age 18), and 57.1% were African-Americans. Ninety-four per cent were still in school or had graduated high school, and 52.8% were employed. Nearly 40% (n=93) had multiple chlamydia diagnoses.

Neighbourhood poverty was not significantly associated with individual education ($p=0.58$), whereas it was significantly associated with individual employment ($p=0.02$). In unadjusted models, lower education was associated with multiple chlamydia diagnoses (table 1) but employment was not. Those living in the highest poverty neighbourhoods were significantly more likely than those living in the lowest poverty neighbourhoods to have multiple chlamydia diagnoses (table 1).

In adjusted models, neither education nor employment was significantly associated with multiple chlamydia diagnoses (table 1). However, neighbourhood-level poverty maintained its significant association (adjusted OR 3.46, 95% CI 1.18 to 10.15). The pseudo R^2 indicated that individual-level education and employment improved fit by 7% and 1%, respectively. The neighbourhood-level poverty variable improved fit by 17% (table 1).

DISCUSSION

Individual-level measures of SES (eg, education) are difficult to validly assess in young women. For this population, neighbourhood-level SES measures are easily accessible and may be more meaningful than traditional individual-level measures.⁵ In this study, neighbourhood-level poverty was more strongly associated with, and explained more variance in, multiple chlamydia diagnoses compared with individual-level SES measures. Therefore, it may be an appropriate proxy for individual-level measures when they cannot be collected. While an absolute increase in the variability explained over the base model was small (2.4%), chlamydia impacts nearly 3 million people a year in the USA, and being able to explain this additional disease burden could have a substantial overall impact at the population level.

Previous studies comparing individual and neighbourhood SES measures have demonstrated the salience of neighbourhood SES measures as predictors of health outcomes.^{5,10,11} For example, using statewide mortality surveillance data, neighbourhood SES measures detected socioeconomic inequalities not seen for individual-level education in all-cause mortality among individuals younger than 25.¹⁰ The results of this study suggest that the neighbourhood environment may also exert an independent influence on an individual's risk of multiple chlamydia diagnoses.

This study is not without limitations. It relied on a convenience sample, and results may not be generalisable. Individual-level measures were collected via self-report and may be subject to misclassification error. Lastly, the neighbourhood-level poverty measure is based on the 2000 census data, which may not accurately represent the poverty level at the time of the study.

Results suggest that the socioeconomic position of an individual's neighbourhood is an important predictor of multiple chlamydia diagnoses and can be particularly useful when valid individual SES measures are not available. Additionally, neighbourhood SES measures may indicate better targets for interventions and can better inform service development than would individual SES measures. It may be more meaningful to target neighbourhoods for

interventions and services based on their risk profile for neighbourhood poverty, rather than target individuals with low education or low income.

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Key messages

- ▶ Young women of low socioeconomic status (SES) are disproportionately impacted by chlamydia and individual-level measures of SES are difficult to assess for young women.
- ▶ We examined whether neighbourhood SES provides a useful measure in comparison with individual-level SES with respect to the burden of multiple chlamydia diagnoses among a sample of young women.
- ▶ Neighbourhood-level poverty had more explanatory power for multiple chlamydia diagnoses than individual-level education and employment.
- ▶ Neighborhood-level poverty is accessible and may be useful when valid measures of individual-level SES are unavailable.

Table 1
Associations of multiple chlamydia diagnoses with individual and neighbourhood socioeconomic (SES) characteristics

Variable	Overall N (%)	Unadjusted models [*]		Adjusted models [†]		% Change in R ² from base model [‡]
		OR (95% CI)	OR (95% CI)	Pseudo R ²		
Individual SES characteristics						
Education					0.152	7.04
In school/high-school graduate	219 (94.0)	1.0		1.0		
Not in school and <high-school graduate	14 (6.0)	2.94 (1.11 to 7.79)		2.43 (0.68 to 8.76)		
Employment					0.144	1.41
Still in school	63 (27.0)	1.0		1.0		
Currently employed	123 (52.8)	1.62 (0.91 to 2.87)		1.18 (0.47 to 2.95)		
Not currently employed	47 (20.2)	1.50 (0.63 to 3.56)		0.89 (0.33 to 2.41)		
Neighbourhood SES characteristic						
Poverty					0.166	16.90
<5% (least disadvantaged)	23 (9.9)	1.0		1.0		
5–9.9%	41 (17.6)	2.25 (0.71 to 7.12)		3.02 (0.92 to 9.86)		
10–19.9%	66 (28.3)	2.46 (0.84 to 7.15)		2.82 (0.89 to 8.89)		
20% or greater (most disadvantaged)	103 (44.2)	3.00 (1.06 to 8.49)		3.46 (1.18 to 10.15)		

* Separate model for each SES characteristic.

[†] Separate models for each SES characteristic, adjusting for race, age and sexual history characteristics (those that were significant at p<0.20 in bivariate analysis).

[‡] Base model includes race, age and sexual history characteristics (those that were significant at p<0.20 in bivariate analysis) (pseudo R²=0.142).