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Laboratory-Diagnosed Sexually Transmitted Infections in Former Foster Youth Compared With Peers

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Abstract

OBJECTIVES—The objective of this study was to evaluate the association between having resided in foster care and risk for sexually transmitted infection (STI) during young adulthood.

METHODS—Multiple regression analyses were performed by using Waves I to III of the National Longitudinal Study of Adolescent Health (1994–2002) to evaluate the association between foster care status and STI biomarkers and risk behaviors. Female ($N = 7563$) and male participants ($N = 6759$) were evaluated separately. Covariates in all models included baseline age, race, ethnicity, parental education level, parental income level, and average neighborhood household income level.

RESULTS—Female participants who had been in foster care were more likely to have *Trichomonas* (odds ratio [OR]: 3.23 [95% confidence interval (CI): 1.45–7.23]) but not gonorrhea or chlamydia and reported increased sexual risk behaviors compared with nonfostered peers. Male participants who had been in foster care were more likely to have both gonorrhea (OR: 14.28 [95% CI: 2.07–98.28]) and chlamydia (OR: 3.07 [95% CI: 1.36–6.96]) but not *Trichomonas* and did not report a higher risk for most sexual risk behaviors than nonfostered peers.

CONCLUSIONS—Results suggest that individuals who have been in foster care are at increased risk for STIs during young adulthood. The pattern of exposure may differ between male and female individuals. If findings are confirmed, they suggest that health care providers who work with these youth should adjust their STI screening practices. Child welfare agencies should also consider targeted interventions to reduce STI risk in this population.

Keywords

foster care; sexually transmitted infection; adolescent sexual behaviors; sexual and reproductive health; sexual activity

Sexually transmitted infections (STIs) are a preventable cause of morbidity and mortality, and incidence rates of these infections have been demonstrated to be of epidemic proportion

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among certain adolescent and young adult subgroups.¹ Half of the 510 000 youth in foster care in the United States are adolescents.² These youth have high rates of several factors linked with STI risk,^{3,4} including exposure to physical and sexual abuse, neglect, parental substance abuse, poverty, and violence early in life,^{5–8} and high rates of mental health problems, substance abuse disorders, and juvenile or criminal justice system involvement later in life.^{6,9–11} They also report in some studies having vaginal intercourse at an earlier age^{12–14} and a higher number of partners¹² compared with their general population peers.

Despite the seeming vulnerability of this population, to the author's knowledge only 2 studies have specifically evaluated the risk for STIs for youth who have been in foster care relative to other adolescent subgroups. In the first study, foster care exposure was evaluated retrospectively as a risk factor for laboratory-diagnosed chlamydia infection in a sample of homeless youth in Canada. An association was found for young women but not men.¹⁵ In the second study, self-report of STI risk was evaluated as part of a larger prospective, longitudinal study comparing the outcomes of youth who were emancipating from the foster system with those of general population youth. In that study, young adults who had been in foster care were more likely to report having been tested or treated for an STI⁶ or having had sex with an infected partner in the previous year^{16,17} compared with the control group. They were also more likely to report having engaged in sex for money¹⁶ (a known risk factor for STIs¹⁸). Interestingly, however, in contrast to the other studies described in the previous paragraph, there were no differences in the self-reported age at first intercourse, number of lifetime sexual partners, number of partners in the previous year, or frequency of intercourse or condom use in the previous year of former foster youth compared with peers.^{16,17} Thus, studies that have evaluated STI risk among youth who were exposed to foster care have been very limited, with only 1 (retrospective) study using an objective laboratory-based assessment of STIs¹⁵ and results of studies including behavioral risk factors for STIs indicating mixed results.^{12–14,16,17} The objective of the present study was to address this gap in the literature by comparing the risk for laboratory-diagnosed STI as well as several behavioral risk factors among male and female youth who were exposed to foster care and their general population peers by using a large nationally representative sample.

METHODS

Sample

Data were drawn from a large, longitudinal data set (the National Longitudinal Study of Adolescent Health; "Add Health").¹⁹ Wave I, stage 1 consisted of a questionnaire administered in schools when youth were in grades 7 to 12 ($N = 90\,118$). In Wave I, stage 2, computer-assisted interviews with a trained interviewer were conducted with a subset of youth in the home environment ~1 year after the initial interview ($N = 20\,745$); parent interviews were also conducted when possible during this stage. Wave II and Wave III interviews were conducted with the youth only ~2 and 6 years from Wave I, stage 1 by using the in-home procedure described ($N = 14\,738$ and $15\,197$, respectively). Laboratory data were collected in Wave III. We used data from Wave I, stage 2 (hereafter abbreviated as Wave I), Wave II, and Wave III. Per recommendations from Add Health authors, participants were excluded when they did not have a valid Wave III survey weight to allow for design corrections to ensure generalizability of the sample. For example, youth who were recruited solely as part of a secondary study to evaluate genetic markers in sibling pairs did not have a survey weight.^{20,21} A total of 7563 female and 6759 male participants who were interviewed at Wave III met these criteria and were included in this study (875 did not).

Measures

Foster Care Status—Participants were considered as having been in foster care if they reported living with a foster mother or father at Wave I or II or if they retrospectively indicated that they had ever lived in a foster home at Wave III.

Biomarker Outcomes—At Wave III, urine specimens were collected and tested for gonorrhea and chlamydia by using Ligase Chain Reaction amplification technology in the Abbott LCx Probe System and for *Trichomonas* by using an in-house polymerase chain reaction enzyme-linked immunosorbent assay that detects *Trichomonas vaginalis* DNA. Participation in the biospecimen collection was optional; participants were given an additional \$10 incentive for participation. Results were made available confidentially to participants via a toll-free telephone line.¹⁹

Sexual Risk Behavior Outcomes—Sex with a casual partner was defined as “yes” to the question, “Not counting the people you may have described as romantic relationships, since January 1, 1994, have you had a sexual relationship with anyone?” This outcome was measured at Wave I only. Having sex for money was defined by answering “yes” to a question regarding ever having had sex “for drugs or money” at Wave I or “for money” at Wave III (the 2 questions differed slightly; neither specified vaginal intercourse). Participants were considered as having had vaginal intercourse when they responded “yes” to the question, “Have you ever had sexual intercourse? When we say sexual intercourse, we mean when a male inserts his penis into a female’s vagina.” This outcome was measured at Waves I and III. The following additional self-reported outcomes were examined at Wave III among participants who indicated that they had engaged in vaginal intercourse:

- condom use at most recent vaginal intercourse;
- age at first vaginal intercourse;
- number of partners in the previous year (question did not specify vaginal intercourse);
- number of times had vaginal intercourse in the previous year;
- frequency of condom use during vaginal intercourse in the previous year;
- history of having vaginal intercourse with a partner with an STI;
- history of having sex with a partner who “takes or shoots street drugs using a needle” (question did not specify vaginal intercourse).

Analysis

Results were analyzed by using Stata SE 10 (Stata Corp, College Station, TX). Procedures that were developed by Add Health investigators were used to correct for design effects, unequal selection probability, and bias as a result of nonresponse for Wave III to ensure unbiased results.^{20,21} The ICE multiple-imputation program²² with predictive matching was used to impute 15 data sets with complete data for most covariates. The foster care questions, outcome variables, and race and ethnicity variables were excluded from imputation. Before imputation, item-level missingness for imputed variables ranged from <1% for gender and age to 24% for parental income level. Item-level missingness for our nonimputed variables was <4% for most variables but was higher for the biomarker, number of times had sex in the previous year, and frequency of condom use outcomes (10%–18%).

After the imputation procedure, descriptive statistics were computed by comparing youth who were exposed to foster care with general population youth. Estimates of raw point

prevalence of the biomarker outcomes for male and female youth in the entire sample were calculated by using survey design corrections without adjustment for covariates. Multiple regression analyses were then performed to evaluate the relationship between foster care status and each of the behavioral and biomarker outcomes. Logistic, linear, and ordinal regressions were performed for binary, continuous, and ordered categorical outcomes, respectively. We included age, race, ethnicity, parental education level, parental income level, and average neighborhood household income level from Wave I as covariates for all multiple regression analyses. Analyses were stratified by gender because of known differences in STI prevalence rates and risk behaviors among males and females.⁴ We also performed exploratory multiple regression analyses stratifying by 2 racial subgroups—white and black—within each gender because of differences in STI prevalence which have been previously reported.¹²

RESULTS

Youth who were exposed to foster care represented 2.5% of the female and 1.8% of the male participants in the sample. Only a small percentage of participants who had ever been in foster care were in care at Wave I or II (8% for female and 11% for male participants). Descriptive statistics indicated that female participants who had been in foster care had a significantly lower parental income compared with female individuals in the general population (Table 1). Male participants who had been in foster care had a significantly lower parental and neighborhood household income and were less likely to be white and more likely to be Native American compared with general population peers.

Point prevalence of the biomarkers for the entire sample were as follows: gonorrhea, 0.4% for female and 0.5% for male participants; chlamydia, 4.7% for female and 3.7% for male participants; and *Trichomonas*, 2.8% for female and 1.7% for male participants.

Multiple regression analyses indicated that female participants who were exposed to foster care were significantly more likely to be positive for *Trichomonas* but not gonorrhea or chlamydia compared with general population youth (Table 2). Male participants who were exposed to foster care were significantly more likely to be positive for both gonorrhea and chlamydia but not *Trichomonas* compared with peers.

For the behavioral outcomes, multiple regression analyses indicated that female participants who had been in foster care were significantly more likely to report having had sex with a casual partner at Wave I, ever having sex for money at Wave I, and having vaginal intercourse at Waves I and III compared with their general population peers (Table 3). When analyses were restricted to participants who reported a history of vaginal intercourse, female participants who had been in foster care were also significantly more likely to report a younger age at first sexual intercourse and a higher number of lifetime partners compared with female individuals in the general population at Wave III. All other outcomes except the number of partners in the previous year trended in the direction of increased risk for female participants from the foster care sample as well. For male participants, the only significant behavioral outcome was an increased odds of reporting ever having vaginal intercourse at Wave III when they had been in foster care, and trends were not in a consistent direction. Exploratory analyses that stratified by both gender and race revealed results that were consistent with our main analyses. For white women, odds ratios, coefficients, and significance levels all were similar to non-race-stratified analyses with the exception that the variable number of partners ever became nonsignificant. For analyses that compared black young women who were in and out of foster care, odds ratios and coefficients were consistently smaller and less likely to be significant but were similar in directionality. Once

again, there were no differences in the behavioral outcomes comparing male participants who were and were not exposed to foster care in either black- or white-only samples.

DISCUSSION

This is the first study to our knowledge that has used a prospective cohort design to compare the odds of STI biomarkers of youth who have been in foster care with those of general population youth. Our results confirm and extend previous work suggesting that foster care status is a marker for higher risk for biologically diagnosed STIs. We found this to be true for both female (for *Trichomonas*) and male individuals (for gonorrhea and chlamydia), whereas the 1 previous study that evaluated biomarker data found this association for female participants only.¹⁵

The odds ratios for our significant biological outcomes were sizeable for both female and male participants. It is interesting, therefore, that for participants of both genders, the trends for the nonsignificant biological outcomes were in the direction of decreased rather than increased risk. Given the high odds ratios and the degree of statistical significance for all 3 significant outcomes, it is unlikely that these results were spurious. The reasons behind these discrepancies most likely lie elsewhere and are different for female and male individuals. In 1 previous study, young women in foster care were more likely to report being tested or treated for an STI and to receive family planning services compared with general population peers.⁶ *Trichomonas* is frequently asymptomatic and is more difficult to diagnose than the other 2 diseases, especially when the most common method of diagnosis for this infection (wet mount) is used.²³ It may be that some female participants received a diagnosis and were treated for gonorrhea and chlamydia but not *Trichomonas* during adolescence. For male participants, the discrepancy in the direction of the 2 significant outcomes (gonorrhea and chlamydia) and the nonsignificant outcome (*Trichomonas*) may be because *Trichomonas* colonization is harder to diagnose in male individuals with a single urine specimen,²⁴ making these data less accurate for male individuals. Although it was beyond the scope of this study to evaluate these explanations, they should be explored in future studies by obtaining biomarker data at multiple time points beginning earlier in adolescence among youth of both genders.

Our results also contribute to previous work that evaluated behavioral correlates of STI risk.^{6,12–14,16,17} For female participants, we found a consistent picture of increased risk behaviors to explain the biomarker results. Previous studies that evaluated STI risk behaviors suggested a more mixed picture^{16,17} or evaluated only a limited number of behaviors.^{12–14} We did not find a consistent pattern of increased STI risk behaviors in male participants, suggesting that the increased STI risk of male youth in foster care is partly mediated by 1 variable that was not evaluated (eg, factors related to partner choice, characteristics of their abuse history) or for which we were underpowered to detect in this study. Alternately, male participants who had been in foster care may have answered the sexual behavior questions inaccurately or on the basis of different perceived norms than did general population youth.

It is important to note that it is unlikely that the increased risk for STIs that we found in this study is attributable exclusively to exposure to the foster care system itself. In 1 previous study of youth who were involved in the child welfare system, young women in out-of-home placements were less likely ever to have had sex voluntarily compared with system-involved youth who were living with their families.¹⁴ This suggests at least preliminarily that this population's increased STI risk and associated behaviors may be attributable to preexisting factors such as high rates of early adverse exposures^{5–8}; the mental health, substance abuse, behavioral and relational problems that these exposures can produce^{6,9–11,4,6,12–14,16,17,25–29}

rather than to the foster care system itself. Indeed, on the basis of the findings of the aforementioned study, it is possible that being placed in foster care may be protective of future STI risk for female adolescents.¹⁴ Future research should investigate the specific behavioral correlates of STI risk for male individuals in the foster care system and should investigate the causes of these behaviors for youth of both genders in foster care.

Finally, in our exploratory analyses, there did not seem to be a significant influence of race on the direction of odds ratios when former foster care youth were compared with their peers. There was, however, a trend toward smaller odds ratios for black female participants when compared with white female participants. The issue of race as a potential effect modifier of the relationship between foster care status and STI risk should be explored further in future research, particularly because we were underpowered to address this question definitively in this study.

This study has several limitations. First, our foster care variable primarily reflects participants' retrospective report of having ever been in care. This definition may therefore be subject to recall bias, and results may not accurately reflect STI risk for young people who lived in foster care during adolescence when efforts to prevent STI risk would be well targeted. Also, we were unable to measure the dose effect of time in this system on STI risk, because this variable was not assessed in the Add Health study. Second, our foster care sample was fairly small. This limits our ability to make firm conclusions with these data, especially with regard to the null behavioral outcomes for male participants, for which sample sizes of exposed youth were particularly small. It also limits our ability to determine accurately the magnitude of associations between foster care exposure and our rarer outcomes, as indicated by the large confidence intervals for gonorrhea in male participants and having sex for money in female participants. Third, it is possible that the item-level missingness for some of the outcomes with higher degrees of missingness (eg, biomarkers, number of times had sex in the previous year, frequency of condom use outcomes) produced biased results; however, except for chlamydia incidence in male participants, which was higher than expected, overall incidence rates for all 3 STI biomarkers for both genders were consistent with national statistics,¹ which provides some evidence regarding the validity of these data. Fourth, the behavioral outcomes were limited in that they primarily assessed heterosexual vaginal sexual activity rather than covering a broader spectrum of sexual risk behaviors, and they did not distinguish between voluntary and involuntary acts. Finally, our STI biomarkers were collected at 1 time point in young adulthood rather than during adolescence, the time of highest risk.¹

CONCLUSIONS

Results suggest that exposure to foster care is associated with increased odds of having 1 laboratory-confirmed STI for both male and female youth. Among female participants, a clear pattern of heterosexual sexual risk behaviors emerged in our data; this was not the case for male participants. Future studies should evaluate both biomarkers and behavioral correlates of STI risk beginning in early adolescence and should use a sample of youth currently in foster care rather than those with retrospective reports of foster care involvement. Behavioral variables should distinguish between voluntary and involuntary as well as heterosexual and non-heterosexual activity. Additional work should also be done to evaluate the factors that are associated with being in foster care and may be at the root of this increased STI risk and to evaluate race as a potential effect modifier. If our findings are confirmed, then health care providers for current and former foster youth should consider modifying their screening practices to reflect the increased STI risk of these youth. Policymakers for the child welfare system should also consider incorporating programming to reduce STI risk into existing services for adolescents who are in foster care.

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ABBREVIATIONS

STI	sexually transmitted infection
Add Health	National Longitudinal Study of Adolescent Health

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WHAT'S KNOWN ON THIS SUBJECT

Adolescents who have been in foster care have many risk factors for STIs; however, very few studies have evaluated the risk for STIs in this population in comparison with their general population peers.

WHAT THIS STUDY ADDS

This is the first prospective, longitudinal study to evaluate the risk for laboratory-diagnosed STIs and 1 of the first to evaluate STI risk behaviors among youth who have been in foster care compared with general population youth.

TABLE 1

Descriptive Statistics Comparing Youth Who Have Been in Foster Care With General Population Youth

Parameter	Female Participants		Male Participants	
	Foster Youth (N = 191) ^a	General Population Youth (N = 7372) ^a	Foster Youth (N = 125) ^a	General Population Youth (N = 6634) ^a
Age, mean (SE)	15.9 (0.3)	15.9 (0.1)	16.2 (0.2)	16.0 (0.1)
Race, % ^b				
White	69.1	72.6	58.5	71.7 ^c
Black	21.2	16.4	25.4	15.8
Native American	2.1	1.3	8.5	1.3 ^d
Asian	4.3	3.6	3.4	4.2
Other	3.4	6.2	4.2	7.0
Hispanic ethnicity, % ^e	12.3	11.5	8.3	12.3
Parental income, mean (SE), \$1000s	29 (3)	46 (2) ^d	23 (3)	45 (2) ^d
Parental education, % complete				
Did not complete high school	25.3	17.0 ^c	24.7	16.4
High school diploma or GED	37.4	32.5	32.2	31.1
Some college	24.9	28.2	25.7	29.7
College degree	12.4	22.4 ^f	17.4	22.7
Neighborhood household income, mean (SE), \$1000s ^b	27 (2)	31 (1)	23 (2)	31 (1) ^d

^aNs vary slightly between imputed data sets because the foster care question was imputed, and Ns presented reflect the average of all data sets.

^bN = 7357 for female general population participants 6626 for male general population participants and 124 for male foster care participants due to exclusion from imputation.

^cP < .10.

^dP < .001.

^eN = 7346 for female general population participants and 6620 for male general population participants due to exclusion from imputation.

^fP < .05.

TABLE 2

Association Between Ever Having Been in Foster Care and STI Biomarkers

Characteristic	<u>Female Participants Only</u>		<u>Male Participants Only</u>	
	<i>N</i> ^a	OR (95% CI)	<i>N</i> ^a	OR (95% CI)
Gonorrhea	5651	0.18 (0.02–1.68)	4485	14.28 (2.07–98.28) ^b
Chlamydia	6565	0.80 (0.22–3.00)	5922	3.07 (1.36–6.96) ^b
<i>Trichomonas</i>	6503	3.23 (1.45–7.23) ^b	5797	0.54 (0.15–1.94)

OR indicates odds ratio.

^a*N* = total number included in analysis.^b*P* < .01.

TABLE 3

Association Between Ever Having Been in Foster Care and Sexual Risk Behaviors

Characteristic	Female Participants			Male Participants		
	<i>N</i> ^a	OR (95% CI) or Coefficient (SE)	<i>P</i>	<i>N</i> ^a	OR (95% CI) or Coefficient (SE)	<i>P</i>
All youth						
Any sexual activity with casual partner ^b	7447	2.96 (1.85–4.74)	<.001	6655	0.97 (0.50–1.88)	.920
Ever had sex for money						
Wave I	7346	11.74 (4.51–30.57)	<.001	6564	^c	
Wave III	7480	1.48 (0.65–3.33)	.340	6699	1.55 (0.41–5.84)	.520
Ever had vaginal intercourse						
Wave I	7449	3.01 (1.82–4.99)	<.001	6667	0.86 (0.43–1.72)	.660
Wave III	7442	2.97 (1.20–7.34)	.020	6664	5.12 (1.13–2.22)	.040 ^c
Youth who reported a history of vaginal intercourse only ^d						
Condom use at most recent intercourse						
Wave I	2767	0.60 (0.33–1.11)	.110	2640	1.87 (0.85–4.09)	.120
Wave III	5950	0.68 (0.43–1.09)	.110	5106	0.85 (0.50–1.44)	.540
Age at first sexual activity ^e	6528	–1.48 (0.22)	<.001	5680	0.01 (0.39)	.990
No. of partners, vaginal sex ever ^e	6465	2.22 (0.79)	.006	5620	1.35 (1.64)	.410
No. of partners, vaginal sex in previous year ^e	6498	–0.08 (0.09)	.390	5642	–0.16 (0.33)	.640
No. of times had vaginal sex in previous year ^e	5159	29.80 (16.35)	.070	4683	–7.66 (16.59)	.650
Frequency of condom use in previous year ^e	5945	0.87 (0.54–1.39)	.560	5099	0.62 (0.34–1.13)	.120
Sex with partner with STI in previous year ^e	6319	1.20 (0.55–2.61)	.640	5501	1.13 (0.32–4.06)	.850
Sex with intravenous drug user in previous year ^e	6587	2.31 (0.81–6.55)	.120	5734	0.38 (0.06–2.39)	.300

OR indicates odds ratio.

^a*N* = total number included in analysis (ie, with complete data) for this outcome.^bAnalysis conducted at Wave II.^cNo participants who reported a history of sex for money at this wave were in the foster care group.^dAnalyses were restricted to participants who reported a history of ever having vaginal sex in the wave of data being evaluated for outcomes in this section.^eAnalyses conducted at Wave III.