

STD and Abortion Prevalence in Adolescent Mothers With Histories of Childhood Protection Involvement

CONTEXT: Early sexual debut and unprotected sexual activity place adolescents at risk of adverse sexual health outcomes. Adolescents involved with child protective services (CPS) may be a particularly vulnerable population.

METHODS: California birth records for 86,946 adolescents who became first-time mothers in 2008–2010 were probabilistically linked to statewide CPS records from 1998 and later. The prevalence of STDs at birth and of abortion history were explored by preconception CPS involvement. Generalized linear models, adjusted for health, socioeconomic and demographic characteristics, were used to assess correlates of current STDs and history of abortion.

RESULTS: At the time they gave birth, 1% of adolescents had a documented STD, and 5% reported a previous abortion. After adjustment for other characteristics, CPS involvement was associated with a significantly elevated prevalence both of STDs (relative risk, 1.2) and of previous abortion (1.4). Other characteristics also were associated with both outcomes, but not always in the same direction. For example, delaying prenatal care until after the first trimester or getting none at all was associated with an increased prevalence of STDs (1.3), but a reduced prevalence of abortion (0.8–0.9); having public insurance coverage for the birth was associated with a reduced STD prevalence (0.9) and an elevated abortion history prevalence (1.2).

CONCLUSIONS: To assess whether adolescents with a history of CPS involvement need targeted sexual health interventions, further research is needed on the mechanisms that underlie associations between CPS involvement and adverse sexual health outcomes.

Perspectives on Sexual and Reproductive Health, 2015, 47(4):187–193, doi: 10.1363/47e4215

By Julie A. Cederbaum, Emily Putnam-Hornstein, Kathrine Sullivan, Hailey Winetrobe and Melissa Bird

Julie A. Cederbaum and Emily Putnam-Hornstein are assistant professors, Kathrine Sullivan and Melissa Bird are doctoral students, and Hailey Winetrobe is project specialist, all at the University of Southern California School of Social Work, Los Angeles.

Sexual activity among adolescents is a normative experience; in 2013, some 46% of adolescent women attending high school reported having ever had sexual intercourse.¹ Early sexual debut, multiple partners and unprotected sexual activity place adolescents at risk of adverse outcomes, including heightened rates of pregnancy and increased rates of STDs.² Although the birthrate among adolescents in the United States is at an all-time low (a finding observed across age and racial and ethnic groups),³ adolescent pregnancy continues to be a significant public health concern because of its association with poor outcomes for both mothers and children.^{4–7}

One group who may be particularly vulnerable to the risk of pregnancy and STDs is adolescents who have a history of involvement with child protective services (CPS) for alleged or substantiated maltreatment. Although almost half of all adolescents attending high school report engagement in sexual activity,¹ rates of involvement in risky sexual behaviors are higher for youth with a history of maltreatment allegations.⁸ Furthermore, research documents that any history of CPS involvement is associated with a heightened risk of poor outcomes—including teenage pregnancy⁹ and mental health and substance abuse disorders^{10,11}—regardless of whether the allegations are ever substantiated.¹² The present analyses explored whether previous involvement with the CPS system was independently associated with

STDs and abortion history in a population-based cohort of first-time adolescent mothers.

BACKGROUND STDs and Births Among Adolescents

In the general population of women aged 14–19, the STD prevalence rate is approximately 24% overall; the rate is 4% for chlamydia, 2% for herpes simplex virus and 1% for gonorrhea.¹³ In 2011, women aged 15–24 in California had a chlamydia rate of 19 per 1,000, a gonorrhea rate of two per 1,000 and a syphilis rate of less than one per 1,000.¹⁴ Black adolescents are more likely than their white counterparts to test positive for an STD, and older adolescents are more likely than younger ones to have a clinically documented STD.¹⁵

Children born to adolescents account for almost 7% of annual births in the United States.¹⁵ There were 26.5 births for every 1,000 adolescents aged 15–19 in 2013; nearly three-quarters of adolescent births were to 18- and 19-year-olds.¹⁶ Hispanic adolescents have the highest birthrate among racial and ethnic groups (41.7 per 1,000), followed by black adolescents (39.0 per 1,000) and whites (18.6 per 1,000). Birthrates among California adolescents are similar to those among U.S. teenagers overall, and the highest rate is among Hispanic adolescents.^{9,17} Differences by race and ethnicity may be attributed to cultural or

religious differences in attitudes toward sexual activity, the value placed on the maternal role, and the support for adolescent pregnancies among extended families and communities.^{18,19}

CPS Involvement

In 2013, CPS agencies nationwide received 3.5 million reports of child maltreatment (defined as allegations of physical abuse, sexual abuse, neglect or emotional maltreatment) involving approximately six million children and adolescents up to 18 years of age.²⁰ The majority of reports (61%) met legal definitions justifying an investigation of maltreatment.²⁰ Maltreatment was substantiated in only 18% of CPS investigations.²⁰ A growing body of research, however, indicates the fallibility of substantiation decisions and points to heightened rates of various adversities in the broader population of children reported to CPS.^{12,21,22}

Children and adolescents with a history of reported maltreatment are overwhelmingly from families with very low incomes and are disproportionately from racial and ethnic minority backgrounds, characteristics that are associated with heightened health risks.²³ Beyond the health risks associated with poverty and minority group status, there are documented links between maltreatment and elevated rates of risky sexual behavior, pregnancy and STDs.^{24,25} James et al.²⁶ found that half of female adolescents involved with the CPS system report sexual debut by age 15, and 40% report debut before age 13. In California, 45% of teenage mothers have a documented report of alleged maltreatment after age 10 and prior to conception.⁹

Although rates of contraceptive use have been increasing among teenagers, many unwanted pregnancies still occur in this population. This is reflected in the fact that close to 50% of teenage pregnancies end in abortion.²⁷ Moreover, research on risky sexual behavior among adolescents with a history of reported maltreatment suggests that these young people may also have above-average rates of pregnancy termination.²⁸

PRESENT STUDY

Using population-based birth record data linked to CPS records, the present study builds on existing knowledge about the risks of STDs and abortions among adolescents. Access to administrative records of officially documented histories of alleged maltreatment provided an opportunity to further work done with smaller samples relying on self-reported data. Using a cohort of primiparous adolescents who gave birth in California between 2008 and 2010, we sought to understand the prevalence of STDs at birth, explore the prevalence of prior abortion and investigate whether these two outcomes varied by CPS history. On the basis of prior literature highlighting the vulnerability of CPS-involved youth, we hypothesized that adolescent mothers with CPS involvement would be more likely than others to have a clinically documented STD at the time of birth and to report a previous abortion.

METHODS

Data

Our study was based on a data set constructed by linking vital birth and CPS records for the state of California. CPS records were available through a collaboration between the University of California at Berkeley, the University of Southern California and the California Department of Social Services; vital birth records were obtained from the California Department of Public Health. Personally identified data were extracted from birth records for all 12–19-year-olds who gave birth for the first time in 2008, 2009 or 2010. Birth records were then probabilistically linked to statewide CPS records to identify all adolescents who gave birth and had previous involvement with the CPS system as alleged victims of maltreatment.

Available CPS records dated back to 1998, when the current child protection case management system was established. Allegations of adolescent maltreatment received after the estimated date of conception (calculated on the basis of the average gestational age of newborns in this population) were excluded because this analysis was focused on associations with reported maltreatment prior to conception. If an adolescent was first reported to CPS as an alleged victim of maltreatment after becoming pregnant, she was coded as having no CPS history. Some 31,964 adolescent mothers were born outside of California; these women were excluded from the analysis because of uncertainty regarding when they moved to the state and, therefore, their exposure to maltreatment reporting. We assumed that adolescents who both were born in California and gave birth in California had spent a majority of the period after 1998 in the state and therefore would have had a roughly constant window of potential exposure to CPS involvement prior to conception.

Following variable inspection, cleaning and standardization across the two files, potential birth and CPS record pairs were generated using LinkPlus, a probabilistic matching software developed by the Centers for Disease Control and Prevention (CDC) for linking administrative records. Probabilistic record linkage differs from deterministic linkage in that it does not require perfect agreement between matching variables to establish a link between a record pair.^{29,30} Rather, it relies on a formal statistical model to compute a numerical weight that captures the similarity of two records on the basis of the probabilities of agreement and disagreement for the specified match variables. Record pairs are deemed matches if the ratio of the probability of agreement to the probability of disagreement—or the degree of difference between files—suggests that it is “highly likely” that the two records capture information for the same individual.

Variables used in the linkage were nonunique personal identifiers common to both files (e.g., first name, last name, date of birth). Each record pair was assigned a weight on the basis of the similarity and dissimilarity of information contributing to the match. A random 10% sample of matched-record pairs in each score decile were then

extracted and subjected to clerical review. This review was used to determine an upper-bound score, above which matches were deemed true matches, and a lower-bound score, below which matches were designated false matches. All matches falling between the lower and upper bounds were subjected to further clerical review to assign match status. Following the linkage of records, all identifying information was stripped, and a de-identified analytic file was created.

Use of probabilistic algorithms with a clerical review has been documented to be the most rigorous approach to linking administrative records that do not contain a validated, unique identifier common across records.³¹ The linkage of records for this project was approved by committees for the protection of human subjects overseeing research at both California's Health and Human Services Agency and the University of Southern California; the project was also reviewed by California's Vital Statistics Advisory Committee.

Measures

•Characteristics at birth. The CPS history variable captured whether any reports of alleged maltreatment had been made for an adolescent mother after 1998 and prior to conception. Given the fallibility and variability of substantiation decisions,^{32,33} all reports of maltreatment were included, regardless of substantiation. Adolescent mothers were categorized into three groups on the basis of their age at the time of birth: 12–15, 16–17 and 18–19 years. Age groupings were chosen to be consistent with those used in national and other reports of adolescent births.¹⁵ To understand differences in the prevalence of STD and abortion by race and ethnicity, we categorized adolescents into one of five mutually exclusive groups: white, black, Hispanic, Asian or Pacific Islander, or Native American. No “other” category appears here because California data collection requires that the mother report a primary race or ethnicity (and provides an option for a second); for women who reported two racial or ethnic identities, primary identification was used. Insurance type (or birth payment method) was used as a proxy for socioeconomic status and coded as private or public. In California, mothers who do not have insurance coverage at the time of birth are retroactively enrolled in the state's public health insurance program. Timing of prenatal care was categorized as first trimester, second trimester, or third trimester or no recorded prenatal care. Last, we included a measure of whether paternity was established (i.e., a father was named in the birth record). The establishment of paternity reflects that the father was present to sign the birth certificate and legally acknowledged his status (which would allow for the later collection of child support). As such, paternity establishment was included as a proxy for maternal social and financial support leading up to the birth.

•Outcomes. Medically documented STDs were recorded by the attending provider. Although data were reported by STD type, we created a dichotomous variable to denote

TABLE 1. Percentage distribution of adolescents having a first birth, by selected characteristics, California, 2008–2010

Characteristic	% (N=86,946)
CPS history	
No	57.8
Yes	42.2
Age	
12–15	6.3
16–17	31.1
18–19	62.6
Race/ethnicity†	
White	16.6
Black	11.2
Hispanic	69.2
Asian/Pacific Islander	2.3
Native American	0.7
Insurance type	
Private	22.5
Public	77.5
Timing of prenatal care	
First trimester	68.2
Second trimester	12.1
Third trimester/none	19.7
Paternity established	
Yes	76.3
No	23.7
STD at birth	
No	98.8
Yes	1.2
Prior abortion	
No	95.5
Yes	4.5
Total	100.0

†California requires individuals to select a primary racial or ethnic affiliation and offers an option to provide a secondary affiliation. For these analyses, the primary affiliation was used; therefore, no “other” category is presented. Notes: CPS=child protective services. Data include only adolescents who were born in California. Race and ethnicity was missing for 1.7% of adolescents, and insurance type was missing for 1.2%.

whether any of the following were present: chlamydia, gonorrhea, syphilis and herpes simplex virus.* A history of pregnancy termination was reported by the adolescent mother. This variable excluded miscarriages and stillbirths.

Analysis

We generated descriptive statistics for the full population of adolescents who had a first birth in 2008–2010. We then used generalized linear models to calculate the adjusted relative risk and accompanying 95% confidence intervals indicating associations between adolescents' characteristics and their likelihood of having a medically documented STD at the time of birth and a history of one

*Although California birth records also contain other STDs, these are the most common ones found among adolescents nationally and in California. Including others would not provide more meaningful outcomes, given how rarely they occur. HIV was excluded because California does not release this information in STD data reported in birth records.

or more abortions.³⁴ Because our models had (not uncommon) convergence problems when run on the basis of a log-binomial distribution, we used the modified Poisson regression technique proposed as an alternative method for cohort studies in which the outcome of interest is binary.³⁵ We specified a Poisson distribution and log link, using a robust standard error adjustment (sandwich estimator) to correct for estimated confidence intervals that would otherwise be too wide. All statistical analyses were conducted using StataSE version 13.

RESULTS

Of the 86,946 California adolescents who gave birth for the first time in 2008–2010, some 42% had been reported as victims of abuse or neglect (Table 1). A majority were 18–19 years of age (63%) and Hispanic (69%). More than three-quarters had their births paid for through public insurance (78%). Notably, prenatal care commenced only during the third trimester or not at all for 20% of adolescents, and paternity was not established for 24%. The prevalence of medically documented STDs was slightly more than 1% at the time of delivery; prior pregnancy terminations were reported by approximately 5% of adolescent mothers. Among adolescent mothers with an STD, 73% had chlamydia, 23% had herpes simplex virus, 3% had gonorrhea and 1% had syphilis; five had more than one STD (not shown).

Several variables were associated with the presence of an STD at the time of birth (Table 2). After other variables were controlled for, adolescents with a history of reported maltreatment had a prevalence of medically documented STDs that was 1.2 times that of adolescents without an identified CPS history. STDs were documented for black adolescents at 1.5 times the rate at which they were detected in white adolescents; in contrast, Hispanic adolescents were significantly less likely than white adolescents to have a clinically documented STD (risk ratio, 0.6). Adolescents who delayed prenatal care beyond the first trimester or received none at all were more likely than those who began prenatal care early to have an STD (1.3). Finally, adolescents without established paternity at the time of birth had a prevalence of STDs that was 1.5 times the prevalence among those with established paternity.

Many of the variables associated with STDs were also associated with a history of abortion, although not always in the same direction. Adolescents with a history of alleged maltreatment reported having had an earlier abortion at 1.4 times the rate of those without any maltreatment history. Adolescent age at the time of birth was also significantly correlated with previous abortions: Compared with 12–15-year-olds, both mothers aged 16–17 and those aged 18–19 were more likely to have had an abortion (risk ratios, 2.1 and 3.9, respectively). Black and Hispanic mothers were significantly less likely than whites to report a prior abortion (0.8 for each), and adolescents with public health insurance reported prior abortions at 1.2 times the rate of those with private insurance. Contrary to the findings with regard to STD risk, history of abortion was negatively associated with delayed or no receipt of prenatal care (0.8–0.9) and with missing paternity (0.9).

DISCUSSION

While unintended consequences of risky sexual behavior among adolescents are well documented,^{8,24,25} to our knowledge, this analysis was the first to use population-based administrative data to compare the prevalence of STDs and previous abortion among adolescent mothers with and those without a history of alleged maltreatment. Our results suggest that the sexual health of first-time adolescent mothers, as defined by these outcomes, varies by preconception CPS involvement. Self-reported history of childhood abuse or neglect is an established correlate of increased rates of early sexual behavior² and prior abortions.²⁸ Our analysis extends these findings by using population-based administrative data to document that adolescents who had a history of CPS involvement were significantly more likely than others to have a medically documented STD at the time of delivery and to report prior abortion. Several dynamics may explain these findings.

First, previous research has shown that positive parent-child relationships are associated with delayed sexual initiation and increased use of contraceptives.^{36–38} However, adolescents with a history of CPS involvement are likely to have less supportive and sustained relationships with

TABLE 2. Rates of STDs and of reports of prior abortion at time of delivery per 1,000 adolescents having a first birth, by selected characteristics; and adjusted risk ratios (and 95% confidence intervals) from generalized linear regression analyses assessing associations between those characteristics and outcomes

Characteristic	STD		Prior abortion	
	Rate	Risk ratio	Rate	Risk ratio
CPS history				
No (ref)	10.5	1.00	38.6	1.00
Yes	14.5	1.19 (1.05–1.34)*	53.8	1.42 (1.33–1.51)**
Age				
12–15 (ref)	11.4	1.00	13.6	1.00
16–17	11.1	1.01 (0.77–1.34)	28.8	2.08 (1.63–2.65)**
18–19	12.9	1.15 (0.88–1.50)	56.2	3.92 (3.09–4.96)**
Race/ethnicity				
White (ref)	16.4	1.00	48.4	1.00
Black	25.8	1.46 (1.22–1.76)**	60.6	0.84 (0.75–0.94)*
Hispanic	9.1	0.57 (0.49–0.67)**	40.4	0.75 (0.69–0.81)**
Asian/Pacific Islander	10.3	0.65 (0.41–1.03)	49.4	0.90 (0.73–1.11)
Native American	21.3	1.27 (0.73–2.21)	67.2	1.06 (0.78–1.45)
Insurance type				
Private (ref)	13.1	1.00	39.9	1.00
Public	12.1	0.92 (0.80–1.06)	46.9	1.20 (1.11–1.30)**
Timing of prenatal care				
First trimester (ref)	11.4	1.00	48.8	1.00
Second trimester	14.7	1.27 (1.07–1.52)*	41.0	0.87 (0.79–0.97)*
Third trimester/none	14.3	1.30 (1.03–1.41)*	34.8	0.80 (0.72–0.87)**
Paternity established				
Yes (ref)	10.5	1.00	47.3	1.00
No	17.6	1.49 (1.30–1.71)**	37.4	0.85 (0.78–0.92)**

*p<.05. **p<.001. Notes: CPS=child protective services. ref=reference group.

their parents than other youth,³⁹ and they therefore benefit less from any effects of positive parent-child relationships on sexual health outcomes. Second, youth with a history of CPS involvement are more likely than others to experience some instability, such as changes in adult caregivers or between schools. This instability may reduce their likelihood of receiving messages about delaying sexual debut or contraceptive use, or their exposure to school-based sex education.

Several social and demographic characteristics and health behaviors were associated with the presence of an STD for this population, although the findings did not always align with national statistics. Prevalence rates of STDs reported in the present study are lower than commonly cited national rates.¹³ We suggest two possible explanations for this. First, our measure of STDs did not include human papillomavirus. Second, our estimates were generated at the time of birth, and most women had obtained timely prenatal care (which was associated with a reduced prevalence of STDs in our population). The CDC and the American Congress of Obstetrics and Gynecology recommend routine screening of all pregnant women for a variety of STDs.⁴⁰ Although it is plausible that our findings reflect the success of routine screening and treatment, we cannot determine this on the basis of our data; the findings may also reflect unobserved selection effects.

National STD surveillance data indicate that increased age is a correlate of STD prevalence.⁴¹ In this population, there were no statistically significant differences in overall STD prevalence by age. The discrepancy between our findings and those at the national level may be due in part to the age range examined in our population of first-time mothers (12–19 years). Nationally, the greatest increase in the prevalence of STDs occurs between ages 15–19 and 20–24.⁴¹ Our exclusive focus on adolescents may explain the absence of significant differences.

As with STDs, history of pregnancy termination was associated with several characteristics of our adolescent population, although once again, findings did not always align with national data. As expected, older adolescents were more likely than the youngest ones to report a prior abortion. This is likely a product of time; older adolescents had a longer window since sexual debut to engage in unprotected sex, increasing the likelihood of pregnancy (whether or not intended). Compared with white adolescents, blacks and Hispanics were less likely to report prior abortion. In sharp contrast, a 2010 report by Kost and Henshaw⁴² noted that abortion rates for U.S. Hispanic and black adolescents were 2–3 times that of their white counterparts.

Early engagement in prenatal care was associated with an increased prevalence of prior abortion. It may be that adolescents reporting an abortion were better connected to providers than others or that when they decided to carry a pregnancy to term, they invested more in it; either of these circumstances might have resulted in their earlier engagement in prenatal care. More exploration of these associations is needed.

Limitations

Despite the strengths of using population-based birth records linked to official child protection reports, findings should not be interpreted causally, and several limitations should be considered. First, prior abortion was based on self-reported information; as a result, prevalence statistics should be viewed as estimates that are vulnerable to factors that might influence disclosure. Second, official maltreatment reporting data prior to 1998 were not available. Despite the inability to incorporate CPS reports received during early childhood (a period when maltreatment rates are highest⁴³), we observed statistically significant differences in the prevalence of STDs and prior abortion by CPS involvement. Still, findings should not be generalized to all populations with a history of CPS involvement. Third, adolescents with a history of reported maltreatment may be at increased risk of STDs and prior abortion for reasons we were unable to assess in our data, such as substance use⁴⁴ or participation in transactional sex.⁴⁵ Fourth, available data did not allow for an exploration of whether adolescent mothers were involved with other systems (e.g., mental health or juvenile justice). Future research would be strengthened by the exploration of multisystem involvement and its association with sexual health, particularly among CPS-involved adolescents. Last, the analysis included only a crude measure of socioeconomic status (insurance type) and of social and financial support (paternity establishment); models did not adjust for community-level dynamics, particularly those related to poverty, that may influence risky sexual behaviors tied to pregnancy and STDs.

Conclusions

Although efforts to reduce rates of pregnancy among adolescents have contributed to a steady decline in births, normative rates of sexual intercourse among adolescents leave substantial numbers of young people at risk of consequences of unprotected sex, including unplanned pregnancy and STDs. As documented in the present study, at the time of their first birth, adolescents with a history of maltreatment reported to CPS have a heightened prevalence of STDs and of abortion experience. These adolescents may be in need of targeted prevention and intervention services to address adverse sexual health outcomes. Further efforts are needed to understand the mechanisms underlying these associations—which may include limited support from parental figures, compromised intrafamilial relationships and reduced access to preventive medical services—and how these mechanisms contribute to unintended sexual health outcomes.

REFERENCES

1. Kann L et al., Youth risk behavior surveillance—United States, 2013, *Morbidity and Mortality Weekly Report Surveillance Summaries*, 2014, Vol. 63, No. SS-4. <<http://www.cdc.gov/mmwr/pdf/ss/ss6304.pdf>>, accessed Apr. 2, 2015.
2. Sandfort TGM et al., Long-term health correlates of timing of sexual debut: results from a national US study, *American Journal of Public Health*, 2008, 98(1):155–161.

3. Hamilton BE and Ventura SJ, Birth rates for U.S. teenagers reach historic lows for all age and ethnic groups, *NCHS Data Brief*, 2012, No. 89, <<http://www.cdc.gov/nchs/data/databriefs/db89.pdf>>, accessed Apr. 15, 2015.
4. Savio Beers LA and Hollo RE, Approaching the adolescent-headed family: a review of teen parenting, *Current Problems in Pediatric and Adolescent Health Care*, 2009, 39(9):216–233.
5. Jutte DP et al., The ripples of adolescent motherhood: social, educational, and medical outcomes for children of teen and prior teen mothers, *Academic Pediatrics*, 2010, 10(5):293–301.
6. Lipman EL, Georgiades K and Boyle MH, Young adult outcomes of children born to teen mothers: effects of being born during their teen or later years, *Journal of the American Academy of Child and Adolescent Psychiatry*, 2011, 50(3):232–241.
7. Putnam-Hornstein E et al., A population-level and longitudinal study of adolescent mothers and intergenerational maltreatment, *American Journal of Epidemiology*, 2015, 181(7):496–503.
8. Leslie LK et al., Health-risk behaviors in young adolescents in the child welfare system, *Journal of Adolescent Health*, 2010, 47(1):26–34.
9. Putnam-Hornstein E et al., A population-based examination of maltreatment history among adolescent mothers in California, *Journal of Adolescent Health*, 2013, 53(6):794–797.
10. U.S. Department of Health and Human Services (DHHS), Administration for Children and Families, *Adolescents with a History of Maltreatment Have Unique Service Needs That May Affect Their Transition to Adulthood*, 2012, <http://www.acf.hhs.gov/sites/default/files/opre/youth_spotlight_v7.pdf>, accessed May 5, 2015.
11. Felitti VJ and Anda R, The relationship of adverse childhood experiences to adult medical disease, psychiatric disorders, and sexual behavior: implications for healthcare, in: Lanius R, Vermetten E and Pain C, eds., *The Hidden Epidemic: The Impact of Early Life Trauma on Health and Disease*, New York: Cambridge University Press, 2010, <<http://www.theannainstitute.org/LV%20FINAL%202-7-09.pdf>>, accessed June 2, 2015.
12. Kohl PL, Jonson-Reid M and Drake B, Time to leave substantiation behind: findings from a national probability study, *Child Maltreatment*, 2009, 14(1):17–26.
13. Forhan SE et al., Prevalence of sexually transmitted infections among female adolescents aged 14 to 19 in the United States, *Pediatrics*, 2009, 124(6):1505–1512.
14. Centers for Disease Control and Prevention (CDC), *Rates of Reportable STDs Among Young People 15–24 Years of Age: California*, 2011, 2013, <<http://www.cdc.gov/std/stats/by-age/15-24-all-STDs/state/2011/CA11.pdf>>, accessed Jan. 25, 2015.
15. CDC, Births and natality, 2015, <<http://www.cdc.gov/nchs/fastats/births.htm>>, accessed Apr. 10, 2015.
16. DHHS, Reproductive health: teen pregnancy & childbearing, no date, <<http://www.hhs.gov/ash/oah/adolescent-health-topics/reproductive-health/teen-pregnancy/index.html>>, accessed Apr. 10, 2015.
17. Sampson O et al., Barriers to adolescents' getting emergency contraception through pharmacy access in California: differences by language and region, *Perspectives on Sexual and Reproductive Health*, 2009, 41(2):110–118.
18. Afable-Munsuz A and Brindis CD, Acculturation and the sexual and reproductive health of Latino youth in the United States: a literature review, *Perspectives on Sexual and Reproductive Health*, 2006, 38(4):208–219.
19. Doğan-Ateş A and Carrión-Basham CY, Teenage pregnancy among Latinas examining risk and protective factors, *Hispanic Journal of Behavioral Sciences*, 2007, 29(4):554–569.
20. DHHS, Administration for Children and Families, *Child Maltreatment 2013, 2015*, <<http://www.acf.hhs.gov/sites/default/files/cb/cm2013.pdf>>, accessed Apr. 10, 2015.
21. Jonson-Reid M et al., Understanding chronically reported families, *Child Maltreatment*, 2010, 15(4):271–281.
22. Putnam-Hornstein E et al., A population-level and longitudinal study of adolescent mothers and intergenerational maltreatment, *American Journal of Epidemiology*, 2015, 181(7):496–503.
23. Shaw TV et al., Measuring racial disparity in child welfare, *Child Welfare*, 2008, 87(2):23–36.
24. Trickett P and Negriff S, Review: childhood non-sexual maltreatment is associated with poor mental and sexual health outcomes, *Evidence-Based Mental Health*, 2013, 16(2):55.
25. Stock JL et al., Adolescent pregnancy and sexual risk-taking among sexually abused girls, *Family Planning Perspectives*, 1997, 29(5):200–203 & 227.
26. James S et al., Sexual risk behaviors among youth in the child welfare system, *Children and Youth Services Review*, 2009, 31(9):990–1000.
27. Aruda MM et al., Adolescent pregnancy diagnosis and outcomes: a six-year clinical sample, *Journal of Pediatric and Adolescent Gynecology*, 2008, 21(1):17–19.
28. Steinberg JR and Tschann JM, Childhood adversities and subsequent risk of one or multiple abortions, *Social Science & Medicine*, 2013, 81:53–59.
29. Winkler WE, Record linkage software and methods for merging administrative lists, *Statistical Research Report Series*, Washington, DC: Bureau of the Census Statistical Research Division, 2001, No. RR2001/03.
30. Herzog TN, Scheuren FJ and Winkler WE, *Data Quality and Record Linkage Techniques*, New York: Springer, 2007.
31. Campbell KM, Deck D and Krupski A, Record linkage software in the public domain: a comparison of Link Plus, The Link King, and a 'basic' deterministic algorithm, *Health Informatics Journal*, 2008, 14(1):5–15.
32. Drake B, Unraveling "unsubstantiated," *Child Maltreatment*, 1996, 1(3):261–271.
33. Putnam-Hornstein E et al., Risk of re-reporting among infants who remain at home following alleged maltreatment, *Child Maltreatment*, 2015, 20(2):92–103.
34. McCullagh P and Nelder JA, *Generalized Linear Models*, second ed., London: Chapman & Hall, 1989.
35. Zou G, A modified Poisson regression approach to prospective studies with binary data, *American Journal of Epidemiology*, 2004, 159(7):702–706.
36. Cederbaum JA et al., Maternal HIV serostatus, mother-daughter sexual risk communication and adolescent HIV risk beliefs and intentions, *AIDS and Behavior*, 2013, 17(7):2540–2553.
37. Markham CM et al., Connectedness as a predictor of sexual and reproductive health outcomes for youth, *Journal of Adolescent Health*, 2010, 46(3, Suppl.):S23–S41.
38. Windle M et al., Parenting predictors of early-adolescents' health behaviors: simultaneous group comparisons across sex and ethnic groups, *Journal of Youth and Adolescence*, 2010, 39(6):594–606.
39. Boonstra HD, Teen pregnancy among young women in foster care: a primer, *Guttmacher Policy Review*, 2011, 14(2):8–19.
40. Koumans EHA et al., Prevention of mother-to-child transmission of infections during pregnancy: implementation of recommended interventions, United States, 2003–2004, *American Journal of Obstetrics & Gynecology*, 2012, 206(2):158.e1–158.e11, <[http://www.ajog.org/article/S0002-9378\(11\)01148-3/abstract](http://www.ajog.org/article/S0002-9378(11)01148-3/abstract)>, accessed Apr. 25, 2015.

41. CDC, STDs in adolescents and young adults, 2014, <<http://www.cdc.gov/std/stats12/adol.htm>>, accessed Jan. 25, 2015.

42. Kost K and Henshaw S, *U.S. Teenage Pregnancies, Births and Abortions, 2010: National and State Trends by Age, Race and Ethnicity*, New York: Guttmacher Institute, 2014, <<http://www.guttmacher.org/pubs/USTPtrends10.pdf>>, accessed Jan. 25, 2015.

43. DHHS, Administration for Children and Families, *Child Maltreatment 2013*, 2015, <<http://www.acf.hhs.gov/programs/cb/research-data-technology/statistics-research/child-maltreatment>>, accessed Apr. 25, 2015.

44. Lightfoot M, Morgan-Jackson J and Pollack L, Substance use and risk profiles of adolescent medical patients, *Drug and Alcohol Dependence*, 2015, 146:e179–e180, <<http://dx.doi.org/10.1016/j.drugalcdep.2014.09.404>>, accessed Mar. 20, 2015.

45. Raiford JL et al., Low prospects and high risk: structural determinants of health associated with sexual risk among young African American women residing in resource-poor communities in the South, *American Journal of Community Psychology*, 2014, 54(3-4):243–250.

Acknowledgment

This work was funded through a grant from the Conrad N. Hilton Foundation to the Children's Data Network. The authors thank colleagues at both the California Department of Social Services and the California Child Welfare Indicators Project for their assistance in preparing data files underlying this analysis.

Author contact: jcederba@usc.edu