Published in final edited form as:
Am J Epidemiol. 2008 May 1; 167(9): 1102–1109. doi:10.1093/aje/kwn011.

Gang Exposure and Pregnancy Incidence among Female Adolescents in San Francisco: Evidence for the Need to Integrate Reproductive Health with Violence Prevention Efforts

AM Minnis[1,2], **JG Moore**[2], **IA Doherty**[3], **C Rodas**[1], **C Auerswald**[4], **S Shiboski**[5], and **NS Padian**[1,2]

[1]Women's Global Health Imperative, RTI International

[2]Department of Obstetrics, Gynecology and Reproductive Sciences, University of California San Francisco

[3]Department of Medicine, University of North Carolina

[4]Department of Pediatrics, University of California San Francisco

[5]Department of Epidemiology and Biostatistics, University of California San Francisco

Abstract

Among a cohort of 237 sexually active females aged 14–19 recruited from community venues in a predominantly Latino neighborhood in San Francisco we examined the relationship between gang exposure and pregnancy incidence over two years of follow-up. Using discrete-time survival analysis we investigated whether individual and partner gang membership were associated with pregnancy incidence and determined whether partnership characteristics, contraceptive behaviors and pregnancy intentions mediated the relationship between gang membership and pregnancy. Pregnancy incidence was determined by urine-based testing and self-report. Seventy-seven percent of participants were Latinas, with one in five born outside the U.S. One-quarter (27.4%) became pregnant over follow-up. Participants' gang membership had no significant effect on pregnancy incidence (Hazard Ratio (HR)=1.25; 95% confidence interval (CI): 0.54, 3.45); however, having partners who were in gangs was associated with pregnancy (HR=1.90; 95% CI: 1.09, 3.32). Perceived male partner's pregnancy intentions and having a partner in detention each mediated the effect of partner's gang membership on pregnancy risk. Increased pregnancy incidence among young women with gang-involved partners highlights the importance of integrating reproductive health prevention into programs for gang-involved youth. In addition, high pregnancy rates indicate a heightened risk for sexually transmitted infections.

MeSH terms

pregnancy; violence; sexual partners; sexually transmitted diseases; Hispanic Americans; adolescent

Contact Information for Corresponding Author: Alexandra Minnis, PhD, MPH, Epidemiologist, Women's Global Health Imperative, RTI International – San Francisco, 114 Sansome Street, Suite 500, San Francisco, CA 94104, Phone: 415-848-1323, Fax: 415-848-1330, aminnis@rti.org.

Latino youth in the United States experience elevated pregnancy rates compared to all other ethnic groups. National birth rates in 2004 (per 1000 women aged 15–19) were 83 for Latina, 63 for African-American and 27 for white women (1). Seventy-one percent of California's teen births in 2004 were to Latinas, and although the rate of teen births has declined for all adolescents in California as it has nationally, the decline from 1990 to 2004 was smallest for Latinas (39 percent) compared to African Americans (60 percent) and Whites (64 percent) (1). In addition to the numerous adverse consequences of teen pregnancy, both for young women and their children, including lower educational attainment and persistent poverty (2–4), high pregnancy rates indicate unprotected sexual behavior and the accompanying risk for sexually transmitted infections (STIs), including HIV.

In many urban communities throughout the U.S., street gangs contribute to shaping the risk environment in which sexual partnerships are formed (5). Adolescents' gang involvement has been associated with increased violence, substance use and risky sexual behaviors, including higher risk partnership characteristics and lower levels of condom use (6–10). Several studies have examined the relationship between gang involvement and STI or pregnancy prevalence. A gang-related outbreak of gonorrhea in Colorado Springs, for example, was documented in 1993 (11); however, subsequent studies on the relationship between gang involvement and STI risk have yielded inconsistent results (8–10, 12). The role of gang exposure in influencing pregnancy risk is even less well understood. One cross-sectional study that examined whether gang exposure increased pregnancy risk found that partner's gang involvement was positively associated with pregnancy among Mexican American, but not Puerto Rican and African American, adolescents (13).

In addition to establishing the independent effects of gang membership on pregnancy risk using prospective biological data, elucidation of the mechanisms through which gang membership may influence pregnancy incidence would inform prevention efforts. Few of the studies of gang membership and reproductive health risk conducted to date included Latino adolescents (8–11, 13). All have been cross-sectional and relied on self-reported pregnancy history, and thereby were unable to demonstrate a temporal relationship. Many enrolled exclusively school-based or detention center populations. Most measures of gang involvement reflect only individual membership without an assessment of gang involvement within a sexual partnership. Furthermore, none have examined factors that may be on the causal pathway between gang exposure and pregnancy risk and that may contribute to an explanation of the ways in which gang membership could increase risk for pregnancy.

Numerous behavioral determinants of teen pregnancy have been identified through epidemiologic research. Partnership characteristics, contraceptive practices and pregnancy intentions are among the most critical factors demonstrated to influence pregnancy risk end (14–20). Having older partners (14–15), a higher perceived level of commitment within a relationship (16–17) (e.g., main vs. casual partnerships; monogamous partnerships), and low decision-making power within a relationship (18–19) are consistently associated with higher rates of teen pregnancy. Likewise inconsistent contraceptive use and a desire to become pregnant are known risks for teen pregnancy (20). Understanding through which of these

proximate behavioral mechanisms gang membership influences pregnancy risk is critical to informing effective prevention strategies.

Among a cohort of adolescents recruited from a predominantly Latino neighborhood in San Francisco and followed prospectively for two years we investigated: 1) whether individual and partner gang membership were associated with pregnancy incidence; and 2) how partnership characteristics, contraceptive behaviors and pregnancy intentions mediated the relationship between gang membership and pregnancy.

MATERIALS AND METHODS

Sample and study design

The Mission Teen Health Project was a prospective cohort study of adolescents aged 14–19 years at enrollment conducted in San Francisco's Mission District during the period October 2001- December 2004. The study was designed to examine sexual networks among adolescents in this community. The Mission District is a predominantly Latino neighborhood that serves as a residential and cultural center for Latinos in the San Francisco Bay Area and is home to one-third of San Francisco's Latino population (21). Latino youth constitute the ethnic majority in the Mission District: 58 percent of female and 68 percent of male youth identify as Latino (21).

The Mission Teen Health Project cohort was recruited using three approaches: venue-based sampling at 45 venues in the Mission District neighborhood; recruitment at community agencies; and friend referrals (details on recruitment are reported elsewhere (22–23). The baseline study visit included an epidemiologic and social networks interview; specimen collection for pregnancy and STI (chlamydia and Herpes Simplex Virus-2 (HSV-2)) testing; and a reproductive health education session. Participants were given educational brochures, male condoms and referral information for health care and other services as needed. Study visits took place at our community-based project office, at a community agency, or at the participant's home. Young women who tested positive for pregnancy were offered pregnancy options counseling regarding abortion, prenatal care and adoption. Participants who tested positive for any STIs were referred for follow-up medical care. Treatment and partner-delivered therapy were offered to all participants who tested positive for chlamydia. Participants were followed for two years, with in-person study visits completed at six-month intervals (up to five visits total). At each study visit, participants received $35 for participation. The Committee for Human Research at the University of California, San Francisco approved all study procedures. Parental consent was obtained for all minors.

This analysis includes all female participants who returned for at least one follow-up visit and who reported having had vaginal sex over the follow-up period. Participants contributed person-time to the analysis during intervals when they were sexually active, yet only through the interval during which they first became pregnant.

Conceptual model and measures

The conceptual model guiding analysis of the research questions is adapted from the proximate determinants of fertility framework (24) which also has been applied to HIV/

AIDS (25) (figure 1). This framework delineates underlying social determinants that influence health and demographic outcomes through intermediate behavioral factors. Potential interventions aimed at modifying underlying determinants can be conceptualized to address risks by acting through specific behavioral pathways more proximate to the biological outcomes.

Outcomes—First pregnancy during the follow-up period served as our primary outcome measure. At four follow-up visits (six, 12, 18 and 24 months) pregnancy was determined by combining self-report and lab test results. Pregnancy tests were conducted for all female participants using the Clearview HCG II test which detects human chorionic gonadotrophin in urine with 100 percent specificity and 99 percent sensitivity (26). At each study visit participants were asked: “Since your last study visit in [insert month of last visit] have you been pregnant? This includes if you are currently pregnant or have given birth, had an abortion or a miscarriage.” Pregnancies were defined as a positive pregnancy test at a study visit or a report of having been pregnant since the previous study visit. Sixty-two percent of incident pregnancies were detected through biologic testing. Five participants were pregnant at baseline; we retained them in the analytic sample because their pregnancies had terminated prior to the first follow-up visit. We assessed chlamydia using urine-based ligase chain reaction and HSV-2 by Focus ELISA. Both tests were conducted by the San Francisco Department of Public Health laboratory.

Exposures—We assessed gang membership (“belonging to a gang or claiming a color”) for the participants and their sexual partners (based on the participant’s report) at baseline and at each follow-up visit. To achieve a clear temporal sequence between this exposure, the time-dependent mediators and the occurrence of pregnancy, we chose the two baseline gang membership measures as exposures for this analysis.

Mediators—We assessed the mediating roles of several categories of factors that, based on the literature, we hypothesized were intermediate on the causal pathway between gang exposure and pregnancy. The mediators were assessed prospectively at each follow-up visit and included partnership characteristics; contraceptive use practices; and pregnancy intentions (figure 1). Participants reported characteristics of their recent sexual partners (up to four). From these data, we considered six measures characterizing sexual partnerships, including two items from the Pulerwitz gender-power scale (27). We examined two measures of condom use behavior, and assessed pregnancy intentions of the female participant and her perceptions regarding the pregnancy intentions of her current male partner.

Confounders—Four background characteristics were examined as potential confounding factors: participant’s age, two measures of socioeconomic status (maternal education and residing in crowded housing conditions (28)) and foreign- vs. U.S.-born, which, given the large proportion of immigrant youth in the sample (20.3 percent), was included due to its association in other research with adolescent risk taking (29) and pregnancy (30). We also considered potential confounding effects of previous pregnancy.

Statistical analysis

Discrete-time survival analysis—We employed discrete-time survival analysis to study the effects of gang membership on pregnancy risk during the follow-up period. This technique accounts for variable length of follow-up among participants and allows both for time-varying and invariant predictors of pregnancy risk (31). We used duration of follow-up as the time scale, with discrete time points corresponding to study visits. The baseline pregnancy hazard was modeled non-parametrically with a separate hazard parameter for each visit interval.

Mediation analyses—To evaluate whether the relationship between gang exposure and pregnancy could be partially explained through the indirect effects of the hypothesized mediators, we followed the four steps in establishing mediation recommended by Baron and Kenny (32). First, we assessed whether gang membership measures were associated with pregnancy incidence (the direct effect). Second, we evaluated the bivariate correlation between each gang membership measure and the mediators. Variables were considered correlated if the Chi-square statistic, Fisher Exact Test statistic, or Spearman's correlation coefficient was significant at or above the 0.05 level at any of the four follow-up time points. Only those factors that met both of these criteria were explored further as mediators. Third, we examined the relationship between the hypothesized mediating factors and pregnancy incidence, both unadjusted and adjusted for gang exposure. Finally, we investigated the extent to which these factors mediated the relationship between gang membership and pregnancy incidence, adjusting for the hypothesized confounding factors. In this step, we calculated the proportion of gang membership's effect on pregnancy incidence mediated by each factor (as well as all in combination) following Lin, et al. (33). When the mediated effect was in the opposite direction from the direct effect ("suppression effect" (34)), we calculated the proportion of mediated effects based on Alwin and Hauser (35). The adjusted effect of partner gang membership was estimated by first including one mediator in the model at a time, followed by including all mediators simultaneously.

RESULTS

A total of 555 adolescents (297 females) enrolled in the study; 81.5 percent of females returned for their final study visit two years after enrollment and 83.2 percent of expected follow-up study visits were completed (988 of 1,188). This analysis includes the 237 female adolescents who completed at least one follow-up visit and were sexually active over follow-up. Excluded were 17 teens (5.7 percent) who never returned for a follow-up visit and 43 teens (14.5 percent) who were not sexually active at any point during the follow-up period.

Study population characteristics

The median age for female participants was 17 years (table 1) and more than 77 percent self-identified as Latina. The majority (72 percent) reported that their mothers had less than high school education. One in five were born outside the U.S.; Mexico and Central American countries constituted the predominant places of origin. At baseline, 6.4 percent were in a

gang and 17.4 percent had a partner who was in a gang. Twenty percent had been pregnant prior to study enrollment.

Pregnancy and STI incidence during follow-up

A total of 72 pregnancies among 65 participants occurred during the follow-up period. Over one-quarter (27.4 percent) of participants were pregnant at least once over follow-up with the rate varying over time: 32.9 percent (at 6-month follow-up); 14.3 percent (at 12-month follow-up); 13.3 percent (at 18-month follow-up); and 28.6 percent (at 24-month follow-up). These proportions correspond to a pregnancy incidence rate of 166/1000 woman-years.

The cumulative incidence of chlamydia was 5.5 percent and of HSV-2 was 3.4 percent, with 8.9 percent testing positive for either infection.

Effects of gang membership on pregnancy incidence

Participants' gang membership had no significant effect on pregnancy incidence during the follow-up period (Hazard Ratio (HR)=1.25, 95 percent confidence interval (CI)=0.54, 3.45); because of the low prevalence and lack of an association, we excluded it from further analysis. However, having a sexual partner who was in a gang was associated with becoming pregnant during the follow-up period (HR=1.90; 95 percent CI=1.09, 3.32).

Correlations between gang membership and the mediators

Seven factors among the mediators examined were positively correlated ($p < 0.05$) with having a partner in a gang (table 2). Statistically significant correlations ranged in magnitude from 0.2 to 0.3. Five characteristics of sexual partnerships and the pregnancy intentions of the female and her male partner were correlated with having a partner in a gang.

Effects of mediators on pregnancy incidence

Nine of the ten mediators were significantly associated with pregnancy incidence with and without controlling for partner gang exposure (table 2). Having a casual partner, for example, was associated with a reduced risk of pregnancy (HR=0.46, $p<0.05$) and low power to negotiate condom use was associated with an increased risk of pregnancy (HR=1.42, $p<0.05$). Pregnancy intentions, both the female's and her perceptions of those of her partner, achieved the greatest magnitude associations with pregnancy risk.

Mediating effects on the relationship between partner gang membership and pregnancy

The six factors that were significantly associated *both* with partner gang membership and pregnancy incidence were evaluated for their effects on the adjusted hazard ratio expressing the relationship between partner gang membership and pregnancy (table 3). These factors included: having a casual partner, the number of partners who had concurrent partners, having a partner in detention, low power in negotiating condom use, female wanting a pregnancy, and male partner perceived as wanting a pregnancy. Perceiving that your male partner wanted a pregnancy diminished the role of partner's gang membership on pregnancy incidence (indicated by a reduced adjusted hazard ratio, a non-significant association, and a large mediated effect of 14.3 percent). In addition, having a partner in detention, which also

was associated with an increased risk of pregnancy, decreased the role of partner gang membership on pregnancy incidence (mediated effect was 19.3 percent).

We also observed two partnership factors having large suppressor effects (35) on pregnancy incidence: having a casual partner (mediated effect was 17.4 percent), and number of partners with concurrent partners (mediated effect was 26.9 percent). This indicates that the direct effect of partner gang membership on pregnancy incidence was decreased through these two pathways. Adjustment for all mediators resulted in a slight increase in the hazard ratio for partner gang membership and the mediated effect was 9.0 percent. Thus, overall we observed a suppressor effect on pregnancy risk.

DISCUSSION

Pregnancy rates among this population of young women in San Francisco point to high levels of unprotected sex and the accompanying risk for STIs. Though the observed rates of chlamydial infection and HSV-2 remained relatively low, sexual practices evidenced by the high pregnancy rates suggest the potential for STI spread. With a pregnancy rate of 166/1000 woman-years among this population of sexually active youth, 27.4 percent of the study population experienced a pregnancy during follow-up. Twenty percent had been pregnant prior to study enrollment. These pregnancy rates among a population of sexually active youth are considerably higher than those for California overall (96/1000 for girls aged 15–19 in 2000 (1)).

Having a sexual partner who belonged to a gang was associated with an increased risk for pregnancy. This finding supports research linking gang involvement to risky sexual activity (8–10). In particular, it supports the observation from one small cross-sectional study among adolescents in Chicago that, for Mexican teens, having a boyfriend in a gang was significantly associated with pregnancy (13). Though violence prevention is a clear priority when working with gang-affiliated youth, this finding underscores the need to address reproductive health as well. That females' gang membership was not associated with pregnancy risk may be a result of the low prevalence of this exposure due to lower participation in gangs by females or an unwillingness to report participation.

By what mechanisms might gang membership of a partner increase risk for pregnancy? Though, as expected, more consistent contraceptive method use practices were associated with reduced pregnancy incidence, method use practices did not constitute the mechanism through which partners' gang membership influenced pregnancy risk. Having casual partners and partners suspected to have other partners concurrently were associated with a decreased risk of pregnancy and suppressed the direct effect of partner gang membership on pregnancy incidence. Other research suggests that condom use is more common with casual than main partners (36), a pattern also seen in this study (data not shown (37)), which could explain why pregnancy risk was reduced among young women with casual partners (nearly half of participants with casual partners reported no main partnerships during the same follow-up interval).

Pregnancy intentions, particularly those of the male partner, assumed a prominent role in mediating the relationships between partner's gang membership and pregnancy incidence. These findings underscore that a partner's desire for a pregnancy strongly influenced whether one in fact occurred, particularly within couples where the female had a male partner who was gang involved. Several potential explanations for these associations include: 1) perceived social pressures to have a baby may be greater for youth with gang-involved partners than for youth without gang-involved partners; 2) norms that pregnancy strengthens the commitment between couples or influences the status of a female within a relationship are strong for females with gang-involved partners; and 3) the decreased power to negotiate condom use seen among young women with gang-involved partners strengthened the influence of the partners' pregnancy desires on the occurrence of pregnancy.

Having a partner in detention also mediated the relationship between partner gang membership and pregnancy incidence. A qualitative study of relationship intimacy between females and their incarcerated male partners detained at a California state prison found that despite physical separation, women with strong emotional ties to partners and confidence in sexual monogamy within the relationship, had a strong desire to conceive during the reunion following release (38). These findings suggest that the importance of having a baby with an incarcerated partner may be heightened. Partner incarceration, however, can also disrupt sexual partnerships and has been shown to prompt "separational concurrency" (39) and bridging of low and high risk sexual networks (40), both of which increase risk for STIs/HIV. Future investigations could explore these issues among adolescents and examine the intersection of pregnancy and STI risk.

Several limitations should be noted. First, measurement of gang membership may be biased by participants underreporting this activity. Despite its prevalence in the community, youth may have been unwilling to report gang involvement. De-briefing interviews with study interviewers revealed that some gang-affiliated participants asked interviewers not to record their gang involvement on study instruments. The extent to which this risk was underreported remains unknown. Females who reported individual gang membership at baseline were less likely to complete the study than those who reported no gang membership, which also could have influenced our ability to assess its association with pregnancy. Our pregnancy measure includes both self-reported pregnancies that occurred between study visits and pregnancies detected through lab tests conducted at each study visit. Relying solely on lab test results would have underestimated the actual pregnancy incidence, though it is possible that participants did not report pregnancies that occurred between visits. Any misclassification of our outcome likely would bias our estimates to the null. Parental monitoring and the cultural concept of familism (family connectedness and responsibility to family) each constitute potentially confounding factors that we did not include in our analysis due to incomplete measurement. Finally, our ability to examine partnership characteristics associated with pregnancy risk was limited by the fact that we could not determine the specific partnership to which to attribute the pregnancy, only the characteristics of partnerships reported during each observation period.

This analysis explored the relationship between two sources of gang exposure and pregnancy incidence using prospective data and biological measures within a community-based sample of underserved urban youth. Participants included in- and out-of-school adolescent females. The significant role of partner gang membership in increasing pregnancy risk highlights the importance of addressing the reproductive health needs of gang-involved youth. Though violence prevention remains a clear priority, reproductive health prevention should be offered to this vulnerable population as well. Our findings suggest that focusing on pregnancy intentions, including those of male partners, remains an important area for intervention. Examining further whether having a partner in detention increases pregnancy risk simply through increased sexual risk-taking generally or through increased desires to have a child would also inform prevention approaches with gang-involved youth. Finally, the elevated risk for pregnancy in this population of sexually active females points to the accompanying risk for STIs. Integrated reproductive health prevention, therefore, is critical.

Acknowledgments

The Mission Teen Health Project research team would like to thank our community collaborators from the following organizations for supporting and informing our work: Mission Neighborhood Centers, Columbia Park Boys and Girls Club, St. John's Educational Threshold, Jamestown Community Center, the Community Response Network, the Mission Planning Council, RAP High School and United Playaz. Laboratory testing for sexually transmitted infections and partner-delivered therapy were provided by the San Francisco Department of Public Health, STD Programs. We are grateful to Dr. Jeffrey Klausner for this contribution. In addition, we would like to acknowledge the contributions of all study staff; in particular, Evan vanDommelen-Gonzalez, Arturo Durazo, and Mi-Suk Kang.

Funding: National Institute of Allergy and Infectious Diseases, National Institutes of Health (R01-AI48749); University-wide AIDS Research Program, University of California (M00-SF-056 & 057A).

References

1. [Accessed 29 November 2007] The National Campaign to Prevent Teen and Unplanned Pregnancy: statistics. 2006. URL: http://www.teenpreg.org/america/statistics/asp?ID=4
2. Olausson P, Haglund B, Weitoft G, Cnattingius S. Teenage childbearing and long-term socioeconomic consequences: a case study in Sweden. Arch Pediatr Adolesc Med. 2005; 159:261–265. [PubMed: 15753270]
3. Hoffman S. Teenage childbearing is not so bad after all, or is it? A review of the new literature. Fam Plann Perspect. 1998; 30:236–239. [PubMed: 9782047]
4. Hofferth S, Reid L, Mott F. The effects of early childbearing on schooling over time. Fam Plann Perspect. 2001; 33:259–267. [PubMed: 11804435]
5. Palmer CT, Tilley CF. Sexual access to females as a motivation for joining gangs: An evolutionary approach. The Journal of Sex Research. 1995; 32:213.
6. Ohene SA, Ireland M, Blum RW. The clustering of risk behaviors among Caribbean youth. Matern Child Health J. 2005; 9:91–100. [PubMed: 15880978]
7. Harper GW, Robinson WL. Pathways to risk among inner-city African-American adolescent females: the influence of gang membership. Am J Community Psychol. 1999; 27:383–404. [PubMed: 10492881]
8. Auerswald CL, Muth SQ, Brown B, Padian N, Ellen J. Does partner selection contribute to sex differences in sexually transmitted infection rates among African American adolescents in San Francisco? Sex Transm Dis. 2006; 33:480–4. [PubMed: 16645551]
9. Wingood GM, DiClemente RJ, Crosby R, Harrington K, Davies SL, Hook EW 3rd. Gang involvement and the health of African American female adolescents. Pediatrics. 2002; 110:e57. [PubMed: 12415063]

10. Voisin DR, Salazar LF, Crosby R, DiClemente RJ, Yarber WL, Staples-Horne M. The association between gang involvement and sexual behaviours among detained adolescent males. Sex Transm Infect. 2004; 80:440–2. [PubMed: 15572610]
11. Bethea R, Muth SQ, Potterat D, Woodhouse J, Muth J. Gang-related outbreak of penicillinase-producing Neisseria Gonorrhoeae and other sexually transmitted diseases-Colorado Springs, Colorado, 1989–1991. MMWR. 1993; 42:25–28. [PubMed: 8419788]
12. Crosby R, Salazar LF, Diclemente RJ, Yarber WL, Caliendo AM, Staples-Horne M. Health risk factors among detained adolescent females. Am J Prev Med. 2004; 27:404–10. [PubMed: 15556741]
13. Talashek ML, Alba ML, Patel A. Untangling the health disparities of teen pregnancy. J Spec Pediatr Nurs. 2006; 11:14–27. [PubMed: 16409503]
14. DiClemente R, et al. Sexual risk behaviors associated with having older sex partners: a study of black adolescent females. Sex Transm Dis. 2002; 29:20–24. [PubMed: 11773874]
15. Manlove J, Terry-Humen E, Ikramullah E. Young teenagers and older sexual partners: correlates and consequences for males and females. Perspect Sex Reprod Health. 2006; 38:197–207. [PubMed: 17162312]
16. Bauman L, Berman R. Adolescent relationships and condom use: trust, love and commitment. AIDS Behav. 2005; 9:211–22. [PubMed: 15933840]
17. Davies S, DiClemente R, Wingood G, Person S, Crosby R, Harrington K, Dix E. Relationship characteristics and sexual practices of African American adolescent girls who desire pregnancy. Health Educ Behav. 2004; 31:85S–96S. [PubMed: 15296694]
18. Manlove J, Ryan S, Franzetta K. Contraceptive use and consistency in US teenagers' most recent sexual relationships. Perspect Sex Reprod Health. 2004; 36:265–275. [PubMed: 15687085]
19. Harvey SM, Henderson JT, Casillas A. Factors associated with effective contraceptive use among a sample of Latina women. Women Health. 2006; 43:1–16. [PubMed: 17000608]
20. Rosengard C, Phipps MG, Adler NE, Ellen JM. Adolescent pregnancy intentions and pregnancy outcomes: a longitudinal examination. J Adolesc Health. 2004; 35:453–61. [PubMed: 15581524]
21. Census 2000 Summary File 3. US Census Bureau; 2000.
22. Minnis, A.; Auerswald, C.; Doherty, I.; Ellen, J.; Shiboski, S.; Padian, N. Qualitative and quantitative methods for developing a venue-based sampling approach for a study of Latino adolescents' social and sexual networks. The Network Paradigm in Research on Drug Abuse, HIV, and Other Blood-Borne and Sexually Transmitted Infections: New Perspectives, Approaches, and Applications; NIDA/CAMCODA Working Meeting; 2002. p. 34-40.
23. Auerswald C, Greene K, Minnis A, Doherty I, Ellen J, Padian N. Qualitative assessment of venues for purposive sampling of hard-to-reach youth: An illustration in a Latino community. Sex Transm Dis. 2004; 31:133–138. [PubMed: 14743078]
24. Stover J. Revising the proximate determinants of fertility framework: what have we learned in the past 20 years? Stud Fam Plann. 1998; 29:255–67. [PubMed: 9789319]
25. Boerma J, Weir S. Integrating demographic and epidemiologic approaches to research on HIV/AIDS: the proximate determinants of fertility framework. J Infect Dis. 2005; 191 (Suppl 1):S61–67. [PubMed: 15627232]
26. Clearview HCG, II. Cranbury, NJ: Wampole Laboratories, Dist; 2000.
27. Pulerwitz J, Amaro H, De Jong W, Gortmaker S, RR. Relationship power, condom use and HIV risk among women in the USA. AIDS Care. 2002; 14:789–800. [PubMed: 12511212]
28. Bennefield, R.; Bonnette, R. U.S. Department of Commerce U.S. Census Bureau. Structural and occupancy characteristics of housing: 2000. 2003.
29. Blake SM, Ledsky R, Goodenow C, O'Donnell L. Recency of immigration, substance use, and sexual behavior among Massachusetts adolescents. Am J Public Health. 2001; 91:794–8. [PubMed: 11344890]
30. Johnson HP. Birth rates in California. Public Policy Institute of California. 2007; 9:24.
31. Allison, PD. Survival Analysis using the SAS System: A practical guide. Cary, NC: SAS Institute; 1995.

32. Baron R, Kenny D. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. J Pers Soc Psychol. 1986; 51:1173–1182. [PubMed: 3806354]
33. Lin D, Fleming T, Gruttola V. Estimating the proportion of treatment effect explained by a surrogate marker. Statistics in Medicine. 1997; 16:1515–1527. [PubMed: 9249922]
34. MacKinnon D, Krull J, Lockwood C. Equivalence of the mediation, confounding and suppression effect. Prevention Science. 2000; 1:173–181. [PubMed: 11523746]
35. Alwin D, Hauser R. The decomposition of effects in path analysis. American Sociological Review. 1975; 40:37–47.
36. Ibanez G, Van Oss Marin B, Villareal C, Gomez C. Condom use at last sex among unmarried Latino men: an event level analysis. AIDS Behav. 2005; 9:433–441. [PubMed: 16323039]
37. Doherty I, Minnis A, Auerswald C, Adimora A, Padian N. Concurrent sexual partnerships among adolescents in a Latino community: The Mission District of San Francisco. Sex Transm Dis. 2007; 34:437–43. [PubMed: 17195772]
38. Comfort M, Grinstead O, McCartney K, Bourgois P, Knight K. “You cannot do nothing in this damn place”: sex and intimacy among couples with an incarcerated male partner. J Sex Res. 2005; 42:3–12. [PubMed: 15795799]
39. Gorbach P, Stoner B, Aral S, Whittington W, Holmes K. “It takes a village”: understanding concurrent sexual partnerships in Seattle, Washington. Sex Transm Dis. 2002; 29:453–462. [PubMed: 12172529]
40. Adimora AA, Schoenbach VJ, Doherty IA. HIV and African Americans in the southern United States: sexual networks and social context. Sex Transm Dis. 2006; 33:S39–45. [PubMed: 16794554]

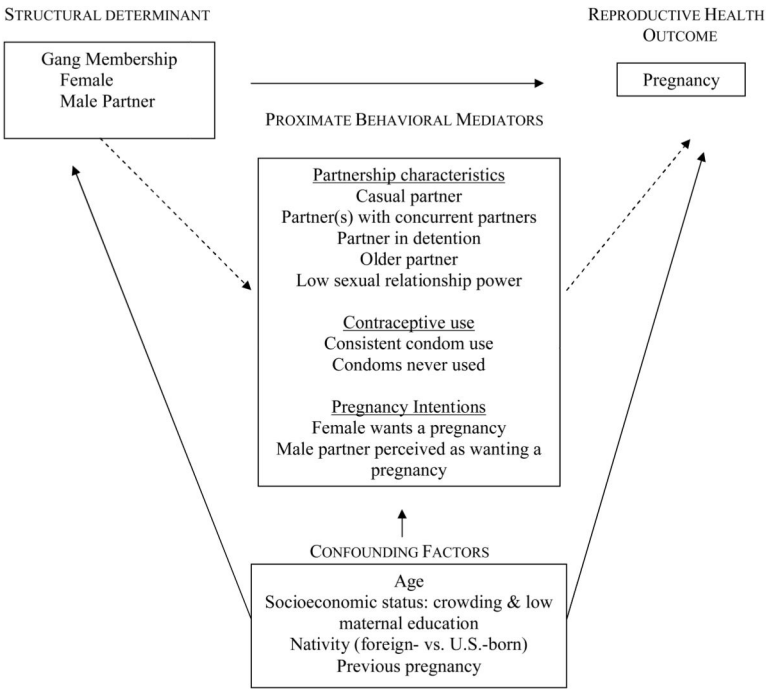

FIGURE 1.

Conceptual model: direct and indirect relationship between gang membership and pregnancy

TABLE 1

Background characteristics of study population Mission Teen Health Project, San Francisco, CA 2001–2004

	N N=237	Percent
Sociodemographic characteristics		
Ethnicity		
Latina	182	78.1
African American	30	12.8
Asian	13	5.6
Other†	8	3.4
Age <= 16‡	66	28.0
Mother's education less than high school	164	72.3
Reside in severely crowded conditions	37	15.7
Foreign-born	48	20.3
Gang exposure at enrollment		
Participant in a gang	15	6.4
Partner in a gang	40	17.4
Close friends in a gang	66	28.5
Pregnancy history		
Pregnant prior to enrollment	47	20.1

† "Other" ethnicity includes white, Native American, and other.

‡ Median age = 17 years; interquartile range = 16–18 years.

TABLE 2

Evaluation of hypothesized mediating factors: relationships with partner gang membership and pregnancy incidence Mission Teen Health Project, San Francisco, CA 2001–2004

	Partner Gang Membership†	Pregnancy Incidence	
Mediating Factor	**Spearman Correlation Coefficient**	**Unadjusted Hazard Ratio**	**Adjusted Hazard Ratio‡**
Partnership characteristics			
Had a casual partner in the last 6 months	0.24**	0.46*	0.41*
Number of partners with concurrent partners	0.30***	0.56*	0.51**
Had a partner in detention	0.29***	2.09**	1.95*
Number of older partners (>= 3 years)	0.30*	1.54	1.47
You feel stuck or pressured in your relationship	0.07	1.96*	2.03*
If you asked your boy friend to use a condom, he would think you're having sex with someone else	0.25**	1.42*	1.36*
Contraceptive behaviors			
Consistent condom use in at least one partnership	0.07	0.20***	0.21***
Condoms never used in at least one partnership	0.11	2.22**	2.12**
Pregnancy intentions			
Participant wants pregnancy, lagged 1 visit	0.25**	6.73***	6.99***
Male partner wants pregnancy, lagged 1 visit	0.20*	2.61**	2.72**

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$

† Average distribution of each mediating factor over two years of follow-up.

‡ Hazard ratio adjusted for partner gang membership at baseline.

TABLE 3

Partner gang membership and pregnancy incidence: mediation analysis results Mission Teen Health Project, San Francisco, CA 2001–2004

	Hazard Ratio†	95% CI	*p*-value	% Mediated Effect
Partner gang membership	1.90	1.09, 3.32	0.024	
Partnership characteristics				
Had a casual partner in the last 6 months	2.36	1.29, 4.32	0.005	17.4%
Number of partners with other partners	2.64	1.45, 4.83	0.002	26.9%
Had a partner in detention	1.77	0.96, 3.27	0.066	19.3%
If you asked your boy friend to use a condom, he would probably think you're having sex with someone else	2.00	1.08, 3.72	0.028	2.3%
Pregnancy intentions				
Participant wants pregnancy, lagged 1 visit	1.99	0.99, 3.97	0.052	3.5%
Male partner wants pregnancy, lagged 1 visit	1.84	0.91, 3.70	0.088	14.3%
All mediators combined	2.18	1.02, 4.64	0.043	8.8%

†Hazard ratios express the adjusted effects of gang exposure on pregnancy risk. Also included in each model were: study time, US vs. foreign born, mother's educational level, age, and crowded living conditions.