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Systematic review of sexual risk among pregnant and mothering teens in the USA: pregnancy as an opportunity for integrated prevention of STD and repeat pregnancy

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Abstract

Behaviors that lead to teen pregnancy also place young women at risk for STDs and repeat pregnancy. Compared to the broad literature on adolescent sexual risk behavior, our understanding of sexual risk in pregnant/mothering teens lags far behind. Primary objectives of this systematic review (1981–2003) of pregnant/mothering teens were to: (1) document rates of STD, repeat pregnancy, condom use, and contraception; (2) identify correlates of these biological and behavioral outcomes; (3) review sexual risk reduction interventions; and (4) discuss directions for future research and implications for clinical care. Fifty-one studies met inclusion criteria. Rates of STD and repeat pregnancy were high, with the majority of teens engaging in unprotected sex during and after pregnancy. An Ecological Model of Sexual Risk, based on Bronfenbrenner's (1989) Ecological Systems Theory, was proposed to organize findings on correlates of sexual risk. Improvements in research, including integration of outcomes and risk factors, stronger methodologies, and standardized assessments, are essential. Results suggest that teen pregnancy is a marker for future sexual risk behavior and adverse outcomes, and that pregnant/mothering teens need hybrid interventions promoting dual use of condoms and hormonal contraception. Pregnancy may provide a critical "window of opportunity" for sexual risk reduction.

Keywords: Teen mothers; Pregnant teens; Sexual risk behavior; STD; Repeat pregnancy; Review; USA

Introduction

Pregnant/mothering teens are at exceptionally high risk for sexually transmitted diseases (STDs) and subsequent pregnancy within 2 years of first delivery (repeat pregnancy). The behavior that led to initial pregnancy, unprotected intercourse, is also the major risk factor for STDs and repeat pregnancy. Teen mothers tend to remain sexually active and practice inconsistent protection (Coley & Chase-Landsdale, 1998). Despite increased risk for STDs and repeat pregnancy, our understanding of sexual risk in pregnant/mothering teens lags far behind the large body of research on adolescents in general.

The high rate of teen pregnancy in the United States is a significant public health concern. Nearly one million teens become pregnant each year, and more than 480,000 young women carry their pregnancies to term (Henshaw, 2003). Teen pregnancy has adverse consequences for mother and child. For example, pregnant teens are more likely than older women to receive late or no prenatal care, have gestational hypertension and anemia, and achieve poor maternal weight gain (Scholl, Hediger, & Belsky, 1994). They are more likely to have a pre-term delivery and low birth weight, increasing the risk of child developmental delay, illness, and mortality (Chandra, Schiavello, Ravi, Weinstein, & Hook, 2002). Long-term consequences of teen motherhood include

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lower educational attainment, lower levels of employment and income, and higher rates of marital instability and likelihood of single parenthood compared to older mothers (Coley & Chase-Lansdale, 1998). With each additional birth, the likelihood of inadequate prenatal care, premature birth, low birth weight, school discontinuation, unemployment, and welfare dependence increases (Akinbami, Schoendorf, & Kiely, 2000).

The rate of STDs among young women is high. Approximately three million teens become infected with an STD each year, and females aged 15–19 years have the highest rate of STDs compared to other age and gender groups (Berman & Hein, 1999). Moreover, nearly two-thirds of new HIV infections in teens are among females (CDC, 2003). Biological factors converge with sexual risk behaviors to increase young women's vulnerability to STDs. STD/HIV is more easily transmitted sexually from men to women than vice versa (Anderson, 1999). Teenage women are at heightened risk due to the immature anatomical development of their cervix, and pregnant teens are at greater risk due to cervical changes occurring in pregnancy (Watts & Brunham, 1999).

STDs among women are associated with significant morbidity and mortality, including increased risk of cervical cancer, pelvic inflammatory disease, involuntary infertility, and premature death (Berman & Hein, 1999). Pregnant women with STDs have higher rates of ectopic pregnancy, spontaneous abortion, low birth weight, premature delivery, and stillbirth compared to women without STDs (Watts & Brunham, 1999). Some STDs can be transmitted perinatally from mother to infant, leading to life-threatening congenital infections and mortality.

When used correctly and consistently, condoms are effective in reducing the spread of STDs, but they are less effective than hormonal contraceptives in preventing pregnancy. Consistent use of hormonal contraceptives, including oral contraceptives, Depo Provera injections, and Norplant implants, are effective in preventing pregnancy but provide no protection from STDs. This dilemma highlights the need for dual protection with condoms and hormonal contraception among sexually active teens (Bearinger & Resnick, 2003).

To develop effective prevention programs to reduce both STDs and repeat pregnancy among pregnant/mothering teens, it is essential to identify correlates of sexual risk behavior. Previous publications have reviewed predictors of sexual risk behavior and first-time pregnancy among adolescents (e.g., Coley & Chase-Lansdale, 1998; Corcoran, 1999; Kotchick, Shaffer, Forehand, & Miller, 2001), though research on HIV/STD and pregnancy prevention has generally been divergent (Bearinger & Resnick, 2003). Only two reviews examined risk factors for repeat pregnancy among young mothers (Nelson, 1990; Rigsby, Macones, & Driscoll, 1998), and none has examined sexual risk among pregnant/mothering teens more broadly, including STDs and unprotected sex. Thus, the current paper expands the literature by providing a systematic review of sexual risk behavior in this population. The primary objectives are to: (1) document rates of STDs, repeat pregnancy, condom use, and contraception among pregnant/mothering teens; (2) identify correlates of these biological and behavioral outcomes; (3) review existing risk reduction interventions; and (4) discuss directions for future research and implications for clinical care. The review focused on American teens because the United States has the highest rate of teen pregnancy among industrialized countries (Alan Guttmacher Institute, 2002), and factors related to sexual risk behavior may differ domestically versus internationally.

Method

Review procedure

PsychINFO and MEDLINE, two online databases in the social and health sciences, were searched for English publications since 1981, the first year AIDS cases were documented in the United States. Variations of the following terms were used in the search: *adolescent*, *teenage*, *pregnancy*, *motherhood*, *sexual behavior*, *sexual risk*, *STDs*, *HIV*, *repeat pregnancy*, *condoms*, *contraception*, and *maternal outcomes*. Additionally, articles were obtained through bibliographic review of acquired articles. Literature reviews, book chapters, and dissertations were excluded because they were either non-empirical or not peer-reviewed.

Inclusion criteria

Inclusion criteria were: (1) study sample of mothering and/or pregnant teens intending to keep their baby; (2) target age $\leqslant$19 years (samples with young women $\leqslant$22 years included if majority teen); (3) outcomes: (a) STDs, (b) repeat pregnancy, (c) condom use, and/or (d) contraception; and (4) to ensure a "best evidence synthesis" (Slavin, 1986), three methodological criteria had to be met: (a) minimum sample size of 50; (b) if longitudinal, retention rate of $\geqslant$70%; and (c) control/comparison group. When several studies from the same research were published, only the most recent and/or those presenting unique findings were included.

Results

Overview of studies

Fifty-one empirical papers met inclusion criteria. Characteristics of reviewed studies are presented in Table 1. Forty-two studies (82%) were descriptive; only nine assessed the effectiveness of an intervention. Among descriptive studies, 40% were longitudinal and only 11% included a comparison group. Most studies were comprised of multi-ethnic or Black samples (82%) and recruited participants from urban clinics (69%). Only 18% utilized biological testing to confirm STDs or pregnancy. Results are reported based on outcome: STDs ($n=19$), repeat pregnancy ($n=22$), condom use ($n=10$), and contraceptive use ($n=22$). An individual study could be included in more than one category if it examined multiple outcomes.

Rates of sexual risk

STDs

Table 2 describes 19 papers that examined rates of STDs before, during, and/or after pregnancy. Across seven independent samples, 10–51% of pregnant/mothering teens reported a *history of STDs* prior to their index pregnancy, with a weighted mean of 23.8% (95% CI = 21.6%, 26.0%).

Ten studies reported rates of *STDs during pregnancy*. While differences in assessment protocol (e.g., number of STDs, timing, data collection) made it difficult to compare results across all studies, a weighted mean was calculated using cumulative rates across pregnancy or point prevalence rates. Across six studies that used biological measures, 19–39% of pregnant teens tested positive for chlamydia, trichomoniasis, and/or gonnorhea (weighted $M=28.8\%$, 95% CI = 26.2%, 31.4%), and 8–19% became infected or re-infected during pregnancy. A seventh study tested pregnant teens for HSV-2, and found prevalence of 21%. Three retrospective studies used medical records, documenting STD rates during teen pregnancy of 10–21% (weighted $M=10.8\%$, 95% CI = 10.6%, 11.0%). These results likely represent a conservative estimate, as most studies did not assess cumulative rates of STDs across pregnancy and were limited in the number of STDs assessed.

In two studies examining *postpartum STDs*, 14–39% of teen mothers were diagnosed with an STD within 6–10 months following delivery. One study found that teen mothers were nearly twice as likely to have an STD compared to nulliparous peers (Ickovics, Niccolai, Lewis, Kershaw, & Ethier, 2003).

Repeat pregnancy

Table 3 describes 22 studies that assessed repeat pregnancy/birth. Sixteen studies documented rates of *repeat pregnancy*. Among teen mothers, 12–44% had a repeat pregnancy within 12 months (weighted $M=19.0\%$, 95% CI = 17.6%, 20.4%), and 28–63% within 18 months (weighted $M=39.2\%$, 95% CI = 36.5%, 41.9%). In three studies of teen mothers who initiated hormonal contraception immediately following delivery, 24–26% of oral contraceptive users and 3–12% of Depo Provera users became pregnant within 12–15 months postpartum, and 12% of Norplant initiators became pregnant within 24 months. Four studies found 20–37% of teen mothers had a *repeat birth* within 24 months (weighted $M=24.8\%$, 95% CI = 23.5%, 26.1%).

Condom use

Table 4 describes 10 studies that assessed condom use. Across seven studies examining *condom use during pregnancy*, 78–88% of teens engaged in at least some sex without condoms, and over one-third *never* used condoms. Participants reported a mean of 5.7–6.5 unprotected sex episodes per month. Pregnant teens were approximately five times less likely to use condoms compared to non-pregnant teens (Crosby, et al., 2002a; Niccolai, Ethier, Kershaw, Lewis, & Ickovics, 2003) and teen mothers who were not currently pregnant (Koniak-Griffin & Brecht, 1995; Koniak-Griffin, Lesser, Uman, & Nyamathi, 2003b). Across five studies examining *postpartum condom use*, 32–63% of teen mothers never or infrequently used condoms. Because measures and assessment intervals varied greatly across studies, it was not possible to aggregate findings.

Contraceptive use

Table 5 describes 22 studies that assessed contraceptive use. Across eight studies reporting *history of contraception*, 31–66% of pregnant/mothering teens never used any contraception prior to current pregnancy, and 73–89% reported no contraception at conception. As expected, pregnant teens were less likely to have used contraception in the year prior to pregnancy compared to non-pregnant teens. Across nine studies examining *postpartum contraception*, 13–52% of teen mothers never or inconsistently used hormonal contraception, and 8–32% used no contraception of any type. In two of these studies, only 16–35% of teen mothers reported *dual protection* of hormonal contraception and condoms (Kershaw et al., 2003; Mapanga & Andrews, 1995). Two additional studies found that less than half of teens initiating postpartum hormonal contraception used condoms (Polaneczky, Slap, Forke, Rappaport, & Sondheimer, 1994; Templeman, Cook, Goldsmith, Powell, &

Table 1
General characteristics of reviewed studies ($N = 51$)

	Number of studies
Study design	
Descriptive	42 (82%)
Longitudinal	17 (40%)
Comparison group	5 (11%)
Intervention	9 (18%)
Follow-up period (months; longitudinal and intervention studies only)	
6	2 (8%)
12	12 (46%)
18	3 (12%)
⩾24	9 (35%)
Sample size	
50–99	7 (14%)
100–149	13 (25%)
150–199	6 (12%)
⩾200+	25 (49%)
Ethnic/racial distribution of participants	
⩾60% Black	19 (37%)
⩾60% Hispanic	7 (14%)
⩾60% White	1 (2%)
Mixed	23 (45%)
Unspecified	1 (2%)
Upper age limit of participants	
16	1 (2%)
17	11 (22%)
18	10 (20%)
19	17 (33%)
20–22	11 (22%)
Unspecified	1 (2%)
Percent unmarried	
100%	16 (31%)
⩾60% or "most"	23 (45%)
Unspecified	12 (24%)
Recruitment sites	
Clinics	35 (69%)
Specialized programs	3 (6%)
Schools	2 (4%)
Clinics, specialized programs, and/or schools	4 (8%)
National surveys	3 (6%)
Community	3 (6%)
Data collection	
Self-report	30 (59%)
Medical records	7 (14%)
Self-report and medical records	5 (10%)
Self-report and biological tests	9 (18%)
Study outcomes	
STD	19 (37%)
Repeat pregnancy	22 (43%)
Condom use	10 (20%)
Contraception	22 (43%)

Hertweck, 2000). Differences in measurement and assessment intervals likely explain the large prevalence ranges and made it impossible to compute weighted means.

Five studies examined *discontinuation of hormonal contraception* initiated postpartum. For oral contraceptives, discontinuation rates were 48–66% within 6 months and 68–73% within 12 months; for Depo Provera, they were 26–42% and 37–66%, respectively. For Norplant, less than 10% had the implant removed within 12 months.

Correlates of sexual risk

Across reviewed studies, 29 (56%) reported correlates of sexual risk. Tables 2–5 present significant findings across each outcome. All variables examined in the studies are presented without censor. Bronfenbrenner's (1989) Ecological Systems Theory was used to organize findings. This theory asserts that behavior is influenced by multiple factors within different domains—individual, dyadic, family, social relationships, community—that interact reciprocally to influence behavior longitudinally. Fig. 1 depicts an adapted Ecological Systems Model of Sexual risk, illustrating the multiple domains of influence on sexual risk among pregnant/mothering teens.

Individual

Age: Studies yielded contradictory results for age as a risk factor for STDs (Chang, O'Brien, Nathanson, Mancini, & Witter, 2003; Crosby, DiClemente, Wingood, & Rose, 2003b; Ickovics et al., 2003; Ismail, Chandler, Beem, & Moawad, 1985), repeat pregnancy (Coard, Nitz, & Felice, 2000; Gillmore, Lewis, Lohr, Spencer, & White, 1997; Koenig & Zelnik, 1982; Polit & Kahn, 1986; Stevens-Simon, Kelly, & Singer, 1996), condom use (Koniak-Griffin et al., 2003b), and contraception (O'Dell, Forke, Polaneczky, Sondheimer, & Slap, 1998; Polaneczky et al., 1994). However, studies examining repeat *birth* found a consistent age by ethnicity effect: Younger age was predictive for Black and Hispanic teens, but not for Whites (Ford, 1983; Kalmuss & Namerow, 1994; Mott, 1986).

Education: School dropout and lower educational attainment were consistently associated with repeat pregnancy (Kalmuss & Namerow, 1994; Linares, Leadbeater, Jaffe, Kato, & Diaz, 1992; Polit & Kahn, 1986; Stevens-Simon et al. 1996; Stevens-Simon, Dolgan, Kelly, & Singer, 1997), postpartum contraceptive use (Berenson & Wiemann, 1997), and condom use (Crosby et al., 2003a), with one exception (Coard et al., 2000). Education was unrelated to STDs (Crosby et al., 2003b; Ickovics et al., 2003) and postpartum Norplant (Stevens-Simon, Kelly, & Singer, 1999).

Table 2
Studies examining STDs among pregnant/mothering teens ($n = 19$)

Study	Sample	Recruitment site	Design	Data collection[a]	Results: rates and correlates of STDs (UV = univariate, MV = multivariate)
Pre-pregnancy ($n = 7$): *lifetime, any STD*					
Berger et al. (1993)	87 pregnant teens; 14–19 yrs; 100% Hispanic.	Prenatal clinic	Cross-sectional	Self-report	26%. *UV*: ⩾2 lifetime sex partners.
Brown et al. (1998)	58 teen moms; 13–19 yrs; 40% primiparous; 55% Hispanic, 17% Black, 15% White.	Teen-tot clinic	Cross-sectional	Self-report	14%.
Crosby et al. (2002b)	170 pregnant teens; 14–20 yrs; 100% Black.	Prenatal clinic	Cross-sectional	Self-report	51%. *UV*: low perceived family support, not residing with family, infrequent mother–daughter communication about STD/AIDS.
Gillmore, Butler, Lohr, and Gilchrist (1992)	241 pregnant teens; 12–17 yrs; 51% White, 32% Black.	Prenatal clinics, schools, social service agencies	Cross-sectional	Self-report	39%.
Ickovics et al. (2003)	411 sexually active, nulliparous teens; 49% pregnant; 14–19 yrs; 44% Black, 42% Hispanic.	Clinics	Longitudinal, baseline only	Self-report	32%.
Koniak-Griffin et al. (2003b)	572 pregnant/mothering teens; 14–20 yrs; 77% Hispanic.	Maternity programs	Cross-sectional	Self-report	10%.
Koniak-Griffin and Brecht (1995)	151 pregnant/mothering teens; 12–20 yrs; 64% Hispanic.	Teem moms programs	Cross-sectional	Self-report	13%.
Pregnancy ($n = 10$)					
Begley et al. (2003)	169 pregnant teens; 14–20 yrs; 69% primiparous; 100% Black.	Prenatal clinic	Cross-sectional	Urine	*First prenatal visit*: chlamydia: 13%, trichomoniasis: 9%, any: 22%. *UV of chlamydia*: older partner.
Chang et al. (2003)	1120 teen moms; 12–17 yrs; 83% nulliparous; 100% Black.	Maternity clinic	Retrospective	Medical records	*Cumulative*: chlamydia: 21%, trichomoniasis: 11%, gonorrhea: 7%, syphilis: 0.7% *UV* of gonorrhea: older age.
Chokephaibulkit et al. (1997)	596 pregnant teens; 13–18 yrs; 58% White, 41% Black.	Prenatal clinic	Retrospective	Medical records	*Cumulative*: chlamydia: 11%. *MV of chlamydia* (67 cases vs. 56 uninfected controls): Black ethnicity, later entry into prenatal care.
Crosby et al. (2002a)	278 sexually active teens; 14–18 yrs; 10% pregnant at 12–mths; 100% Black.	Clinics, schools	Prospective	Urine	*Third trimester*: chlamydia: 15%, trichomoniasis: 8%, gonnorhea: 7%, any: 31%.
Crosby et al. (2003b)	127 pregnant teens; $M = 18$ yrs; 67% nulliparous; 100% Black.	Prenatal clinic	Cross-sectional	Blood	*First prenatal visit*: HSV-2: 21%. *UV of HSV-2*: older age, prior STD.

Table 2 (*continued*)

Study	Sample	Recruitment site	Design	Data collection[a]	Results: rates and correlates of STDs (UV = univariate, MV = multivariate)
Eure, Lindsay and Graves (2002)	14,718 pregnant teens; 11–19 yrs; 82% Black.	Hospital	Retrospective	Medical records	*Cumulative*: any: 10%.
Hardy et al. (1984)	115 pregnant teens; 13–17 yrs; 93% Black.	Teen-tot clinic	Cross-sectional	Culture	*Third trimester*: chlamydia: 37%, trichomoniasis: 34%, gonnorhea: 1%.
Ismail et al. (1985)	201 pregnant teens; 13–18 yrs; most Black.	Teen maternity clinic	Cross-sectional	Culture	*Third trimester*: chlamydia: 22%, gonnorhea: 8%. *UV of chlamydia*: gonnorhea.
Niccolai et al. (2003)	411 sexually active, nulliparous teens; 49% pregnant; 14–19 yrs; 44% Black, 42% Hispanic.	Clinics	Cross-sectional	Urine	*Third trimester*: chlamydia: 7.5%, gonnorhea: 1.5%, any: 8%.
				Health Depart. records	*Cumulative*: chlamydia: 18%, gonnorhea: 13%, any: 19%.
Oh et al. (1993)	267 pregnant teens; ⩽17 yrs; 100% nulliparous; 73% Black.	Prenatal Clinic	Longitudinal	Culture, Blood tests	*First prenatal visit*: chlamydia: 19%, trichomoniasis: 10%, gonnorhea: 9%, 1% syphilis: 1%, any: 28%. *Third trimester*: chlamydia: 8%, trichomoniasis: 11%, gonnorhea: 3%, syphilis: 0%, any: 19%. *Cumulative*: chlamydia: 24%, trichomoniasis: 15%, gonnorhea: 10%, syphilis: 1%, any: 39%. *UV of chlamydia*: Black race, another STD.
Postpartum ($n=2$)					
Ickovics et al. (2003)	411 sexually active, nulliparous teens; 49% pregnant; 14–19 yrs; 44% Black, 42% Hispanic.	Clinics	Longitudinal	Urine	*4-mths*: chlamydia and/or gonnorhea: 7%. *10-mths*: chlamydia and/or gonnorhea: 14%. *MV*: new partner, more lifetime partners.
Polaneczky et al. (1994)	98 teen moms who initiated hormonal contraception; ⩽17 yrs; "most" Black.	Family planning clinic	Longitudinal	Medical records	*6-mths*: chlamydia: 15%, trichomoniasis: 10%, gonnorhea: 18%, syphilis: 3%, any: 39%.

[a] Studies using biological tests (urine, culture, blood) systematically assessed all participants; those relying on self-report or medical records did not.

Table 3
Studies of repeat pregnancy among teen mothers ($n = 22$)

Study	Sample	Recruitment site	Design	Data collection	Results: rates and correlates of repeat pregnancy/birth (UV = univariate, MV = multivariate)
Repeat pregnancy ($n = 16$)					
Agurcia et al. (2001)	496 teen moms; ⩽18 yrs; 38% Hispanic, 30% White, 32% Black.	Hospital	Longitudinal	Self-report	*12 mths*: 18%.
Ford (1983)	483 teen moms; 14–19 yrs; mostly Black and White.	National survey	Longitudinal	Self-report	*12 mths*: 17%. *UV*: age (younger for Blacks, older for Whites), poverty, marriage before first pregnancy.
Gillmore et al. (1997)	170 pregnant, nulliparous teens; ⩽17 yrs; 49% White, 29% Black.	Prenatal clinics, alternative schools, social service agencies	Longitudinal	Self-report	*6 mths*: 9%. *12 mths*: 28%. *18 mths*: 44%. *MV*: no contraception, frequent intercourse, school expulsion/suspension, substance use, fighting, not residing with parents, long-term boyfriend, younger age at first birth, best friend pregnant.
Havens et al. (1998)	110 unmarried, primiparous teen mothers; 12–19 yrs; 91% Black.	Intervention (no effect)	Longitudinal	Self-report, medical records	*33 mths*: 68%.
Jacoby et al. (1999)	100 pregnant teens; 13–21 yrs; 60% White, 35% Black.	Prenatal clinic	Retrospective	Medical records	*12 mths*: 44%. *18 mths*: 63%. *UV*: current physical/sexual abuse.
Knafl (1998)	88 unmarried, primiparous teen mothers; age, ethnicity unspecified.	Intervention	Longitudinal	Self-report	*24 mths*: 9% intervention vs. 38% control ($p = 0.006$).
Koenig and Zelnick (1982)	320 teen moms; 15–19 yrs; 59% Black, 41% White.	National survey	Longitudinal	Self-report	*6 mths*: 7%. *12 mths*: 21%. *18 mths*: 30%. *24 mths*: 38%.
Koniak-Griffin et al. (2002)	144 nulliparous, pregnant teens; 14–19 yrs; 64% Hispanic.	Intervention (no effect)	Longitudinal	Self-report	*12 mths*: 17%.
Linares et al. (1992)	120 teen moms; ⩽19 yrs; 52% Black, 44% Hispanic.	Clinic	Longitudinal	Self-report	*12 mths*: 39%. *MV*: delayed grade placement.
Lourie, et al. (1998)	58 teens moms; 13–19 yrs; 50% Hispanic, 25% White, 17% Black.	Teen-tot clinic	Cross-sectional	Self-report	*18 mths*: 50%.
Nelson et al. (1982)	105 teen moms; ⩽16 yrs; 91% Black.	Intervention	Retrospective	Medical records	*18 mths*: 23% teen-tot clinic vs. 41% traditional care ($p < 0.05$).
O'Sullivan and Jacobsen (1992)	221 primiparous teen moms; ⩽17 yrs; 100% Black.	Intervention	Longitudinal	Self-report	*18-mths*: 12% intervention vs. 28% control ($p = 0.003$).
Polit and Kahn (1986)	789 pregnant/mothering teens; ⩽17 yrs; 96% primiparous; 46% Black, 42% Hispanic.	Intervention (no effect)	Longitudinal	Self-report	*12-mths*: 13%. *24-mths*: 37%. *MV*: school dropout.
Rubin and East (1999)	208 pregnant teens; 14–19 yrs; "most" nulliparous; 42% Hispanic, 31% Black, 19% White.	Prenatal clinic	Longitudinal	Self-report, medical records	*18 mths*: 40%.
Stevens-Simon et al. (1996)	200 pregnant teens; 13–18 yrs; 80%	Adolescent	Longitudinal	Self-report	

Table 3 (*continued*)

Study	Sample	Recruitment site	Design	Data collection	Results: rates and correlates of repeat pregnancy/birth (UV = univariate, MV = multivariate)
	nulliparous; 45% White, 30% Black, 24% Hispanic.	maternity program			*12 mths*: 12%. *MV*: school dropout, Norplant refusal, previous miscarriage.
Stevens-Simon et al. (1997)	286 primiparous teens; ⩽18 yrs; 44% White, 25% Black, 29% Hispanic.	Intervention (no effect)	Longitudinal	Pregnancy tests	*12 mths*: 20%. *18 mths*: 29%. *24 mths*: 39%. *UV*: non-White ethnicity, school dropout, lower educational attainment, older boyfriend, ⩾5 psychosocial risk factors.
Repeat pregnancy among hormonal contraception initiators ($n=3$)					
O'Dell (1998)	161 teen moms; ⩽19 yrs; 73% primiparous; 100% Black.	Family planning clinic	Longitudinal	Medical records	*15 mths*: 12% Depo users vs. 26% OC users ($p=0.02$).
Stevens-Simon (1999)	309 primiparous teen moms; 13–18 yrs; 50% White, 27% Black, 22% Hispanic.	Adolescent maternity program	Longitudinal	Self-report	*24 mths*: 12% Norplant users vs. 46% Norplant refusers ($p<0.0001$).
Templeman et al. (2000)	172 teen moms ⩽17 yrs; most nulliparous; 48% Black, 52% White.	Family planning clinic	Longitudinal	Self-report, medical records	*12 mths*: 24% OC users vs. 3% Depo users.
Repeat birth ($n=4$)					
Kalmuss and Namerow (1994)	1452 teen moms; 14–19 yrs.	National survey	Longitudinal	Self-report	*24 mths*: 24%. *MV*: poverty for Whites, non-White ethnicity, wanted first baby, lower educational attainment, marriage after first birth, ⩾1 parent school dropout.
Mott (1986)	1448 teen moms; 14–21 yrs; 48% White, 39% Black, 16% Hispanic.	National survey	Longitudinal	Self-report	*24 mths*: 22%. *MV*: first birth ⩽16 yrs (Blacks only), mother school dropout, married at first birth, wanted first baby.
Polit (1986)	789 pregnant/mothering teens; ⩽17 yrs; 96% primiparous; 46% Black, 42% Hispanic.	Intervention (no effect)	Longitudinal	Self-report	24-mths: 28%.
Stevens-Simon (1997)	286 primiparous teens; ⩽18 yrs; 44% White, 25% Black, 29% Hispanic.	Intervention (no effect)	Longitudinal	Pregnancy tests	24 mths: 34%.
Correlates only ($n=1$)					
Coard et al. (2000)	80 primiparous teen moms; 13–17 yrs; 93% Black.	Teen-tot clinic	Longitudinal	Medical records	*UV*: contraceptive method (condom > OC > Depo/Norplant), no/inconsistent contraception, older age, previous miscarriage.

Table 4
Studies of condom use among pregnant/mothering teens ($n = 10$)

Study	Sample	Recruitment site	Design	Timing of assessment	Assessment interval	Results: rates and correlates of condom use (UV = univariate, MV = multivariate)
Pregnancy ($n = 7$)						
Begley et al. (2003)	169 pregnant teens; 14–20 yrs; 69% primiparous; 100% Black.	Prenatal clinic	Cross-sectional	First prenatal visit	30 days	$M = 5.9$ unprotected sex episodes. *UV*: older partner.
Crosby et al. (2002a)	278 sexually active teen; 10% pregnant at 12-mth follow-up; 14–18 yrs; 100% Black.	Clinics and schools	Prospective	Third trimester	6 mths	82% any unprotected sex.
Crosby et al. (2003a)	144 pregnant teens; 14–20 yrs; 69% nulliparous; 100% Black.	Prenatal clinic	Cross-sectional	First trimester	30 days	$M = 6.5$ unprotected sex episodes. *MV*: not residing with $\geqslant 1$ parent, spending $\geqslant 30$ hrs with boyfriend, less sexual communication.
Kershaw et al. (2003)	411 nulliparous teens; 49% pregnant; 14–19 yrs; 46% Black, 41% Hispanic.	Clinics	Longitudinal	Third trimester	6 mths	39% never used condom.
Koniak-Griffin et al. (2003b)	572 pregnant/mothering teen; 14–20 yrs; 77% Hispanic.	Teen mom programs	Cross-sectional	Pregnancy/ postpartum, variable	3 mths, last intercourse	$M = 17$ unprotected sex episodes; 82% no condom at last intercourse. *MV*: less condom use intentions, current pregnancy, steady partner, frequent Church attendance, previous anal sex.
Koniak-Griffin and Brecht (1995)	151 pregnant/mothering teens; 12–20 yrs; 64% Hispanic.	Teen mom programs	Cross-sectional	Pregnancy, variable	Last intercourse	78% no condom at last intercourse.
Niccolai et al. (2003)	411 sexually active, nulliparous teens; 49% pregnant; 14–19 yrs; 44% Black, 42% Hispanic.	Clinics	Cross-sectional	Third trimester	30 days	88% any unprotected sex.
Postpartum ($n = 5$)						
Agurcia et al. (2001)	496 teen moms; $\leqslant 18$ yrs, 38% Hispanic, 30% White, 32% Black.	Hospital	Longitudinal	12-mths postpartum	6 mths	63% inconsistent condom use. *UV*: older partner.
Brown et al. (1998)	58 teen moms; 13–19 yrs; 40% primiparous; 55% Hispanic, 17% Black, 15% White.	Teen-tot clinic	Cross-sectional	Postpartum, variable	Unspecified	47% inconsistent condom use. *UV*: less HIV anxiety, less HIV prevention intentions, self-cutting.
Kershaw et al. (2003)	411 primiparous and nulliparous teen; 14–19 yrs; 46% Black, 41% Hispanic.	Clinics	Longitudinal	4- and 10-mths postpartum	6 mths	*Early postpartum*: 38% never. *Late postpartum*: 32% never.
Koniak-Griffin and Brecht, (1995)	151 pregnant/mothering teens; 12–20 yrs; 64% Hispanic.	Teen mom programs	Cross-sectional	Pregnancy/ postpartum, variable	Last intercourse	57% no condom at last intercourse.
Mapanga and Andrews (1995)	75 primiparous teen moms; 12–18 yrs; 97% Black.	Pediatric clinic	Cross-sectional	Postpartum, variable	Unspecified	44% never used condom.

Table 5
Studies of contraceptive use among teen mothers ($n=22$)

Study	Sample	Recruitment site	Design	Assessment interval	Results: rates and correlates of contraceptive use (UV = univariate, MV = multivariate)
Pre-pregnancy ($n=8$)					
Berger et al. (1993)	87 pregnant teens; 14–19 yrs; 100% Hispanic.	Prenatal clinic	Cross-sectional	Lifetime	66% never.
Gillmore et al. (1992)	241 pregnant teens; 12–17 yrs; 51% White, 32% Black.	Prenatal clinics, alternative schools, social service agencies	Cross-sectional	At conception	73% none. Among contraceptive users, 66% inconsistent.
Havens et al. (1998)	110 unmarried, primiparous teen moms; 12–19 yrs; 91% Black.	Intervention (no effect)	Longitudinal	Lifetime	29% at first intercourse; 41% never.
Holden, Nelson, Velasques, and Ritchie (1993)	128 pregnant and non-pregnant teens; 14–19 yrs; 54% Black, 18% White, 15% Hispanic.	Schools	Cross-sectional	12 mths	70% inconsistent.
Polit and Kahn (1986)	675 pregnant/mothering teens; $\leqslant$17 yrs; 96% primiparous; 46% Black, 42% Hispanic.	Demonstration project	Longitudinal	Lifetime	56% never.
Smith, Weinman, and Mumford (1982)	104 nulliparous pregnant teens; 13–18 yrs; 71% Black.	Prenatal clinic	Cross-sectional	Unspecified	89% none.
Stevens-Simon et al. (1999)	309 teen moms; 13–18 yrs; 84% primiparous; 50% White, 27% Black, 22% Hispanic.	Adolescent maternity program	Longitudinal	Lifetime	31% never.
Templeman et al. (2000)	122 teen moms; $\leqslant$17 yrs; most primiparous; 48% Black, 52% White.	Family planning clinic	Longitudinal	At conception	86% none.
Postpartum ($n=9$)					
Agurcia et al. (2001)	496 teen moms; $\leqslant$18 yrs; 38% Hispanic, 30% White, 32% Black.	Hospital	Longitudinal	Last intercourse	8% none.
Berenson and Weinmann (1997)	359 teen moms; $\leqslant$18 yrs; 78% primiparous; 35% Hispanic, 34% White, 31% Black.	Family planning clinic	Longitudinal	Last intercourse	24% none. *MV*: school dropout, failed grade, low social support, previous abortion, non-adherent to postpartum visits, low belief in efficacy of contraception, desiring another child, depression.
Brown et al. (1998)	58 teen moms; 13–19 yrs; 40% primiparous; 55% Hispanic, 17% Black, 15% White.	Teen-tot clinic	Cross-sectional	Unspecified	30% none/inconsistent (hormonal).
Ford (1983)	483 teen moms; $\leqslant$19 yrs; mostly Black and White.	National survey	Longitudinal	12 mths	18% none. *UV*: poverty, remaining unmarried, Black ethnicity (among teens $\leqslant$17 yrs).
Kershaw et al. (2003)	411 primiparous and nulliparous teens; 14–19 yrs; 46% Black, 41% Hispanic.	Community health clinics	Longitudinal	6 mths	*Early postpartum*: 13% none (hormonal); 23% consistent dual use.

Table 5 (*continued*)

Study	Sample	Recruitment site	Design	Assessment interval	Results: rates and correlates of contraceptive use (UV = univariate, MV = multivariate)
					Late postpartum: 70% none (hormonal); 16% consistent dual use.
Koenig and Zelnik (1982)	278 teen moms; 15–19 yrs; 59% Black, 41% White.	National survey	Longitudinal	Unspecified	15% none.
Linares (1992)	111 teen moms; ⩽19 yrs; 52% Black, 44% Hispanic.	Clinics	Longitudinal	12 mths	32% none (hormonal, condom).
Mapanga and Andrews (1995)	75 primiparous teen moms; 12–18 yrs; 97% Black.	Pediatric clinic	Cross-sectional	Unspecified	15% none, 38% inconsistent; 38% dual use.
Nelson et al. (1982)	105 teen moms; ⩽16 yrs; 91% Black.	Intervention	Retrospective	Unspecified	6 mths: 8% in teen-tot clinic vs. 37% in traditional care "not using" ($p<0.05$).
Postpartum discontinuation ($n=5$)					
Berenson and Weinmann (1997)	359 teen moms; ⩽18 yrs; 78% primiparous; 35% Hispanic, 34% White, 31% Black.	Family planning clinic	Longitudinal	N/a	26% for Depo, 48% for OC.
O'Dell et al. (1998)	117 teens moms; ⩽19 yrs; 73% primiparous; 100% Black.	Family planning clinic	Longitudinal	N/a	6-mths: 42% for Depo, 55% for OC. 12-mths: 66% for Depo, 68% for OC.
Omar, Fowler and D'Angelo (2002)	299 teen moms; 78% primiparous; 51% White, 47% Black.	Teen-tot clinic	Longitudinal	N/a	12-mths: 37% for Depo. 24-mths: 67% for Depo.
Polaneczky et al. (1994)	98 teen moms; ⩽17 yrs; most Black.	Family planning clinic	Longitudinal	N/a	5% for Norplant, 66% for OC.
Templeman et al. (2000)	122 teen moms; ⩽17 yrs at delivery; most primiparous; 48% Black, 52% White.	Family planning clinic	Longitudinal	N/a	6 mths: 29% for Depo, 44% for OC. 12 mths: 45% for Depo, 73% for OC.
Hormonal contraceptive choice ($n=4$)					
Mears et al. (1997)	151 teen moms receiving intensive contraceptive counseling; 12–20 yrs; 30% primiparous; 57% Black, 43% Hispanic.	Family planning clinic	Cross-sectional	N/a	*MV of Norplant*: more discussions with parents about contraception, ⩾2 living children, Medicaid dependence.
O'Dell et al. (1998)	117 teens moms; ⩽19 yrs; 73% primiparous; 100% Black.	Family planning clinic	Longitudinal	N/a	*UV of Depo*: younger age first birth, multiparity, previous negative experience with other methods.
Polaneczky et al. (1994)	98 teen moms; ⩽17 yrs; most Black.	Family planning clinic	Longitudinal	N/a	*MV of Norplant*: multiparity, previous OC use.
Stevens-Simon et al. (1999)	309 teen moms; 13–18 yrs; 84% primiparous; 50% White, 27% Black, 22% Hispanic.	Adolescent maternity program	Longitudinal	N/a	*UV of Norplant*: previous birth, previous problems with other contraception, desire >2 yrs before next baby.

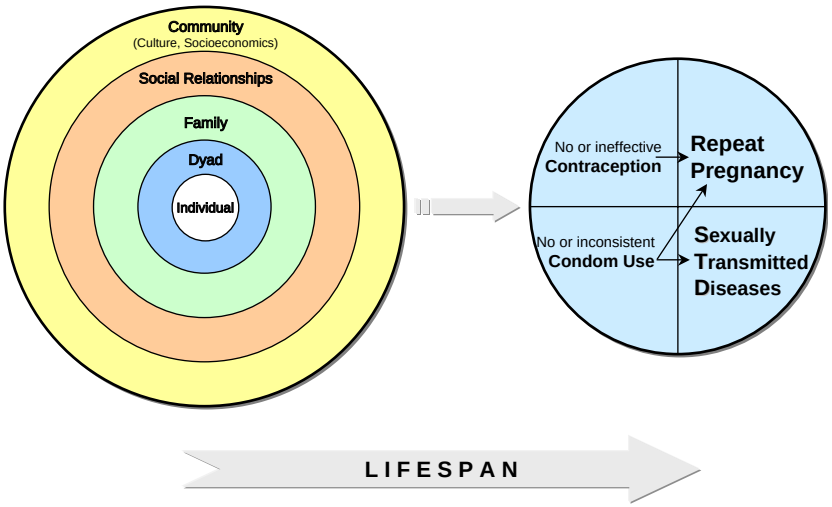

Fig. 1. Ecological model of sexual risk among pregnant/mothering teens.

Sexual history: Previous STD was predictive of HSV-2 infection (Crosby et al., 2003b), but not other STDs (Ickovics et al., 2003) or condom use (Crosby, DiClemente, Wingood, Rose, & Lang, 2003a). Current STD was associated with concurrent chlamydia infection (Ismail et al., 1985; Oh et al., 1993). Having a new sex partner was associated with postpartum STDs (Ickovics et al., 2003), but the effect of multiple lifetime partners on STDs and condom use was equivocal (Berger, Rivera, Perez, & Fierman, 1993; Ickovics et al., 2003; Koniak-Griffin et al., 2003b; Oh et al., 1993). Age of sexual initiation, age at first birth, previous pregnancy or birth, and hormonal contraception were unrelated to STDs and condom use (Brown, Lourie, Flanagan, & High, 1998; Chokephaibulkit, Patamasucon, List, Moore, & Rodriguez, 1997; Crosby et al., 2003a, b; Ickovics et al., 2003; Ismail et al., 1985; Koniak-Griffin et al., 2003b; Oh et al., 1993).

Frequent sexual intercourse and inconsistent contraception were predictive of repeat pregnancy (Coard et al., 2000; Gillmore et al., 1997). Teens who chose Norplant were least likely to have a repeat pregnancy (Coard et al., 2000; Polaneczky et al., 1994; Stevens-Simon et al., 1999). Previous *birth*, but not previous *pregnancy*, was consistently associated with choosing a long-acting contraceptive (Mears, Hediger, Martin, Scholl, & Kramer, 1997; O'Dell et al., 1998; Polaneczky et al., 1994; Stevens-Simon et al., 1999). Previous miscarriage was associated with repeat pregnancy (Coard et al., 2000; Linares et al., 1992; Polit & Kahn, 1986; Stevens-Simon et al., 1996), and previous abortion with inconsistent contraceptive use (Berenson & Wiemann, 1997).

Attitudes: Less condom use intentions and less concern about HIV were associated with less condom use; HIV and condom use knowledge, condom attitudes, perceived barriers to condom use, and self-efficacy for condom negotiation were not (Brown et al., 1998; Koniak-Griffin et al., 2003b; Crosby et al., 2003a). Desire to wait at least 2 years before conceiving again and belief in contraception effectiveness were associated with reliable postpartum contraception (Berenson & Wiemann, 1997; Stevens-Simon et al., 1999), and positive childbearing attitudes and having wanted the first baby were associated with repeat pregnancy (Mott, 1986; Kalmuss & Namerow, 1994; Stevens-Simon et al., 1996).

Other psychosocial factors: Teen mothers with a history of other risk behavior, including substance use, fighting, and school expulsion/suspension, were more likely to have a repeat pregnancy (Gillmore et al., 1997; Stevens-Simon et al., 1996). Perceived social support and better mental health were associated with postpartum contraception (Berenson & Wiemann, 1997), but not condom use, Norplant, or repeat pregnancy (Koniak-Griffin et al., 2003b; Linares et al., 1992; Stevens-Simon et al., 1996). History of sexual abuse was unrelated to sexual risk (Koniak-Griffin et al., 2003b; Stevens-Simon et al., 1999), but current abuse was associated with repeat pregnancy (Jacoby, Gorenflo, Black, Wunderlich, & Eyler, 1999).

Dyad

Being in a long-term or steady relationship and spending more time with one's partner were associated with sex without condoms (Crosby et al., 2003b; Koniak-Griffin et al., 2003b) and repeat pregnancy/birth (Ford, 1983; Gillmore et al., 1997; Kalmuss & Namerow, 1994; Mott, 1986; Stevens-Simon et al., 1996), but not STDs (Chokephaibulkit et al., 1997; Oh et al., 1993). Among teens with a repeat pregnancy,

those in a committed relationship with their baby's father were more likely to have wanted the second baby (Rubin & East, 1999). However, father's support of the initial pregnancy was unrelated to repeat pregnancy (Coard et al., 2000), and living with a sex partner was unrelated long-acting contraception (Mears et al., 1997).

The effect of partner age on condom use, STDs, and repeat pregnancy was equivocal (Agurcia, Rickert, Berenson, Volk, & Wiemann, 2001; Begley, Crosby, DiClemente, Wingood, & Rose, 2003; Chang et al., 2003; Ickovics et al., 2003; Koniak-Griffin et al., 2003b; Stevens-Simon et al., 1996), and partner age was unrelated to self-efficacy for condom negotiation or frequency of communication about sexual health (Begley et al., 2003). Teen mothers with older partners were no less likely to use reliable contraception, but were more likely to desire another baby (Agurcia et al., 2001; Stevens-Simon et al., 1999). Partner risk, was unrelated to condom use (Crosby et al., 2003a; Koniak-Griffin et al., 2003b), but was marginally associated with postpartum STDs (Ickovics et al., 2003).

Family

Low perceived family support, not residing with family, and less parent–daughter communication about protection were associated with sex without condoms (Crosby et al., 2003a), STDs (Crosby, Wingood, DiClemente, & Rose, 2002b), Norplant refusal (Mears et al., 1997), and repeat pregnancy (Gillmore et al., 1997; Stevens-Simon et al., 1996). Family structure (Coard et al., 2000; Kalmuss & Namerow, 1994; Mott, 1986), quality of the parent–daughter relationship (Linares et al., 1992), and mother's support of the initial pregnancy (Coard et al., 2000) were unrelated to repeat pregnancy. Having a parent who dropped out of high school was associated with repeat pregnancy (Kalmuss & Namerow, 1994; Mott, 1986), but parental education was not (Coard et al., 2000; Linares et al., 1992; Polit & Kahn, 1986).

Social relationships

Pregnant/mothering teens who perceived social disapproval of condoms were less likely to use them (Koniak-Griffin et al., 2003b), and those whose best friend had become pregnant were more likely to have a repeat pregnancy (Gillmore et al., 1997).

Community

Culture: Ethnicity was unrelated to STDs (Ickovics et al., 2003), condom use (Koniak-Griffin et al., 2003b), and choice of long-acting contraception (O'Dell et al., 1998; Stevens-Simon et al., 1999). Results were inconsistent for repeat pregnancy (Ford, 1983; Kalmus & Namerow, 1994; Koenig & Zelnick, 1982; Linares et al., 1992; Polit & Kahn, 1986; Stevens-Simon et al., 1997). Social class may partially explain any ethnic differences; an analysis of the National Longitudinal Survey of Youth found no difference in rates of repeat birth when comparing socioeconomically disadvantaged Black versus White teens (Kalmuss & Namerow, 1994).

Social class: A wide variety of measures were used as a proxy for social class (e.g., income, Medicaid dependence, parental education), making comparisons across studies difficult.

Nevertheless, social class was generally unrelated to STDs (Crosby et al., 2002b, 2003b) and repeat pregnancy (Coard et al., 2000; Gillmore et al., 1997; Linares et al., 1992; Polit & Kahn, 1986; Stevens-Simon et al., 1996, 1997). However, large, nationally representative data sets found that poverty was associated with repeat pregnancy/birth (Ford, 1983; Kalmuss & Namerow, 1994; Mott, 1986). Results were inconsistent for contraception (Ford, 1983; Mears et al., 1997; O'Dell et al., 1998; Stevens-Simon, 1999).

Synthesis of reviewed studies

Overall, few studies examined correlates of sexual risk behaviors and adverse outcomes among pregnant/mothering teens. While results must be interpreted with caution due to cross-sectional designs and heavy reliance on univariate analyses, existing data support an Ecological Systems perspective insofar as correlates of sexual risk were derived from multiple domains, including individual (poor education, frequent intercourse and inconsistent contraception, attitudes, other problem behaviors), dyad (long-term relationship), family (poor support and communication, not residing with family), social relationships (peer norms), and community (poverty). Surprisingly, age, ethnicity, and many traditional sexual health factors (e.g., age of sexual initiation, previous pregnancy, partner risk) were inconsistently related to sexual risk.

Interventions

Nine interventions targeting sexual risk reduction among pregnant/mothering teens were identified. Only one, *Project CHARM*, was designed specifically to reduce HIV/STD risk behavior (Koniak-Griffin et al., 2003a). This study recruited pregnant/mothering teens from alternative schools, and schools were randomly assigned to receive either an HIV prevention program or a general health promotion program. At 12-month follow-up, participants in the HIV prevention program had greater condom use intentions, but no difference in unprotected sex.

Eight interventions aimed to prevent repeat pregnancy. Four studies found that integrated clinical and social services for mothers and babies resulted in significantly lower rates of repeat pregnancy (all $p<0.05$). Compared to teens receiving care in traditional

clinics, participants in "teen-tot" clinics were less likely to have a repeat pregnancy 18 months postpartum (23% vs. 41%, Nelson, Key, Fletcher, Kirkpatrick, & Feinstein, 1982; 12% vs. 28%, O'Sullivan & Jacobsen, 1992), as were those who received home visitation and supplemental services from a family support center (e.g., parenting skills) (9% vs. 38%, Knafl, 1998). Pregnant teens attending an alternative high school for a longer duration had significantly lower rates of repeat pregnancy 24-months postpartum (12% vs. 36%), though selection bias may limit generalizability (Seitz & Apfel, 1993). There were no differences in rates of repeat pregnancy among intervention versus comparison teens in studies that evaluated effects of: a multi-city project to increase economic self-sufficiency through employment training (Polit & Kahn, 1985); adult mentors who served as role models and provided support (Havens, Wagstaff, Mercer, Longway, & Gutman, 1997); peer-support groups and/or monetary incentive (Stevens-Simon et al., 1997); or an early intervention program with comprehensive services (Koniak-Griffin et al., 2002).

In sum, there exists remarkably few interventions aimed at reducing sexual risk among pregnant/mothering teens—and less than half were effective. Four programs offering comprehensive care to both teens and their infants significantly reduced rates of repeat pregnancy. Only one study focused on HIV/STD risk reduction, and no intervention targeting both STD/HIV and repeat pregnancy has been published.

Discussion

Focus on high-risk groups: Pregnant and mothering teens

Pregnancy is a marker for current and future sexual risk behavior and adverse outcomes. This review found nearly one-third of pregnant teens were infected with at least one STD, and a significant proportion became re-infected during pregnancy. Pregnant teens had significantly higher rates of STDs compared to non-pregnant teens of similar backgrounds. This may be partially explained by increased susceptibility due to physiological changes of pregnancy (Watts & Brunham, 1999). However, pregnancy also seems to be a time of behavioral vulnerability: across studies, over three-quarters of pregnant teens did not use condoms during sex, significantly less likely than non-pregnant teens.

Furthermore, pregnancy does not deter teens from subsequent sexual risk behavior and adverse outcomes. Up to two-thirds of teen mothers never or infrequently used condoms postpartum, and up to one-half did not consistently use hormonal contraception. Consequently, 14–39% of teen mothers became infected with an STD in the postpartum period, and approximately 40% had a repeat pregnancy. The serious medical and psychosocial risks associated with STDs and repeat pregnancy underscore the importance of targeting pregnant/mothering teens for sexual risk reduction interventions.

State of the science: Lack of integration

The empirical literature provides a clear indication that pregnant/mothering teens are at risk for adverse sexual/reproductive outcomes. However, our understanding of why is limited by a lack of integration within individual studies across multiple outcomes (e.g., STD *and* repeat pregnancy) and across diverse risk factors. Most importantly, none of the reviewed studies examined STDs and repeat pregnancy simultaneously to elucidate why risk factors may differ across these outcomes. Similarly, no study examined correlates of dual protection among teen mothers. To understand these potentially complex associations, future research must become more integrated by examining determinants of multiple sexual outcomes within the same sample of mothers, including possible interactions. Findings from such studies will provide a valuable basis for developing hybrid interventions that prevent both STDs and repeat pregnancy.

Bronfenbrenner's (1989) Ecological Systems Theory was used to organize findings on correlates of sexual risk among pregnant/mothering teens (Fig. 1). With regard to risk factors, most studies focused on a single domain, rather than examine multiple levels of influence. The majority included factors within the individual domain (e.g., demographics, education, sexual history), with scant attention to factors within the dyad, family, and social relationships domains. The community domain was largely neglected.

In synthesizing results—albeit limited—we draw the following conclusions. Across studies, family and peer factors were similarly associated with each sexual risk outcomes: Low perceived family support, not residing with family, poor mother–daughter communication about protection, and peer norms supportive of early childbearing and risky sexual behavior were associated with both STDs and repeat pregnancy. In contrast, individual and dyadic factors had different effects across multiple outcomes: (1) Poor education was strongly associated with repeat pregnancy and inconsistent condom use and contraception, but not STDs. (2) Previous miscarriage was associated with repeat pregnancy and previous abortion with inconsistent contraceptive use, but not other outcomes. (3) Long-acting hormonal contraception significantly reduced risk of repeat pregnancy, but was unrelated to condom use or STDs. (4) Teens' attitudes were consistently correlated with sexual behavior and related outcomes, but with specificity: positive attitudes toward childbearing were associated with repeat pregnancy, and condom use

intentions with condom use. (5) Being in a long-term relationship was strongly associated with unprotected sex and repeat pregnancy, but not STDs. Rather, having a new and/or risky partner was associated with STDs, but likely not repeat pregnancy. Motivational factors may partially account for differences across outcomes: repeat pregnancy is desired by some teens, but STDs likely are not.

Ecological Systems Theory emphasizes the dynamic relationship between an individual and her social environment over time. Theoretically, each domain may affect one or more other domains, thereby influencing sexual behavior in indirect and/or reciprocal ways. For example, poor education is a risk factor for repeat pregnancy, which may in turn limit future educational/occupational endeavors. Alternatively (or simultaneously), teens with low family support may spend more time outside the home, perhaps becoming involved in substance use and/or developing closer relationships with boyfriends—both associated with unprotected sex. The broader social context, including poverty and cultural norms, likely has pervasive influence on each domain, and ultimately on sexual risk. Because most reviewed studies were not longitudinal, such interactions were not tested. Furthermore, longitudinal studies are essential to evaluating behavioral risks and consequences across early to late adolescence and during the transition to young adulthood.

The overall finding that factors from multiple domains influence sexual risk behaviors and adverse outcomes among pregnant/mothering teens is consistent with the broader literature on adolescent sexual risk (Kotchnick et al., 2001; Coley & Chase-Lansdale, 1998). Two published reviews on repeat pregnancy focused primarily on the individual, but noted the baby's father, family, and other social relationships are important (Nelson, 1990; Rigsby et al., 1998). Pregnant/mothering teens are a unique sub-sample of adolescents with life experiences that may influence subsequent behavior differently compared to nulliparous teens. For example, partners may become increasingly important in the sexual decisions of pregnant/mothering teens, while the influence of peers might decrease.

Promoting better science: Recommendations for research

Research on sexual risk among pregnant/mothering teens remains scanty. While providing the basis for a guiding theoretical model, many identified risk factors are based on few studies; replication is needed. The broader literature on adolescent sexual risk suggests that family process (e.g., parental monitoring, relationship quality), romantic relationship dynamics (e.g., closeness, economic dependency, violence), and peer networks (e.g., social norms, deviant friends) are important (e.g., Kotchick et al., 2001). These have yet to be systematically examined in studies of pregnant/mothering teens.

Future research would benefit from methodological improvements. (1) Longitudinal studies that follow pregnant teens prospectively through the postpartum period would allow for better understanding of determinants of sexual risk. (2) Inclusion of appropriate comparison groups is important for understanding how pregnant/mothering teens differ from peers. (3) To facilitate comparisons across studies, measurement should be standardized. Reviewed studies varied in assessment of protective methods, definitions of consistent use, and timeframes. For STDs and pregnancy outcomes, studies should include objective measures such as biological testing or medical record review to obtain more accurate information. (4) Studies should include more diverse samples. Extant research has focused on poor, minority teens from urban clinics, a high risk population deserving concentrated research efforts; however, limitations of homogenous samples include diminished power to detect differences and restricted generalizability. (5) As per an Ecological Systems approach, multivariate statistics should routinely be used.

Promoting better practice: Implications for clinical intervention

Pregnancy may serve as a "window of opportunity" for sexual risk reduction. Prenatal care is often the first time adolescents address sexual health, and many are involved in routine health care throughout pregnancy. Thus, prenatal clinics provide access to pregnant teens, and incorporating risk reduction interventions into routine care would be efficient and cost-effective. Teens make numerous behavioral changes during pregnancy, including improved diet, reduced alcohol consumption, and smoking cessation (e.g., Lohr, Gillmore, Gilchrist, & Butler, 1992; Story, 1997), so interventions might capitalize on teens' concern for their baby's health as a strong motivator for sexual risk reduction.

Given high rates of both STDs and repeat pregnancy among teen mothers, interventions need to promote dual protection of both condoms and hormonal contraception. In this review, over two-thirds of teen mothers did not practice dual protection. Traditionally, family planning providers have encouraged hormonal contraception, while STD/HIV prevention efforts have focused on condom use, creating conflicting prevention messages. Ideally, intervention should begin during pregnancy with the promotion of condom use. After delivery, teens should be encouraged to initiate long-acting hormonal contraception, with continued emphasis on concurrent condom use. "Booster" sessions throughout the postpartum period might decrease discontinuation of dual protection. Finally, repeat

STD testing during pregnancy and postpartum is indicated to ensure rapid identification and treatment of infections. The development and evaluation of hybrid interventions aimed at reducing both STDs and repeat pregnancy is critical.

Consistent with an Ecological Systems perspective, results of this review suggest hybrid interventions need to address risk factors across multiple domains, including individual, dyad, family, social relationships, and community. Teen mothers represent a heterogeneous group, and prevention efforts may need to target specific subgroups. For example, teens in long-term, committed relationships are at particularly high risk for repeat pregnancy and may benefit from additional family planning counseling, while those engaging in multiple risk behaviors (e.g., unprotected sex, substance use, violence) may require interventions with a broader focus, including life skills and educational achievement (Ethier & St. Lawrence, 2002). As more sexual risk reduction interventions are developed, it will be important to consider which components work best for which teens.

Conclusion

Existing studies indicate that pregnant/mothering teens engage in exceptionally high rates of unprotected sex during pregnancy and postpartum, and are at subsequent risk for STDs and repeat pregnancy. Pregnancy may serve as a "window of opportunity" for behavior change. Hybrid interventions that promote dual use of condoms and hormonal contraception are warranted. Currently, no interventions integrating STD/HIV and repeat pregnancy prevention have been empirically validated and published. The development of effective, theoretically driven interventions requires further investigation of determinants of sexual risk, and an understanding of what works for whom. An Ecological Model of Sexual Risk, based on Bronfenbrenner's (1989) Ecological Systems Theory, was proposed to organize findings on correlates of sexual risk among pregnant/mothering teens and provides a useful guide for future studies. Improvements in research, including integration of outcomes and risk factors, use of strong methodologies, and standardization of assessments, are essential to advancing this field. With nearly one million teen pregnancies annually in the United States, this should be a public health priority.

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