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Pediatrics 2006;118:1087-1099

DOI: 10.1542/peds.2005-2318

This information is current as of October 2, 2006

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<http://www.pediatrics.org/cgi/content/full/118/4/e1087>

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Delaying Second Births Among Adolescent Mothers: A Randomized, Controlled Trial of a Home-Based Mentoring Program

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The authors have indicated they have no financial relationships relevant to this article to disclose.

ABSTRACT

CONTEXT. Rates of rapid second births among low-income black adolescent mothers range from 20% to 50%. Most efforts to prevent rapid second births have been unsuccessful.

OBJECTIVES. There were 4 objectives: (1) to examine whether a home-based mentoring intervention was effective in preventing second births within 2 years of the adolescent mother's first delivery; (2) to examine whether greater intervention participation increased the likelihood of preventing a second birth; (3) to examine whether second births were better predicted from a risk practice perspective or a family formation perspective, based on information collected at delivery; and (4) to examine how risk practices or family formation over the first 2 years of parenthood were related to a second birth.

DESIGN. We conducted a randomized, controlled trial of a home-based intervention curriculum, based on social cognitive theory, and focused on interpersonal negotiation skills, adolescent development, and parenting. The curriculum was delivered biweekly until the infant's first birthday by college-educated, black, single mothers who served as mentors, presenting themselves as "big sisters." The control group received usual care. Follow-up evaluations were conducted in the homes 6, 13, and 24 months after recruitment.

METHODS. Participants were recruited from urban hospitals at delivery and were 181 first time, black adolescent mothers (<18 years of age); 82% (149 of 181) completed the 24-month evaluation.

RESULTS. Intent-to-treat analyses revealed that control mothers were more likely than intervention mothers to have a second infant. The complier average causal effect was used to account for variability in intervention participation. Having ≥ 2 intervention visits increased the odds of not having a second infant more than

www.pediatrics.org/cgi/doi/10.1542/peds.2005-2318

doi:10.1542/peds.2005-2318

Key Words

adolescent pregnancy, repeat births, blacks, mentoring

Abbreviations

WIC—Supplemental Nutritional Services for Women, Infants, and Children
BDI—Beck Depression Inventory
CACE—complier average causal effect
CI—confidence interval
OR—odds ratio

Accepted for publication Apr 24, 2006

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PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275). Copyright © 2006 by the American Academy of Pediatrics

threefold. Only 1 mother who completed ≥ 6 visits had a second infant. At delivery of their first infant, mothers who had a second infant were slightly older (16.7 vs 16.2 years) and were more likely to have been arrested (30% vs 14%). There were no differences in baseline contraceptive use or other measures of risk or family formation. At 24 months, mothers who had a second infant reported high self-esteem, positive life events, and romantic involvement and residence with the first infant's father. At 24 months, there were no differences in marital rates (2%), risk practices, or contraceptive use between mothers who did and did not have a second infant. Mothers who did not have a second infant were marginally more likely to report no plans for contraception in their next sexual contact compared with mothers who had a second infant (22% vs 8%, respectively).

CONCLUSIONS. A home-based intervention founded on a mentorship model and targeted toward adolescent development, including negotiation skills, was effective in preventing rapid repeat births among low-income, black adolescent mothers. The effectiveness of the intervention could be seen after only 2 visits and increased over time. There were no second births among mothers who attended ≥ 8 sessions. There was no evidence that risk behavior or contraceptive use was related to rapid second births. There was some evidence that rapid second births among adolescent mothers were regarded as desirable and as part of a move toward increasing autonomy and family formation, thereby undermining intervention programs that focus on risk avoidance. Findings suggest the merits of a mentoring program for low-income, black adolescent mothers, based on a relatively brief (6–8 sessions) curriculum targeted toward adolescent development and interpersonal negotiation skills.

THE UNITED STATES has the highest rate of adolescent births among industrialized nations; $\sim 10\%$ of adolescent girls become pregnant annually, half of whom give birth.¹ Although rates of adolescent childbearing have declined in recent years across all racial and ethnic groups,² 2003 birth rates for black adolescents are more than double the rates for non-Hispanic white teens (64.8% and 27.5%, respectively).¹ Among adolescent mothers, the 2003 national rate of repeat childbirth within 2 years of initial delivery is 20%¹; however, investigators have reported rates as high as 30% to 50%.^{3–5} Young mothers who postpone subsequent births beyond 2 years tend to avoid many of the negative consequences of early childbearing that often lead to chronic poverty and welfare dependence.^{6,7}

Efforts to prevent rapid second births among adolescent mothers have been largely unsuccessful, as illustrated by 3 well-conducted, randomized, controlled trials. Sims and Luster⁸ compared weekly home visits to

less intensive support (telephone, e-mail, and family advocate) in a sample of 99 mothers participating in a family support program. In the 2 years after their first delivery, the birth rate was 33% in the intervention group and 39% in the control group. In a sample of 101 adolescent mothers, Koniak-Griffin et al⁹ compared a nurse-visit intervention group with a standard care control group and found that 32% of the intervention group and 47% of the control group were pregnant again by 24 months. Stevens-Simon and Dolgan¹⁰ evaluated monetary incentives and peer support among 286 adolescent mothers and found that, although mothers who received the monetary incentive were more likely to participate in supervised group discussions about avoiding second births, rates of pregnancy did not differ across groups (39% at 24 months).

At least 2 other interventions have reported success in delaying second pregnancies among adolescent mothers.^{11,12} The Second Chance Club, a high school program for pregnant or parenting teens, provided support, including weekly group meetings, case management, and service outreach programs.¹¹ Only 3 of the 50 participants had a second birth within 3 years of delivery, in contrast with 95 of 255 teens matched through a county birth certificate registry. The second intervention included general support offered by a social worker and center-based services.¹² At 2 years postpartum, 3 of the 49 teens in the intervention group and 11 of the 39 teens in the control group had repeat pregnancies. However, neither intervention study used random assignment, raising concerns about motivation and selection bias.

Efforts to identify factors that predict rapid second births have had little success.^{3,5} Some investigators have emphasized access to contraceptives.^{10,13,14} Others have focused on demographic variables, including younger maternal age,^{8,15,16} minority race,^{10,16} low income,⁴ marital status,¹⁶ and low educational attainment.⁴ Experiences after the first birth may also contribute to the likelihood of a rapid second birth. Using data from 1452 adolescent mothers in the National Longitudinal Survey of Youth, Kalmuss and Namerow¹⁶ reported that adolescent mothers who continue their education are less likely to have a rapid second birth compared with adolescents with no further schooling, regardless of their level of education at the time of their first birth. Young mothers who desire a second infant are more likely to have a rapid second birth,¹⁷ whereas those who have a close relationship with an interventionist are less likely to have a second birth.³

One reason for the inconsistent findings related to rapid second births may be the lack of a clear conceptualization of the reason for second births among adolescent mothers. Many investigations have conceptualized rapid second births as part of a risk profile, consistent with problem behavior theory.¹⁸ This model views repeat pregnancy and birth in the context of other deviant

behaviors, including precocious and risky sexual behavior, illicit drug and alcohol use, violence, and school problems.¹⁹ Consistent with this view, Stevens-Simon et al²⁰ found that having ≥ 5 risk factors together was associated with repeat pregnancy within the first postpartum year. Following this line of reasoning, many interventions have attempted to reduce repeat births by promoting abstinence and contraceptive use and developing strategies to reduce or eliminate substance use, violent behavior, and school dropout.⁵

Other investigators have conceptualized rapid second births as part of a developmental pattern of family formation, particularly within low-income, black communities.^{21,22} For example, Matsushashi et al¹⁷ described the “planned” nature of many repeat pregnancies, and Music²³ has argued that young mothers often desire closely spaced children. The development of autonomy is a central theme of adolescence,^{24,25} often marked by competence in academic pursuits, preparation for vocational roles, and reciprocity in relationships with parents regarding family decision-making. In an arena where there are few opportunities for academic or vocational success, childbearing may enable teenage girls to experience success, along with increasing autonomy, as they take on the responsibilities of raising their children. An intervention to prevent second births based on this conceptualization would emphasize alternative strategies to achieve autonomy and negotiation strategies to enhance family decision-making around childrearing issues.

Guided by encouraging findings from a recent meta-analysis of 60 home-visiting programs²⁶ and by the dual demands for adolescent mothers to gain autonomy and parenting skills, we developed and evaluated a 19-lesson home-based intervention, titled the Three Generation Study.²⁷ After the initial 2 lessons, which introduced the blended themes of adolescent development and parenting, the mentors could vary the order of the lessons, combine lessons, or repeat lessons, depending on the needs of the participants. The intervention focused on the relationship and negotiation skills between the adolescent mother and her mother (grandmother of her child). The young mothers learned what to expect of their infant’s first year of life, to interpret their infant’s cries and bids for interaction, and to provide developmentally enriching activities. Throughout the intervention, there was a focus on personal values and decision-making regarding subsequent pregnancies, access to birth control, and goal setting, rather than an overt message advising participants to avoid a second birth. Condoms were provided at every contact. The intervention was based on social cognitive theory,²⁸ which relies on cultural norms, modeling, and the concepts of self-efficacy and support. Self-efficacy, the belief a person holds regarding her ability to enact specific behaviors, can be enhanced through strategies such as role playing and goal setting, which we incorporated into the inter-

vention. Support represents the feeling of connectedness with family or friends and the perception that others are encouraging of your life choices. We promoted support by conducting the intervention in the home, involving family members as much as possible, and using a mentorship model.

The intervention was delivered by 2 college-educated (degrees in psychology and sociology) black women in their 20s who were single mothers, raising 1 preschool-aged child, and living independently. They presented themselves as “big sisters” who had been through the experience of raising a child but were not authority figures. After extensive training, the mentors participated in weekly supervisory sessions. They each worked 20–30 hours per week, with a caseload of ~ 15 mothers who were seen twice per month. Participants were given their cell phone numbers. The mentors kept a log of visits completed, together with lessons covered and ratings of mothers’ responsiveness, but they did not record cell phone contacts.

As with any intervention, participation rates varied among the mothers. In intervention research, little is known about the impact of variable participation rates on outcomes, often because participation variability may be associated with other variables that influence the outcome. Ignoring variability in the participation rate of the intervention, as is done in a traditional intention-to-treat analysis, may lead to an underestimation of the true causal effect of the intervention, because those who received fewer visits may be less likely to change their behaviors than those who received more visits. On the other hand, simply estimating the impact of the number of visits in a standard regression model may introduce selection bias because of the nonrandom selection of the adolescent mothers into groups with higher numbers of visits.²⁹ Alternative statistical techniques have been introduced to produce unbiased estimates of the intervention effect accounting for noncompliance within the intervention group and to examine how variability in participation is related to intervention effectiveness.^{30–36} These statistical techniques are advantageous in the context of home visiting interventions, because most home visiting interventions suffer from a lack of full participation.³⁷

This study had 4 objectives: (1) to examine whether the mentoring intervention was effective in preventing second births within 2 years of the adolescent mother’s first delivery; (2) to examine whether greater intervention participation increased the likelihood of preventing a second birth; (3) to examine whether second births were better predicted from a risk practice perspective or a family formation perspective, based on information collected at delivery; and (4) to examine how risk practices or family formation over the first 2 years of parenthood were related to a second birth.

METHODS

Participants

Participants included adolescent mothers who were enrolled in a longitudinal randomized, controlled trial of a home-based intervention designed to promote parenting and prevent second births.²⁷ Because national policies require that eligibility for public services is restricted to adolescent mothers who are in the guardianship of an adult,³⁸ many adolescent mothers live with their mother. We limited our sample to low-income, adolescent mothers who were living with their mother (infant's grandmother) and were eligible for Supplemental Nutritional Services for Women, Infants, and Children (WIC) (family income <185% of poverty level). Eligibility for mothers also included age <18 years at delivery, first-time delivery, black race, no indication of cocaine or heroin use in the medical chart, and no chronic illnesses that would interfere with parenting or adolescent development. To ensure that early parenting would not be complicated by the infant's health needs, infants of eligible mothers had to be term (≥ 37 weeks) and birth weight >2500 g, with no congenital problems, chronic illnesses, or disabilities.

Procedures

Mothers were recruited from 3 urban hospitals in Baltimore from September 1997 through December 1999. They were approached shortly after delivery and given a brochure explaining the study. Those who expressed interest in enrolling were scheduled to receive a baseline evaluation at home 3 weeks after delivery. More than 83% (181 of 219) of the eligible mothers agreed to participate and completed the baseline evaluation. There were no differences in maternal age or education between those who completed the baseline evaluation and those who did not.

All of the mothers completed consent forms approved by the institutional review boards of the participating institutions. The baseline evaluation included standardized questionnaires on family demographics and relationships, personal health and mental health, access to services, and early adjustment to parenting. It was self-administered on a laptop computer; questions were presented aurally through headphones and visually on the screen, and responses were selected with a mouse.

After the baseline evaluation, all of the mothers were given information on community resources for young mothers and their children. Using a randomization procedure stratified on maternal age and gender of the child, mothers were assigned to either the intervention or control group. Families in the intervention group received home visits every other week until the infant's first birthday, for a maximum of 19 visits. Families in the control group received no further contact until the evaluation visits.

In-home follow-up evaluations were conducted when infants were 6, 13, and 24 months. Evaluators were unaware of intervention status, and mothers were compensated for baseline and follow-up visits. To evaluate the impact of the intervention on having a second infant, only mothers with both baseline and 24-month data were included in the analysis ($N = 149$); 32 mothers (18%) did not complete a 24-month visit (Fig 1). There were no differences in maternal age, maternal education, infant birth weight, infant gender, or intervention status between mothers included in the evaluation of the intervention (149 of 181) and mothers who were not included (32 of 181).

Measures

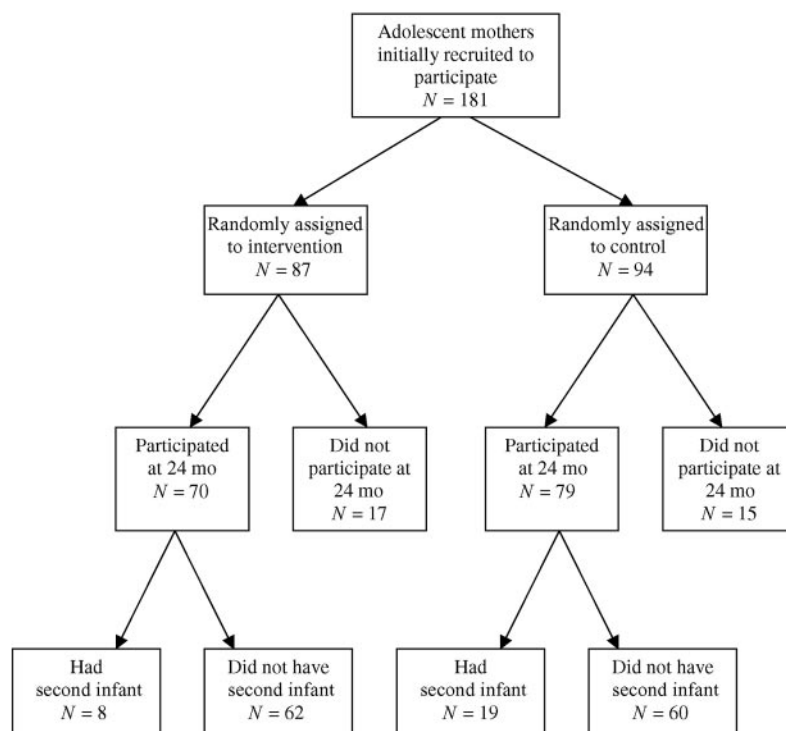
At each evaluation visit, mothers provided demographic information regarding their education, marital status, living arrangements, romantic relationships, and whether they had given birth since their first delivery. Births, rather than pregnancies, were measured, because among adolescents, only 50% of pregnancies are carried to term successfully and result in a birth.³⁹ Mothers also reported on their life aspirations, including the likelihood that they would have a second infant in the next 5 years, scored on a Likert scale from 1 (very unlikely) to 5 (very likely).

Risky behavior was assessed using self-report items adapted from the Centers for Disease Control and Prevention Youth Risk Behavior Surveillance System.⁴⁰ At baseline, participants reported on their lifetime history of risk behaviors, and at follow-up visits, they reported on behaviors since delivery of their first child. Risky behaviors included fighting, weapon carrying, stealing, arrest and incarceration history, number of sexual partners, history of sexually transmitted infections, and use of substances, including cigarettes, alcohol, marijuana, cocaine, heroin, and LSD (a hallucinogenic drug). They also reported on the forms of birth control that they used in the past year (nothing, condom, birth control pill, Depo-Provera, Norplant, withdrawal, diaphragm, sponge, suppository, rhythm, or other).

Mother's mental health status was measured using the Beck Depression Inventory (BDI), a 21-item scale that has been widely used to characterize depressive symptoms among adolescents and adults.^{41,42} High scores indicate more depressive symptoms. The internal consistency of the scale for our sample was high ($\alpha = .96$). The summary measure was dichotomized with a score >9 indicating a clinical cutoff for depressive symptomatology.⁴³

The Kaufman Functional Academic Skills Test⁴⁴ was used to provide a comprehensive examination of the young mothers' academic skills. The Kaufman Functional Academic Skills Test assesses mathematical skills (25 items) and reading skills (25 items). Items are relevant to everyday living, such as following directions in a

FIGURE 1
Flowchart describing study participation and randomization procedure of adolescent mothers.



recipe and making price comparisons. Raw scores are converted to standard scores (mean: 100; SD: 15), with high scores representing more skills.

Maternal self-esteem was measured by the Rosenberg Self-Esteem Scale.⁴⁵ This 10-item questionnaire uses a Likert scale, ranging from 1 (strongly agree) to 4 (strongly disagree); high scores represent higher self-esteem. This scale was developed for use with adolescents. Validity studies conducted with independent groups of adolescents indicated high internal consistency ($\alpha = .77$ and $.88$) and test-retest reliability over 1- and 2-week intervals ($r = 0.82$ and 0.85 , respectively).⁴⁶ The internal consistency of the scale for our sample at baseline ($\alpha = .86$) was comparable to those of the validity studies.

The quality of the adolescent mother-infant's grandmother relationship was measured by the Network of Relationship Inventory.⁴⁷ The Network of Relationship Inventory, a self-report measure completed by the adolescent, assesses both supportive and negative interactions, with responses to 30 items ranging from 1 (little or none) to 5 (the most). We used 2 subscales: support (affection, admiration, reliable alliance, intimacy, companionship, and instrumental help) and conflict (conflict and antagonism). The support scale includes items such as, "How much does your mother treat you like you are good at things?" and the conflict scale includes items such as, "How much do you and your mother get upset with or mad at each other?" The reliability and validity of the measure have been empirically supported in previous research.⁴⁷ In this sample, Cronbach's α s for the 2

scales at baseline were $.83$ (support) and $.90$ (conflict), and the scales were negatively correlated ($r = -0.53$; $P < .01$).

Parenting sense of competence was assessed with the Parenting Sense of Competence Scale.⁴⁸ The 17 items include statements such as, "Being a good mother is rewarding" and "I have all the skills to be a good mother," and the responses range from 1 (strongly agree) to 6 (strongly disagree). Two summary scores are computed: parenting self-efficacy and parenting satisfaction. In this sample, the internal reliabilities for the parenting efficacy and parenting satisfaction subscales at baseline were $\alpha = .73$ and $.75$, respectively.

Participants recorded events experienced during the last year with the Life Experiences Survey.⁴⁹ This 30-item scale was adapted from the original by removing items that did not apply to adolescent mothers. The scale included both positive (eg, get married) and negative (eg, have a serious illness or injury) events. If a respondent indicated that a life event had occurred, she was asked to rate the impact of the event on a 5-point scale ranging from 1 (extremely good) to 5 (extremely bad). There were 2 summary scores with adequate internal consistency at baseline: the total number of negative life events (Cronbach's $\alpha = .68$) and the total number of positive life events (Cronbach's $\alpha = .70$).

Data Analysis

Statistical analyses were conducted using the software programs SPSS version 11.0 (SPSS Inc, Chicago, IL) and SAS version 8.1 (SAS Institute, Inc, Cary, NC). To ex-

amine baseline differences between the intervention and control groups, *t* tests and χ^2 analyses were used to compare continuous and categorical variables, respectively. To address the first objective, intention-to-treat analyses were used to examine the impact of the intervention on the birth of a second infant. Multivariable logistic regression models were used to estimate the association between intervention status and the odds of a second birth.

To address the second objective, whether the impact of the intervention on second births varied by the participation rate, we computed the complier average causal effect (CACE) using the method described by Little and Yau³² and extended to dichotomous outcomes by Peng et al.⁵⁰ This method accounts for the variability in treatment compliance within the intervention group by identifying adolescents within the control group who would have complied with the intervention, had they been assigned to the intervention group. The outcome of the “supposed” compliers is compared with the outcome for the treatment compliers. This effect is commonly referred to as the CACE.

The CACE model is estimated by maximum-likelihood methods using a 2-step iterative expectation-maximization algorithm. First, the estimated probability of compliance for participants in the control group, given their observed values and covariates, is computed. The model developed to predict compliance contained several covariates measured at baseline including maternal age, education, employment status, infant birth weight, infant gender, substance use, self-esteem, depression, maternal-grandmother relationship, parenting satisfaction and self-efficacy, positive and negative life events, and romantic relationship with the infant’s father. Weighted logistic regression is used to determine the estimates for the compliance model, and weighted least-squares regression is used for the outcome model. Participants in the treatment group are given a weight of 1, and participants in the control group are weighted by their estimated probability of being in the complier group. The bootstrap method is used to compute SEs and confidence intervals (CIs) for the CACE.⁵¹

Within the current investigation, these analytic procedures are applied in the context of discrete categories of treatment compliance (ie, complied with the intervention or not). We examined the CACE of the intervention using 4 definitions of compliance: having ≥ 2 , 4, 6, or 8 home visits. This procedure has been applied to the investigation of dose-response effects when selection into dosage groups is nonrandom.^{34,37}

To address the third objective, whether second births were better predicted from a risk practice perspective or a family formation perspective, variables were categorized into 2 domains: risk practices and family formation. Analyses of covariance and logistic regression models were used to examine the association between baseline predictors within each domain and a second birth, adjusting for covariates.

To address the fourth objective, whether risk practices or family formation during the first 2 years of parenting differed for mothers who had a second birth in comparison with mothers who did not have a second birth, we incorporated variables collected at 24 months into the analyses of covariance and logistic regression models. We combined variables from the family formation and risk practices domains into a single multivariable model to examine the relative contribution of each domain adjusting for covariates.

RESULTS

There were no baseline differences on maternal age, education, WIC participation, employment, partner involvement, infant birth weight, or gender based on random assignment to intervention or control group (Table 1). Mothers ranged in age from 13.5 to 17.9 years, 95% were in school, 3% were completing a general educational development program, 9% had a paying job outside of the home, and 66% were romantically involved with the father of the infant. In keeping with enrollment criteria, all of the mothers lived with their mother (infant’s grandmother) in 3-generation households and were eligible for WIC; however, only 67% reported receiving WIC at baseline. Mean birth weight was 3086 g

TABLE 1 Baseline Demographic Characteristics by Intervention Status for 149 Adolescent Mother Study Participants

Variable	Intervention (N = 70), Mean (SD)	No Intervention (N = 79), Mean (SD)
Maternal characteristics		
Age at first delivery, y	16.3 (1.02)	16.3 (0.96)
Education, y	10.2 (1.35)	10.1 (1.04)
WIC, %	71	63
Paying job outside of home, %	9	10
Romantically involved with baby’s father, %	69	64
Infant characteristics		
Birth weight, g	3089 (425.12)	3071 (436.77)
Male gender, %	49	51

(SD: 414 g), and the infants were evenly divided by gender (50% male).

Second Birth

At the 2-year evaluation, 18% of the mothers (27 of 149) had given birth to a second child. Results from the intention-to-treat analysis indicated that mothers in the control group were 2.5 times more likely to have given birth to a second child than mothers in the intervention group (24% vs 11%; odds ratio [OR]: 2.45; 95% CI: 1.003–6.03; $P = .05$). At the 2-year evaluation, there were no other differences between intervention- and control-group mothers.

CACE Models

The number of intervention visits received ranged from 0 to 19 (mean: 6.63; SD: 6.58). Fifty-four mothers (77%) in the intervention group participated in ≥ 2 visits, 42 (60%) participated in ≥ 4 visits, 35 (50%) participated in ≥ 6 visits, and 28 (40%) participated in ≥ 8 visits.

We examined baseline differences between adolescents in the control group and adolescents who participated in ≥ 2 , 4, 6, or 8 visits. There were no statistically significant differences in either demographic variables (age at delivery, education, employment, WIC recipient, child gender, and birth weight) or variables that may be associated with the motivation to participate in the intervention (self-esteem, depression, summary score of risk practices, parenting satisfaction, parenting self-efficacy, positive life events, negative life events, and support or conflict with the infant's grandmother).

We computed the CACE of having ≥ 2 , 4, 6, or 8 visits on the likelihood of having a second infant.^{32,50,52} Overall, 8 adolescents (11%) in the intervention group had a second infant within 24 months after delivery. The number of adolescents in the intervention group who had a second infant decreased as the number of intervention visits increased. Having ≥ 2 visits increased the likelihood of not having a second infant by more than three-fold (OR: 3.3; 95% CI: 3.0–5.1). The likelihood of not having a second infant increased when the threshold for adherence was increased from 4 to 6 (OR: 3.6; 95% CI: 3.1–7.2 and OR: 4.3; 95% CI: 3.0–8.3, respectively; Fig 2). Only 1 of the adolescents who completed ≥ 6 visits had a second infant, and none of the adolescents who completed ≥ 8 visits had a second infant. Therefore, the CACE for having completed ≥ 8 visits was not computed.

Risk Practices at Delivery

Risk practices were common among mothers in this sample, including fighting (28%), marijuana use (38%), arrest (17%), >1 sexual partner (63%), and a history of sexually transmitted diseases (26%; Table 2). With the exception of an increased likelihood of having been arrested among mothers who had a second infant, in comparison with those who did not have a second infant (30% vs 14%; OR: 2.6; 95% CI: 1.0–6.8; $P = .05$), there were no differences in baseline risk practices as a function of subsequent childbearing. A total risk practices score was created by giving participants a score of 1 for each risk practice they endorsed and then summing the number of risk practices. All but 1 study participant

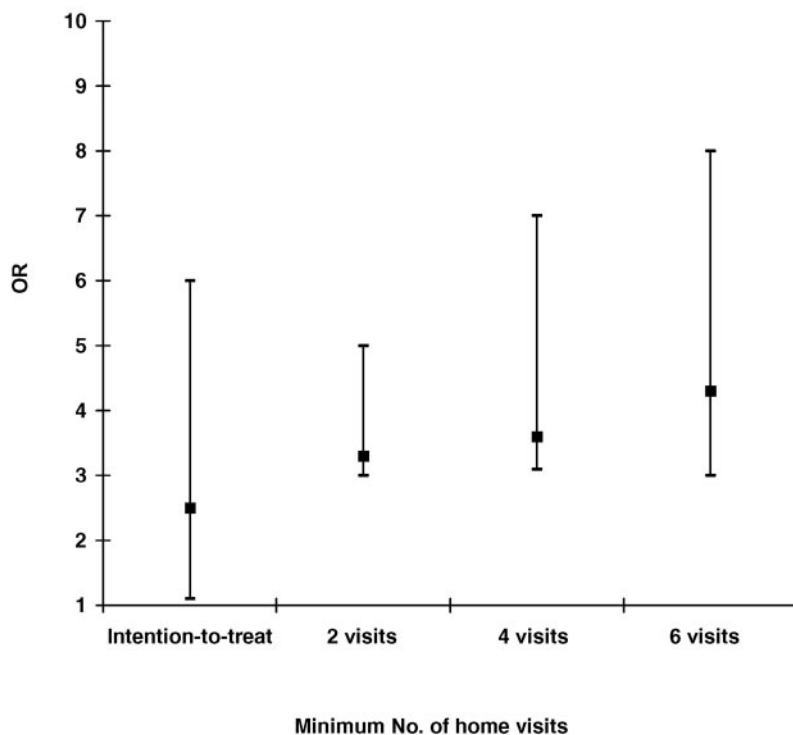


FIGURE 2

CACE model to examine impact of home-visiting intervention on second infant by minimum thresholds for defining compliance, ORs, and 95% CIs.

TABLE 2 Adolescent Risk Behaviors by Second Baby Status at Baseline (3 Weeks After Delivery) and at 24 Months

Variable, %	Baseline				24 mo			
	Second Baby (N = 27)	No Second Baby (N = 122)	OR	95% CI	Second Baby (N = 27)	No Second Baby (N = 122)	OR ^a	95% CI
Friends have baby	29	19	1.8	0.7–4.7	13	13	1.1	0.3–4.4
Fighting	26	28	0.89	0.4–2.3	19	17	1.2	0.4–3.6
Substance use								
Cigarettes	27	21	1.4	0.5–3.7	46	31	2.1	0.9–5.0
Alcohol	54	50	1.2	0.5–2.8	62	58	1.3	0.5–3.2
Marijuana	42	37	1.3	0.5–3.0	54	44	1.7	0.7–4.1
Cocaine/heroin/LSD	0	0			0	0		
Steal	4	3	1.2	0.1–10.8	0	0		
Arrested	30	14	2.6 ^b	1.0–6.8	4	7	0.7	1.0–5.6
Jailed	11	3	4.7	0.6–35.1	4	2.5	1.6	0.2–16.5
>1 sex partner	68	62	1.3	0.5–3.3	95	92	1.7	0.2–14.7
Sexually transmitted infection	30	25	1.3	0.5–3.2	27	34	0.7	0.3–1.8

^a Adjusted for intervention status.

^b $P < .05$

(99%) had participated in ≥ 1 risk practice. There was no difference in the mean number of risk practices for mothers who had a second infant (mean: 3.6; SD: 2.4) and those who did not (mean: 3.4; SD: 1.7; $P = .6$).

We also examined differences in contraception use reported by mothers at baseline. There were no differences between mothers who had a second infant and those who did not in report of contraception use at baseline ($\chi^2 = 0.82$; $P = .5$). The most common form of contraception was condoms (92%), followed by Depo-Provera (43%), birth control pills (34%), and Norplant (1%). Only 8% of the mothers stated that they did not plan on using any form of birth control the next time they have sex. There was no difference on intention to have sex without contraception between mothers who did and did not have a second infant (8% vs 9%, respectively).

Family Formation at Delivery

When baseline family formation and psychological variables were considered, few mothers had dropped out of school (2%). Approximately two thirds of the mothers (66%; $N = 99$) reported that they were romantically involved with the father of their infant, and 20% initiated breastfeeding. Mothers reported relatively high rates of self-esteem (mean: 3.5; SD: 0.4, on a 4-point scale), parenting satisfaction and efficacy (mean: 4.6; SD: 0.7 and mean: 4.0; SD: 0.7, respectively, on a 6-point scale), and support from the infant's grandmother (mean: 3.6; SD: 0.7 on a 5-point scale) and low rates of conflict with the infant's grandmother (mean: 1.8; SD: 0.7 on a 5-point scale where 1 represents the least conflict). Rates of postpartum depressive symptoms were relatively high, at 47%. When asked about future aspirations, only 12% (18 of 149) of mothers reported that it was likely or very likely that they would have another infant within the next 5 years. Aspiration to have an

infant within the next 5 years was not associated with having a second infant ($P = .12$); only 1 of the 18 mothers who aspired to have an infant actually did so.

The only variable within the family formation domain that differed between mothers who did and did not have a second infant was age (Table 3). Those who gave birth a second time within 2 years were ~ 5 months older than those who did not (16.7 vs 16.2 years; OR: 1.7; 95% CI: 1.1–2.7; $P = .05$).

Risk Practices Over the First 2 Years of Parenting

Risk practices remained relatively high during the first 2 years of parenting, including fighting (17%), marijuana use (46%), >1 sexual partner (93%), and history of a sexually transmitted infection (33%; Table 2). Arrest rates decreased from 17% at baseline to 6.7% at 24 months. There were no differences in risk practices or contraceptive use during the first 2 years of parenting based on the birth of a second child. The average number of risk practices reported since the birth of their first child was 3.6 (SD: 1.7) for mothers who did not have a second infant and 3.9 (SD: 1.7) for mothers who did have a second infant (P for difference = 0.30).

At 24 months, there were no differences in contraception use between mothers who had a second infant and those who did not. The most common form of contraception was condoms (78%), followed by Depo-Provera (57%), birth control pills (29%), and Norplant (3%). One fifth (20%) of adolescent mothers stated that they did not plan on using birth control the next time they had sex, an increase from the 8% reported at baseline. Mothers who did not have a second infant were marginally more likely to report no plans for contraception in their next sexual contact compared with mothers who had a second infant (22% vs 8%, respectively; $P = .09$).

TABLE 3 Adolescent Mother Baseline Family Formation Psychological Characteristics by Second Baby Status

Variable	Second Baby (N = 27)	No Second Baby (N = 122)	OR ^a	95% CI
Family formation variables at baseline				
Maternal age at delivery, mean (SD) ^b	16.7 (1.0)	16.2 (0.8)	1.7	1.1–2.7
Dropped out of school, %	11%	5%	1.9	0.7–5.0
Breastfeed, %	19%	21%	0.9	0.4–2.2
Romantic relationship with father of baby, %	63%	67%	0.9	0.4–1.8
Plan to have a second baby in next 5 y, mean (SD) ^c	1.7 (0.9)	1.9 (1.2)	0.9	0.6–1.3
Psychological characteristics at baseline				
Self-esteem, mean (SD) ^d	3.6 (0.3)	3.4 (0.4)	2.5	0.8–7.4
Depressed (BDI >9), %	44%	49%	0.8	0.4–1.9
Parenting satisfaction, mean (SD) ^d	4.0 (0.8)	4.0 (0.7)	0.8	0.5–1.4
Parenting efficacy, mean (SD) ^d	4.8 (0.6)	4.6 (0.7)	1.5	0.8–2.8
Negative life events, mean (SD) ^e	2.2 (1.8)	2.1 (1.7)	1.0	0.8–1.3
Positive life events, mean (SD) ^d	4.5 (2.5)	4.7 (2.0)	0.96	0.8–1.2
Support from infant's grandmother, mean (SD) ^d	3.8 (0.7)	3.5 (0.7)	1.8	0.9–3.4
Conflict with infant's grandmother, mean (SD) ^e	1.8 (0.7)	1.9 (0.8)	0.9	0.6–1.7

^a Adjusted for intervention status.

^b $P < .05$.

^c Scores range from 0 (very unlikely) to 5 (very likely).

^d Low scores are optimal.

^e High scores are optimal.

Family Formation Over the First 2 Years of Parenting

We examined family formation variables at 24 months (Table 4). Marital rates were low (2%); 20% lived with a partner, and 74% lived in their 3-generation family of origin. Approximately 34% had a romantic relationship with the father of their first infant, and 50% had a romantic relationship with a new partner.

Mothers who had a second infant were older at de-

livery, more likely to be romantically involved with the father of the first infant, more likely to live with a partner, less likely to be living with their mother, and less likely to be romantically involved with a new partner in comparison with mothers who did not have a second infant. In addition, mothers who had a second infant reported higher self-esteem and more positive life events when compared with mothers who did not have

TABLE 4 Adolescent Mother 24-Month Family Formation and Psychological Characteristics by Second Baby Status

Variable	Second Baby (N = 27)	No Second Baby (N = 122)	OR ^a	95% CI
Family formation variables at 24 mo				
Maternal age at delivery, mean (SD) ^b	18.8 (0.8)	18.3 (1.0)	1.7	1.1–2.7
Advanced in education since first delivery, %	65%	77%	0.5	0.2–1.3
Married, %	7%	1%	9.4	0.8–112.9
Live with partner, % ^b	33%	17%	2.8	1.1–7.4
Live with grandmother, % ^c	54%	78%	0.3	0.1–0.8
Romantic relationship with father of first baby, % ^c	54%	29%	3.4	1.3–8.7
Romantic relationship with new partner, % ^c	25%	56%	0.3	0.1–0.7
Psychological characteristics at 24 mo				
Self esteem, mean (SD) ^{c,d}	3.7 (0.4)	3.4 (0.5)	4.6	1.4–15.4
Depressed (BDI >9), %	31%	40%	0.8	0.3–1.9
Parenting satisfaction, mean (SD) ^d	4.3 (0.9)	4.2 (0.8)	1.2	0.7–2.1
Parenting efficacy, mean (SD) ^d	4.9 (0.7)	4.8 (0.6)	1.4	0.7–2.7
Negative life events, mean (SD) ^e	2.5 (2.3)	3.2 (2.8)	0.9	0.8–1.1
Positive life events, mean (SD) ^{c,d}	7.4 (3.6)	5.5 (2.9)	1.3	1.1–1.5
Support from infant's grandmother, mean (SD) ^c	2.4 (0.9)	2.0 (0.9)	1.6	0.9–2.6
Conflict with infant's grandmother, mean (SD) ^e	1.0 (0.8)	1.1 (0.9)	0.9	0.5–1.5
Reading and math, mean (SD) ^d	91.3 (11.4)	92.8 (11.4)	1.0	0.9–1.1

^a Adjusted for intervention status.

^b $P < .05$.

^c $P < .01$.

^d High scores are optimal.

^e Low scores are optimal.

a second infant. There were no differences between mothers who did and did not have a second infant in educational advancement of ≥ 1 year since the time of delivering their first infant, depressive symptoms, parenting satisfaction, parenting efficacy, negative life events, adolescent mother-infant's grandmother relationship, or reading and math scores (Table 4).

Risk Practices and Family Formation

Two multivariable logistic regression models composed of baseline and 24-month variables, respectively, were computed to examine the likelihood of having a second birth. In the baseline model, older maternal age at delivery and control group membership were associated with increased likelihood of having a second infant (OR: 1.9; 95% CI: 1.1–3.4; $P < .05$ and OR: 3.1; 95% CI: 1.1–8.6; $P < .05$, respectively). In the 24-month model, positive life events occurring in the past year and control group membership were associated with increased likelihood of having a second infant (OR: 1.2; 95% CI: 1.0–1.5; $P < .05$ and OR: 2.9; 95% CI: 1.01–8.3; $P < .05$, respectively). None of the other baseline or 24-month variables investigated predicted having a second infant.

DISCUSSION

Intervention to Prevent Rapid Repeat Births

This analysis provides convincing evidence that a home-based mentoring intervention focusing on autonomy and parenting can reduce the rate of rapid second births among low-income, first time, black adolescent mothers. Mentoring programs, which connect adolescents with adults for support and advice, have attracted national attention as a strategy to reduce risk behaviors among adolescents.⁵³ Among adolescents from high-risk backgrounds, those with a mentor are less likely to participate in high-risk behavior, such as substance use, weapon carrying, and sex with multiple partners,^{54,55} and more likely to experience academic success, career activities, and feelings of global self-worth and optimism^{56,57} when compared with youth without a mentor. The mentors in our program were black college-educated young women, each of whom had 1 preschool-aged child. They worked to build trusting relationships with the intervention group mothers, listening to the mothers' perspectives and incorporating both adolescent development and parenting into the intervention. By portraying themselves as big sisters, the mentors took on a supportive role, rather than an authoritarian role. Mentoring operates through the formation of a relationship that enables participants to look to the mentor for support,⁵³ making it an ideal strategy for preventing rapid second births. Our findings regarding the mentors are also consistent with the conclusion of Klerman,³ based on a comprehensive program review, that the most important factor in reducing rapid repeat births is a

close relationship between the adolescent mother and the interventionist.

We designed a comprehensive intervention curriculum manual that included 19 lessons to be delivered over 1 year. Although participants could receive > 1 lesson per visit, only 40% of the intervention group mothers received ≥ 8 visits. As others have reported,⁵⁸ the mothers were often unavailable for the visits, resulting in many missed appointments and multiple reschedules. Reasons for missed appointments varied, often reflecting the complex living situations that characterized the lives of many of the young mothers; occasionally missed appointments were caused by administrative and scheduling demands of the home visitors.

Mothers in the control group were threefold more likely to have a second birth compared to mothers who received ≥ 2 intervention visits, raising the question of how the intervention worked. Although the intervention content was comprehensive, most mothers did not receive the bulk of the lessons. One possible explanation for the success of the intervention is that the mothers benefited from the support of a mentor. For example, the young mothers frequently contacted the mentors (who had cell phones), and the mentors often assisted with interpersonal disputes between the mothers and either other family members or partners. This assistance was often provided outside of the regularly scheduled home visits. Another possibility is that the information in the initial lessons was powerful enough to enable the mothers to avoid a second birth. The first 2 lessons focused on negotiation strategies, parenting skills, and "listening" to infants' cues. In the first lesson, mothers viewed and received a 15-minute videotape that featured adolescent mothers with their children, partners, and mothers talking about strategies to avoid conflict, to promote caregiving, and to incorporate personal values into goals. The videotape, which was made by a group of adolescent mothers who had been nominated by the administration of a local school for pregnant and parenting girls for their success in academic performance, citizenship, and parenting behavior, was well received by the young mothers. A previous evaluation conducted when the infants in this sample were 3 months of age showed that intervention group mothers, who received the videotape and the initial few lessons, were ~ 4 times more likely than control group mothers to delay the introduction of solid foods, in keeping with the guidelines from the American Academy of Pediatrics.²⁷ Although the videotape did not address second births per se, the focus on negotiation strategies and caregiving may have given young mothers the strength and skills to avoid a second birth. A third possible explanation is that the adolescents benefited from an approach that appealed to both their egocentrism and their emerging autonomy. Operating from the principles of social cognitive theory, the videotape enabled the young mothers

to identify and model from successful peers. At the same time, the mentors provided the opportunity for the young mothers to view a successful future.

It is tempting to assume a dose effect of the intervention because only 1 of the mothers who received ≥ 6 home visits had a second infant within 2 years. As the number of visits increased, the young mothers were exposed to more content and to the ongoing support of the mentor, perhaps helping them build the desire and skills needed to avoid a second birth. However, it is also possible that the mothers motivated to avoid a second birth may have been motivated to participate in the intervention. The CACE model reduces the likelihood that the difference in second births could be explained entirely by motivational factors. Taken together, our findings suggest that a mentorship model that includes a structured intervention, along with a strong focus on building a supportive relationship, may be an effective strategy in reducing second births. The findings also suggest that a relatively brief intervention may be adequate.

Determinants of Rapid Repeat Births

Our data lend partial support to the problem behavior theory that rapid repeat childbearing is part of an early history of risk behavior¹⁸ but not necessarily ongoing risk behavior. The mothers in this sample engaged in high rates of risky behavior before giving birth to their first child, including illegal substance use, involvement in physical fights, and sexual practices risky enough to contract sexually transmitted diseases. Only a history of arrests differentiated those who had a rapid second birth from those who did not. These findings are consistent with reports from other investigators that rapid repeat births tend to occur within a context of early risk behaviors,^{19,20} partially supporting problem behavior theory.

By 24 months, mothers' risk profile had changed. Although risk practices, particularly substance use, remained relatively common, mothers who had a second infant did not differ in risk practices from those who did not. Arrest rates, measured since the birth of the first infant, declined and did not differ between mothers who did and did not have a second infant, suggesting that concurrent risk practices were not associated with repeat childbearing. Similarly, contraceptive methods did not vary between mothers who did and did not have a rapid repeat birth, suggesting that knowledge and availability of contraceptives did not contribute to rapid second births.

Maternal age at first delivery was the only baseline demographic or psychological variable associated with rapid repeat birth. Young mothers could not predict that they would give birth again within 2 years. Only 12% of the adolescent mothers anticipated having a second infant within 5 years of their first delivery, and only 1 adolescent who anticipated a second birth actually had

one. Mothers' inability to predict a second birth is not surprising, given the ambivalence and inconsistencies surrounding pregnancy intentions⁵⁹ and the relative instability associated with adolescent parenting.²⁰ The finding that maternal age is positively associated with second births provides some evidence for the normative aspects of adolescent childbearing. Mothers who are approaching the end of their adolescent years may be more accepting of an ongoing parenting role than younger mothers or may find more acceptance in their families and communities.²²

At 24 months, mothers who had delivered their second infant differed on a number of demographic and psychological scales from mothers with only 1 child. Although the timing and direction of effect cannot be determined, mothers who had a second infant within 2 years of their first infant were older, more likely to be in a romantic relationship with the father of the first infant, and to live with a partner and not with the infant's grandmother compared with mothers who did not give birth a second time. As others have reported,⁶⁰ mothers' romantic relationship with the father of their first child diminished over time, dropping from 66% at delivery to only 34% at 24 months. Although 50% of the mothers reported a new romantic partner at 24 months, it is likely that the mothers who remained in a romantic relationship with the father of their first infant were having more frequent sexual contact than mothers who had a new partner or were not romantically involved. Marriage rates were extremely low in this sample and unrelated to subsequent childbirth, consistent with reports that nonmarital childbearing is not associated with marriage.⁶¹

Mothers who had a second infant reported higher self-esteem and more positive life events than mothers who did not have a second infant, suggesting that the second birth was viewed from a positive perspective. In low-income, minority communities, childbearing is often regarded as a defining role for adolescents,⁶² making rapid second births a positive option.¹⁷ Although the young mothers in this sample did not plan to have a rapid second birth when they delivered their first infant, for the most part they were pleased and regarded the second birth from a positive perspective. The relatively high rate of intending to avoid contraception in subsequent sexual contact (22%) reported by mothers who had not had a second birth by 24 months provides further evidence that second births may be desired.

In keeping with the increasing autonomy that dominates adolescence, many of the young mothers transitioned from living with their mother to living with a partner. Yet, the quality of the adolescent mother-infant's grandmother's relationship was not associated with subsequent childbearing, regardless of whether it was measured at delivery or after 2 years. This finding is in contrast to reports that repeat childbearing is associ-

ated with poor parent-child relations,⁶³ providing additional evidence that repeat childbearing may be well accepted within the family and community.

There are several methodologic issues that should be considered in interpreting the findings and planning for subsequent research or implementation. First, although intervention group enrollment led to significantly fewer second births than control group enrollment, the numbers were small. In previous reports, we found no effects of the intervention on children's developmental status or on father involvement at 24 months.⁶⁴⁻⁶⁶ The investigation should be replicated in other samples. Second, we cannot be sure whether to attribute the positive effects to the curriculum or to the mentoring provided by the home visitors. Because most home visiting programs use paraprofessionals, rather than college-educated single mothers, further investigation is warranted to determine whether similar effects can be obtained with paraprofessionals. Finally, we do not have information on abortions and, therefore, cannot rule out the possibility that the reduction in second births among intervention group mothers was associated with elective abortions. Information on abortions was not included in the curriculum. Subsequent studies should gather comprehensive information on fertility.

Implications for Clinical Practice

Our findings regarding the intervention to prevent rapid second births and the determinants of second births have implications for clinical practice. A home-based intervention founded on a mentorship model and targeted toward adolescent development, including negotiation skills, was effective in preventing rapid repeat births among low-income, black adolescent mothers. Although there is some evidence to suggest a dose effect of the intervention, with no second births among mothers who attended ≥ 8 sessions, the effectiveness of the intervention could be seen after only 2 visits. Other than age, none of the baseline demographic, psychological, or risk practices could predict the rapid birth of a second infant. Finally, in some communities, rapid second births among adolescent mothers may be valued and regarded as desirable, thereby undermining many intervention programs.

ACKNOWLEDGMENTS

This research was supported by grant MCJ-240301 from the Maternal and Child Health Research Program and grant APRPA006000 from the Office of Population Affairs, US Department of Health and Human Services.

The authors extend their appreciation to the other members of the Three Generation team and to the families who participated in the project.

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Delaying Second Births Among Adolescent Mothers: A Randomized, Controlled Trial of a Home-Based Mentoring Program

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Pediatrics 2006;118;1087-1099

DOI: 10.1542/peds.2005-2318

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