

Home-Visiting Intervention to Improve Child Care Among American Indian Adolescent Mothers

A Randomized Trial

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Objective: To assess the impact of a paraprofessional-delivered home-visiting intervention to promote child care knowledge, skills, and involvement among pregnant American Indian adolescents.

Design: Randomized controlled trial comparing a family-strengthening intervention with a breastfeeding education program.

Setting: One Apache and 3 Navajo communities.

Participants: Fifty-three pregnant American Indian adolescents were randomly assigned to intervention (n=28) or control (n=25) groups. Follow-up data were available for 19 intervention and 22 control participants.

Intervention: Paraprofessionals delivered 41 prenatal and infant care lessons in participants' homes from 28 weeks' gestation to 6 months post partum.

Main Outcome Measures: Child care knowledge, skills, and involvement.

Results: Mothers in the intervention compared with the control group had significantly higher parent knowledge scores at 2 months (adjusted mean difference [AMD], +14.9 [95% confidence interval (CI), +7.5 to +22.4]) and 6 months post partum (AMD, +15.3 [95% CI, +5.9 to +24.7]). Intervention group mothers scored significantly higher on maternal involvement scales at 2 months post partum (AMD, +1.5 [95% CI, -0.02 to +3.02]), and scores approached significance at 6 months post partum (AMD, +1.1 [95% CI, -0.06 to +2.2]). No between-group differences were found for child care skills.

Conclusions: A paraprofessional-delivered, family-strengthening home-visiting program significantly increased mothers' child care knowledge and involvement. A longer and larger trial is needed to understand the intervention's potential to improve adolescent parenting and related child outcomes in American Indian communities.

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ADOLESCENT CHILDBEARING has been linked to negative parenting patterns and poor health and behavior outcomes for teen mothers and their children.^{1,2} Approximately 46% of American Indian women vs 25% of all women in the United States have their first child during adolescence³ and twice as many have 2 or more births during adolescence.³ Expectant American Indian mothers, regardless of age, receive inadequate prenatal care.⁴ Almost twice as many American Indian women compared with other US women receive no prenatal care (31.2% vs 17.3%).⁵ Of those who receive prenatal care, reservation-based teens do not seek prenatal care until late in their second and sometimes not until their third trimester.⁶ Compounding the problems associated with teen parenthood, American Indian adolescents have greater health and

behavior risks than other US ethnic and racial groups: at least 31% of reservation-based adolescents live in poverty; 37% do not complete high school, and only 2% will obtain a bachelor's degree.⁷ American Indian adolescents compared with other US racial groups also have elevated rates of drug abuse, suicide, domestic violence, and injuries.³ Although the health and behavior risks for American Indian youth are well documented, protective factors related to child rearing within reservation communities are often not acknowledged. In general, native traditions promote strong extended family networks and cultural practices that reinforce the value of family-centered healing and prevention.⁸⁻¹⁰

Numerous studies support the short- and long-term efficacy of home-visiting programs delivered during pregnancy and early childhood for low-income, at-risk families with poor access to services.¹¹⁻¹⁹

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Home-visiting interventions have documented improvements in parenting and the home environment²⁰; maternal life outcomes^{15,16,21-23}; children's health and behavior outcomes^{12,24-28}; and reduced lifetime drug use and legal problems for mothers and children.^{18,22,29} However, to our knowledge, no home-visiting studies have included American Indian individuals as the target population. Nurse- vs paraprofessional-delivered home-visiting programs have been more rigorously evaluated and have demonstrated more positive outcomes.¹⁷ Because of a severe shortage of nurses on reservations and the greater cost of nurse vs paraprofessional home visitors, nurse home-visiting programs are not feasible for reservation communities at this time.³⁰⁻³²

We conducted a randomized controlled trial to evaluate the short-term impact of a paraprofessional-delivered home-visiting intervention among rural Navajo and Apache pregnant teens. Primary outcomes included mothers' child care (1) knowledge, (2) skills, and (3) involvement. Secondary outcomes included psychological and behavior risks that could interfere with child care: (1) family conflict and cohesion, (2) social support, (3) self-esteem, (4) locus of control, and (5) drug use.

METHODS

PARTICIPANTS

All pregnant American Indian adolescents aged 12 to 19 years at conception and at 28 weeks' or earlier gestation were potentially eligible for participation. The expectant teens were recruited from 4 American Indian health service catchment areas on the Navajo and White Mountain Apache reservations in New Mexico and Arizona. Expectant teens were not eligible if they had serious medical, legal, or social problems that would preclude their ability to fully participate in the intervention and assessments. Recruitment occurred between July 2001 and February 2002.

The study protocol was approved by the Johns Hopkins institutional review boards, the Navajo Nation Human Research Review Board and appropriate Navajo community health boards, the White Mountain Apache Health Board and Tribal Council, the Whiteriver Service Unit, and the Phoenix Area Indian Health Service. If the participant was younger than 18 years, informed consent was obtained from the parent or guardian and assent, from the participant. If the participant was 18 years or older, consent was obtained from the participant alone.

SAMPLE SIZE

The sample size was based on the number of eligible teens who enrolled during an 8-month recruitment period (n=50). Formal sample-size calculations were not done.

RANDOMIZATION

Study participants were randomly assigned to the intervention or control conditions within each site. Randomization stratified by site was determined by the Randomization.com Web site³³ prior to enrolling any study participants. Although we did not balance by site, the number of intervention and control participants per site was similar. The randomization sequence for each site was stored in Baltimore, Md, by our data manager and was concealed from the key investigators and on-site educators at all times. After each participant signed consent/assent

forms and completed the baseline assessment, the educators faxed these materials to the data manager in Baltimore. The data manager checked that all assessments were properly completed, confirmed that the teen met inclusion criteria and no exclusion criteria, and then informed the educator of the participant's group assignment. The participants and evaluators were not blind to intervention assignment.

INTERVENTION AND CONTROL

Intervention Arm

The home-visiting intervention was modeled on "Healthy Families America." Healthy Families America is a national program founded on 12 research-based principles to ensure quality of home-visiting interventions for at-risk families. The content of the home-visiting intervention was derived from extensive community input on what teen parents needed to learn and was based on the *American Academy of Pediatrics Guide to Baby Care: Caring for Your Baby and Young Child: Birth to Age 5*.³⁴ Lessons covered prenatal care, labor, delivery, breastfeeding, nutrition, parenting, home safety, immunizations, well-baby care, family planning, sexually transmitted disease prevention, and maternal goal setting for personal and family development. The curricular content was scheduled chronologically to provide key instruction at developmentally appropriate times for participants' children. The protocol included 25 home visits and 41 discrete lessons taught from 28 weeks' gestation until 6 months post partum (about 9 months total) by the educators using tabletop flip charts. Home visits were scheduled to last approximately 1.5 hours. Cultural adaptations—including style, graphics, delivery, and content—were achieved through a community-based participatory process.

Control Arm

Control participants received a breastfeeding education program that was developed in 1996-1997 by Johns Hopkins Center for American Indian Health and the participating communities. Participants assigned to the control arm were scheduled to receive 23 home visits covering 20 breastfeeding lessons. The expected visit duration was 1 to 1.5 hours.

Educators

After randomization, participants (both intervention and control) were served by a single educator in their respective community. The educators (n=4) were bilingual American Indian women who had a job history in tribal health and human services, passed a background screening, and had been teen mothers themselves or had special interest in this population. The educators participated in more than 500 hours of training and were tested to ensure they had mastered lesson content and delivery strategies prior to study implementation. Educators received daily supervision at the site and weekly supervision through cross-site conference calls. Ongoing training occurred bimonthly throughout the study. Every 3 months, supervisors observed educators with participants and rated educators' professionalism, rapport, interpersonal skills, and adherence to the home-visitation protocol.

DATA COLLECTION

Data collected included child care knowledge and skills test scores and maternal self-reports at 3 intervals: baseline (≤ 28 weeks' gestation) and 2 months and 6 months post partum.

Description of Key Measures

For all measures, higher scores are better, unless noted.

Primary Outcome Measures. The primary outcome measures were as follows:

- Knowledge. A 51-item multiple-choice test developed by the study team with a possible score of 0% to 100%.
- Skills. Educators asked participants to complete 9 exercises to demonstrate infant care skills, using dolls at baseline and their own infants at 2 and 6 months post partum. Educators scored the results. Possible scores ranged from 0% to 100%.
- Involvement. Five selected self-report items scored on a 4-point scale with a possible score of 5 to 20.

Secondary Outcome Measures. The secondary outcome measures were as follows:

- Family conflict.³⁵ Five self-report items scored on a 4-point scale with a possible score of 5 to 20; higher scores are worse.
- Family cohesion.³⁵ Three self-report items scored on a 4-point scale with a possible score of 3 to 12.
- Social support. A 10-item self-report scored on a 5-point scale with a possible score of 10 to 50.
- Self-esteem.³⁶ A 10-item self-report scored on a 4-point scale with a possible score of 10 to 40.
- Depression.³⁷ A 20-item self-report scored on a 4-point scale with a possible score of 0 to 60; higher scores are worse.³⁸⁻⁴⁵
- Locus of control.⁴⁶ A 7-item self-report scored on a 4-point scale with a possible score of 7 to 28.
- Drug use.⁴⁷ Eight self-report items scored on a 4-point scale with a possible score of 8 to 32.

ANALYSIS

The study sample was defined as those mothers who were randomized and provided at least 1 follow-up evaluation, regardless of the degree of intervention received. For baseline comparisons, we used *t* tests for continuous variables and χ^2 tests for categorical variables. We adjusted for baseline scores and compared outcomes for the intervention and control groups at 2 months and 6 months post partum. We adjusted for baseline scores using PROC REG in SAS 8.0 (SAS Institute Inc, Cary, NC).

For attrition analyses, differences between participants who dropped out (*n*=12) and those who continued (*n*=41) were assessed with *t* tests and χ^2 tests (data not shown). It was not necessary to control for educator bias since 1 educator per site (*n*=4) implemented the intervention and control conditions. Similarly, clustering by site was not necessary because baseline characteristics between sites were comparable (data not shown). Few observations had missing values (<11%), and differences between those participants with known and missing data did not yield any significant differences.

RESULTS

PARTICIPANT FLOW

Of the 77 participants who were initially contacted, 61 (79%) met eligibility criteria and agreed to enroll (**Figure**). Of the 61 enrolled, 8 (13%) dropped out before randomization. Twenty-eight were randomly assigned to the intervention arm and 25, to the control. Of those randomized, 19 (68%) of the intervention mothers and 22 (88%) of the control mothers completed at

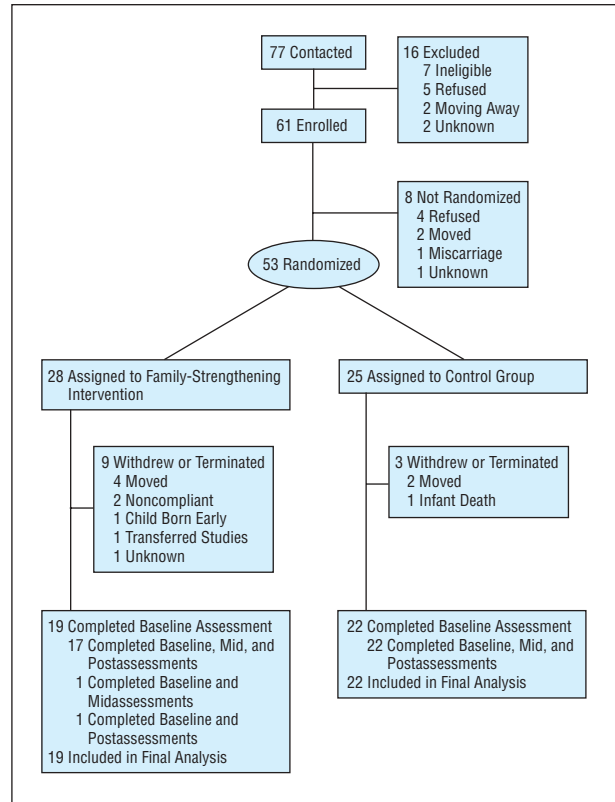


Figure. Study flowchart.

least 1 of 2 follow-up assessments, and 17 intervention (61%) and 22 control (88%) participants completed both follow-up assessments.

PARTICIPANT CHARACTERISTICS

Randomized participants (*N* = 53) ranged in age from 14 to 20 years (median age, 17.1 years) and all were 19 years or younger at conception. Fifty-one (96%) had never married; twelve (23%) (8 intervention participants, 4 controls) had completed high school and 36 (68%) (20 intervention participants, 16 controls) lived with their parents. Forty mothers (75%) (21 intervention participants, 19 controls) were pregnant with their first child, and 7 (13%) (4 intervention participants, 3 controls) had 1 previous child; data on parity was missing for 6 participants (11%). Among all baseline characteristics, only median gestational age at recruitment differed between the 2 groups (intervention, 20 weeks; control, 25 weeks) (**Table 1**). There were no important differences between arms in baseline outcome variables, with the exception of self-esteem score (mean, intervention, 28.6 vs control, 26.3 [95% confidence interval (CI), -4.4 to -0.3]). Those with known data were not substantially different from those with missing data in terms of baseline characteristics and outcome variables. Twelve participants dropped out prior to follow-up (9 intervention participants and 3 controls); the dropouts by study arm appeared similar in age, tribal affiliation, employment, and father involvement, as well as baseline outcome variables. However, dropouts in the intervention group tended to live with their parents (8 intervention participants vs

Table 1. Baseline Comparison of All Randomized Participants*

Variable	Intervention (n = 28)	Control (n = 25)
Demographics		
Age, y		
≤14	2 (7)	2 (8)
15-17	14 (50)	15 (60)
≥18	12 (43)	8 (32)
Tribal affiliation		
Apache	7 (25)	5 (20)
Navajo	19 (68)	15 (60)
Mixed affiliations	2 (17)	5 (20)
Living situation		
Parents	20 (71)	16 (64)
Significant other	4 (14)	5 (20)
Others	4 (15)	4 (16)
Education, y		
<12	3 (11)	6 (24)
≥12	8 (29)	4 (16)
Still in school	16 (57)	15 (60)
Currently employed		
Yes	4 (14)	3 (12)
No	20 (71)	22 (88)
Age at first alcohol use, y		
≤14	12 (43)	9 (36)
15-17	13 (46)	9 (36)
≥18	1 (4)	1 (4)
Never used alcohol	2 (7)	5 (20)
Parity		
0	21 (75)	19 (76)
1	4 (14)	3 (12)
Gestational age, wk		
≤20	14 (50)	4 (16)
21-28	10 (36)	12 (48)
≥29†	2 (7)	7 (28)
Median gestational age, wk	20	25
Father involved		
Yes	16 (57)	11 (44)
No	12 (43)	14 (56)
Parenting, mean score		
Knowledge	46.4	46.5
Skills	73.9	77.8
Involvement	16.8	16.1
Family relationships, mean score		
Conflict	7.5	7.3
Cohesion	8.4	7.9
Mental/behavioral health, mean score		
Social support	24.2	24.2
Self-esteem†	28.6	26.3
Depression	17.7	18.4
Locus of control	21.0	19.4
Drug use	24.4	22.3

*Values are expressed as number (percentage) of participants unless otherwise indicated. Some data were missing for some variables.

† $P < .05$.

0 controls), still be enrolled in school (8 intervention participants vs 0 controls), and were recruited at a younger gestational age (7 intervention participants ≤ 20 gestational weeks vs 0 controls).

FIDELITY TO DOSE OF INTERVENTION

The intervention group completed 82% of 41 lessons and 85% of 25 expected home visits. The control group

completed 86% of 20 lessons and 63% of 23 expected home visits.

PRIMARY OUTCOMES

The adjusted mean difference (AMD) for knowledge scores among mothers in the intervention compared with the control arm at 2 months post partum was +14.9 (95% CI, +7.5 to +22.4) and at 6 months post partum, +15.3 (95% CI, +5.9 to +24.7) (**Table 2**). The AMD for maternal skill scores at 2 months post partum was +5.8 (95% CI, -2.4 to +14.0) and at 6 months post partum, +4.1 (95% CI, -4.0 to +12.3). The AMD for maternal involvement scores at 2 months post partum was +1.5 (95% CI, -0.02 to +3.02) and at 6 months post partum, +1.1 (95% CI, -0.06 to +2.2).

SECONDARY OUTCOMES

There were no within- or between-group changes in family conflict or cohesion scores from baseline to postintervention (Table 2). Regarding psychological and behavioral risk scores, social support, self-esteem, and locus of control, there were no within- or between-group differences from baseline to postintervention. Depression scores were elevated in both groups at baseline (intervention, 16.8 vs control, 18.8, with a cutoff score of < 16 as symptomatic). Mothers in the intervention experienced a larger drop in depressive symptoms at both 2 months and 6 months post partum (AMD, at 2 months post partum, -3.1 [95% CI, -8.8 to +2.5] and at 6 months post partum, -6.1 [95% CI, -13.0 to +0.85]); however, the CIs do include zero. Mothers in both groups reported low drug use (data not shown) and high levels of perceived risk at baseline and follow-up.

LIMITATIONS

The study had 4 major limitations. (1) We were not able to measure the full extent of teen mothers' child care capacity. Parenting knowledge and involvement could be indicators for capacity but the links are not yet proven. The primary outcome measure that would be the closest proxy—the observed child care skill exercises—had implementation difficulties. (2) There was a notable number of dropouts, particularly in the intervention arm (9 of 28 intervention mothers vs 3 of 25 controls). The imbalance in dropouts between arms is potentially a significant source of bias, even if underlying reasons do not appear to favor the intervention arm (see "Comment" section). (3) Most measures were a type of self-report. Thus, respondents may have given socially desirable answers. (4) The study lacked evaluators blind to the intervention group. Although most of the outcomes were self-reports, the educators supervised the self-reports and conducted the 1 observation skill assessment, which may have biased reported outcomes.

COMMENT

To our knowledge, this is the first published randomized trial assessing the impact of a family-strengthening

Table 2. Mean Outcome Scores for Each Study Arm at 2 and 6 Months Post Partum, With Mean Differences Adjusted for Baseline

Outcome Score	Unadjusted Mean (SD)		Adjusted Outcomes	
	Intervention (n = 19)	Control (n = 22)	Difference (95% CI)	P Value
Parenting				
Knowledge (range, 0-100)				
2 mo	71.9 (10)	58.1 (13)	14.9 (+7.5 to +22.4)	<.001
6 mo	71.1 (14)	57.2 (15)	15.3 (+5.9 to +24.7)	.002
Skills (range, 0-100)				
2 mo	92.4 (10)	86.9 (15)	5.8 (-2.4 to +14.0)	.16
6 mo	91.1 (24)	86.4 (15)	4.1 (-4.0 to +12.3)	.31
Involvement (range, 5-20)				
2 mo	16.9 (1)	15.4 (3)	1.5 (-0.02 to +3.02)	.05
6 mo	16.8 (1)	15.7 (2)	1.1 (-0.06 to +2.2)	.06
Family relationships				
Conflict (range, 5-20; higher score is worse)				
2 mo	6.9 (2)	6.6 (2)	0.2 (-0.9 to +1.3)	.68
6 mo	6.8 (2)	6.5 (3)	0.4 (-1.4 to +2.2)	.68
Cohesion (range, 3-12)				
2 mo	8.2 (2)	7.3 (2)	0.6 (-0.3 to +1.5)	.18
6 mo	8.0 (2)	8.3 (2)	-0.4 (-1.4 to +0.7)	.45
Mental/behavioral health				
Social support (range, 10-50)				
2 mo	22.2 (6)	24.0 (5)	-2.3 (-5.4 to +0.97)	.16
6 mo	23.1 (7)	22.5 (5)	0.41 (-3.4 to +4.2)	.83
Self-esteem (range, 10-40)				
2 mo	27.7 (4)	27.2 (3)	-0.84 (-2.9 to +1.2)	.41
6 mo	29.4 (4)	26.4 (3)	1.6 (-0.77 to +4.1)	.17
Depression (range, 0-60; higher score is worse)				
2 mo	11.6 (10)	15.2 (8)	-3.1 (-8.8 to +2.5)	.27
6 mo	8.4 (10)	14.2 (11)	-6.1 (-13.0 to +0.85)	.08
Locus of control (range, 7-28)				
2 mo	20.8 (3)	20.1 (4)	-0.23 (-2.5 to +2.0)	.84
6 mo	21.3 (4)	20.9 (4)	0.17 (-2.3 to +2.6)	.89
Drug abuse (range, 4-32)				
2 mo	23.9 (8)	22.5 (7)	1.1 (-3.9 to +6.0)	.67
6 mo	25.1 (6)	22.4 (8)	2.6 (-2.2 to +7.4)	.27

Abbreviation: CI, confidence interval.

home-visiting intervention on American Indian pregnant teens as a target population.

Intervention mothers had significantly higher knowledge scores at 2 and 6 months post partum. Consistent with numerous behavior change theories, mothers' increased knowledge could lead to increased parental competence, more positive parenting, and better outcomes for mothers and children.⁴⁸⁻⁵⁰

Although we originally expected the intervention to affect child care skill scores, the small positive differences we observed at 2 months post partum were even less at 6 months post partum. If the intervention was responsible for skill improvement for some individuals, it was transitory. The modest change in skills may be related to high scores at baseline (ie, a ceiling effect). The skills test was difficult to implement and rate and requires further development and evaluation.

Intervention mothers had significantly higher involvement scores at 2 months post partum, and scores approached significance at 6 months post partum. These differences were associated with positive maternal self-image and characteristics relating to maternal role attainment. Maternal role attainment is a process whereby

a woman integrates her new child care responsibilities into her existing behavioral repertoire.⁵¹⁻⁵³ Studies have linked maternal role attainment to parent competence, sensitive caregiving, and positive involvement over the long-term.⁵⁴⁻⁵⁶ Adolescent mothers often have complications with maternal role attainment because of their own developmental needs.⁵³

Larger decreases in depression scores at 2 and 6 months post partum for intervention mothers were not significant. However, the magnitude of both unadjusted and adjusted mean score differences between groups suggests the intervention may help reduce mothers' depressive symptoms, although our small sample size resulted in imprecise estimates and wide confidence intervals. Depression during pregnancy and post partum has been associated with significant impairments in functioning for both the mother and, ultimately, her child.⁵⁷⁻⁵⁹ High baseline scores for expectant teens in both groups (>16.0) provide evidence that the study population may be at high risk for depression and invites further investigation of the intervention's impact on depressive symptoms.

With respect to family relationships, there were no differences between groups at end point. One explanation

is that baseline scores identified few problems, with little room for either group to improve. Educators observed levels of family conflict that were higher than participants reported. Family relationship measures may be influenced by cultural beliefs that discourage individuals from speaking negatively about one's family. More appropriate family assessment measures will be required for future studies in this population.

There were no observed intervention effects on psychological or behavioral risks. Locus of control, a measure of psychological self-sufficiency, was not affected in this or other home-visitation studies.¹⁶ Lack of impact on social support was not surprising since each group received a large dose of home visitation. The fact that mothers reported low substance use at baseline and follow-up was not expected. National and local studies have described high endemic substance abuse rates in both participating tribes.^{60,61} Further, onset of alcohol use before age 15 years predicts higher risk for substance use in adulthood,⁶² and our baseline rates of "first drink" averaged 14.5 years of age for all participants. Because the participants were pregnant and legally underage, they may not have been actively using; may have stopped using when they found out they were pregnant; or may have given socially desirable answers. Or the measure for drug use may not have been adequate to assess substance use in this population.

Previous evaluations of home-visiting programs have noted problems with high attrition and adherence to number of expected visits.^{63,64} Effective programs generally planned an average of 60 visits over a 1- to 5-year period but averaged between 22 to 33 visits.⁶³ Our intervention had 25 planned visits covering 41 lessons over a 9-month period. More than 80% of home visits and lessons were completed. However, as illustrated in the Figure, there was a significant number of dropouts from the intervention arm (32%) vs the control arm (12%). Our analyses of the dropouts revealed that the intervention dropouts compared with the control dropouts were more likely to live with their parents, to be currently enrolled in school, and to be recruited earlier in their pregnancies (<20 weeks' gestation). These varying characteristics may suggest that the intervention dropouts had adequate resources (help from their family) to cope with their pregnancy or that the duration and intensity of the intervention was untenable for those still in school or those recruited early in their pregnancy.

Overall, this study indicated that trained American Indian paraprofessionals were able to identify, recruit, obtain consent from, and effectively implement a family-strengthening home-visiting intervention with expectant and postpartum teen mothers. The intervention improved mothers' child care knowledge and involvement and may reduce maternal risk for depression. Firm conclusions cannot yet be drawn because of study limitations. A larger, longer randomized controlled trial incorporating lessons learned from this study is under way to estimate short- and long-term impacts of this paraprofessional-delivered intervention on parenting and health and behavior outcomes for American Indian teen mothers and their children.

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Author Contributions: Dr Walkup, the primary investigator for this work, had full access to the study data and takes responsibility for the data integrity and accuracy of the analyses. *Study concept and design:* Barlow, Varipatis-Baker, Speakman, Ginsburg, Pan, Reid, Santosham, and Walkup. *Acquisition of data:* Goklish, Cowboy, Fields, and Hastings. *Analysis and interpretation of data:* Friberg and Pan. *Drafting of the manuscript:* Barlow, Varipatis-Baker, Ginsburg, Friberg, Santosham, and Walkup. *Critical revision of the manuscript for important intellectual content:* Varipatis-Baker, Speakman, Ginsburg, Goklish, Cowboy, Fields, Hastings, Pan, Reid, and Walkup. *Statistical analysis:* Ginsburg, Friberg, and Pan. *Obtained funding:* Barlow, Varipatis-Baker, Speakman, Ginsburg, and Walkup. *Administrative, technical, and material support:* Barlow, Varipatis-Baker, Speakman, Ginsburg, Reid, and Walkup. *Study supervision:* Barlow, Goklish, Cowboy, Fields, Hastings, Reid, Santosham, and Walkup.

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