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Abstract Intervention strategies are needed to improve maternal and infant outcomes in minority populations living in poverty. Home visiting by nurses has improved outcomes for mothers and young children, but use of professional staff makes these programs expensive. Pride in Parenting was a randomized controlled trial of paraprofessional home visitation to provide health and developmental intervention for high-risk African American mothers in Washington, DC. This study proposed to test whether paraprofessional visitors drawn from the community could effectively influence health and mothers' parenting behaviors and attitudes. African American mothers with inadequate prenatal care were recruited at delivery and randomized to intervention or usual care groups. The intervention curriculum was delivered through both home visitation and parent-infant groups for 1 year. The intervention curriculum was designed to improve knowledge, influence attitudes, and promote life skills that would assist low-income mothers in offering better health oversight and development for their infants. Both intervention and usual care groups received monthly social work contact over the one-year study period to provide referrals for identified needs. The intervention participants improved their home environments, a characteristic important for promoting good child development. Mothers' perceptions of available social support improved and child-rearing attitudes associated with child maltreatment were reduced. Paraprofessional home visitors can be successful in improving the child-rearing environments and parenting attitudes for infants at risk, perhaps offering a less costly option to professional home visitors.

Keywords Parenting · African American · Infant development · Home visiting · Intervention · Paraprofessional · Child maltreatment · Home environment · Low income

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Background

African American children born into poverty are at increased risk for poor developmental and health outcomes. Such outcomes have been attributed to perinatal factors including prematurity and low birth weight [1–3], but also

correlate with sub-optimal family environment and rearing practices [4]. A variety of early interventions have been attempted in recent years to improve outcomes for at-risk mothers and children. These interventions have focused on improving utilization of health care during pregnancy, reducing adverse pregnancy outcomes, and enhancing developmental outcomes for children at risk [5–8]. These studies have resulted in improved developmental outcomes for children, fewer emergency room visits for child injury, and fewer subsequent pregnancies for the mothers living in environments with limited resources [9–12].

Families that present perhaps the greatest challenge to intervention programs are those from inner city, low income minority populations. These families may have had negative experiences with health and social service systems, discouraging them from accessing needed community resources, including prenatal care and health care for their children. In addition, stressors associated with poverty may interfere with the parent's capacity to provide a nurturing home environment for their children.

In 1993 in Washington DC (DC), a multidisciplinary, multi-institutional group of scientists implemented a community-based intervention study in a population of mothers with inadequate or no prenatal care. This project was part of Phase I of the NIH-DC Initiative to Reduce Infant Mortality (NIH-DCI). The Pride in Parenting (PIP) study was designed as a community-based intervention targeting African American mothers who had used prenatal care inadequately or not at all. The intervention emphasized expanding the mother's knowledge and attitudes about health, nutrition, parenting, use of services, and promoting positive health behaviors.

Formulation of the PIP Intervention Model

The goal of the intervention was to influence parenting knowledge, attitudes, and skills that would contribute to improved healthcare utilization for the mothers and their infants and improved child-rearing environments. PIP used an ecological intervention model focused on parenting, infant health, individual coping skills, and recruitment and maintenance of social support systems. Prior successful interventions guided the study design and curriculum development in DC [13–15]. Some of these interventions used professional home visitors, usually nurses or educators, while others used paraprofessional staff. The PIP program chose lay home visitors to deliver the home-based intervention. It was anticipated that paraprofessional home visitors of the same racial-ethnic backgrounds as the participants would enhance trust and communication during delivery of the intervention.

A detailed report of the success of the PIP intervention in improving health care utilization in this high-risk population is reported elsewhere [5]. In this paper we explore the effects of the intervention on: (1) mothers' parenting knowledge, attitudes, and behaviors; (2) their perceptions of stress and social support; (3) the appropriateness of the home environment; and (4) the infants' development.

Methods

This study utilized a randomized controlled experimental research design to test the efficacy of paraprofessional home visitation to provide health and developmental intervention for high-risk African American mothers. This study proposed to test whether paraprofessional visitors drawn from the community could effectively influence health behaviors and attitudes of the mothers in the intervention. The study was reviewed and approved by the institutional review boards of all participating institutions.

Participants

Women over age 18 who were DC residents with inadequate prenatal care (PNC) were recruited at the collaborating hospitals following delivery. Inadequate prenatal care was defined as 5 or fewer prenatal care visits, care initiated in the third trimester, or no prenatal care. Exclusionary criteria were: a psychiatric diagnosis for the mother; infants of less than 34 weeks gestational age or 1,500 g at delivery; and major infant health problems. Mothers were recruited at George Washington University Hospital, Howard University Hospital, Columbia Hospital for Women, and DC General Hospital.

Hospital records for mothers and infants were screened for eligibility, and eligible mothers were approached for enrollment at delivery by the study social workers. A total of 286 women agreed to enrollment and, after consent, mother-infant dyads were randomly assigned either to the intervention arm or the standard social services (control) group. To ensure comparable numbers within each group across the 4 hospitals, site-specific block randomization was used. Block randomization ensured avoiding selection bias attributed to demographic factors or differences in follow-up care provided across the 4 sites.

The Home Visit Curriculum

A curriculum was developed with specific structure and content for each home visit [16]. The focus of the curriculum was to improve knowledge, influence attitudes, and promote life skills that would assist low-income mothers in offering a more optimal health and developmental environment for their infants. The major objectives were to

Table 1 Topics for parent intervention sessions

Topics for home visits

Newborn care/Postpartum women's health needs	Healthy relationships
Family planning and pregnancy spacing	Planning for your future
Immunizations/scheduling health visits	Safety in the home
Reducing health risks	Establishing family routines
Reproductive health	Budgeting
Coping with stress	Family meal planning
Problem solving strategies	Family recreation
Identifying resource needs	Infant development
Developing social support	Dealing with baby's crying
Involvement of fathers	Managing child behavior
Meeting needs of family members	Infant learning activities

Topics for parent-infant groups

Play group	Parent discussion
Infant development	Safety at home
Infant feeding	Infant health
Infant massage	Effects of prenatal alcohol use, drug use and smoking
Toy making workshop	Managing finances
Planning the baby's day	Handling relationships
How you're special to your baby	Education and training resources
Selecting toys	Looking good
Infant development: year 2	Handling tension
	Women's health
	Managing children's behavior

improve use of maternal and child health and social service resources, identify and maintain existing community systems, develop effective coping strategies, establish family routines and personal goals, and improve responsiveness to the child's needs.

Home visitors worked to establish a supportive, cooperative relationship with mothers and respond to the mothers' individual needs. Home visitors followed a standardized curriculum during the visits, including instruction on various parenting health and child care topics that coincided with the infant's age and development. Specific topics drawn primarily from existing programs were selected to address these objectives (Table 1). Each home visit session included a play activity adapted from the Partners educational curriculum, validated on a similar population [17, 18].

Visual aids and support materials were drawn predominately from commercially available print materials. A health educator with expertise in work with low-literate and racial-ethnic minority populations helped create new materials and selected the final materials. Materials were culturally appropriate and relevant to the lives of low-income women. The recruited paraprofessional visitors participated in a 45-day intensive training on issues to be covered and the specific content for each visit [19, 20].

Parent Group Curriculum

Combining home visiting and group-based interventions has been shown most effective for improving outcomes for children from socioeconomically disadvantaged homes [4]. Therefore, both were included in the PIP intervention. The group sessions, adapted from a previously developed curriculum [21, 22], expanded on topics presented during the home visits (Table 1). A master's level early intervention specialist led the groups in conjunction with the lay home visitors. The group session format was a 45-minute parent-infant playgroup focused on developmental issues, followed by a 45-minute parent group discussion.

Measures

After enrollment, baseline data were collected by reviewing hospital records and conducting personal interviews with mothers before discharge. Baseline data included an assessment of maternal and infant characteristics including maternal age, race/ethnicity, marital status, socioeconomic status, reproductive and pregnancy history, use of PNC during the index pregnancy, history of drug and alcohol use, and infant health at delivery.

Mothers were also asked to respond to a number of questionnaires exploring their attitudes about health risks, health care, child rearing, and perceived social support. After consenting to participate, mothers completed questionnaires including: the Adult Adolescent Parenting Inventory (AAPI) [23], a reliable measure predictive of parenting behaviors associated with risk for abuse and neglect [24]; the Knowledge of Infant Development Inventory (KIDI) [25]; and the Carolina Parent Support Scale (CPSS)[26], a measure of their perception of the availability and value of their social supports. These questionnaires were administered during the mother's hospital stay following delivery. At one month postpartum, the mothers were administered The HOME Screening Questionnaire (HSQ) [27], evaluating the appropriateness of the home environment for positive stimulation of infant development, and the Parenting Daily Hassles Scale (PDHS) [28] a measure of parenting stress. Data collection points following hospital discharge occurred at 1 month, 4, 8, and 12 months for health care utilization information and at 12 months for re-administration of baseline measures. Infant development was assessed using the Bayley Scales of Infant Development-2nd Edition (BSID) [29] at the end of the first year of life.

Procedure

The goal of the Pride in Parenting project was to increase the use of healthcare by the mother for herself and her infant and to increase skills in providing a safe and structured child-rearing environment. The intervention plan was developed by an interdisciplinary group of researchers drawn from each of the participating healthcare institutions in the NIH-DCI.

Following administration of the one-month postpartum baseline questionnaires, mothers were randomized to either the intervention or control group. The intervention group received visits from the home visitor for 1 year. Visits occurred weekly from birth through 4 months and biweekly from 5 to 12 months. Intervention mothers also were offered biweekly parent-infant playgroups and parent discussion groups beginning at 5 months and continuing until the infant was 12 months old. Both intervention and usual care (control) groups received monthly contacts from a hospital-based social worker for 1 year postpartum to offer referrals for needs expressed by the families.

Statistical Methods

Descriptive statistics were used to characterize the sample population. Bivariate statistical tests were conducted to compare the characteristics of two groups of mothers: control versus intervention and, within the intervention group, by level of participation in intervention. Comparisons of proportions and means were conducted for various socioeconomic background variables and the questionnaire measures, described above. These comparisons were investigated with Fisher's exact tests using StatXact V4 statistical software and t-tests using SAS statistical software V6.12, 20 respectively. The *P*-values for these tests were used to determine the significance of the difference between the groups of mothers with respect to the outcome variables.

Results

A total of 13,705 mother-infant records were screened for possible enrollment; 426 mothers were eligible. Of these, 67.1% (286) of the women consented to participate and were enrolled. Some of the 426 women who were approached for enrollment at delivery refused participation. Those women who refused ($n = 140$) differed from the enrolled group in being slightly older, having more children, had more limited prenatal care, lacking any health insurance, and having a higher percentage admitting to drug, tobacco, and alcohol use.

The women enrolled were predominately unmarried African American mothers. Almost 45% of the women had not completed high school. Most received Medicaid benefits to cover medical care costs. The group as a whole averaged 3.7 prenatal visits. Although their current pregnancy was reported as unwanted (93% of the mothers), only 22% reported using a contraceptive method at the time they became pregnant. No significant difference was found in demographic characteristics between the intervention and control groups (Table 2).

Despite implementing a variety of strategies to reduce attrition of participants from this high-risk study population [30], 41% of the enrolled women terminated from the study early. Women who terminated differed from those who completed the study in being more likely to have had no prenatal care visits, a lower mean number of prenatal visits, and a higher mean number of children. No differences were found in scores of the two groups on any baseline questionnaire measures of attitudes about child rearing or perceived social support.

Comparison of the outcome measures for intervention mothers versus the control mothers is shown in Table 3. A significant difference was found in the percentage of change from baseline favoring the intervention group in mothers' ratings on the HSQ ($P = 0.0005$), a measure of appropriate child stimulation provided in the home environment.

When the intervention and control mothers were compared at program completion on the CPSS to measure their perception of the availability and value of their social supports, there was no difference between the two groups' perceptions of informal social support resources. In the case of formal social support, mothers in the intervention group showed significantly greater change than control mothers in their positive perceptions of the value of the formal support resources available to them ($P = 0.008$). Other outcome measures, including the KIDI, the PDHS, and the subscales of the AAPI, yielded no significant differences between intervention and usual care participants. There were no statistical differences in baseline measures between intervention and control mothers, as expected in a randomized design; therefore no adjusted analyses were performed.

The PIP curriculum included plans for 32 home visits and 16 parent-infant group sessions. The mean number of home visits for the intervention group as a whole was 15.4 with SD± 10.6. The mean number of parent-infant group visits was 4.3 with SD± 5.0. Since the mothers showed variable levels of participation in home visits and parent-infant groups, mothers who received more intervention were compared to those who received less. The median for mothers' participation in the scheduled interventions, including both home visits and group sessions, was 30 contacts. This level of participation was chosen for classification of mothers into 2 groups: high intervention (HI)

Table 2 Baseline characteristics of mothers participating in the Pride in Parenting study

Maternal baseline characteristics	Control N = 140 N (%)	Treatment N = 146 N (%)	Total N = 286 N (%)
Mean age (P = 0.567)	25.2	24.8	25.0
Racial distribution (P = 0.623)			
African American	139 (99.3)	143 (98.0)	282 (98.6%)
Other	1 (0.7)	3 (2.1)	4 (1.4%)
Marital status (P = 0.278)			
Married	9 (6.4)	6 (4.1)	15 (5.2)
Never been married	126 (90.0)	133 (91.1)	259 (90.6)
Education (P = 0.221)			
Less than high school	67 (47.9)	61 (41.8)	128 (44.8)
High school	55 (39.3)	71 (48.6)	126 (44.1)
Above high school	18 (12.9)	13 (8.9)	31 (10.8)
Socioeconomic status			
Below poverty level (P = 0.117)	91 (65.0)	81 (55.5)	172 (60.1)
At least one household member receiving medicaid (P = 0.465)	114 (81.4)	113 (77.4)	227 (79.4)
At least one household member receiving WIC (P = 0.632)	56 (40.0)	63 (43.2)	119 (41.6)
Employment (working at time of pregnancy) (P = 0.278)	51 (36.4)	63 (43.2)	114 (39.9)
Living arrangements (P = 0.065)			
Independent	50 (35.7)	43 (29.5)	93 (32.5)
With mother	36 (25.7)	50 (34.3)	86 (30.1)
With other family	33 (23.6)	35 (24.0)	68 (23.8)
With male partner	14 (10.0)	5 (3.4)	19 (6.6)
With non-family	7 (5.0)	13 (8.9)	20 (7.0)
Reproductive history			
Mean number of pregnancies (P = 0.155)	3.9	3.6	3.8
Mean number of children (P = 0.305)	3.0	2.8	2.9
Using contraceptives at time of pregnancy (P = 0.480)	34 (24.3)	30 (20.6)	64 (22.4)
Current pregnancy wanted (P = 1.000)	9 (6.4)	11 (7.5)	20 (7.0)
Mean number of prenatal care visits (P = 0.634)	3.7	3.6	3.6
Mean week of gestation prenatal care was Initiated (P = 0.856)	26.6	26.7	26.7
No prenatal care (P = 0.504)	23 (16.4)	19 (13.0)	42 (14.7)
Self-reported			
Illicit drug use (P = 0.379)	21 (15.0)	16 (11.0)	37 (12.9)
Smoking (P = 0.693)	41 (29.3)	39 (26.7)	80 (28.0)
Alcohol (P = 0.378)	31 (22.1)	26 (17.8)	57 (19.9)
Baby's father involved during pregnancy (P = 0.188)	107 (76.4)	121 (82.9)	228 (79.7)

(30 contacts or more) and low (LI) (<30 contacts) intensity intervention participation. No significant baseline demographic differences were found between the two groups classified according to level of participation.

The results of the analysis of outcome measures comparing mothers with HI versus those with LI are found in Table 3. Mothers who received HI had significantly greater improvement in providing appropriately stimulating environments for their infants, as measured by the HSQ than those with LI ($P < .009$). With further comparison of the mothers with HI versus the control group, those receiving HI showed significantly greater change ($P < .05$) in the positive direction on the AAPI subscale that reflects a mother's tendency to reverse parent–child roles in expecting her child to look after her.

Mothers who received HI rated both formal and informal support on the CPSS significantly higher at study completion than did mothers with LI ($P < .03$ and $P < .01$, respectively). To assess the effect of participation in the parent-infant groups on perception of formal support, a comparison was made of CPSS scores of those mothers who participated in at least one group ($N = 67$) versus

Table 3 Analysis of outcome measures at 12 months postpartum

Measures	Treatment group Mean % change N = 90	±SD[b]	Control mean % change N = 77	±SD	P-value	≥30 visits mean % change N = 46	±SD	<30 visits mean % change N = 44	±SD	P-value
KIDI	.11	.17	.10	.20	.55	.13	.17	.09	.17	.22
HSQ	.28	.28	.14	.21	.0005	.35	.31	.20	.23	.009
AAPI										
Appropriateness	.04	.13	.06	.17	.39	.04	.14	.05	.12	.79
Empathy	.05	.17	.06	.20	.57	.08	.20	.02	.14	.12
Punishment	.03	.14	.05	.16	.48	.04	.16	.01	.12	.31
Reversing roles	.14	.23	.09	.19	.12	.18[a]	.25	.11	.20	.13
CPSS										
Informal	−.05	.37	.02	.49	.34	.03	.35	−.14	.38	.03
Formal	.67	1.07	.27	.78	.008	.93	1.22	.38	.80	.01
PDHS										
Frequency	1.0	2.04	.83	1.77	.55	.96	1.7	1.05	2.34	.84
Intensity	.17	.42	.15	.35	.75	.14	.33	.20	.49	.52
Behavior	.12	.55	.16	.45	.48	.18	.49	.24	.62	.60
Task	.17	.54	.17	.40	.96	.11	.34	.23	.69	.30
BSID	N = 73		N = 51			N = 46		N = 27		
MDI mean	101.0	12.4	101.4	17.3	.64	99.8	13.4	100.5	10.6	.62[c] .78[d]
PDI mean	95.1	13.6	93.1	11.9	.39	94.2	15.1	96.6	10.8	.69[c] .20[d]
IBS total score	%		%		.31	%		%		.39
Normal	98.6		94.1			100		96.3		
Question	0		3.9			0		0		
Non-optimal	1.4		2.0			0		3.7		

[a] ≥30 visits group versus control group is significant at 0.05 for AAPI reversing parent–child roles

[b] Standard deviation(SD)

[c] ≥30 visits group versus control group

[d] <30 visits group versus control group

AAPI Adult Adolescent Parenting Inventory (subscales: Appropriateness of developmental expectations, Empathy towards child's needs, Belief in use of corporal punishment, Reversing parent–child roles), *KIDI* Knowledge of Infant Development Inventory, *CPSS* Carolina Parent Support Scale, *HSQ* HOME screening questionnaire, *PDHS* Parenting Daily Hassles Scale (subscales: Frequency with which event occurs, Intensity of hassle, Challenging behavior factor, Parenting tasks factor); *BSID* Bayley Scales of Infant Development-2nd Edition, *MDI* mental development index, *PDI* psychomotor development index, *IBS* infant behavior scale

mothers with no group participation (N = 20). Those who attended one or more sessions showed significant increase in their perception of formal support (P < .003) in contrast to those intervention mothers who did not attend any parent-infant group sessions (Table 4). There were no significant differences in perceptions of informal support by participation in the parent-infant groups. No significant differences were found between mothers with HI versus those with LI on the KIDI, PDHS, or other subscales of the AAPI. Infant developmental outcome as measured by scores at 12 months on the BSID revealed no significant differences between the intervention and control groups. There were also no significant differences in infant

development between the infants whose mothers had HI versus those whose mothers had LI.

Discussion

In this study we explore the impact of paraprofessional-delivered home visitation and group intervention on various aspects of social and developmental domains of parenting for African American mothers who had delivered without adequate PNC. This is a particularly high-risk population of mothers, the majority of whom had not wanted their pregnancy and averaged only 3.7 prenatal

Table 4 Percentage change in perception of social support on the Carolina Parent Support Scale (CPSS) for intervention mothers who participated in at least 1 parent-infant group versus those who did not

Measure	One or more parent-infant groups N = 67 (% change)	±SD*	No parent infant-group participation N = 20 (% change)	±SD	P-value
Support					
Informal	−1.80	6.12	−3.45	6.07	.30
Formal	5.97	5.70	1.10	5.98	.003

* Standard deviation (SD)

visits, as compared with the 8–10 visits recommended for women with low risk pregnancies [31]. Inadequate PNC serves as a significant predictor for adverse child outcomes [32].

A significant impact of this intervention was its effect on the mothers' ability to create home environments more suitable for the needs of their infants. This was true in mothers with different levels of participation in home visits and parenting groups, despite lack of measurable change in mothers' knowledge of infant development. This effect may reflect an emphasis of the curriculum on familiarizing mothers with developmentally appropriate infant play interactions rather than broad developmental concepts.

The importance of the early home environment for children's cognitive development is supported in numerous studies [33–35]. Children growing up in home environments with limited developmental support often show a pattern of decline in cognitive performance after achieving normal milestones in the first year of life. This reflects a lack of appropriate environmental stimulation for those cognitive skills important after 1 year of age, and correlates with academic failure in later childhood [36, 37]. Both intervention and control infants in the PIP study showed the typical pattern of normal cognitive scores at 12 months. Being limited to a one-year follow-up period, we were not able to determine whether the infants of mothers in the intervention group would show a later advantage in developmental outcomes as might be associated with the enhancement of the home environment.

The second domain addressed in this study was parenting attitudes that are associated with adverse outcomes. Children of mothers with poor prenatal care, as were those in our study, are at increased risk for child abuse, neglect, and unintentional injury [32, 38]. This association is confirmed in our study by the mothers' poor AAPI scores at baseline. The intervention was successful in improving the mothers' attitudes related to reversal of parent–child roles with their infants, a strong marker for child abuse; however, the difference was significant only for mothers with HI. Among the HI group, reduction was seen in two

attitudes: expecting the infant to be sensitive to parental needs, and expecting the infant to be an emotional support to the parent. The focus of the intervention on helping the mother set appropriate expectations in the parenting role, including recognizing and responding to infant needs, may have contributed to our findings. Mothers were encouraged to balance anticipating and addressing their infants' needs versus their own. The success of the intervention in improving the mothers' health seeking behaviors [5], suggests that the program was effective in changing behaviors as well as attitudes. The home visitors worked with the mothers to identify barriers to obtaining service needs and ways to overcome them.

The third domain addressed in this paper is parenting stress and social support. Social support may play an important role in reducing stress in high-risk mothers and in improving pregnancy outcomes [39]. At the study's conclusion 1 year after delivery, only the mothers with HI showed an increase in perception of informal support. The mothers with LI actually showed a reduction in their perception of the informal supports available to them. This may point to their overestimation in the immediate postpartum period of what their informal circle of support is willing or able to offer them. The positive attention shown by family and friends associated with the arrival of a new baby may diminish over the first year and anticipated supports may not materialize. On the other hand, all mothers participating in the intervention initially assigned a lower value to formal support systems than they did by the end of 1 year.

When analyzed further, important differences between the intervention and control groups in perception of social support emerged. The intervention group initially assigned a lower score for formal support as compared to the score they assigned at the end of the year. They thus placed higher value on those services offered by the PIP project; namely, home visits and parent groups over the course of the year. Interestingly, the change in score for the perceived benefit was highest for mothers attending parent groups. It was not easy to attract mothers to this component of the intervention; once they received it, however, their participation in parent groups significantly influenced their perception of the benefit from formal support.

The attitudes of the intervention group related to social support were further analyzed by level of participation. A positive change in perception of informal support over the one-year intervention was observed only for the group of mothers who had HI. A greater level of involvement in the intervention may influence the mother's ability to maximize benefit from available sources of informal social support. Better coping and interactive skills emphasized in the intervention may have helped mothers identify and maintain informal supportive networks more effectively. Perception of formal support increased significantly with

participation in the intervention. Mothers with HI perceived more benefit of formal support when compared to mothers with LI. The benefit of improved social support in this population may serve as a protective factor against stresses that contribute to poor pregnancy outcomes [39]. Lack of social support is suggested as a predictor of child maltreatment in families at risk [40]. Strengthening social support, both informal and formal, for high-risk mothers would be expected to have an impact on pregnancy outcomes and child well-being.

The last domain addressed in this paper relates to the impact of the intervention on infant developmental outcomes. The lack of significant differences between intervention and control infants in BSID Indices at 12 months was not unexpected. Cognitive test scores in the first year of life measure skills considered primarily maturational and less influenced by environmental factors than thereafter [41]. Infants from disadvantaged homes typically show a decline in scores after age one, from a normal to a low average or delayed level by age 2 years [36, 37]. The significant improvement in the home environments of the PIP intervention families suggests that the enhanced environment might contribute to maintaining better cognitive scores for the children. Limitations of our study were the unavailability of budgetary resources for continued evaluation beyond infancy and the inability to assess the intervention's long range outcomes.

Another limitation of the study was the sizable attrition of participants. This was anticipated and a variety of strategies used to counteract it [30]. Unfortunately, by definition of the study population, these were women with complicated lives who might not always make themselves available for health interventions. Results of the study also may not be generalizable to other populations.

Some of the effects found for the PIP intervention are similar to those found for the nurse home visitor program developed by Olds and colleagues [42]. The use of the paraprofessional home visitors in the PIP model makes this potentially a less costly approach than an intervention requiring professional home visitors. Besides a cost advantage, lay visitors may be more readily accepted by the families because they share life experiences and neighborhood connections. These workers were familiar with resources available in the community that might benefit the PIP participants. While use of nurse home visitors in the studies conducted by Olds and colleagues suggests very good results, at follow-up, women who met with paraprofessional home visitors also continued to show benefits from the intervention after its completion [43]. Home visitation, whether by professional or lay staff, is costly in terms of travel and frequent unavailability of counseling recipients, even for scheduled visits. Additional costs for paraprofessional staff would involve substantial training in preparation for curriculum delivery and need for regular oversight by professional supervisors. A future study might test any advantage of professional home visitors over lay visitors with the challenging, low income, inner city minority population targeted in this study.

Desirable characteristics for home visitors were considered in the hiring process for the PIP program. These included personal warmth, cultural competence, good communication skills, and a demonstrated commitment to the local community. Careful selection of the lay home visitors and the very structured nature of the curriculum may have prevented some of the problems cited by Korfmacher et al. [44] in their use of lay personnel. Efforts to minimize the chance of staff turnover included selecting women with at least a high school education and a track record of staying with a job, paying them a competitive salary, incorporating a sense of team effort and specific mission, and being responsive to staff needs. Over the three-year study period there was no turnover of PIP home visiting staff.

Conclusion

The Pride in Parenting intervention model provided outreach to a very high-risk population of women delivering infants without adequate PNC. The use of paraprofessional home visitors contributed to cost-effective service and good rapport with a high-risk inner city population. Further research is needed to test the effectiveness of paraprofessional home visitors with other groups. The PIP intervention influenced the home environment positively, reduced reversal of parent–child roles in parenting attitudes, and improved the women's perceptions of existing social support. The intervention's success in increasing positive perceptions of support resources and utilization of health care resources in women who initially placed limited value on prenatal care, suggests improved attitudes that could facilitate their children's long-term well-being.

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