Prenatal and Infancy Home Visiting by Nurses: From Randomized Trials to Community Replication

David L. Olds

This paper summarizes a 25-year program of research that has attempted to improve the early health and development of low-income mothers and children and their future life trajectories with prenatal and infancy home visiting by nurses. The program has been tested in two separate large-scale randomized controlled trials with different populations living in different contexts. The program has been successful in improving parental care of the child as reflected in fewer injuries and ingestions that may be associated with child abuse and neglect; and maternal life-course, reflected in fewer subsequent pregnancies, greater work force participation, and reduced use of public assistance and food stamps. In the first trial, the program also produced long-term effects on the number of arrests, convictions, emergent substance use, and promiscuous sexual activity of 15-year-old children whose nurse-visited mothers were low-income and unmarried when they registered in the study during pregnancy. Since 1996, the program has been offered for public investment outside of research contexts. Careful attention has been given to ensuring that the program is replicated with fidelity to the model tested in the scientifically controlled studies by working with community leaders to ensure that organization and community contexts are favorable for the program; by providing the nurses with excellent training and technical assistance and detailed visit-by-visit guidelines; and by providing organizations with a web-based clinical information system that creates a basis for monitoring program performance and continuous quality improvement.

**KEY WORDS:** home visiting; pregnancy; infancy; child abuse; injuries; maternal; health.

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**INTRODUCTION**

In recent years, national attention has been focused on the earliest years of life as an opportune time to promote the health of children by helping parents learn how to more effectively care for their children and to provide early enrichment experiences thought to facilitate brain development (Families and Work Institute, The University of Chicago, 1996). Given the sensitivity of the brain to early experience in this age-range, policy makers have experienced increased pressure to fund programs during the first 3 years of life. How are they to decide, however, what is a sensible investment, given competing claims about the value of different programs and service strategies? We believe that policy makers should give special consider-

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the same beneficial effects as nurses when they were trained in the same program model. Outcome data from the Denver trial (Olds et al., 2002) are not ready for publication here.

The program of research reported here was guided by both epidemiology and developmental theory. This paper describes the empirical and theoretical foundations upon which this program of research was founded; the design of the program itself; and the research designs, methods, and findings from the Elmira and Memphis trials. It also describes our current initiative to replicate the program model outside of research contexts while attempting to maintain fidelity to the model tested in the trials.

A Research-Based and Theory-Driven Model

The program tested in this series of randomized trials has been firmly grounded in epidemiology and theories of child development and behavioral change (Kellam & Wertheimer-Larsson, 1986; Olds et al., 1997b).

Research-Based

Research has guided decisions about the families to be served and the content of the program. Each of the studies has examined program impact with women who have had no previous live births, and each has focused recruitment on women who were low-income, unmarried, and adolescents. Women with these characteristics were recruited because the problems the program was designed to address (e.g., poor birth outcomes, child abuse and neglect, and diminished economic self-sufficiency of parents) are concentrated in those populations (Elster & McAnarney, 1980; Furstenberg et al., 1987; Overpeck et al., 1998).

Program effects in Elmira were greater for the higher-risk families (especially those who were both unmarried and low income), so the subsequent Memphis and Denver trials focused recruitment more exclusively on those with overlapping risks (i.e., being both unmarried and low-income).

All three of the trials focused on women who had no previous live births because it was hypothesized that such women would be more receptive to home-visitation services concerning pregnancy and child rearing than would women who had already given birth. Moreover, parents in the program should be better able to care for subsequent children and, if the program helped parents plan the timing of subsequent pregnancies, then it would be easier for parents to finish their education and find work because of fewer problems with child care (Furstenberg et al., 1987), and their children would benefit from more focused parental nurture and guidance (Tygart, 1991).

The content of the program is also research-based. It seeks to modify specific risks that are associated with the negative outcomes the program seeks to address: poor birth outcomes, child abuse and neglect, injuries, and compromised parental life course. Figure 1 summarizes how these influences are thought to reinforce one another over time. On the far left side of this figure we note the three broad domains of proximal risks and protective factors that the program was designed to affect: prenatal health-related behaviors; sensitive, competent care of the child; and early parental life-course (pregnancy planning, parents' completion of their educations, finding work, and father involvement in the lives of their children). The middle set of outcomes reflects corresponding child and parental outcomes that the program was originally designed to influence: birth outcomes (obstetric complications, preterm delivery, and low birthweight); child abuse, neglect, and unintentional injuries; child neurodevelopmental impairment (perturbations in emotional, behavioral, and cognitive development); and later parental life-course (family economic self-sufficiency, welfare dependence, maternal substance abuse). On the far right, we show child and adolescent outcomes that the program might affect years after completion of the program at child age 2, including antisocial behavior and substance abuse. Part of the program effect on adolescent functioning was thought to be affected by reducing children's exposure and susceptibility to negative peer influences. Each of these sets of influences is discussed in greater depth below.

Prenatal Health Behaviors: Modifiable Risks and Protective Factors for Poor Birth Outcomes and Child Neurodevelopmental Impairment. Prenatal exposure to tobacco, alcohol, and illegal drugs are established risks for poor fetal growth (Kramer, 1987) and, to a lesser extent, preterm birth (Kramer, 1987), and neurodevelopmental impairment (such as attention-deficit disorder, or poor cognitive and language development) (Fried et al., 1987; Mayes, 1994; Milberger et al., 1996; Olds, 1997; Streissguth et al., 1994). In all three trials (Elmira, Memphis, and Denver) the home visitors therefore sought to reduce mothers' use of these substances. The prenatal protocols also address other behavioral factors that increase the risk for low birthweight, preterm
delivery, and poor child development, including inadequate weight gain (Institute of Medicine, 1990), inadequate diet (Institute of Medicine, 1990), inadequate use of office-based prenatal care (Klein & Goldenberg, 1990), and failure to promptly identify and treat obstetric complications, such as genitourinary tract infections and hypertensive disorders (Klein & Goldenberg, 1990).

Sensitive, Competent Care of the Child: Modifiable Risks and Protective Factors for Child Abuse and Neglect and Injuries to Children. Parents who empathize with their infants and sensitively read and respond to their babies’ communicative signals are less likely to abuse or neglect their children and they are more likely to read their children’s developmental competencies accurately, leading to fewer unintentional injuries (Peterson & Gable, 1998). Parents’ caregiving skills are affected by ontogenetic and contextual factors. Parents who grew up in households with punitive, rejecting, abusive, or neglectful caregiving are more likely to abuse or neglect their own children (Egeland et al., 1988; Quinton & Rutter, 1984; Rutter, 1989). Parents’ psychological immaturity and mental health problems can reduce their ability to care for their infants (Newberger & White, 1990; Sameroff, 1983). Although it is impossible to change parents’ personal histories and it is very difficult to reduce personal immaturity and mental illness, the program has sought to mitigate the effect of these influences on parents’ caregiving. Moreover, recent evidence suggests children born with subtle neurological perturbations resulting from prenatal exposure to substances such as tobacco and alcohol and maternal stress and anxiety during pregnancy are more likely to be irritable and incontrollable and to have difficulty habituating to auditory stimuli in the first few weeks of life (Clark et al., 1996; Saxon, 1978; Streissguth et al., 1994), making it more difficult for parents to find enjoyment in their care. Child characteristics affected by the quality of the uterine environment may thus contribute to parents’ abilities to become competent parents.

Early Parental Life Course (Subsequent Pregnancies, Education, Work, and Father Involvement): Modifiable Risks and Protective Factors for Compromised Maternal Life-Course Development. One of the major risks for compromised maternal educational achievement and workforce participation is rapid, successive pregnancy, particularly among unmarried women (Furstenberg et al., 1987). Such pregnancies often occur when women have limited visions for their futures in the areas of education and work (Musick, 1993), as well as limited beliefs in their control over their life circumstances and over contraceptive practices in particular (Bratford & Beck, 1991; Heinrich, 1993; Levinson, 1986).
One of the more significant questions that young mothers must address is the role that the child's father will play in their lives. In most cases, fathers are eager to be supportive partners and providers for their children. In some cases, they are ambivalent, abusive, and involved in criminal activities. Couples who are married are more likely to achieve economic self-sufficiency and their children are at lower risk for a host of problems (McLanahan & Carlson, 2002). The nurses encourage father involvement in all aspects of the program insofar as the mothers want him involved and there is a constructive basis for the relationship.

To the extent that families improve their economic conditions over time, they are less likely to live in unsafe, crime-ridden neighborhoods where children are exposed to negative peer influences. And even if children are exposed to negative peers, nurse-visited children are less likely to be susceptible to those negative influences because they will have stronger relationships with their parents, which will have helped them develop a stronger moral core (Ernle & Buchsbaum, 1990).

The young women consult with nurses as they make these significant life-shaping decisions. In all of this, the nurses help women envision a future consistent with their deepest values and aspirations; they help women evaluate different contraceptive methods, childcare options, and career choices; and they help women develop concrete plans for achieving their goals.

**Early Life-Course Modifiable Risks for Early-Onset Antisocial Behavior.** Many of the factors listed above are risk factors for early-onset antisocial behavior (Olds et al., 1998c), a type of disruptive behavior that frequently characterizes children who grow up to become violent adolescents and, sometimes, chronic offenders (Moffitt, 1993; Raine et al., 1994). For example, children who develop early-onset disorder are more likely to have subtle neurodevelopmental deficits (sometimes due to poor prenatal health; Milberger et al., 1996; Olds, 1997; Streissguth et al., 1994) combined with abusive and rejecting care early in life (Moffitt, 1993; Raine et al., 1994). Recent evidence indicates that prenatal tobacco exposure is a unique risk for conduct disorder and youth crime (Wakschlag et al., 2002). Adverse prenatal influences on fetal neurological development are sometimes exacerbated by adverse postnatal experiences. Children who have been abused are more likely to develop negative attribution biases that make them more likely to interpret neutral behaviors on the part of others as threatening (Dodge et al., 1990) and to have internal representations of interpersonal relationships characterized by dysregulated aggression and violence (Buchsbaum et al., 1992) both of which probably reflect an adaptive neurological response to a threatening world (Teicher, 2000). They are more likely to come from large families, with closely-spaced children (Tygart, 1991), where parents themselves are involved in substance abuse and criminal behavior (Moffitt, 1993).

**Theory-Driven**

The program is grounded in theories of human ecology (Bronfenbrenner, 1979, 1995), self-efficacy (Bandura, 1977), and human attachment (Bowlby, 1969). Human ecology theory emphasizes that children's development is influenced by how their parents care for them, and that, in turn, is influenced by characteristics of their families, social networks, neighborhoods, communities, and the interrelations among them (Bronfenbrenner, 1979). Drawing from this theory, nurses attempt to enhance the material and social environment of the family by involving other family members, especially fathers and grandmothers, in the home visits, and by linking families with needed health and human services.

Self-efficacy theory provides a useful framework for understanding how women make decisions about their behavior. It suggests that individuals choose those behaviors that they believe (1) will lead to a given outcome, and (2) they themselves can successfully carry out (Bandura, 1977). The curriculum therefore is designed first to help women understand what is known about the influence of particular behaviors on their own health and on the health and development of their babies. The nurses then help parents establish realistic goals and small achievable objectives that, once accomplished, increase parents' reservoir of successful experiences. In turn, these successes increase parents' confidence in taking on larger challenges.

Finally, the program is based on attachment theory, which posits that infants are biologically predisposed to seek proximity to specific caregivers in times of stress, illness, or fatigue in order to promote survival (Bowlby, 1969). Attachment theory hypothesizes that children's trust in the world and their later capacity for empathy and responsiveness to their own children once they become parents is influenced by the degree to which they formed an attachment with a caring, responsive, and sensitive adult when they were growing up, which affects their internal
representations of themselves and their relationships with others (Main et al., 1985). The program therefore explicitly promotes sensitive, responsive, and engaged caregiving in the early years of the child’s life (Barnard, 1990; Dolezol & Butterfield, 1994). The nurses also help mothers and other caregivers review their own child-rearing histories and make decisions about how they wish to care for their children in light of the way they were cared for as children. Finally, the visitors seek to develop an empathic and trusting relationship with the mother and other family members because such a relationship is expected to help women trust others and promote more sensitive, empathic care of their children.

Program Design

The same basic program design has been used in Elmira, Memphis, and Denver.

Frequency of Visitation

The recommended frequency of home visits changed with the stages of pregnancy and was adapted to the parents’ needs. When parents were experiencing crises, the nurses were allowed to visit more frequently. Mothers were enrolled through the end of the second trimester of pregnancy. In Elmira and Memphis, the nurses completed an average of 9 (range 0–16) and 7 (range 0–18) visits during pregnancy respectively; and 23 (range 0–59) and 26 (range 0–71) visits from birth to the child’s second birthday. Each visit lasted approximately 75–90 min. Nurses completed more visits with women who had few coping resources than they did with women who had greater coping resources. This is probably because the nurses recognized these women’s greater need for help (Olds & Kobrsmacher, 1997).

Nurses as Home Visitors

Nurses were selected to be the home visitors because of their formal training in women’s and children’s health and their competence in managing the complex clinical situations often presented by at-risk families. Nurses’ abilities to competently address mothers’ and family members’ concerns about the complications of pregnancy, labor, and delivery, and the physical health of the infant are thought to provide nurses with increased credibility and persuasive power in the eyes of family members. Nurses probably have additional persuasive power because the public views them as having the highest standards of ethics and honesty of all professionals (Gallup Organization, 2000). In addition, through their ability to teach mothers and family members to identify emerging health problems and to use the health care system, nurses enhance their clinical effect through the early detection and treatment of disorders.

METHODS

In each of the three studies, women were randomized to receive either home visitation services during pregnancy and the first 2 years of their children’s lives or comparison services. Although the nature of the home-visitation services was essentially the same in each of the trials as described above, the comparison services were slightly different. Both studies employed a variety of data sources. We looked for consistency in program effect across those sources before assigning much importance to any one finding. Findings corroborated by data from different sources have increased validity.

Elmira Design and Methods

The first study was conducted in a small, semirural county of approximately 100,000 residents in the Appalachian region of New York State. Pregnant women were actively recruited for the study through their sources of prenatal care if, at intake, they had no previous live births, they were at least 26 weeks of gestation, and they had any one of the following characteristics that predispose to infant health and developmental problems: (i) under 19 years of age; (ii) single parent status; and (iii) low socioeconomic status. Any woman who asked to participate was enrolled, however, regardless of her age, marital status, or income, if she had no previous live birth.

Five hundred women were invited to participate and 400 enrolled, 85% of whom were either low-income, unmarried, or younger than 19 years of age at registration; none had a previous live birth. Eighty-nine percent of the sample was White. Over 50% of the sample smoked cigarettes at registration. There were no sociodemographic differences between those who enrolled and those who declined, although participation was higher among African Americans. It is important to note that the study sample contained
Table 1. Study Design and Sample Sizes at Randomization and Follow-Up for Elmirra and Memphis Trials

<table>
<thead>
<tr>
<th>Elmirra experimental conditions</th>
<th>Sample size</th>
<th>15-year-follow-up¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensory and development screenings for children at 12 and 24 months</td>
<td>94</td>
<td>72</td>
</tr>
<tr>
<td>Group 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensory and development screenings for children at 12 and 24 months</td>
<td>90</td>
<td>76</td>
</tr>
<tr>
<td>Free transportation for prenatal and well-child care through 24 months</td>
<td></td>
<td></td>
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<tr>
<td>Group 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensory and development screenings for children at 12 and 24 months</td>
<td>100</td>
<td>79</td>
</tr>
<tr>
<td>Free transportation for prenatal and well-child care through 24 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home visits by nurse during pregnancy</td>
<td></td>
<td></td>
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<tr>
<td>Group 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensory and development screenings for children at 12 and 24 months</td>
<td>116</td>
<td>97</td>
</tr>
<tr>
<td>Free transportation for prenatal and well-child care through 24 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home visits by nurse during pregnancy and until child’s 2nd birthday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memphis experimental conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>166</td>
<td>NA</td>
</tr>
<tr>
<td>Free transportation for prenatal care appointments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td>515</td>
<td>443</td>
</tr>
<tr>
<td>Free transportation for prenatal care appointments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developmental screening and referral services for children at 6, 12, and 24 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 3</td>
<td>230</td>
<td>NA</td>
</tr>
<tr>
<td>Free transportation for prenatal care appointments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developmental screening and referral services for children at 6, 12, and 24 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home visits by nurse during pregnancy; one visit in hospital after childbirth; one visit at home after birth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 4</td>
<td>228</td>
<td>203</td>
</tr>
<tr>
<td>Free transportation for prenatal care appointments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developmental screening and referral services for children at 6, 12, and 24 months</td>
<td></td>
<td></td>
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<tr>
<td>Home visits by nurse during pregnancy and until child’s 2nd birthday</td>
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</table>

¹ Twenty-eight cases were unavailable for follow-up because of fetal, infant, child, or maternal death.
² Forty-two cases in Groups 2 and 4 were unavailable for postnatal follow-up because of fetal or infant death.

virtually the entire population of low-income mothers bearing first babies in the community. This means that the results of this trial have substantial generalizability to low-income parents bearing first children and that we are likely to see less slippage between the findings of the randomized trial and later community replications because such a large portion of the population was included in the sample. The sample was stratified on the basis of maternal race, marital status, and geographic region of residence and then randomly assigned to the nurse-visited and comparison groups outlined at the top of Table 1. Table 1 also shows the number of cases retained for analysis at the most recent phase of follow-up and indicates a high level of sample retention. This increases the validity of inferences made about the impact of the program on maternal and child outcomes.
Memphis Design and Methods

The Memphis trial was designed to determine if the encouraging results of the Elmira program could be replicated when the program was conducted through an existing health department and when it served low-income African American women, children, and their families living in a major urban area (Kitzman et al., 1997). The study focused on those groups where Elmira effects had been greatest, that is, low-income, unmarried women (most of whom were teens); and gave greatest attention to those outcomes where the benefits had been greatest (e.g., health risks in pregnancy, childhood injuries and ingestions, rates of subsequent pregnancies). Women with few psychological resources (defined in Memphis as having high rates of mental-health symptoms, limited intellectual functioning, as well as limited beliefs in their control over their lives) were hypothesized to benefit the most from the program (Kitzman et al., 1997).

One thousand two hundred ninety women were invited to participate and 1,139 enrolled through the obstetrical clinic at the Regional Medical Center in Memphis. Women were recruited if they were less than 29 weeks of gestation, had no previous live births, no specific chronic illnesses thought to contribute to fetal growth retardation or preterm delivery, and at least two of the following risk conditions: (i) unmarried, (ii) less than 12 years of education, (iii) unemployed. There were no differences in the sociodemographic characteristics of those who enrolled and those who declined, except that African Americans were more likely to participate than were Whites. As in Elmira, the Memphis sample consisted of a very large portion of the women who had these characteristics and this increases the generalizability of the Memphis findings. Overall, at registration, 92% of the 1,139 women registered were African American, 98% were unmarried, 65% were aged 18 or younger, 85% came from households with incomes at or below the federal poverty guidelines, and 9% (7% of the African Americans) smoked cigarettes. Those who registered were randomly assigned to one of the four nurse-visited or comparison groups outlined at the bottom of Table 1. Note that only two of these groups (2 and 4) were followed for postnatal assessments (N = 742) and that high rates of sample retention were accomplished in this trial as well.

The program was conducted through the Memphis/Shelby County Health Department. This trial was conducted during a nursing shortage, which led to fairly high rates of staff turnover (50% in the first 2 years of the program) because nurses left to take higher paying jobs in local hospitals. Given that these kinds of factors are likely to buffet the program as it is administered in other community settings, the Memphis study comes closer to an effectiveness trial, further increasing the generalizability of its findings. This study may thus provide a good estimate of what the program might be able to achieve if it were replicated on a large scale.

Table 2 summarizes the major findings from the Elmira and Memphis trials as they relate to Fig. 1.

Elmira Results

At randomization, the treatment groups in the Elmira trial were essentially equivalent on all background characteristics examined. At the 15-year follow-up, assessments were completed on 324 women—81% of the women originally randomized, and 87% of those cases where there was no fetal, maternal or child death. The treatment groups remained essentially equivalent on background characteristics for those individuals on whom the 15-year follow-up assessments were completed.

The assessment of program effects on prenatal health behaviors and pregnancy outcomes was based upon the contrast of the average of Groups 1 and 2 (the comparison group) with the average of Groups 3 and 4 (prenatal nurse home visiting). Tests of postnatal effects contrasted Groups 1 and 2 (comparison) with 4 (prenatal and infancy home visiting). In most cases, Group 3 (prenatal home visiting) fell between the comparison Group (1 and 2) and Group 4 in its postnatal functioning.

Prenatal Health Behaviors

During pregnancy, compared to their counterparts in the control group, nurse-visited women improved the quality of their diets to a greater extent (p = .04), and those identified as smokers smoked 25% fewer cigarettes by the 34th week of pregnancy (p = .0001). Analyses of serum cotinine (the major nicotine metabolite) on a subsample of 100 women showed that by the end of pregnancy nurse-visited women were more accurate in reporting the number of cigarettes they smoked than were women in the control group (Olds et al., 1986b). By the end of pregnancy, nurse-visited women experienced greater informal social support and made better use of formal community services (p < .05).
### Table 2. Summary of Major Outcomes—Elmira and Memphis

<table>
<thead>
<tr>
<th>Outcome domains</th>
<th>Elmira</th>
<th>Memphis</th>
</tr>
</thead>
</table>
| **Prenatal health behaviors**            | *By the end of pregnancy:*  
Less cigarette smoking  
Better diets  
More informal support  
More use of community services  
**Birth outcomes**  
Fewer kidney infections  
Reduction in preterm delivery among smokers  
Increased birthweight among young teens (<17 years old)  | *By the end of pregnancy:*  
Greater use of community services  
Tobacco use too infrequently occurring  
Decrease in pregnancy-induced hypertension  
Decrease in vaginal yeast infections  
No effect on length of gestation or birthweight  |
| **Sensitive, competent care of child**   | *In the first 2 years of the child’s life:*  
Less punishment and restriction and increase in  
appropriate play materials (among low-income, unmarried teen mothers) at 10 and 22 months  
Better HOME total scores at 34 and 46 months for whole sample  
More language stimulation and educational materials at 46 months (among low-income, unmarried teen mothers)  
Fewer safety hazards in home at 34 and 46 months for whole sample  
More punishment of child at 46 months for whole sample  | *In the first 2 years of the child’s life:*  
More attempted breast feeding  
Fewer beliefs associated with child abuse  
Better HOME scores  
Child more responsive to mother (NCAST scale)  
No effect on maternal teaching (NCAST scale)  |
| **Child abuse, neglect, and injuries**   | *Fewer state-verified reports of child abuse and neglect*  
from 0 to 2 years (p = .07)  
Fewer state-verified reports of child abuse and neglect  
from 0 to 15 years  
Fewer emergency department visits from 0 to 12 months  
Fewer emergency department visits for injuries and ingestions 12-24 months (children born to poor, unmarried mothers)  
Fewer injuries and ingestions noted in the medical record 25-50 months (children born to poor, unmarried mothers)  | *Fewer health-care encounters for injuries/ingestions*  
Fewer outpatient visits for injuries/ingestions  
Fewer days hospitalized for injuries/ingestions  |
| **Child neurodevelopmental impairment**   | *Less irritability on part of 6-month olds (among infants born to poor, unmarried, teens)*  
Less intellectual impairment among 3 and 4-year-old children born to mothers who smoked 10+ cigarettes at registration during pregnancy  | *No measured effects on child behavior or cognition through child age 2*  |
| (emotional/behavioral regulation and cognition) | **Early parental life course**  
*In first 4 years after delivery of first child:*  
Greater workforce participation  
Fewer subsequent pregnancies (poor, unmarried women)  | **Early parental life course**  
*In first 2 years after delivery of first child:*  
Fewer subsequent pregnancies  
Fewer subsequent births  |
|                                           | **Later parental life course**  
*In first 5 years after delivery of first child, among low-income, unmarried women:*  
Fewer subsequent pregnancies  
Fewer subsequent live births  
Greater spacing between birth of first and second child  
Fewer months using Food Stamps  
Fewer months using AFDC  
Fewer behavioral impairments due to use of substances  
Fewer arrests  
Fewer convictions  
Fewer days in jail  | **Later parental life course**  
*In first 5 years after delivery of first child:*  
Fewer subsequent pregnancies  
Fewer subsequent live births  
Fewer closely spaced subsequent pregnancies  
Fewer months using Food Stamps  
Fewer months using AFDC  
Higher rates of cohabitation with father of child  
Higher rates of marriage (p = .09)  |
| **Child/adolescent functioning**         | *In first 15 years of child’s life, among those born to low-income, unmarried mothers:*  
Fewer incidents of running away  
Fewer arrests  
Fewer convictions  
Fewer sex partners  
Fewer days of alcohol use in past 6 months  | NA  |
Pregnancy and Birth Outcomes

By the end of pregnancy, nurse-visited women had fewer kidney infections (p = .005), and among women who smoked, those who were nurse-visited had 75% fewer preterm deliveries (p = .04), and among very young adolescents (aged 14–16), those who were nurse-visited had babies who were 395 g heavier than their counterparts assigned to the comparison group (p = .02; Olds et al., 1986b).

Sensitive, Competent Care of Child

At 10 and 22 months of the child’s life, nurse-visited poor, unmarried teens, in contrast to their counterparts in the control group, exhibited less punishment and restriction of their infants and provided more appropriate play materials than did their counterparts in the control group (p < .05; Olds et al., 1986a). At 34 and 46 months of life, nurse-visited mothers provided home environments that were more conducive to their children’s emotional and cognitive development as rated by the HOME inventory (p < .05) and that were safer, based upon observations of safety hazards (p < .05; Olds et al., 1994a). Overall, nurse-visited mothers were observed to punish their 46-month old children more frequently (p < .05). Greater punishment among nurse-visited parents was associated with fewer injuries noted in the medical record but among comparison families, an increase in punishment was associated with a greater number of injuries, suggesting that the functional meaning of punishment varied by treatment (Olds et al., 1994a).

Child Abuse, Neglect, and Injuries

During the first 2 years of the child’s life, nurse-visited children born to low-income, unmarried teens had 80% fewer verified cases of child abuse and neglect than did their counterparts in the control group (one case or 4% of the nurse-visited teens vs. eight cases or 19% of the control group, p = .07). During the second year of life, nurse-visited children were seen in the emergency department 32% fewer times (0.74 vs. 1.09 visits, p = .01), a difference that was explained in part by a 56% reduction in visits for injuries and ingestions (0.15 vs. 0.34 visits, p = .03).

As can be seen in Figs. 2 and 3, the effect of the program on child abuse and neglect in the first 2 years of life and on emergency department encounters in the second year of life was greatest among children whose mothers had little belief in their control over their lives when they first registered for the program. The numbers on the vertical axis show the rates of the outcome (child abuse or emergency visits) whereas the numbers on the horizontal axis display mothers’ scores for their control beliefs measured at registration (Rotter, 1966), with higher scores indicating

![Simultaneous Region of Treatment Differences (p < .10)](image)

Fig. 2. Concentration of program effects on child abuse and neglect in low-income, unmarried teens with little sense of mastery. Reproduced with permissions from Pediatrics, Vol. 78, Page(s) 65–78, Figure 1, Copyright 1986.
greater belief in their control over their life circumstances. The lines on the top and bottom of these figures marked Comparison and Nurse are fitted regressions of abuse and neglect (Fig. 2) and emergency department visits (Fig. 3) on maternal sense of control and can be thought of as the mean rates of the outcome (child abuse/neglect or emergency visits) at different levels of maternal control beliefs for Comparison (Group 1 + 2) and Nurse-Visited (Group 4) mothers, respectively. These lines (fitted regressions) are significantly different from one another ($p < .05$).

The shaded regions show where we can say with specified levels of confidence ($p < .10$, two-tailed tests) that the two groups differed (Olds et al., 1986a).

During the 2 years after the program ended, its impact on health-care encounters for injuries endured: irrespective of risk, children of nurse-visited women were less likely than their control group counterparts to receive emergency room treatment (a per-child average of 1.00 vs. 1.53 visits, $p < .001$) and to visit a physician for injuries and ingestions (per child average of 0.34 vs. 0.57 visits, $p = .03$; Olds et al., 1994a). The impact of the program on state-verified cases of child abuse and neglect, on the other hand, disappeared during that 2-year period (Olds et al., 1994a), probably because of increased detection of child abuse and neglect in nurse-visited families and the nurses’ linkage of families with needed services (including child protective services) at the end of the program at the child’s second birthday (Olds et al., 1995). When child abuse or neglect was identified in the first 4 years of the child’s life, the nurse-visited cases were found to be less serious, again probably because of the early identification of less serious forms of maltreatment in the nurse-visited (Group 4) families (Olds et al., 1995).

Results from a 15-year follow-up of the Elmira sample (Olds et al., 1997a) indicate that the Group 4-comparison differences in rates of state-verified reports of child abuse and neglect grew between the children’s 4th and 15th birthdays. Overall, during the 15-year period after delivery of their first child, in contrast to women in the comparison group, those visited by nurses during pregnancy and infancy were identified as perpetrators of child abuse and neglect in an average of 0.29 versus 0.54 verified reports per program participant ($p < .001$). This difference for the entire time period overrode the disappearance of program effects during the 2-year period immediately following the end of the program. This program effect was greater for women who were poor and unmarried at registration (0.11 vs. 0.53 reports per program participant, $p < .001$; Olds et al., 1997a).

Although this reduction in child abuse and neglect was quite promising, the program did not eliminate maltreatment. We, therefore, turned our
attention to an analysis of why the program was not successful in preventing child abuse and neglect for certain families, and hypothesized that the presence of domestic violence in the home would attenuate the preventive effects of the program. The program had no impact on the incidence of domestic violence, but domestic violence did moderate the impact of the program on child abuse and neglect. The program effect on child abuse and neglect was reduced in those households in which domestic violence was higher during the 15-year period following the birth of the first child. As a result of this analysis, we have intensified our efforts to help women cope with domestic violence and to promote effective communication between partners, including strategies to reduce the likelihood that miscommunication will escalate. It is important to note that the domestic violence did not moderate program effects on any other reported program effect on maternal or child functioning at the 15-year follow-up. The moderation was specific to child abuse and neglect (Eckenrode et al., 2000).

This analysis illustrates a more general strategy that we have begun to employ in assessing program impact on a variety of outcomes, such as program effects on the prevention of subsequent pregnancy. The systematic evaluation of those cases that failed to respond to the intervention as expected can be used to give us insight into why the program may have been less effective in these cases and can be used to strengthen the program over time.

**Child Neurodevelopmental Impairment**

At 6 months of age, nurse-visited poor unmarried teens reported that their infants were less irritable and fussy than did their counterparts in the comparison group (Olds et al., 1986a). Subsequent analyses of these data indicated that these differences were really concentrated among infants born to nurse-visited women who smoked 10 or more cigarettes per day during pregnancy in contrast to babies born to women who smoked 10 or more cigarettes per day in the comparison group (Olds et al., 1994b,c). Over the first 4 years of the child’s life, children born to comparison-group women who smoked 10 or more cigarettes per day during pregnancy experienced a 4–5 point decline in intellectual functioning in contrast to comparison-group children whose mother smoked 0–9 cigarettes per day during pregnancy (Olds et al., 1994b). In the nurse-visited condition, children whose mothers smoked 0–9 cigarettes per day at registration did not experience this decline in intellectual functioning, so that at ages 3 and 4 their IQ scores on the Stanford Binet test were about 4–5 points higher than their counterparts in the comparison group whose mothers smoked 10+ cigarettes per day at registration (p < .05; Olds et al., 1994c).

**Early Parental Life-Course**

By the time the first child was 4 year of age, nurse-visited women, low-income, unmarried women, in contrast to their counterparts in the control group had fewer subsequent pregnancies (0.58 vs. 1.02, p < .05), longer intervals between the birth of the first and second child (49.33 vs. 37.28 months, p < .05), and greater participation in the work force (15.66 vs. 8.59 months, p < .05) than did their counterparts in the comparison group (Olds et al., 1988).

**Later Parental Life-Course**

At the 15-year follow-up, no differences were reported for the full sample on measures of maternal life course such as subsequent pregnancies or subsequent births, the number of months between first and second births, receipt of welfare, or months of employment. Poor unmarried women, however, showed a number of enduring benefits. In contrast to their counterparts in the comparison condition, those visited by nurses both during pregnancy and infancy averaged fewer subsequent pregnancies (1.5 vs. 2.2, p = .03), fewer subsequent births (1.1 vs. 1.6, p = .02), longer time between the birth of their first and second children (65 vs. 37 months, p = .001), fewer months on welfare (60 vs. 90 months, p = .005), fewer months receiving food stamps (46.7 vs. 83.5, p = .001); fewer behavioral problems due to substance abuse (0.41 vs. 0.73, p = .03), and fewer arrests (0.18 vs. 0.58 arrests by self-report, p < .001; 0.16 vs. 0.90 arrests based on New York State records, p < .001; Olds et al., 1997a).

**Child|Adolescent Functioning**

The follow-up study also assessed children of the original participants, when the children were 15 years of age (Olds et al., 1998a). There were no differences between nurse-visited and comparison-group adolescents for the whole sample, but there were differences among the children of poor, unmarried women. In contrast to adolescents born to poor, unmarried women in the comparison group, those visited by nurses during pregnancy and infancy reported fewer instances of running away (0.24 vs. 0.60, p = .003),
fewer arrests (0.20 vs. 0.45, \( p = .03 \)), fewer convictions/violations of probation (0.09 vs. 0.47, \( p < .001 \)), fewer lifetime sex partners (0.92 vs. 2.48, \( p = .003 \)), fewer cigarettes smoked per day (1.50 vs. 2.50, \( p = .10 \)), and fewer days having consumed alcohol in the last 6 months (1.09 vs. 2.49, \( p = .03 \)). Parents of nurse-visited children reported that their children had fewer behavioral problems related to use of drugs and alcohol (0.15 vs. 0.34, \( p = .08 \); Olds et al., 1998a). There were no program effects on other behavioral problems, such as teachers’ reports of adolescents’ acting out in school; suspensions; initiation of sexual intercourse; and parents’ or children’s reports of major acts of delinquency, minor antisocial acts, or other behavioral problems (Olds et al., 1998a).

Cost Analysis

The Rand Corporation has conducted an economic evaluation of the program that extrapolates the results of the 15-year follow-up study to estimate cost savings generated by the program (Karoly et al., 1998). Although there were no net savings to government or society for serving families in which mothers were married and of higher social class, the savings to government and society for serving families in which the mother was low-income and unmarried at registration exceeded the cost of the program by a factor of 4 over the life of the child. The return on the investment was realized well before the child’s fourth birthday and the primary cost savings were found in reduced welfare and criminal justice expenditures, and increases in tax revenues.

Conclusion

In general, the beneficial effects of the program were greater for families at greater risk (e.g., for low-income or unmarried women, and those who smoked during pregnancy). Moreover, the beneficial effects of the program during the first 2 years of life on child abuse and neglect and on childhood injuries were greater for mothers with little belief in their control over their life circumstances. This led us to give even greater attention to training the nurses in promoting parents’ self-efficacy in the Memphis trial.

Memphis Results

At randomization, the nurse-visited and comparison groups in the Memphis trial were essentially equivalent on all background characteristics examined (Kitzman et al., 1997). For those individuals on whom 2-year assessments were conducted (90% of those randomized, and 96% of those randomized and where there was no fetal, infant, or maternal death), the groups remained equivalent on background characteristics.

The estimates of prenatal outcomes (prenatal health behaviors and pregnancy outcomes) were based upon the contrast of Groups 1 and 2 (comparison) with 3 and 4 (prenatal and infancy home visiting). The estimates of postnatal effects were based upon the contrast of Group 2 (comparison) with Group 4 (prenatal and infancy home visiting).

Prenatal Health Behaviors

There were no program effects on women’s use of standard prenatal care or obstetrical emergency services after registration in the study. By the 36th week of pregnancy, nurse-visited women were more likely to use other community services than were women in the control group (29% vs. 20%, \( p = .01 \)). There were no program effects on women’s cigarette smoking, probably because the rate of cigarette use was only 9% in this sample.

Pregnancy and Birth Outcomes

In contrast to women in the comparison group, nurse-visited women had fewer yeast infections after randomization (0.14 vs. 0.19, \( p = .05 \)) and fewer instances of pregnancy-induced hypertension (13% vs. 20%, \( p = .009 \)). Among women with pregnancy-induced hypertension, those who received a nurse home visitor had mean arterial blood pressures during labor that were 4.6 points lower (\( p = .006 \)) than those in the comparison group, an indication of less severe cases (Kitzman et al., 1997).

Despite these differences, there were no program effects on birth outcomes such as average birthweight, percent low birthweight, length of gestation, spontaneous preterm delivery, indicated preterm delivery, or Apgar scores.

Sensitive, Competent Care of Child

Nurse-visited mothers reported that they attempted breast-feeding more frequently than did women in the comparison group (26% vs. 16%, \( p = .006 \), although there were no differences in duration
of breast-feeding. By the 24th month of the child's life, in contrast to their comparison-group counterparts, nurse-visited women held fewer beliefs about childrearing associated with child abuse and neglect ($p = .003$). Moreover, the homes of nurse-visited women were rated on the HOME scale as more conducive to children's development (32.3 vs. 30.9 points, $p = .003$; Kitzman et al., 1997).

Although there was no program effect on observed maternal teaching behavior, children born to nurse-visited mothers with low levels of psychological resources were observed to be more communicative and responsive toward their mothers than were their comparison-group counterparts (17.9 vs. 17.2, $p = .03$).

**Child Abuse, Neglect, and Injuries**

The rate of substantiated child abuse and neglect in the population of 2-year-old, low-income children in Memphis was too low (3-4%) to serve as a valid indicator of child maltreatment in this study. We, therefore, hypothesized that we would see a pattern of program effects on childhood injuries that would be similar to the pattern observed in Elmira, reflecting a reduction in dysfunctional care of children.

During their first 2 years, nurse-visited children overall had fewer health-care encounters in which injuries and ingestions were detected than did children in the comparison group (0.43 vs. 0.56, $p = .05$), an effect that was accounted for primarily by a reduction in outpatient clinic encounters. Nurse-visited children also were hospitalized for fewer days with injuries and/or ingestions than were children in the comparison group (0.04 vs. 0.18, $p < .001$).

As can be seen in Figs. 4 and 5, the effect of the program on both total health-care encounters and number of days children were hospitalized with injuries and ingestions was greater for children born to women with few psychological resources. As with Figs. 2 and 3, the numbers on the vertical axis show the rates of the outcome (in this case number of health-care encounters where injuries or ingestions were detected or days hospitalized with injuries or ingestions) whereas the numbers on the horizontal axis display mothers' scores on the psychological-resource scale. In order to assist with its interpretation, the psychological

![Fig. 4. Intensification of program effect on health care encounters for injuries and ingestions concentrated among children born to mothers with few psychological resources. (Advances in Infancy Research, Volume 12, Carolyn Rovee-Collier, Rutgers University, Lewis P. Lipsitt, Brown University, Harlene Hayns, University of Otago, editors. Copyright © 1998 by Ablex Publishing Corporation. Reproduced with permission of Greenwood Publishing Group, Inc., Westport, CT.)](image-url)
resources scale has been standardized to a mean of 100 for this sample, with a standard deviation of 10. The lines on the top and bottom of these figures marked Comparison and Nurse are fitted regressions of the dependent variables on women's psychological resources measured prior to randomization and can be thought of as the mean rates of the outcome (health care encounters for injuries and ingestions or days hospitalized for injuries/ingestions) at different levels of maternal psychological resources for Comparison (Group 2) and Nurse-Visited (Group 4) mothers, respectively. In both figures, the fitted regressions for the nurse-visited and comparison-group women are significantly different from one another ($p < .01$). The shaded regions show where we can say with confidence ($p < .05$ and $p < .01$) that the two groups differed.

An examination of the children's hospital records provides insight into reasons that nurse-visited children were hospitalized for fewer days than children in the comparison group. As can be seen in Table 3, nurse-visited children tended to be older when hospitalized and to have less severe conditions. The 3 nurse-visited children who were hospitalized with injuries and ingestions were admitted when they were 12 months of age or older, whereas 6 of the 14 comparison children were hospitalized when they were younger than 6 months of age. Eight of the 14 comparison-group hospitalizations involved serious trauma, whereas none of the nurse-visited hospitalizations did. In interpreting the number of hospitalizations, it is important to note that the Comparison group ($N = 465$) had a larger number of cases than Group 4 ($N = 206$). These profiles suggest that many of these hospitalized comparison-group children suffered from more seriously deficient care than children visited by nurses.

**Child Neurodevelopmental Impairment**

After 2 years in the program, children in nurse visited and comparison groups did not differ in their mental development or reported behavioral problems, either for the full sample or for mothers with lower psychological resources.
Table 3. Results From the Memphis Study: Diagnoses for Hospitalizations in Which Injuries and Ingestions Were Detected—By Treatment Condition

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Age (in months)</th>
<th>Sex</th>
<th>Length of hospital stay (in days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse-visited (Group 4) [N = 216]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First and second degree burns to face</td>
<td>12.0</td>
<td>M</td>
<td>2</td>
</tr>
<tr>
<td>Coin ingestion</td>
<td>12.1</td>
<td>M</td>
<td>1</td>
</tr>
<tr>
<td>Ingestion of iron medication</td>
<td>20.4</td>
<td>F</td>
<td>4</td>
</tr>
<tr>
<td>Comparison group (Group 2) [N = 481]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head trauma</td>
<td>2.4</td>
<td>M</td>
<td>1</td>
</tr>
<tr>
<td>Fractured fibula/congenital syphilis</td>
<td>2.4</td>
<td>M</td>
<td>12</td>
</tr>
<tr>
<td>Strangulated hernia with delay in seeking</td>
<td>3.5</td>
<td>M</td>
<td>12</td>
</tr>
<tr>
<td>care/first degree burn to lips</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bilateral subdural hematoma(^a)</td>
<td>4.9</td>
<td>F</td>
<td>19</td>
</tr>
<tr>
<td>Fractured skull</td>
<td>5.2</td>
<td>F</td>
<td>5</td>
</tr>
<tr>
<td>Bilateral subdural hematoma (unresolved)/</td>
<td>5.3</td>
<td>F</td>
<td>4</td>
</tr>
<tr>
<td>aseptic meningitis—Second hospitalization(^a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fractured skull</td>
<td>7.8</td>
<td>F</td>
<td>3</td>
</tr>
<tr>
<td>Coin ingestion</td>
<td>10.9</td>
<td>M</td>
<td>2</td>
</tr>
<tr>
<td>Child abuse/neglect suspected</td>
<td>14.6</td>
<td>M</td>
<td>2</td>
</tr>
<tr>
<td>Fractured tibia</td>
<td>14.8</td>
<td>M</td>
<td>2</td>
</tr>
<tr>
<td>Second degree burns to face/neck</td>
<td>15.1</td>
<td>M</td>
<td>5</td>
</tr>
<tr>
<td>Second and third degree burns to leg(^b)</td>
<td>19.6</td>
<td>M</td>
<td>4</td>
</tr>
<tr>
<td>Gastroenteritis/head trauma</td>
<td>20.0</td>
<td>F</td>
<td>3</td>
</tr>
<tr>
<td>Burns—Second hospitalization(^b)</td>
<td>20.1</td>
<td>M</td>
<td>6</td>
</tr>
<tr>
<td>Finger injury/osteomyelitis</td>
<td>23.0</td>
<td>M</td>
<td>6</td>
</tr>
</tbody>
</table>

\(^a\) One child was hospitalized twice with a single bilateral subdural hematoma.

\(^b\) One child was hospitalized twice for burns resulting from a single incident.


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**Early Parental Life-Course**

At the 24th month of the first child’s life, nurse-visited women reported fewer second pregnancies (36% vs. 47%, *p = .006*) and fewer subsequent live births (22% vs. 31%, *p = .01*) than did women in the comparison group. Nurse-visited women and their first-born children relied upon welfare for slightly fewer months during the second year of the child’s life than did comparison-group women and their children (7.8 vs. 8.4 months, *p = .07*), although there were no differences during the child’s first year of life. There were no program effects on mothers’ reported educational achievement or length of employment for either the whole sample or for those with few psychological resources (Kitzman et al., 1997).

**Later Parental Life-Course**

During the 4.5-year period following birth of the first child, in contrast to counterparts assigned to the comparison condition, women visited by nurses had fewer subsequent pregnancies (1.15 vs. 1.34, *p = .03*), fewer therapeutic abortions (0.05 vs. 0.10, *p = .08*), and longer durations between the birth of the first and second child (26.6 vs. 30.2 months, *p = .004*); fewer total person-months (based upon administrative data) that the mother and child used Aid to Families with Dependent Children (AFDC) (62.8 vs. 69.1, *p = .02*) and food stamps (81.3 vs. 87.1, *p = .02*); higher rates of living with a partner (43% vs. 32%, *p = .006*), marriage (15% vs. 10%, *p = .10*), and living with the biological father of the child (19% vs. 12%, *p = .006); and partners who had been employed for longer durations (35.2 vs. 26.5 months, *p = .045*). There were no statistically significant effects on maternal educational achievement, employment, or use of Medicaid (Kitzman et al., 2002).

**SUMMARY OF RESULTS, POLICY IMPLICATIONS, AND PROGRAM REPLICATION**

Many of the beneficial effects of the program found in the Elmira trial that were concentrated in
higher risk groups were reproduced in the Memphis replication. Data from the Denver trial (Olds et al., 2002), indicate that the nurses in the Denver trial have affected the major outcome domains targeted by the program model in ways that are consistent with the nurses in Elmira and Denver. Overall, the Elmira and Memphis trials demonstrate that the nurse home visitation program achieved two of its most important goals—the reduction in dysfunctional care of children and the improvement of maternal life course. The impact on pregnancy outcomes, however, was equivocal.

Policy Implications

One of the clearest messages that has emerged from this program of research is that the functional and economic benefits of the nurse home visitation program are greatest for families at greater risk. In the Elmira study, it was evident that most married women and those from higher socioeconomic households managed the care of their children without serious problems and that they were able to avoid lives of welfare dependence, substance abuse, and crime without the assistance of the nurse home-visitors. Similarly, their children on average avoided encounters with the criminal justice system, the use of cigarettes and alcohol, and promiscuous sexual activity. Low-income, unmarried women and their children in the comparison group, on the other hand, were at much greater risk for these problems, and the program was able to avert many of these untoward outcomes for this at-risk population. Cost analyses suggested that the program’s cost savings for government are solely attributable to benefits accruing to this higher risk group. Among families at lower risk, the financial investment in the program was a loss. This pattern of results challenges the position that these kinds of intensive programs for targeted at-risk groups ought to be made available on a universal basis. Not only is it likely to be wasteful from an economic standpoint, but it may lead to a dilution of services for those families who need them the most, because of insufficient resources to serve everyone well.

During the past 5 years, new studies have been reported that have led us to doubt the effectiveness of home-visitation programs that do not adhere to the elements of the model studied in these trials (Gomby et al., 1999; Olds et al., 2000), including especially the hiring of nurses and the use of carefully constructed program protocols designed to promote adaptive behavior (Olds et al., 2002). Most home visiting programs for low-income families studied in randomized controlled trials have failed to alter clinically important maternal, child, and family outcomes (Gomby et al., 1999). These results should give policymakers and practitioners pause as they consider investments in home visitation programs without careful consideration of program structure, content, methods, and likelihood of success.

Replication and Scale-Up of the Nurse Home Visitation Program

Even when communities choose to develop programs based on models with good scientific evidence, such programs run the risk of being watered down in the process of being scaled up. So, it is with some apprehension that our team has been working to make the program available for public investment in new communities (Olds et al., in press). The National Center for Children, Families and Communities has been established at the University of Colorado Health Sciences Center to help new communities develop the Nurse-Family Partnership, as the program is now called, outside of traditional research contexts, with an emphasis on program replication with fidelity to the model tested in the trials. The National Center is organized around the creation in state and local organizations those capacities necessary for the success of the program. Communities and states pay for part of the training and evaluation services provided by the National Center. These payments, however, cover only part of the cost to provide replication services.

The focus of this effort is to help create sufficient capacity to carry out the program with fidelity and sustain it over time. Studies are being conducted to determine what influences the quality and performance of the program in community settings and to refine the resources and services the National Center offers to support program development.

State and local governments are securing financial support for the Nurse-Family Partnership (about $8,000 per family for 2.5 years of services, in 2002 dollars) out of existing sources of funds, such as Temporary Assistance to Needy Families, Medicaid, the Maternal and Child Health Block-Grant, and child-abuse and crime-prevention dollars. Sharing the costs among several government agencies reduces the strain on any one agency’s budget; and an approach the National Center is encouraging states
and communities to consider given the breadth of the outcomes the Nurse–Family Partnership is able to produce.

Capacities Necessary to Support Dissemination

Each site choosing to implement the Nurse–Family Partnership needs certain capacities to operate and sustain the program with high quality, ideally expanding it gradually to reach a significant portion of the target population. These capacities include having an organization and community that are fully knowledgeable and supportive of the program; a staff that is well trained and supported in the conduct of the program model; and real-time information on implementation of the program and its achievement of benchmarks to guide efforts in continuous quality improvement. Staff members at the National Center are organized around three major functions devoted to creating these state and local capacities.

Site Development

The Nurse–Family Partnership will not thrive in a community unless there is clear need for the program and consensus that it is an important strategy to reach goals of child health and family well-being. The site development function of the National Center is designed to make sure that the program is a “fit” with the community’s needs and agenda, as well as a “fit” with the mission and goals of the agency being proposed to implement the program.

With the assistance of a National Center site developer, the prospective implementing organization in a site works with other community leaders to devise a detailed program implementation plan based on the requirements of the program model. Having well-developed strategies for staff and client recruitment, housing the program with the proper space and technological capacity, making sure organizational policies and operating culture will support the nurses’ effective work with families, coordinating work with other health and human services, and getting adequate funding in place are all part of the work of initial organizational community preparation guided by site developers.

Every implementing organization develops with the National Center a contract that lays out the organization’s commitment to conduct the Nurse–Family Partnership in accord with the specific standards that characterize this model of home visiting, including the organization’s commitment to enter data into a Clinical Information System that allows the sites and the National Center to monitor the performance of the program. The contract also specifies the National Center’s obligation to provide training, technical assistance, and evaluation/quality-improvement services for the organization. The expectation is that the relationship between the site and the National Center will become a long-lasting partnership in which they work together to improve the health and well-being of low-income first-time pregnant women and their families in the community. Our team believes that such deep and sustained collaboration is what will enable the network of Nurse–Family Partnerships around the country to evolve and become more effective over time.

Staff Training, Supervision, and Enhancements of the Program Guidelines

Sites are encouraged to recruit staff sufficient to serve at least 100 families (e.g., four full-time nurse visitors and a supervisor). Nurses must be recruited who have the basic personal and professional qualifications to carry out the program successfully with families who are often challenging because of complex and risky life circumstances. The minimum educational requirement recommended for a nurse home visitor working in the Nurse–Family Partnership is the BSN, and for a supervisor, the MSN. The National Center provides new staff thorough training and to the program model and training to use the home visit guidelines and client-centered intervention techniques. Supervisors are trained to facilitate the learning process of the home visitors.

A significant part of the success of the Nurse–Family Partnership depends upon the nurses’ application of the detailed program guidelines that have been developed, based on the trials, to provide structure to their work with families. The structure provided by the home-visit guidelines helps the nurse remain focused, but it does not dictate her actions. The structure of the Nurse–Family Partnership is simply the way in which nurses develop the expertise to respond effectively to the often complex and changing life circumstances of young, low-income families.

Program Evaluation and Quality Improvement

Every site implements a Clinical Information System (CIS) that has been designed specifically for
the Nurse–Family Partnership using software developed by the National Center. Data are gathered by every nurse for every family served on a set of core outcome variables, including changes in maternal smoking over the course of pregnancy, rates and timing of subsequent pregnancies, women’s completion of their education, participation in the workforce, use of welfare, childhood injuries, and reported child abuse and neglect. In addition, the nurses fill out encounter forms on every visit. These forms include the date and time of the visit, who was present, the mother’s and other family members’ engagement in the visit, their degree of conflict with the content of the material covered, and the proportion of time spent during the visit on the particular domains addressed by the program. The forms are also filled out when visits are attempted but not completed, so that measures can be taken of the ratio of completed to attempted visits, an important productivity variable.

With identifying information on individual cases stripped, local staff enter the data from encounter and other forms onto a web-based data-system developed and maintained by the National Center. Both the local program and the National Center are able to produce routine reports that monitor program quality and that can guide quality improvement efforts. Challenging aspects of program implementation are closely watched by the National Center. At present, these include for some sites relatively late gestational age of women at the time of enrollment, problems with participant attrition, and an underemphasis by the nurses of that portion of the program curriculum devoted to helping parents learn how to care competently for their children. Staff members at the National Center work with sites, individually and in groups, to solve problems and improve program performance using the CIS data as a guide.

**DISCUSSION**

This program of prenatal and infancy home visiting by nurses shows considerable promise for reducing some of the most damaging and widespread problems faced by low-income children and families in our society. The Nurse–Family Partnership is grounded in epidemiology and theories of development and behavior change, is specified in detailed visit-by-visit guidelines, and has produced enduring and replicated effects with different populations, in different contexts, and at different points in time in a series of randomized controlled trials. Since publication of the results from the trials, the demand for the program in local communities and states has been strong, perhaps in part because dissemination began in the middle of the long U.S. economic boom of the 1990s. The National Center’s effort in disseminating this program, while challenging, has met with reasonable success so far. Whether the Nurse–Family Partnership will continue to be sustained and grow as economic conditions fluctuate is not yet known. Ironically, it is during periods of economic stagnation and high unemployment that this program is needed most. Preliminary data on implementation give reason to be optimistic that the program is being conducted with essential fidelity to the model, even though some participant attrition and attenuation of effects on maternal and child outcomes are of concern. The data being gathered and analyzed on dissemination have helped the National Center learn how to better support communities’ efforts to manage the program with quality and to sustain it over time. It is hoped that this experience will be instructive to others who seek to use science to improve the lives of vulnerable children and families.

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