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Taking Preventive Intervention to Scale: The Nurse-Family Partnership

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Abstract

We outline a program of research aimed at improving the outcomes of pregnancy, child health and development, and maternal life-course with a program of prenatal and infancy home visiting by nurses for low-income mothers having first babies. We present the theoretical and epidemiologic foundations of the program, the major findings from the randomized controlled trials employed to test the program, and our efforts to translate these findings into effective community nurse home visitor programs. Particular attention is given to our development of the National Center for Children, Families, and Communities, which serves as the organization devoted to replicating the program, now called the Nurse-Family Partnership, in new communities with fidelity to the model tested in the trials. Our national replication work revolves around three major functions: helping organizations and communities become prepared to conduct and sustain the program over time; training nurses and providing them with structured guidelines to enable them to conduct the program with a high level of clinical excellence; and research, evaluation, and quality improvement activities designed to continuously improve the program and its implementation as it is offered to a larger number of communities over time.

INTRODUCTION

Our wherewithal to improve the lives of vulnerable children and families depends upon the ability of scientists and practitioners working together to replicate effective interventions that prevent social ills before they arise or worsen. For decades, committed professionals have promoted *prevention* as the solution to many of society's most troubling problems. Yet, even when promising preventive interventions have been identified in scientifically controlled studies, little guidance has emerged about how to replicate those programs effectively outside of research contexts.

Programs that have emerged from careful research looking good have often gotten watered down or adulterated in the process of being scaled up. Why? Insufficient attention has been given to examining the ways in which characteristics of the populations served, staffs, organizations, communities, and the larger environment affect the degree to which effective programs can be replicated with quality and sustained over time. As yet, for example, there have been no successful early preventive interventions (pregnancy through age five) that have proceeded through the earlier phases of research that establish the efficacy of interventions and then gone on to answer questions related to their dissemination in the context of significant replication (Olds, Hill, Robinson, Little, Song SAMSH report),.

Evidence is needed to guide policymakers and practitioners in translating effective models into effective services that maintain fidelity to those models. Steps in the right direction have been taken in publications supported by the National Institute of Mental Health (National Institute of Mental Health (NIMH), 1993; NIMH, 1996) and the Institute of Medicine over the past decade. (Mrazek & Haggerty, 1993). But, much more work in this area is needed if social science is to fulfill its promise to society. One field in which the necessary work to penetrate the

“black box” of dissemination is beginning to happen is home visiting with young families.

Home Visiting for Pregnant Women and Parents of Young Children

Home visiting, as a means of service delivery to families with young children, has in recent years been identified as the most promising method of preventing child maltreatment (U.S. Advisory Board, 1990) and promoting the economic self-sufficiency of low-income families through the prevention of rapid successive pregnancies (Loury, 2001). However, the promise, though real, is not equally shared by all home visiting programs. Recent reviews indicate that home visiting interventions are not uniformly effective in improving the life circumstances of vulnerable families with children (Gomby, Culross, & Behrman, 1999).

One program that has managed to produce consistent evidence of effectiveness is a model involving prenatal and infancy home visiting by nurses. In a series of randomized controlled trials, this program has been found to reduce dysfunctional care of the child, rapid consecutive pregnancies, and use of welfare among pregnant women and their first-born children (Olds et al., 1988, Olds et al, 1997; Kitzman et al., 1997; Kitzman et al., 2000). The program sets three major goals for nurse visitors: to help women improve the outcomes of pregnancy by improving their health-related behaviors; to improve the health and development of the child by helping parents provide responsible and competent care in the first two years of life; and to help parents become economically self-sufficient by helping them plan future pregnancies, complete their education, and find work. Consistent, positive findings have been found for the program in each of these outcome domains.

The first trial was conducted in Elmira, NY (Olds, Henderson, Tatelbaum, & Chamberlin, 1986a; Olds, Henderson, Chamberlin, & Tatelbaum, 1986b) the second in Memphis (Kitzman et al., 1997), and the most recent in Denver (Korfmacher, O'Brien, Hiatt, Olds, D., 1999). Findings

from a long-term follow-up of the families in the Elmira trial suggest that several of the positive outcomes of this program actually grew over a 15-year period (Olds et al., 1997). It is important to note that the three trials were designed more like effectiveness studies: virtually the entire target population was recruited for participation in the selected cities. While investigator involvement with the programs undoubtedly increased staff enthusiasm and commitment to careful implementation, enrollment of nearly the entire population in these trials has meant that slippage in effects is less likely as the effort has shifted within the past six years to the development of effective services offered on a much larger scale.

Given the consistently positive results from the trials, an initiative was launched in 1996 under the auspices of the U.S. Department of Justice to support development of the program, now called the Nurse-Family Partnership (NFP), in communities outside of research settings. In 1999, the National Center for Children, Families and Communities was created with support from the Robert Wood Johnson Foundation to expand this effort to assist state and local health organizations develop the NFP in a larger number of communities over time. The Center houses staff committed to the national replication of the model. These staff nurture community and organizational development in support of the program; train nurses and develop program guidelines; and conduct research, evaluation, and quality improvement.

The goal of the National Center is to implement the program with fidelity to the model tested in the randomized trials, and sustain it over time. The demand for the Nurse-Family Partnership has been high, in large part because of the evidence that the program can work if it is implemented as designed. At the time of this writing, the Nurse-Family Partnership exists in nearly 250 counties, across 23 states. Several states are now engaged in efforts to bring the program to sufficient scale that population-level impacts might be achieved. Much has been

learned about the resources needed in both the National Center and state and local implementing organizations to produce success. In the following sections, after briefly describing the Nurse-Family Partnership model and the research conducted to test its effectiveness, we turn to the challenges of bringing a preventive intervention of this kind, with strong evidentiary foundations, to scale while maintaining fidelity to its essential elements.

A Model Grounded in Epidemiology and Theory

The program tested in the randomized trials, and now being replicated around the country, is firmly grounded in epidemiology and theories of child development and behavioral change (Kellam & Werthamer-Larsson, 1986; Olds, Kitzman, Cole, & Robinson, 1997a). The program focuses on clearly preventable risks and has the specificity and coherence needed to be replicated consistently.

Epidemiology. Decisions about the families to be served and the content of the Nurse-Family Partnership have been guided by evidence about specific, modifiable risk and protective factors for poor pregnancy outcomes, problems with child health and development, and compromised economic self-sufficiency. All of the trials have examined program effects for women who have had no previous live births, and recruited women who were low income, unmarried, and adolescents. The problems the program was designed to address are concentrated in these populations (Elster & McAnarney, 1980; Overpeck, Brenner, Trumble, Trifiletti, & Berendes, 1998; Furstenberg, Brooks-Gunn, & Morgan, 1987).

The focus on women who have no previous live births stems from the belief that first-time mothers are more receptive to home-visitation services concerning pregnancy and child rearing than are women who have already given birth. Moreover, as parents learn parenting and other skills through the program, they are better able to care for subsequent children, generating

even broader salutary effects. Finally, if the program helps parents plan subsequent births, it is easier for parents to finish their education and find work because of fewer problems with child care (Furstenberg et al., 1987), and the children benefit from more focused parental nurture and guidance (Tygart, 1991).

The program is designed to reduce risks associated with the negative outcomes it seeks to address: poor birth outcomes, child abuse and neglect, welfare dependence, and poor maternal life course. Figure 1 summarizes how these influences are thought to reinforce one another over time.

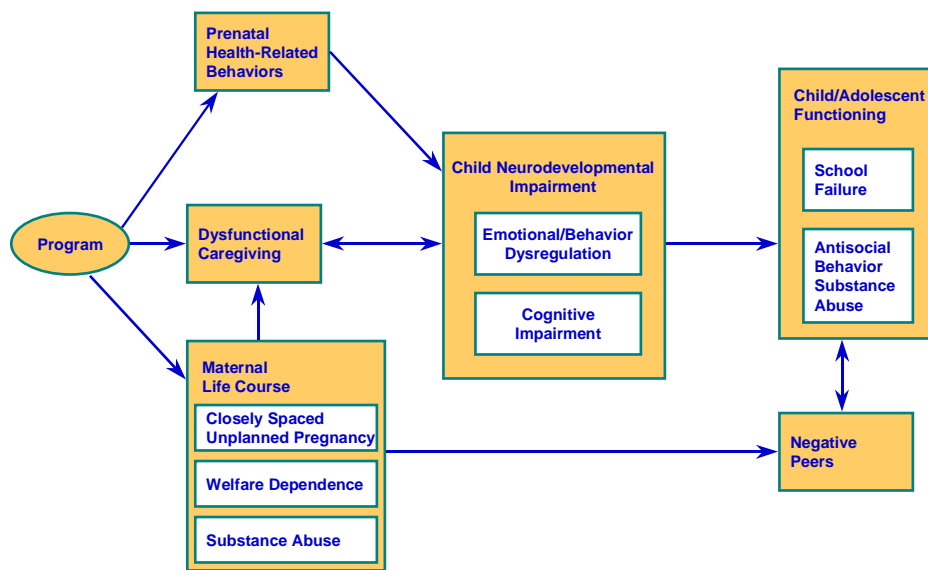


Figure 1. Conceptual Model of Program Influences on Maternal and Child Health and Development

Improving Prenatal Health-Related Behaviors: Modifiable Risks for Poor Birth Outcomes (Low Birthweight, Preterm Delivery, and Fetal 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) (Olds, 1997; Streissguth, Sampson, Barr, Bookstein, & Olson, 1994; Olds, Henderson, & Tatelbaum, 1994a; Olds, Henderson, & Tatelbaum, 1994b; Milberger, Biederman, Faraone, Chen, & Jones, 1996; Wakschlag et al., 1997; Fried, Watkinson, & Dillon, 1987; Mayes, 1994). The home visitors therefore seek to reduce mothers' use of these substances. The program's guidelines for prenatal home visits also address other factors that increase the risk for low birthweight, preterm delivery, and poor child development such as: inadequate weight gain (Institute of Medicine, 1990), inadequate diet (Institute of Medicine, 1990), inadequate use of office-based prenatal care (Klein & Goldenberg, 1990), and obstetric complications, including genitourinary tract infections and hypertensive disorders of pregnancy (Klein & Goldenberg, 1990).

Reducing Dysfunction Caregiving: Modifiable Risks for Child Abuse and Neglect and Injuries to Children. Mothers' psychological immaturity and mental health problems can reduce their ability to care for their infants (Newberger & White, 1990; Sameroff, 1983). Parents who grew up in households with punitive, rejecting, abusive, or neglectful caregiving are considered at heightened risk (Rutter, 1989; Egeland, Jacobvitz, & Sroufe, 1988; Quinton & Rutter, 1984b). In addition, unemployment (Gil, 1970), poor housing and household conditions (Gil, 1970), marital discord (Belsky, 1981), and isolation from supportive family members and friends (Garbarino, 1981) are all associated with higher rates of abuse and neglect, perhaps because they create stressful conditions in the household that interfere with parents' ability to care for their children (Bakan, 1971; Kempe, 1973). Further, recent evidence suggests that children with Attention-Deficit Hyperactivity Disorder are at increased risk for becoming seriously injured (DiScala, Lescohier, Barthel, & Li, 1998), a finding that highlights the role that prenatal factors can play in increasing children's susceptibility to being cared for poorly. The

program guidelines contain specific strategies to reduce these risks.

Reducing Modifiable Risks for Welfare Dependence and Compromised Maternal Life-Course Development. One of the major risks for compromised maternal educational achievement and workforce participation is rapid, successive pregnancies, particularly among unmarried women (Furstenberg et al., 1987). Such pregnancies often occur when women have limited visions for their future in the areas of education and work (Musick, 1993), as well as a limited belief in their control over their life circumstances and over their contraceptive practices in particular (Brafford & Beck, 1991; Levinson, 1986; Heinrich, 1993). The nurses help women envision a future consistent with their own values and aspirations; evaluate different contraceptive methods, childcare options, and career choices; and develop concrete plans for achieving their goals.

Reducing Modifiable Risks for Early-Onset Antisocial Behavior. Many of the factors listed above also are risk factors for early-onset antisocial behavior (Olds, 1997; Olds et al., 1998; Olds et al., 1997; Olds et al., 1998), a type of disruptive behavior often associated with children who grow up to become violent adolescents and, sometimes, chronic offenders (Moffitt, 1993a; Raine, Brennan, & Mednick, 1994). For example, children who develop early-onset disorder are more likely to have subtle neurodevelopmental deficits (sometimes due to poor prenatal health) (Olds, 1997; Stressguth et al., 1994; Milberger et al., 1996; Wakschlag et al., 1997) combined with abusive and rejecting care early in life (Moffitt, 1993a; Raine et al., 1994). 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, 1993a).

Theories of Child Development and Behavior Change. The program is grounded in

theories of human ecology (Bronfenbrenner, 1979; Bronfenbrenner, 1995), self-efficacy (Bandura, 1977), and human attachment (Bowlby, 1969). Together, these theories suggest that behavior change is a function of families' social context as well as the individual's beliefs, motivations, and emotions – a view that has implications for program design.

Human ecology theory emphasizes that a child's development is influenced by how his parents care for him, and that, in turn, is influenced by characteristics of their family, social networks, neighborhoods, communities, and the interrelations among them (Bronfenbrenner, 1995). Drawing from this theory, nurses attempt to enhance the material and social environment of the family by involving other family members, including fathers, in the home visits, and by linking families with needed health and human services.

Parents help select and shape the settings in which they find themselves, however (Plomin, 1986). Self-efficacy theory provides a useful framework for understanding how women make decisions about their health-related behaviors during pregnancy, care of their children, and own personal development. This theory suggests that individuals choose those behaviors they believe: (1) will lead to a given outcome, and (2) they themselves can successfully carry out (Bandura, 1977). Therefore, the program 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. Second, the home visitors help parents establish realistic goals and small achievable objectives that, once accomplished, increase parents' reservoir of successful experiences. In turn, these successes increase their confidence in taking on larger challenges.

Lastly, the program draws from attachment theory, which posits that infants are biologically predisposed to seek proximity to specific caregivers in times of stress, illness, or fatigue to promote survival (Bowlby, 1969). Attachment theory also hypothesizes that

children's trust in the world and their later capacity for empathy and responsiveness regarding their own children once they become parents are influenced by the degree to which they formed an attachment with a caring, responsive, and sensitive adult when they were growing up (Main, Kaplan, & Cassidy, 1985). The program explicitly promotes sensitive, responsive, and engaged caregiving in the early years of the child's life (Barnard, 1990; Dolezol & Butterfield, 1994). The visitors also seek to develop an empathic and trusting relationship with the mother and other family members because experiences in such relationships are expected to help women eventually be more likely to trust others and provide more sensitive, empathic care of their children.

PROGRAM DESIGN

Frequency of Visitation

The frequency of home visits changes with the stages of pregnancy and infancy and is adapted to the mother's needs. Mothers typically are enrolled through the end of the second trimester of pregnancy. Visits are scheduled once a week during the first month after enrollment, which helps the new mother and the home visitor establish a trusting relationship. Thereafter, visits are scheduled for every other week until the birth of the baby. Nurses again visit weekly for 6 weeks after the baby is born, helping the new mother and newborn adjust. From the child's 2nd to 21st postnatal month, visits are scheduled twice a month, and then, in the remaining four months are set to occur monthly. Assuming that women register in the program at 18 weeks of gestation, the maximum number of completed home visits during pregnancy would be 13 (assuming delivery at 40 weeks of gestation) and 47 visits after the child's birth.

Nurses as Home Visitors

Nurses serve as 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 address competently mothers' and family members' concerns about the complications of pregnancy, labor, and delivery, and the physical health of the infant often provide nurses with increased credibility and persuasive power in the eyes of family members. By teaching mothers and family members to identify emerging health problems and to use the health-care system, nurses enhance their clinical impact through the early detection and treatment of disorders. Each nurse carries a caseload of 20-25 families. The nurses are expected to receive weekly individual supervision and weekly case conferencing to support their work with families.

Program Content

During the home visits, the nurses carry out three major activities: (1) they promote improvements in women's (and other family members') behavior thought to affect pregnancy outcomes, the health and development of the child, and parents' life course; (2) they help women build supportive relationships with family members and friends; and (3) they link women and their family members with other needed health and human services.

The nurses follow detailed visit-by-visit guidelines whose content reflects the challenges parents are likely to confront during pregnancy and the first 2 years of the child's life. Specific assessments are made of maternal, child, and family functioning that correspond to those stages; and specific activities are recommended to address problems and strengths identified through those assessments.

During pregnancy, the nurses help women complete 24-hour diet histories on a regular basis and plot weight gains at every visit; they assess the women's cigarette smoking and use of alcohol and illegal drugs and facilitate a reduction in the use of these substances through

behavioral change strategies. They teach women to identify the signs and symptoms of pregnancy complications, encourage women to inform their physicians about those conditions, and facilitate compliance with treatment. They give particular attention to urinary tract infections, sexually transmitted diseases, and hypertensive disorders of pregnancy (conditions associated with poor birth outcomes). They coordinate care with physicians and nurses in the office and measure blood pressure when needed.

After delivery, the nurses help mothers and other caregivers improve the physical and emotional care of their children. They teach parents to observe the signs of illness, to take temperatures, and to communicate with office staff about their children's illnesses before seeking care. Specially designed curricula are used to promote parent-child interaction by facilitating parents' understanding of their infants' and toddlers' communicative signals, enhancing parents' interest in playing with their children in ways that promote emotional and cognitive development, and creating households that are safer for children. The nurses also help mothers clarify their goals and solve problems that may interfere with their education, finding work, and planning future pregnancies (Olds et al., 1997a).

OVERVIEW OF RESEARCH DESIGNS, METHODS, AND FINDINGS

In each of the three trials, women were randomized to receive either home visitation services during pregnancy and the first two years of their children's lives or comparison services. All studies employed a variety of data sources to confirm consistency of program effects. We summarize the results of the Elmira and Memphis trials below. The results of the Denver trial have not yet been published, but the basic pattern that is emerging is consistent with the findings from the first two studies.

Design and Methods

The first study was conducted in a small, semi-rural county of approximately 100,000 residents in the Appalachian region of New York State. Pregnant women with no previous live births were actively recruited through their sources of prenatal care if, at intake, they were at less than 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; or (iii) low socioeconomic status. Four hundred women enrolled, eighty-nine percent of who were white.

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 the effects in Elmira had been greatest, that is, low-income, unmarried women (most of whom were teens); and gave most 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 fewer 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). A total of 1,139 women enrolled in Memphis.

At randomization and in subsequent assessments, the treatment and comparison groups were essentially equivalent in each trial.

Findings

Pregnancy Outcomes. During pregnancy in the Elmira trial, 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 ($p=.0001$). The incidence of smoking among the largely African-American sample in Memphis was too low to detect an effect. By the end of pregnancy, nurse-visited women in Elmira had fewer kidney infections ($p=.005$). In Memphis, nurse-visited women had fewer yeast infections ($p=.05$) and fewer cases of pregnancy-induced hypertension ($p=.009$), and the cases they had tended to be less severe than in the comparison group. Among women who smoked in Elmira, those who were nurse-visited had 75% fewer pre-term deliveries ($p=.04$), and among young adolescents (aged 14-16), those nurse-visited had babies who were 395 grams heavier than their counterparts assigned to the comparison group ($p=.02$) (Old et al., 1986a). In Memphis, there were no detectable program effects on birth outcomes. Finally, nurse-visited women in both trials made better use of community services, and in Elmira they experienced greater informal social support.

Dysfunctional Caregiving. Overall, nurse-visited children in Elmira were seen in the emergency department 27% fewer times during the first year of life ($p=.04$), a difference that was even greater for children born to poor, unmarried teens. During the second year of life, these nurse-visited children were seen in the emergency department 32% fewer times ($p=.01$), a difference that was explained in part by a 56% reduction in visits for injuries and ingestions. Perhaps most importantly, nurse-visited children born to low-income, unmarried teens had 80% fewer verified cases of child abuse and neglect during the first two years of the child's life than did their counterparts in the control ($p=.07$). In Memphis, nurse-visited children had fewer health-care encounters involving injuries or ingestions ($p=.05$), an effect mainly accounted for by reduced outpatient clinic encounters. Memphis nurse-visited children also were hospitalized

fewer days for injuries or ingestions ($p=.04$). These effects were greater for children born to women with fewer psychological resources. This same group was also observed to be more communicative and responsive toward their mothers ($p=.03$). Results from a 15-year follow-up of the Elmira sample (Olds et al., 1997) indicate that the treatment-comparison differences in rates of state-verified reports of child abuse and neglect grew between the children's fourth and fifteenth birthdays ($p < .001$).

Maternal Life Course after Delivery of First Child. At the 15-year follow-up of the Elmira families, while there were no differences for the full sample on measures of maternal life course, the subsample that was poor and unmarried showed a number of enduring benefits: fewer subsequent pregnancies ($p = .03$), fewer subsequent births ($p = .02$), longer time between the birth of their first and 2nd children ($p = .001$), fewer months on welfare ($p = .005$), fewer months receiving food stamps ($p = .001$); fewer behavioral problems due to substance abuse ($p = .03$), and fewer arrests ($p < .001$) (Olds et al., 1997). In Memphis, by the fifth year after delivery of their first child, nurse-visited women had, relative to the comparison group, fewer subsequent pregnancies ($p=.03$); longer intervals between the birth of first and second children ($p=.004$); fewer months using Aid to Families with Dependent Children ($p=.01$) and food stamps ($p=.005$); higher rates of living with a partner ($p=.006$) and living with the father of the child ($p=.03$); and partners employed for longer periods ($p=.045$).

Antisocial Behavior Among the Fifteen-Year-Old Adolescents. The follow-up study of the Elmira children, again, while showing no differences between nurse-visited and comparison-group adolescents for the whole sample, did find differences among the children of poor, unmarried women (Olds, et al., 1998). Those visited by nurses during pregnancy and infancy reported fewer instances of running away ($p=.003$), fewer arrests ($p=.03$), fewer

convictions/violations of probation ($p < .001$), fewer life-time sex partners ($p = .003$), fewer cigarettes smoked per day ($p = .10$), and fewer days consuming alcohol ($p = .03$). Parents of nurse-visited children reported that their children had fewer behavioral problems related to use of drugs and alcohol ($p = .08$) (Olds et al., 1998). 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., 1998).

Cost Analysis. The Rand Corporation has conducted an economic analysis that extrapolates the results of the 15-year follow-up of the Elmira sample to estimate cost savings generated by the program (Karoly et al., 1998). While 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 four over the life of the child. The primary cost savings were found in reduced welfare and criminal justice expenditures, and increases in tax revenues.

POLICY IMPLICATIONS

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. Overall, the Elmira and Memphis trials demonstrate that the nurse home visitation model achieved two of its most important goals — the reduction in dysfunctional care of children and the improvement of maternal life course. Its impact on the third goal – the improvement of pregnancy outcomes (in particular, the reduction of preterm delivery and low birthweight) – was equivocal.

One of the clearest messages emerging from the research to date is that the functional and

economic benefits 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 consequences for similar families in the treatment group. Cost analyses suggested that the program's cost savings for government are solely attributable to benefits accruing to the higher risk group.

This pattern of results challenges the position that intensive preventive interventions, such as this one, as a general rule, ought to be made available on a universal basis. To be sure, making programs and services available to everyone may reduce the stigma clients sometimes experience when accessing services limited to people who fall into specific risk categories. And universal availability, by including the middle class among the beneficiaries, may increase political support for public investment. But these ostensible benefits come at a high price. Not only is universal availability likely to be wasteful economically, as services are given to people who do not need them. It also increases the chances that services will be diluted for those families who need them most. Giving all first-time families a home visit, for example, may be politically appealing, but it uses up resources that could be more cost-effectively spent helping those more in need.

During the past five years, new studies have led to doubt about the effectiveness of home-visitation programs that do not adhere to the elements of the model studied in the trials described

above. These elements include, especially, the hiring of nurses and the use of carefully constructed home visit guidelines designed to promote adaptive behavior (St. Pierre, Layzer, Goodson, & Bernstein, 1997). The results of the research should give policymakers and practitioners pause about investing in home visitation without careful attention to program structure, content, and methods.

The trial begun in 1994 in Denver, Colorado speaks directly to this issue. It compares program effects when the home visitors are nurses with the effects achieved by paraprofessional home visitors. Analyses of program implementation show that nurse-visited families were less likely to drop out of the program than were families visited by paraprofessionals, nurses were able to complete more visits than paraprofessionals, and turnover among paraprofessionals was higher than among nurses (Korfmacher et al., 1999). Additional analyses will examine program outcomes for parents and children, and the effects of these variations in service delivery on those outcomes.

REPLICATION OF THE NURSE-FAMILY PARTNERSHIP

Overview

Even when communities choose to develop interventions based on models with good scientific evidence, programs run the risk of being watered down in the process of being scaled up. Under grants from the United States Department of Justice, the Administration for Children and Families (DHHS), and the David and Lucile Packard, Doris Duke Charitable Trust, and Robert Wood Johnson Foundations, the Nurse-Family Partnership is being offered to communities where sufficient capacity exists to carry it out 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 \$7,500 per family for 2½ years of services, in 1998 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 is 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.

The National Center is organized around the creation in state and local organizations of fundamental 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 based on a fixed schedule of prices that is the same across the country. These prices, however, only cover part of the cost incurred by the National Center to provide replication services. Early in the dissemination of a program of this kind, costs tend to be high because of the additional work involved in startup. To ease adoption of the Nurse-Family Partnership during the startup period, the National Center decided not to charge sites the full cost for training and evaluation. Consequently, it has been necessary to supplement the revenue earned from fees with grants from private philanthropies. Whether the National Center will eventually be able to charge sites for the full cost of replication services, without impairing demand for the program, is unknown at this point.

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; access to sustainable funding appropriate to the program's design; a staff that is well trained and supported in the conduct of the program model; and real-time information on program and benchmark outcomes to guide efforts in continuous quality improvement. Staff 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 preparation that site developers guide.

Having the resources needed to implement the program is a necessary but not sufficient condition for a site to gain access to the Nurse-Family Partnership. All of the other conditions just mentioned must be met, as well. For example, in coordinating with other health and human

services, the site's implementing agency has to do what it can to identify and establish formal understandings with other home visiting programs serving a similar population. These understandings might call for: dividing up the local geography into sections, with different programs assigned to different sections; enabling families in the community to make an informed, voluntary choice about which program they will participate in; or making the Nurse-Family Partnership the program of choice for first-time, low-income families, with other families served by other programs. A prospective implementing organization needs to make a demonstrable effort to prepare itself in all the ways that experience and logic indicate may be crucial to the effective performance of the program over time.

Every implementing organization develops with the National Center a contract which 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 as it is implemented outside of the randomized trials. 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. 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.

At present, most local sites run the Nurse-Family Partnership through their public health agency, although in some sites hospitals and community-based nonprofit agencies are the

operators. After starting small, many sites opt to expand to serve more families or extend the program to adjoining jurisdictions. In Colorado, Pennsylvania, Oklahoma, Louisiana, and Wyoming, the passage of state legislation or budget measures is making it possible for the program to achieve significant scale, with statewide availability the aim.

Staff Training, Supervision, and Enhancements of the Program Guidelines. Sites are encouraged to recruit initial 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 a thorough orientation 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, and all site staff are taught how to use the Clinical Information System (described below). Training is provided in three segments, scheduled to coincide with the point in time at which nurse visitors will need to begin to use new program resources and skills with clients. All initial training is provided over the first 18 months following program start-up.

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. One of the criticisms sometimes made by those outside the program, who are not familiar with its details, is that it is overly specific and prescriptive. However, what the critics fail to appreciate is that within the structure provided by the visit-by-visit guidelines, nurse visitors exercise a high level of discretion in how they work

with each families they serve. If, for example, a visit guideline calls for discussing breastfeeding with the mother, and the nurse sees that the mother is not ready for that discussion, then the nurse does not force the issue, but looks for a more opportune time in the near future to return to it. The structure helps the nurse remain focused, but it does not dictate her actions. In fact, the guidelines provide specific resources to assist the nurse to identify the family's own strengths and priorities, and to use those to set priorities for their partnership. In essence, the "thick" 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.

Staff at the National Center make improvements to the program guidelines to ensure that their content is consistent with the latest scientific evidence about predictors of maternal and child health outcomes and strategies for behavioral change. Improvements over the last five years have also made the guidelines easier for nurses in the field to use. As the Nurse-Family Partnership continues to grow, it will be necessary to provide sites with some predictability about when the guidelines will change and the opportunity they will have to influence the direction of those changes. Constant or random changes in the content of the program increases sites' uncertainty about what they are supposed to be implementing, and with greater uncertainty comes a loss of confidence in being able to operate the program well. Signaling to sites when they can expect guideline revisions to occur will allow them to participate in the revision process and prepare themselves better for change.

Program Evaluation and Quality Improvement. Every site implements, with software developed by the National Center, the Clinical Information System (CIS) that has been designed specifically for the Nurse-Family Partnership. Data are gathered by every nurse for every family

served on a set of core process and 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 work force, 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 the gestational age of women at the time of enrollment, the degree to program participants are retained, and the allocation of time spent on each content domain during home visits. Staff 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.

Given that the program now operates in close to 250 counties, and has served over 24,000 families, with nearly 1,000 nurses, the National Center is analyzing a variety of program-implementation and maternal and child health outcomes. Although the analyses do not have the level of scientific validity that can be achieved with randomized trials, they enable simultaneous

examination of variations in the functioning of the dissemination system at the levels of individual families, nurses, sites, and states. It is hoped this will provide insight into how to guide dissemination more effectively over time.

Most of the examinations of the data conducted so far have consisted of simple descriptions of program implementation and maternal and child functioning on a site-by-site basis. The National Center also periodically produces reports that aggregate across sites to obtain system-wide summaries of progress. The information allows comparing features of implementation and maternal and child health in particular sites with corresponding outcomes produced in the randomized controlled trials. Highlights of these analyses are summarized here.

First, the nurses on average are completing more visits during pregnancy than the nurses in the randomized trials, in spite of the fact that women have tended to register later in gestation than they did in the trials. During the first year of the child's life, on the other hand, nurses are completing slightly fewer visits than their counterparts in the trials. This stems, in part, from the fact that the rate of participant attrition from the program is somewhat higher than experienced in the trials. In the second year of the child's life, the difference in number of completed visits between the trials and replication sites is greater, again because of higher rates of attrition.

Analyses are currently under way to identify the role that mothers, nurses, program sites, and features of implementation play in accounting for different types of attrition. Reasons for attrition have been classified into four major categories: the mother declines further participation, moves from the catchment area, cannot be located, or has an excessive number of missed appointments that lead to her dismissal. These reasons are analyzed within the specific stages of the program – pregnancy, infancy (0-12 months), and toddlerhood (13-24 months). It is plausible to expect to find different predictors for different types of attrition within different time

periods. Attrition due to women's refusal of services, for example, is likely connected to their personal characteristics to a greater degree than attrition arising from an excessive number of missed appointments, which may be more affected by agency policies governing the amount of time nurses are allowed to expend in tracing hard-to-reach clients.

Among the insights gained to date is that attrition rates vary widely among local sites, even after controlling for individual family characteristics that predict families' decision to drop from the program. This suggests that there may be either written rules or aspects of organizational culture influencing how much effort nurses are encouraged to put forth when mothers are not present for home visits at the appointed time. It is hoped that these analyses, along with consultation with nurses and supervisors who have exceptionally low rates of attrition, will lead to refinements in the National Center's site development, technical assistance, training, and quality improvement procedures to reduce attrition throughout the growing network of program sites.

The nurses in the replication sites allocate their time during the home visits consistent with the allocations reported in the trials, with two exceptions. They tend to spend less time on the promotion of competent parenting and more time on issues of physical health than the nurses in the trials. It appears likely that nurses in replication sites are tending to stick longer with what they know best (i.e., health) and that technical assistance by the National Center needs to zero in on these aspects of program implementation.

Finally, health outcomes, such as reductions in maternal cigarette smoking over the course of pregnancy and the rate and timing of subsequent pregnancies, suggest that replication sites are achieving positive program effects, although the results are somewhat weaker than those observed in the trials. Some attenuation of effects as the Nurse-Family Partnership is conducted

outside of research settings – where the nurses would not have the on-going support of a highly enthusiastic team of researchers – is not surprising. It should be possible, however, to improve outcomes over time, as the nurses gain experience with the model and as the National Center learns how to support more effectively their learning and competence.

In addition to the use of quantitative data, staff at the National Center systematically gather qualitative reports of the challenges experienced by nurses, supervisors, and agency leaders in the implementation of the program. Site developers conduct monthly phone calls with supervisors and administrators from each site to inquire about program management, community coordination, funding issues, and the experience with the services provided by the National Center. An instrument has been developed, not altogether different from the encounter form used by nurses, to record the results of these phone discussions. This will support careful, regular monitoring and allow data on the overall context in which the program is being implemented locally to be incorporated into analysis of factors influencing performance.

Supportive Policy and Finance Strategies. National Center staff and state and local leaders committed to the Nurse-Family Partnership work to assure favorable fiscal and policy contexts. State and local policies governing the qualifications, compensation, working hours, and work conditions of nurses influence greatly whether competent staff can be recruited and retained, can conduct the program with fidelity to its design, and can do so in a way that responds quickly to the unique needs and schedules of each family.

Policies governing funding streams affect a local agency's ability to achieve fidelity in delivering the program. The reality is that not all money is good money for a health services program targeted to low-income, pregnant women. If the funding stream tapped by a site, for example, does not support services during pregnancy, the program cannot be implemented

successfully there. If funding streams do not allow the nurses to address all of the family's needs related to health, parental role, and life course, the program cannot be implemented as designed. Particular challenges are created by funding sources that reimburse sites on a per visit basis. Per visit reimbursement may reduce the incentive nurses have to persist with families who may be erratic in their participation (i.e., not always available for visits) but who need the program just as much, if not more, than more cooperative families. A careful analysis must be done of the policies governing funding prior to program initiation. If the available funding interferes with the proper execution of the program, it has to be avoided or changed. Of course, changing how a funding stream operates is usually no easy matter and may even be impossible in some circumstances. However, it is a task that has to be considered seriously if effective preventive interventions, like the Nurse-Family Partnership, are to spread successfully.

In addition, funding for a comprehensive, intensive, multi-year program must, perforce, be sustainable and of a nature that will support reasonable program growth. A patchwork of single-year funding or small non-renewable grants will not provide adequate stability to develop, maintain, and grow a Nurse-Family Partnership site.

For this reason, it will usually be the case that local program sites will perform better and last longer if they are working in a mutually-supportive fashion with state agencies that see the Nurse-Family Partnership as a critical component of their health and human services mission. Over time, state and local authorities should find ways to combine resources from renewable sources to assure that site staff are employed long enough to become expert practitioners of the model and to serve families throughout the 2 ½ years called for by the model's protocol.

Program sustainability is enhanced by working with partners who are free to conduct community organizing and political activities necessary to advocate the program's interests and

needs in legislative, governmental, and public venues over time. While the support of majority party leaders and governors is often crucial to establish a program, the program will not be sustained in the long-term without continuous attention to the changing political scenery. Having a combination of bipartisan support, champions in key leadership positions in the legislature and state agencies, and a network of capable local advocates can help tremendously to maintain awareness of the program's role in achieving improvements in the lives of a state's most vulnerable citizens. Though such "political assets" sometimes fall into place, the more normal condition is needing to invest a considerable amount of time and talent in their development and maintenance. This is especially so in today's environment, where competition for limited public and private resources is stiff. The National Center is making such investments currently in states where the promise of scale and sustainability appears greatest. Reaching critical mass in a limited number of states will increase the visibility and legitimacy of the Nurse-Family Partnership, which should, in turn, enable it to spread more widely and deeply over time.

Conclusions

The National Center's efforts at developing, testing, and disseminating an evidence-based preventive intervention for vulnerable women, children, and families, while fraught with challenges, has met with success so far. 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 well conducted 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 US economic boom of the 1990's. 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 the program of this kind 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 participant attrition and attenuated 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.

As new early interventions are devised in the future, clinicians and program planners may increase their chances of success by building their efforts on the foundation laid by studies such as those conducted on the Nurse-Family Partnership. Fundamental questions about program design and replication have yet to be answered satisfactorily. Can ways be found to increase families' participation and engagement? How can clinical power be increased for accomplishing behavior change? What does it take to assure faithful implementation of models that have demonstrated effectiveness? What will increase the likelihood of sustained funding for programs that work?

The improvement of preventive intervention research in the next decade is likely to be accelerated if we are able to forge a closer alliance between preventive intervention practitioners, researchers, and policymakers, and if they focus their time and energy on addressing these fundamental questions. The discovery of effective preventive interventions and improving the lives of our most vulnerable citizens depend upon our commitment to making that alliance a reality.

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