Final Report To The Administration For Children And Families:

Effect of the Nurse Family Partnership on Government Expenditures for Vulnerable First-Time Mothers And their Children in Elmira, New York, Memphis, Tennessee, and Denver, Colorado (#90XP0017)

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Introduction

We conducted an economic analysis of the Nurse Family Partnership (NFP) in the context of three randomized trials we are carrying out to examine long-term effects of the NFP on maternal, child, and family functioning. The study we have conducted is a net-cost analysis from the standpoint of government spending.

The NFP is a program of prenatal and infancy home visiting by nurses in which they have three major goals:

1) to improve the outcomes of pregnancy by helping women improve their prenatal health;
2) to improve the child's health and development by helping parents provide more competent care of their children the first two years of life; and
3) to improve families' economic self-sufficiency by helping parents develop a vision for their future and to help parents accomplish their goals by helping them plan the timing of future pregnancies, staying in school, and finding work.

Nurses visit low-income families in which mothers have had no previous pregnancies, beginning during pregnancy and following the children through the child's second birthday.

Since 1993, when a study of the NFP on government expenditures was published on the first trial of the program conducted in Elmira, New York (Olds, Henderson, Phelps et al., 1993), policy makers have been interested in whether the effects found for the Elmira program persisted and whether they could be replicated in other populations. The Elmira study found that, for participants with low incomes at randomization, the cost of the program was recovered in terms of government program savings by the time the study child was 4 years old. The same program has been tested subsequently in randomized controlled trials in Memphis, Tennessee and Denver, Colorado, providing an opportunity for determining whether the results found in Elmira could be reproduced in these sites.

The program thus has been tested in three sites:

1) Elmira, NY, with a sample of 400 families (primarily whites)
2) Memphis, TN, with a sample of 743 families (primarily blacks)
3) Denver, CO, with a sample of 735 families (including a large portion of Hispanics – 46%), with simultaneous tests of the program when delivered by paraprofessionals and by nurses, each compared to a randomly assigned control group.

The analysis presented in this report provides information on both the persistence of home visitation program effects on government expenditures and on their ability to be reproduced in different settings. We have analyzed government expenditures incurred by both comparison and treatment groups for all three sites. Because of the differential timing of the intervention in the three sites, we analyzed government expenditure data for different periods in the lives of the study families. For Elmira families, we analyzed government expenditures for the period from the birth of the study child until the family was interviewed during the child's 15th year. For Memphis, we analyzed expenditures for the period from the study child's birth until the family was interviewed when the child was 4 ½. For Denver, the period analyzed was birth to 4 years.

The approach we have taken is a net cost analysis, in this case, the net cost to government of providing the nurse home visitation program. Such an analysis takes into account not only government expenditures for study subjects but also taxes paid by study subjects and the cost of the nurse visitation program itself. Tax revenues are subtracted from government expenditures to arrive at a net government cost figure for each treatment group. By comparing the net government cost figures for the treatment and comparison groups, the net cost to government of the nurse visitation program can be determined. If government expenditures for the treatment group are lower than those for the comparison group and the difference exceeds visitation program costs, the intervention can be said to result in a net benefit for government.

Conceptual Framework and Rationale for Expecting Long-Term Economic Impacts on Government Costs

Figure 1 illustrates the conceptual underpinnings of the NFP and the way we have hypothesized that it reduces government expenditures. It provides the framework for our assessment plan.

Cost Outcome Domains

As illustrated in Figure 1, our findings from the Elmira cost study through the first four years of the children's lives suggested that the NFP would reduce government costs in five domains through a number of common pathways (Olds et al., 1993), which have formed the basis for our hypothesizing corresponding effects in each of the replication sites. First, by improving maternal health, quality of parental caregiving and child health, and by reducing subsequent pregnancies, we hypothesized that the NFP would reduce health-care costs (Medicaid costs from the standpoint of government). Second, by improving parental caregiving and reducing subsequent pregnancies, we hypothesized that the NFP would reduce costs associated with child abuse and neglect (investigation, on-going follow-up of cases, and foster care). Third, by improving parental caregiving and child development and by reducing the number of subsequent pregnancies (and children), we hypothesized that the NFP would reduce education costs. Fourth, by reducing the number of subsequent pregnancies and children and by increasing workforce participation, we expected the program to reduce public assistance costs. Fifth, by reducing the number of subsequent pregnancies and children, and increasing parental workforce participation, we hypothesized that the NFP would increase family income and tax revenues. The anticipated effects of home visitation in these five domains are discussed below.

Our analysis of the 15-year follow-up in Elmira suggested that we will find treatment effects in a sixth domain, criminal justice costs, but this domain is not shown in Figure 1 as the children in the Memphis and Denver trials are not yet old enough to incur these costs.

Reductions in Health Care Expenditures. It is important to note that our experience in the Elmira and Memphis studies indicated that total health-care encounters are not likely to be reduced substantially. This is because home-visited women and children are likely to make a larger number of visits due to increased detection of health problems (such as UTI among women during pregnancy) and to have fewer visits for prevented health problems (such as injuries and ingestions on the part of children). Total health-care expenditures are likely to be reduced, nevertheless, because of the influence of the program on the rate of subsequent pregnancy (which will affect pregnancy and delivery-related health-care costs). This will be important in those communities in which Medicaid costs are covered on a fee-for-service basis (in this study, in New York State only). In Tennessee and Colorado, most Medicaid patients were enrolled in managed care organizations.

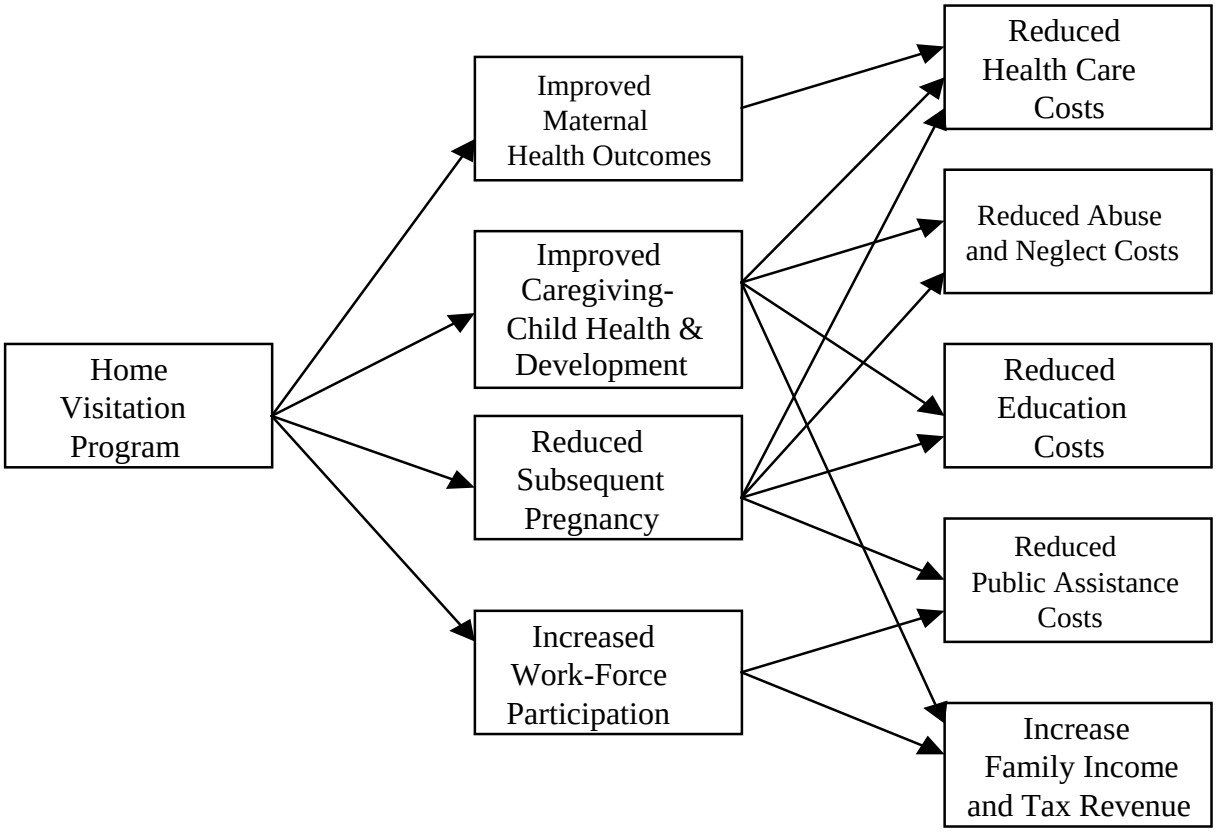

Figure 1. Conceptual Model of Program Influences on Government Spending

From the perspective of reducing government expenditures, we expected to find reductions in Medicaid and other government health care expenditures from the prevention of health problems but increases in Medicaid costs to the extent that the nurses found maternal and child health problems that otherwise would have gone undetected or treated. Total government-sponsored health care costs

for the home-visited families were expected to be lower than for the comparison group, nevertheless, because families receiving home visitation would have fewer subsequent pregnancies. That portion of Medicaid cost reduction that results from reduced participation in the Medicaid program is discussed under "Reductions in Public Assistance Costs," because, like other reductions in public assistance, it results from increased workforce participation and corresponding reduced eligibility.

Reductions in the Costs of Child Abuse and Neglect. We also hypothesized that home visitation reduces government expenditures associated with child abuse and neglect, including the cost of programs that investigate, monitor, and treat abuse and neglect. This reduction will occur as a result of the program's directly influencing the quality of parental care as well as of the visited families' having fewer subsequent children (Olds et al, 1988, 1997; Kitzman et al., 1997, 2000). It is important to note that, in spite of increased detection of child maltreatment due to the involvement of the nurse (Olds et al., 1995), nurse-visited families in the Elmira trial had substantially fewer verified cases of child abuse or neglect during the first 15 years after delivery of the index child. This will be reflected in fewer government expenditures on investigation, on-going services, and foster care. Some of these effects on state-verified reports of child abuse and neglect will only begin to emerge as the children become older, however, as surveillance bias will increase the detection of low-severity cases while the program is in operation and in the first few years after it ends (Olds et al., 1995).

Reductions in Education Costs. We also expected the NFP to reduce the costs of children's education. To the extent that home-visited children had fewer neurodevelopmental disorders (impaired IQ, attention deficit, hyperactivity) resulting from improved health-related behaviors during pregnancy and improved parental caregiving in the early years of the child's life (as the Denver year-4 results now suggest), we hypothesized fewer placements of home-visited children in special education classes, fewer grade retentions, and fewer behavioral problems leading to school suspensions. Education costs also are likely to be reduced as a result of the home-visited parents having fewer subsequent children, some of whom will require special education.

Reductions in Public Assistance Costs. We expected to find that home visitation reduces public assistance costs. In the Elmira study, nurse-visited at-risk women participated in the work force to a greater extent and had fewer subsequent pregnancies during the first four years after delivery than did their counterparts in the comparison group. This led to substantial reductions in public assistance costs for low-income families. The 15-year follow-up data show even stronger effects on completed family size and months on AFDC (Olds et al., 1997). In the Memphis study, we found reductions in subsequent pregnancy, longer intervals between the birth of the first and second child, and reductions in AFDC and food stamps use among nurse-visited women by the time the first-born children were four years old (Kitzman et al., 2000). These findings led us to hypothesize that public assistance costs (AFDC/TANF, food stamps, Medicaid, WIC, subsidized child care, housing subsidies, energy assistance) eventually would decrease among the nurse-visited women in Denver, and that these effects would increase over time.

Because the NFP produced effects on employment, we expected that subsidized childcare expenses might increase for the nurse-visited group, at least in the short run. Especially since welfare reform was enacted in 1996, an increasing public investment has been made in government subsidized childcare so women could enter the work force, so we expected that subsidized childcare expenses

would be increased for the NFP in the Memphis and Denver sites. We therefore examined subsidized childcare as part of public assistance costs.

Another government investment aimed at helping women gain economic self-sufficiency is job training, which the nurses helped families access. Job training is thus another government benefit that was factored into our estimate of government costs, given the likelihood that nurse-visited women would make greater use of it in their efforts to become financially independent.

Increases in Family Income and Tax Revenues. We also expected the home-visitation programs to increase family income and tax revenues. In the Elmira study, nurse-visited at-risk women participated in the work force to a greater extent than did their counterparts in the comparison group (Olds et al., 1988). Corresponding effects have emerged in the Memphis and Denver trials through child age two (Olds, 2002). These findings led us to hypothesize that earnings would increase among nurse-visited low-income women in the Memphis and Denver trials. These increases in family income would lead not only reductions in public benefits, but increased tax revenues, including increases in income and social security taxes. While we considered analyzing the effect of the program on sales and consumption taxes, our preliminary estimates of the influence of the program on these forms of revenue revealed that these are likely to be so small as to be inconsequential in light of the larger set of government costs and revenues.

Methods

Study Population

Recruitment of women into the three trials is described elsewhere (Olds, Henderson, Tatelbaum, et al., 1986; Kitzman, Olds, 1997; Olds, Robinson, O'Brien, et al., 2002). The study populations in the three sites were all primiparous pregnant women. Most were in low-income households, and most were unmarried. But the composition of the population in the three sites differed in some respects. The data in Table 1 suggest that the three samples differed with respect to level of risk for negative pregnancy outcomes, inadequate parenting and compromised child health and development, and other negative life-course outcomes. In particular, the Elmira group had fewer and lower levels of risk factors than did the other two samples, and the Memphis sample was at greatest risk.

Table 1: Socio-demographic Characteristics of Enrollees In the Study Sites, Percentages

Characteristic of Mother	Elmira, New York	Memphis, Tennessee	Denver, Colorado
Under 19 years	47%	65%	58%
Unmarried	62	97	87
Low income	61*	85*	95*
Minority group	11	92	65

* Low income in Elmira was defined as Hollingshead class IV or V, semi-skilled and unskilled laborers. Low income in Memphis was defined as <100% of the federal poverty level. Low-income in Denver was defined as qualifying for Medicaid (<133% of poverty).

Government Expenditures

Government expenditures we measured included those that are usually considered part of the social welfare system, e.g., Aid to Families with Dependent Children (AFDC), now transformed to Temporary Assistance for Needy Families (TANF), Food Stamps, low-income energy assistance, child care subsidies, Medicaid and State Children's Health Plan programs. The aspects of government expenditures we examined in the study went beyond welfare. As noted above, we examined major government expenditures that theoretically could be affected by this program, such expenditures made for children who repeat a grade in school or those required to prosecute crimes committed by participating mothers.

We were not able to measure costs for all programs in each site for several reasons. First, some programs did not exist in all three sites during the period analyzed. In Elmira, the period included in this analysis was 1978-1994. Subsidized child care did not exist during the period in which the Elmira children would have been able to use it. Also, the State Children's Health Plan did not exist in any state until 1998.

The second reason for differences in the government programs included in this analysis has to do with data availability. Surveys of study families have been conducted periodically since the study child's birth and are an important source of data on government expenditures. Because the cost analysis is a relatively recent addition to the numerous studies conducted on these samples, there is some variability in government program-related questions asked at different periods for the three samples. The government program information gathered for the Elmira group was somewhat limited compared with that gathered for the other two sites, largely because it was collected prior to the initiation of these cost analyses.

The primary source of information on government programs, other than surveys of the families, is administrative data maintained by government programs. Where possible, we used administrative data for our estimates of government expenditures, but there are some gaps in administrative data that are the result of the length of time between use of a program by a study family and the time data were collected for the current analysis. The databases maintained by states for beneficiaries of government programs are quite large, and, as a result, they are regularly purged of data for which the state no longer has a use. This practice most affected the Elmira analysis in that, with the exception of arrest and child welfare data, none of New York state's administrative data were available for study. The Elmira analysis therefore relied principally on survey data. For Memphis and Denver, we were able to obtain much administrative data and used them in our analyses.

Another reason for differences in the programs whose expenditures we measured had to do with the age of the child during the study period. In Elmira, because the study period ended at the child's 15th year, we were able to include some school-related variables: special education and grade repetition. Children in the other two sites were too young to attend school during the study period.

There were some government programs whose use might be expected to be affected by the nurse visiting program, but which we decided not to measure. When a government program's expenditures could conceivably be affected by nurse visitation, we included it unless local conditions suggested that there could not be a program effect. An example of this is subsidized

housing. In both Memphis and Denver, the waiting list for subsidized housing was approximately 5 years long. When, as in this case, we found the supply of government services to be so inelastic that it was unlikely that it could be affected by the nurse visitation program, we did not measure it.

The programs included for all three sites were:

- **AFDC/TANF**
- **Food Stamps**
- **Medicaid**
- **Child Protective Services**
- **Foster care (Elmira and Memphis) and Out-of-home placement and family preservation in Denver (part of its foster care system)**

The programs included in two of the three sites were:

- **Supplemental Security Income (SSI) (Elmira and Denver)**
- **Subsidized child care (Memphis and Denver)**
- **Job training (Memphis and Denver)**

The programs included in only one site were:

- **Repeated grades (Elmira)**
- **Special education (Elmira)**
- **Crime Investigation and court costs (Elmira)**
- **Child Health Plan (Denver)**
- **Head Start and Early Head Start (Denver)**
- **Low-income Energy Assistance Program (Denver)**

Taxes Paid

An important component of this net cost analysis is the contribution study subjects made to social welfare in the form of taxes paid. We have therefore included taxes, primarily income and social security taxes, paid by working study subjects in our calculations.

Analytic Methods

Methods of Measuring Visitation Program Costs. We calculated visitation program costs for Memphis and Denver from accounting documents that reported actual spending on the nurse home visitation program, which was delivered until the study child's 2nd birthday in all sites. We excluded research-related costs in order to isolate the costs that would be incurred by those wishing to replicate the visitation program. For Elmira, we used visitation program costs calculated for the 1993 cost study (Olds, Henderson, Phelps, et al., 1993). Visitation program costs were apportioned to the months in which they were incurred for Denver and Memphis. For Elmira, they were apportioned equally to the first 24 months of the study child's life. This

process created visitation program cost streams for each subject for the entire study period for each site. All program costs included actual overhead costs (rent, utilities, administrative expenses, etc.). This differs from the approach we took to accounting for government costs, described below, which did not monetize overhead expenses. This is a conservative approach.

Methods of Measuring Government Program Costs. Detailed methods used for each program in each site as well as sources of all data and program values will be described in an Appendix, which is forthcoming. The following paragraphs describe our general approach to using both administrative and survey data and summarize our methods.

Administrative Data. When we were able to obtain administrative utilization data from government agencies, we used them, rather than survey data, in estimating costs for each family, because we believed that government program data were likely to be more accurate than information provided by study participants who were asked to recall program use over a number of years. Sometimes we received administrative utilization data only; sometimes we received both utilization and cost data. In Memphis, for example, we received administrative files from AFDC and Food Stamps for the families in the study. These showed every month in which the family received AFDC grants and food stamps as well as the grant amounts. Our examination of the cost data revealed that they often were not credible—the most common problem being that the amounts shown greatly exceeded the maximum grant amount for the number of people in the family. We therefore assumed that the family received the maximum grant amount allowable based on the number of persons in the family for each month in which they were enrolled. In Denver, we were provided only utilization data for AFDC, so we used the same approach: assuming the maximum grant amount for all families, based on family size. This is a conservative approach, in that we would expect intervention-group families to have smaller grant amounts due to their earlier labor force participation and higher incomes. We therefore could have overestimated these costs for the intervention group.

From the Food Stamps program, we received data for units other than the study families. Food stamp amounts are based on the number of people who eat together rather than family size, so we adjusted the coupon amounts to reflect only the number of people in the study family.

For several programs, we received administrative data for enrollment rather than utilization. In those cases, we imputed costs. This was the case for Medicaid in both Memphis and Denver, so we estimated costs based on the category of eligibility for each family and the applicable capitation rates provided by both states (most families in Denver and all families in Memphis were in managed care plans). In New York, where Medicaid recipients were not in managed care plans, we used average Medicaid expenditures for enrollees according to age to estimate costs.

For cases in which we received administrative data on incidents of use, we assigned average costs per case. For instance, for child protective services in Elmira, we applied the New York state average cost of investigation per case of child maltreatment to the administrative data on number of investigated reports for the study families.

In Elmira, the only site for which we had administrative arrest data, we had only number of maternal arrests and general type of crime from New York State. We imputed costs based on the type of crime for which the mother was arrested, according to state records and the number of days she reported spending in jail in response to the 15-year survey. We used arrest and jail costs estimated for Washington State by Aos et al. (2001) to estimate costs of crime.

Survey Data. For a number of government programs, we did not have administrative data; we had only survey data collected at varying intervals and describing varying periods of time. For nearly all government programs used by the Elmira families, we had only survey data (the only exceptions were child protective services, foster care, and criminal justice system services). In Memphis, use of subsidized childcare and job training were reported in response to follow-up surveys. In Denver, receipt of SSI, subsidized childcare, and low-income energy assistance, as well as enrollment in the Child Health Plan and Head Start/Early Head Start were reported in response to surveys. The surveys typically asked the respondent questions about whether they used a program since the prior interview date or the birth of the child and, if so, for how long. Since the period between interviews could be lengthy, and dates of use often were not provided, it was necessary in numerous cases to make assumptions about when the families used the program. For childcare, it was logical to assume that use occurred at the beginning of the period covered by the survey, when children were younger, since that is when childcare is needed most. Moreover, it is the most conservative assumption possible because of the declining value of money over the study period. For other programs, when we did not know the time period during which the program was used, we usually assigned it to the beginning of the interview period. Exceptions included repeated grades in Elmira, which could not have occurred until the child was old enough to attend school. Assuming that utilization occurred at the beginning of the period covered by the interview was inevitably the most conservative assumption possible because of the discounting and inflation adjustment process we used, which insured that dollars spent at earlier time periods were more valuable than those spent later.

Survey data on use of government programs often were limited to frequency and duration of utilization and did not include actual government expenditures. For those programs for which we had utilization data only, we estimated government expenditures by multiplying utilization by average program cost, which was obtained from the study state for the period of interest**.** All costs were assigned to the month in which they occurred or were assumed to occur. In this way we created monthly government expenditure cost streams for each subject.

Taxes Paid. Survey respondents were not asked for tax data, but they were asked about employment, including job title and the period during which they worked at each job and wages. From this, we were able to estimate income for each study subject for Elmira and Denver. In Memphis, we had access to administrative income data maintained by the state's unemployment insurance program. To estimate federal income tax, Internal Revenue Service tax rates for each year were applied to reported income for that year. If the subject's income qualified for the Earned Income Tax Credit, the credit was calculated and subtracted from estimated taxes. We also estimated Medicare tax and Social Security taxes (a fixed rate is assessed for both) based on each family's reported income. In the case of Memphis, the only site for which administrative income data were available, we compared income estimated based

on survey responses with that from the Tennessee Department of Labor and found that survey data produced, on average, higher income estimates than Labor Department data. The difference was not significant, however. It is possible that the survey captures some unreported income, which would account for the higher self-reported estimates. For our purposes, the income of interest is reported income, since that is what taxes are based on. We therefore used the Department of Labor's figures. The Department of Labor data included only income reported by Tennessee companies. It therefore does not include income information for families that moved out of state. About 10% of the Tennessee families lived out of state for some part of the study period. More nurse-visited families moved out of state than did comparison group families. As a result, it is possible that taxes paid by nurse-visited families are understated relative to comparison families. Cost (in this case, revenue, or negative costs) streams were also created for taxes paid.

Inflation Adjustment and Discounting. The three nurse visitation programs were conducted at different times: Elmira in the late 1970s and early 1980s; Memphis in the early 1990s; and Denver in the mid-1990s. Because of this and since the costs of the interventions and their associated outcomes occurred at different times, and because it was necessary to develop a summary net cost for each intervention, we adjusted the cost streams described in the preceding paragraphs for both inflation and the time value of money. To adjust for inflation, we used the Consumer Price Index for all items for the Denver-Boulder-Greeley area (for Denver), for the southern United States (for Memphis), and for the northeastern United States (for Elmira). We then discounted these costs to adjust for the time value of money to arrive at their present value, which allows us to make more accurate comparisons among expenditures that occur at different times. The discount rate we used was 3 percent, as recommended in Gold et al. (1996). All values are expressed in 2001 dollars.

Estimating Net Costs. Once all cost streams were adjusted for inflation and discounted, it was straightforward to calculate total visitation program costs, total government costs and total taxes paid. All amounts are summed separately for the comparison group and the intervention group. The sum of all tax revenues is subtracted from the sum of all government program costs to arrive at net government cost for each group. If the comparison group's net government expenditures exceed those for the intervention group, the difference is compared with the sum of all visitation program costs to determine the ratio between them. This expresses the degree to which the visitation program's costs have been recouped through savings in government expenditures.

Statistical Analysis

The cost data presented herein, like much economic data, are not approximately normal. After examining histograms of raw data and log-transformed data, we chose to employ the non-parametric Wilcoxon rank sum to test the hypothesis of equivalence between the control and visited groups. This test, which uses ranks of the data rather than the data itself, is not unduly influenced by extreme values. For the Elmira data, in addition to testing the whole sample, we performed the test separately for the low SES group and for the high SES group.

Results

Elmira Results

Average per family net costs to government for the nurse-visited and non-visited groups are summarized in Table 2. Over the first 15 years of the study child's life, the nurse-visited group used $56,000 (2001 dollars) less per family in government services than did the non-visited group. The visited group also paid $8,300 more per family in taxes than did the non-visited group. This resulted in a 393 percent recovery of the amount invested in the nurse-visitation program by the study child's 15th year.

During the study child's first 15 years, use of AFDC, Medicaid, and food stamps was substantially lower in visited families than in comparison group families and accounted for the greatest government cost savings (Table 3). Use of child protective services and Supplemental Security Income (SSI) were also low for visited families. Interestingly, education costs, both special education and repeated grades, were somewhat higher per family in the nurse-visited group than in the comparison group, although the difference was not statistically significant. Given that low-income families, and especially those headed by single mothers are at greater risk for use of government services, it is useful to determine whether the cost savings in the Elmira study were greater for low-income families. We therefore examined government costs for the treatment and comparison groups according to socio-economic status (SES) at randomization as expressed by Hollingshead classes I, II and III versus IV and V (Hollingshead, 1976). Hollingshead classes IV and V include semi-skilled and unskilled laborers. Classes I, II, and III include all other classes, including skilled craftsmen, clerical and sales workers, minor and technical professionals, and major business professionals. Table 4 shows per capita expenditures for the two Hollingshead groupings within each treatment group. It is apparent that most of the recovery of visitation program costs in Elmira occurred

Table 2: Average per Family Net Cost to Government, Period from Study Child's Birth to 15th Year, Nurse-visited and Comparison Group Families in Elmira, New York, 2001 Dollars

Type of Cost/Revenue	Comparison Group (N=134)	Nurse-Visited Group (N=87)	Difference	P-Value
Government Programs[1]	$148,998	$101,190	$47,808	p = .049
Tax Revenues[2]	45,157	53,494	8,337	p = .238
3. Net Government Cost (line 1 – line 2)	$103,841	$ 47,696	$56,145	p = .028
4. Home visitation program cost	---	$ 14,287	$14,287	
5. Percent recovery	---	---	393%	

[1] Government programs include Child Protective Services, AFDC, SSI, Medicaid, Food Stamps, Foster Care, Education (repeated grades), Special Education and New York State crime data. These figures include net government costs (government program expenses minus tax revenues) for the first 15 years of the study child's life.

[2] These figures include tax revenues for the period between the subject child's birth and 15th year.

in the low SES group, with a five-fold return. The higher SES families recovered 150% of the visitation program's cost. This finding coincides with that of the earlier Elmira cost study which found program savings at the study child's fourth year to be concentrated in low-income families (Olds, Henderson, Phelps, et al., 1993). And it provides continuing justification for focusing this nurse home visitation program on low-income families.

Table 3: Government Program-Specific Costs Per Family for the Period from Study Child's Birth through 15th Year, Nurse-visited and Comparison Group Families in Elmira, New York, 2001 Dollars

Government Program	Comparison Group (N=134)	Nurse-visited Group (N=87)	Difference	P-Value
1. Aid to Families with Dependent Children (AFDC)	$65,354	$73,754	$ 8,400	p = .051
2. Child Protective Services	3,032	1,772	1,260	p = .143
3. Food Stamps	31,779	22,143	9,636	p = .027
4. Foster Care	2,052	599	1,453	p = .701
5. Medicaid	28,155	20,088	8,067	p = .066
5. Repeated Grades	3,775	4,352	(577)	p = .629
6. Special Education	2,525	3,436	(911)	p = .474
7. Supplemental Security Income (SSI)	8,953	3,543	5,410	p = .100
8. Costs of crime	3,373	2,274	1,099	p = .980
Total	$148,998	$101,190	$47,808	p = .049

Comparison of Current Economic Analysis with RAND Analysis

Prior to the current analysis, a study of the Elmira home visitation program was undertaken by the RAND Corporation (Karoly et al., 1998). There are several differences in the approaches taken by RAND and by the present study. A description of the most important differences is provided in the following paragraphs.

Both studies are net cost analyses or partial cost-benefit analyses, in that they monetize the benefits to government of having to provide less support to nurse-visited families. They fall short of full cost-benefit analyses because numerous benefits to society and to individuals, such as the reductions in child abuse and neglect and crime and improvements in children's behavior cannot be monetized easily. Both studies adjusted for inflation in order to express values in real dollars. The differences between the two analyses lie in the scope and number of government programs analyzed and in some of the assumptions underlying the cost estimates. In terms of the number of programs analyzed, the RAND study included welfare programs, specifically AFDC, Medicaid, and food stamps, emergency room visits by the study child, taxes paid, and crime. The estimates of crime costs were especially detailed and inclusive.

Table 4: Comparison of Per Family Government Expenditures and Taxes Paid between Study Child's Birth and 15 Year According to Hollingshead Socio-economic Status Categories,*Elmira, New York, 2001 Dollars

	Hollingshead Categories IV and V				Hollingshead Categories I-III			
Program	Comparison Group (n=82)	Nurse-visited Group (n=48)	Difference		Comparison Group (n=52)	Nurse-visited Group (n=39)	Difference	
AFDC	$85,259	$55,536	$29,723	p = .038	$33,966	$27,533	$6,433	p = .833
CPS	3,845	1,648	2,197	p = .077	1,752	1,924	(172)	p = .967
Food Stamps	40,649	25,395	15,254	p = .021	17,792	18,141	(349)	p = .447
Medicaid	35,959	24,507	11,412	p = .053	15,848	14,650	1,198	p = .818
Education (repeated grades)	4,264	4,930	(666)	p = .694	3,004	3,640	(636)	p = .659
Special Ed	2,610	4,995	(2,385)	p = .188	2,391	1,517	(874)	p = .595
SSI	9,972	4,555	5,417	p = .369	7,347	2,298	5,049	p = .138
Crime	4,227	1,405	2,822	p = .745	2,027	3,343	(1,316)	p = .701
Foster Care	1,975	828	1,147	p = .364	2,174	317	1,857	p = .428
Total	$188,759	$123,800	$ 64,959	p = .033	$86,299	$73,363	12,936	p = .800
Taxes Paid	$40,216	$46,877	6,661	p = .261	$52,949	$61,637	8,688	p = .662
Total (Govt prog savings + taxes paid)			$71,620	P = .040			$21,624	p = .384
Per capita program cost			14,287				14,287	
Percent recovery			501%				151%	

* Hollingshead Categories IV and V families have lower socio-economic status than do Hollingshead Categories I-III families.

With the exception of emergency room visits, the current study includes all of the categories explored by RAND; in addition it monetizes child protective services, foster care, Supplemental Security Income, repeated grades and special education. Our estimation of crime costs is much more limited than that in the RAND study. The source of all government program utilization for the RAND study came from the 15-year follow-up survey of program participants; the current study used data from that survey as well as administrative data for child protective services, foster care, and arrests.

Except for the costs of crime, the RAND study used more general assumptions than did the present analysis. For instance, RAND obtained monthly amounts for AFDC, Medicaid, and food stamps from Census Bureau documents. The report did not specify whether these were Chemung County, New York state, or national estimates nor whether they were averages. Also, the RAND study included welfare administration, thereby adopting an average cost analysisapproach, rather than a marginal cost approach. For the present study, we assumed that each family received the maximum AFDC and food stamps grant amounts. We obtained Chemung county AFDC grant amounts from New York State, and calculated each year's amounts based on changes in the AFDC benefit. Over the period covered by the 15-year interview, items like home energy allowance, shelter allowance and supplemental home energy allowance were added to the AFDC benefit. We did not include welfare administrative costs because we conducted a marginal cost analysis, rather than an average cost analysis. We assumed that program impact on government programs, such as Medicaid or TANF, would be relatively small and thus would not affect the administrative costs for implementing those programs.

Another substantial difference in approach was in estimating the costs of crime. The RAND study provided a much more comprehensive analysis of the effects of crime reduction, by including not only the costs of arrests, but also cost of adjudication, jail operating costs, prison costs, tangible victim costs, and costs of being a criminal career for both the mother and study child. All arrest and conviction data came from the 15-year survey. All unit costs were based on published data. The current study used arrest data provided by New York State and estimated only arrest and jail costs for the study mother, because juvenile arrest cost data were not available from the state. Number of nights spent in jail were obtained from the 15-year survey.

Estimation of taxes paid by study families differed greatly between the two studies. Both studies obtained months employed from the 15-year follow-up survey (Olds et al., 1997). The RAND study used hourly income from published data on mean wages for women who had been on AFDC. The RAND authors assumed all taxes amounted to 25% of salary; they further assumed taxes in the amount of 10% of salary were paid by employers (for Social Security and Medicare). Also included were fringe benefits of 10%. The current study based income on wages reported in the 15-year survey. We assumed no benefits for this group, based on published reports about the likelihood of receiving benefits for women who had moved from welfare to work (Heymann, 1999). We also did not assume employer-paid taxes, such as the employer's share of Social Security and Medicare taxes. We reasoned that the job filled by the respondent would have been filled by someone else, if it weren't filled by the respondent, and

that the employer would be paying those taxes anyway. These taxes would not be affected by the home visitation program. This is consistent with our marginal analysis approach.

We used income tax rates and credits in effect for each year during which the respondent reported income. We calculated income taxes using rates for household heads for each year. Most respondents were eligible for the earned income tax credit, which we also calculated.

Social security tax estimates were based on respondents' reported income; we applied the fixed social security tax rate to estimate these taxes. Medicare taxes were estimated using the approach used for Social Security taxes.

Our approach resulted in much lower taxes paid by the study families than did the RAND study. RAND's assumption that total taxes would be 35% of income seems on its face to be too high for these typically low-income families. The total tax rate in the United States, including not only the taxes included here, but also excise taxes, property taxes and sales taxes, amounts to less than 30% of Gross Domestic Product. These families, whose incomes were relatively low during the study period, are not likely to have paid 35% of their income in taxes, even considering the general regressivity of the U.S. tax system.

Denver Results

Table 5 summarizes the net costs of the home visitation program in Denver as of the study child's 4th year of age. While the nurse-visited group accounted for over $1600 per family less in government support than did the comparison group, the paraprofessional-visited group required $618 more per family than did the comparison group. The nurse-visited group paid more taxes than did any other group, $874 more than the comparison group and about $500 more than the paraprofessional-visited group. As a result of these two factors, the nurse visitation program in Denver recouped 29 percent of its cost by the study child's fourth year by virtue of lower net government expenditures and greater taxes paid. In contrast, the paraprofessional program, because the visited families used more government services than the comparison group, showed a negative recovery rate.

Table 5: Average per Family Net Cost to Government, Pregnancy to Study Child's 4th Year, Comparison Group, Nurse-visited, and Paraprofessional-visited Families in Denver, 2001 Dollars

Type of Cost/Revenue	Control (N=224)	Nurse (N=206)	Paraprofessional (N=211)	Difference (Control – Nurse)	P-Value	Difference (Control - Paraprofessional	P-Value
1. Government Programs	$14,964	$13,361	$15,582	$1,603	p = .378	(618)	p = .651
2. Tax Revenue	5,575	6,449	5,946	874	p = .957	371	p = .864
3. Net Government Costs (line 1-line 2)	$ 9,389	$6,912	$ 9,636	$2,477	p = .761	(247)	p = .396
4. Home Visitation Program Cost	---	$8,661	$5,838	$8,661		$5,838	
5. Percent recovery				28.6%		-0.4%	

The higher taxes paid by the nurse-visited group suggests that these mothers were farther along in the process of attaining economic independence than was the comparison group. Evidence of this is also provided by this group's lower use of welfare programs, especially Medicaid and food stamps (Table 6). But the nurse-visited group used less subsidized child care than did the other two groups, a surprising finding, since child care is more often used by working mothers than non-working mothers. At this point in the Denver trial, none of the differences between the groups in individual government program costs is significant.

A continuation of these differences for the nurse-visited group could result in recovery of program costs over the next several years, although at a slower rate than occurred in Elmira for low-income women.

The performance of the paraprofessional-visited group suggests that such a program may not be a wise expenditure of limited tax revenues. While it is less expensive to deliver than is the nurse-visitation program, it does not show promise for future recovery of program costs, as does the nurse-visitation program.

Table 6: Detailed Government Program Costs per Family for Nurse-visited, Paraprofessional-visited, and Comparison Groups at Age 4, Denver, Colorado, 2001 Dollars

Government Program	Comparison (N=224)	Nurse (N=206)	Paraprofessional (N=211)	Difference (Comparison - Nurse)	P-Value	Difference (Comp. – Paraprof.)	P-Value
Survey Data:							
Colorado Child Health Plan	$12	$49	$55	($37)	p = .220	($43)	p = .070
Early Head Start	1, 210	1,158	610	52	p = .593	600	p = .953
Head Start	644	482	701	162	p = .314	(57)	p = .767
Energy Assistance	57	44	52	13	p = .549	5	p = .968
SSI	652	492	216	160	p = .662	436	p = .233
Administrative Data:							
AFDC/TANF	3,304	3,204	4,183	100	p = .638	(879)	p = .061
Subsidized Child Care	1,184	685	1,043	499	p = .842	141	p = .217
Family Preservation*	22	33	43	(11)	p = .782	(21)	p = .665
Out-of-home Placement*	69	75	261	(6)	p = .589	(192)	p = .602
Food Stamps	2,674	2,383	2,987	291	p = .903	(313)	p = .225
Job Training	113	77	140	36	p = .480	(27)	p = .084
Medicaid	5,023	4,679	5,291	344	p = .334	(268)	p = .745
Total	$14,964	$13,361	$15,582	$1,603	p = .378	(618)	p = .651

*Family preservation and out-of-home placement are programs within the Colorado foster care system and correspond to the Foster Care program described for Memphis and Elmira.

Memphis Results

Nurse-visited families in Memphis required $2,285 less in government expenditures than did the comparison group from the study child's birth until age 4 ½, a significant difference (Table 7). They also paid $218 more in taxes than did the comparison group, resulting in a net government cost difference of $2,503. This represents a 25.7% recovery of program costs, somewhat lower than the recovery rate for nurse-visited families in Denver.

Table 7: Average per Family Net Cost to Government, Birth of Study Child to Age 4 ½ , Comparison Group and Nurse-visited Families in Memphis, 2001 Dollars

Type of Cost/Revenue	Comparison Group (n=456)	Nurse-visited (n=204)	Difference	
1. Government Programs	$27,865	$25,580	$2,285	p = .041
2. Tax Revenue	1,872	2,090	218	p = .976
3. Net Government Costs	25,993	23,490	2,503	p = .053
4. Home visitation program cost	---	9,755	9,755	
5. Percent Recovery			25.7%	

Most (63.5%) of the difference in government program costs between the nurse-visited group and the comparison group resulted from significantly lower use of food stamps by the nurse-visited group (Table 8). The average cost of several other government services was also lower for nurse-visited families: AFDC, Foster Care and Medicaid. The nurse-visited families, however, accounted for significantly greater subsidized child care expenses. The higher taxes paid by nurse-visited families are consistent with greater use of subsidized child care, since their higher taxes may have been the result of holding more or better jobs than were held by comparison group families. The Child Protective Services and Foster Care costs are interesting. Child Protective Services agencies spent more on nurse-visited families than on comparison families, but nurse-visited families required much less in Foster Care expenditures than did other families. Earlier work in Elmira found that child maltreatment case-finding for nurse-visited families was greater than for comparison families (Olds et al., 1995), but that case severity was lower in nurse-visited families. This could be the explanation for the seemingly paradoxical results we found for Child Protective Services and Foster Care costs for the two groups of families in Memphis.

Table 8: Detailed Government Program Costs per Family for Comparison and Nurse-visited Groups at Age 4 ½, Memphis, 2001 Dollars

Government Program	Comparison Group (n=456)	Nurse-visited (n=204)	Difference	
AFDC	$ 7,914	$ 7,234	$680	p = .053
Child Protective Services	643	879	-236	p = .958
Subsidized Child Care	1,026	1,612	-586	p = .011
Foster Care	728	39	689	p = .592
Food Stamps	14,060	12,608	1,452	p = .013
Medicaid	3,494	3,208	286	p = .097
Total	$27,865	$25,580	$2,285	p = .041

Recovery of the cost to deliver the home visitation program has proceeded somewhat more slowly in Memphis than in the other sites. This may be explained in part by differences in the

populations among the three sites. As Table 1 shows, the Memphis participants were more likely to be unmarried, more likely to be under 19, and more likely to be a member of a minority group than were participants in either of the other sites. They were more likely to have low incomes than were the Elmira participants. This relatively high level of risk for negative outcomes could have placed more obstacles in the path toward labor force participation and self-sufficiency for the Memphis group than for the other two sites. Nevertheless, the nurse-visited group in Memphis earned more income, paid more taxes and used government programs less than did the comparison group. The nurse-visited group may yet recover visitation program costs, albeit at a slower rate than in Elmira or Denver. An analysis of the longer term effects of the Memphis nurse home visitation program should reveal whether this has happened.

Conclusion

The research described herein provides information on the persistence of the effects on government expenditures of an intensive program of nurse home visitation conducted in Elmira, New York. It also provides evidence about the effects of the same program in two higher risk populations in two disparate sites.

It is apparent that the beneficial effects on dependence on government programs and on labor force participation and income found in a 1993 study of the Elmira program have indeed persisted and in fact increased. These effects have been most pronounced in those who began the program with the lowest socio-economic status.

Replication of the program in Memphis and Denver has so far had more modest effects than did the original program in Elmira. In both Memphis and Denver, nurse-visited families were less dependent on welfare and contributed more in taxes than did the comparison families, but the impact on welfare was substantially less than we observed in Elmira. This is likely due to the impact of welfare reform, which placed five-year limits on life-time use and two-year limits on any one period of use. Moreover, the extremely favorable economic conditions of the mid-to-late 1990's meant that many women, including those in the control groups, could find work more easily than did women in the period covered by the Elmira trial. In addition, as noted above, at least in the Memphis study, nurse-visited women indeed made greater use of subsidized child care, which enabled them to work more, but which incurred government costs, which offset savings in other areas.

Overall, the difference government expenditures for Memphis and Denver is not very large in comparison to control-group expenditures: 9.6% less in net government expenditures for nurse-visited families in Memphis and 8.2% less in Denver than for comparison group families. But the evidence provided by the Elmira study that differences found when the study child was age four persisted and increased over the next 11 years suggests that the differences between nurse-visited and comparison group families in both Denver and Memphis will continue to increase and that program costs may be fully recovered over time.

We were surprised that the Elmira program produced no effects on education costs. Recent analyses of children's school readiness in Memphis and Denver suggest that there is some

likelihood of program impact on education costs in those sites. Subsequent follow-up studies of the Memphis and Denver samples as the children enter school will provide estimates of additional economic benefits to government.

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