



Top Tier Evidence Initiative:

Evidence Summary for the Nurse-Family Partnership

HIGHLIGHTS:

- **Intervention:** A nurse home visitation program for first-time mothers – mostly low-income and unmarried – during their pregnancy and children’s infancy.
- **Evaluation Methods:** Three well-conducted randomized controlled trials, each carried out in a different population and setting.
- **Key Findings:** Pattern of sizable, sustained effects on important child and maternal outcomes in all three trials. The specific types of effects differed across the three trials, possibly due to differences in the populations treated. Effects found in two or more trials include (i) reductions in child abuse/neglect and injuries (20-50%); (ii) reduction in mothers’ subsequent births (10-20%) during their late teens and early twenties; (iii) improvement in cognitive/educational outcomes for children of mothers with low mental health/confidence/intelligence (e.g., 6 percentile point increase in grade 1-6 reading/math achievement).

I. The Top Tier initiative’s Expert Panel has identified this intervention as *Top Tier*.

The Panel finds that this intervention meets the Congressional Top Tier Evidence standard, defined as: *Interventions shown in well-designed and implemented randomized controlled trials, preferably conducted in typical community settings, to produce sizable, sustained benefits to participants and/or society.*

II. Description of the Intervention:

The Nurse-Family Partnership program provides nurse home visits to pregnant women with no previous live births, most of whom are (i) low-income, (ii) unmarried, and (iii) teenagers. The nurses visit the women approximately once per month during their pregnancy and the first two years of their children’s lives. The nurses teach (i) positive health related behaviors, (ii) competent care of children, and (iii) maternal personal development (family planning, educational achievement, and participation in the workforce). The program costs approximately \$13,600 per woman over the three years of visits (in 2014 dollars).

[Click here to go to the program’s website.](#)

III. Evidence of Effectiveness:

This summary of the evidence is based on a systematic search of the literature, and correspondence with leading researchers, to identify all well-designed and implemented randomized controlled trials of the Nurse-Family Partnership. Our search identified three such trials, each of which is summarized below.

Importantly, the three trials – each carried out in a different population and setting – all found the program to produce sizable, sustained effects on important mother and child outcomes. This provides confidence that this program would be effective if faithfully replicated in other, similar populations and settings. However, the specific types of effects often differed across the three studies. For example, two of the trials found a reduction in mothers’ receipt of welfare, whereas the third trial did

not. These differences may be caused by (i) differences in the study populations across the three trials (e.g., different rates of pre-program welfare participation); (ii) differences in the time periods when the trials were conducted (e.g., whether before or after the major 1996 welfare reforms); or (iii) other, unknown factors. Thus, although the study results provide confidence of *overall* effectiveness, they offer less confidence that a faithful replication of this program will reproduce the *specific* effects found in any one trial.

The specific effects that were replicated, with no countervailing findings, in two or more of the trials – and thus are the most likely to be reproducible in a program replication – are: (i) reduction in measures of child abuse and neglect (including injuries and accidents), (ii) reduction in mothers' subsequent births during their late teens and early twenties, (iii) reduction in prenatal smoking among mothers who smoked at the start of the study,¹ and (iv) improvement in cognitive and/or academic outcomes for children born to mothers with low psychological resources (i.e., intelligence, mental health, self-confidence).

The following summarizes the program's effects on all of the main outcomes measured in each study, including any such outcomes for which no or adverse effects were found. All effects shown are statistically significant at the 0.05 level unless stated otherwise.

Study 1 (Elmira, New York)

This was a randomized controlled trial of 300 women in Elmira, New York, a semi-rural community. The women, who had agreed to enroll in the study, were randomly assigned either to (i) a group given the opportunity to participate in the Nurse-Family Partnership, or (ii) a control group that was provided developmental screening and referral to treatment for their child at ages 1 and 2 and, in some cases, free transportation to prenatal and well-child care.

Approximately 90% of the women were white, 60% were low income, and 60% were unmarried. Their average age was 19.

Effects on the first-born children of the nurse-visited women at ages 15-19 (versus the control group):

- 48% fewer officially-verified incidents of child abuse and neglect as of age 15 (an average of 0.26 incidents per nurse-visited child versus 0.50 per control-group child).
- 43% less likely to have been arrested, and 58% less likely to have been convicted, as of age 19 (21% of nurse-visited children had been arrested versus 37% of control-group children, and 12% versus 28% had been convicted, according to self-reports).
- 57% fewer lifetime arrests and 66% fewer lifetime convictions, as of age 19 (an average of 0.37 versus 0.86 arrests, and 0.20 versus 0.58 convictions, according to self-reports).
- No significant effect on recent substance use (per self-reports at age 19).
- No significant effect on high school graduation rates (per self-reports at age 19).

¹ The reduction in prenatal smoking is not discussed in detail in this summary because of the summary's focus on longer-term life outcomes. However, the smoking reduction may have affected some of these longer-term outcomes (e.g., child cognitive development).

- No significant effect on likelihood of becoming pregnant or giving birth, or causing a pregnancy or birth (per self-reports at age 19).
- No significant effect on percent engaged in economically productive activities at age 19 (e.g., work or school), or on lifetime use of welfare or other public assistance, per self-reports.

Effects on the nurse-visited women when their children reached age 15 (versus the control group):

- 20% less time spent on welfare (an average of 53 months per nurse-visited woman versus 66 months per woman in the control group). *This effect was statistically significant at the .10 level, but not the .05 level.*
- 19% fewer subsequent births (an average of 1.3 births versus 1.6).
- 61% fewer self-reported arrests (an average of 0.13 versus 0.33).
- 72% fewer self-reported convictions (an average of 0.05 versus 0.18).
- There were no significant effects on months employed, months on food stamps or Medicaid, or behavior-impairing substance abuse.

There was suggestive evidence that the above effects on the children and women were largest for the subgroup of women who, at study enrollment, were unmarried and of low socioeconomic status. Also, the decrease in the children's criminal activity appears to be concentrated among the girls, who experienced reductions of over 80% in lifetime arrests and convictions. There were no statistically significant effects on the boys' arrests and convictions.

Discussion of study quality:

- This was a relatively large study with a long-term follow-up (child age 15-19) and low attrition: Data on the outcomes described above were obtained for 77-83% of the original sample (depending on the outcome), and follow-up rates were similar for the nurse-visited and control groups.
- At the child age-15 and 19 follow-up, the women in the nurse-visited group and those in the control group were highly similar in their observable pre-program characteristics (e.g., demographics).
- The study measured outcomes for all mothers and children assigned to the nurse visitation group, regardless of whether or how long they actually participated in the program (i.e., the study used an "intention-to-treat" analysis).
- Official records of criminal activity and/or delinquency, although not complete, tended to corroborate the mothers' self-reports. (Such crime/delinquency records were too incomplete to provide similar corroboration for the children's self-reports.)
- Research staff gathering outcome data were blind as to whether women were assigned to the nurse-visitation group or the control group.

Study 2 (Memphis, Tennessee)

This was a randomized controlled trial of 743 women in Memphis, Tennessee. The women, who had agreed to participate in the study, were randomly assigned to (i) a group given the opportunity to participate in the Nurse-Family Partnership, or (ii) a control group that was provided free transportation to scheduled prenatal medical appointments, and developmental screening and referral to treatment for their child between birth and age 2.

92% of the women were African-American, 85% came from households with income at or below the poverty line, and 98% were unmarried. Their average age was 18.

Effects on the first-born children of nurse-visited women at age 2 (versus the control group):

- 23% fewer health care encounters for children's injuries or ingestions (an average of 0.43 encounters per child in the nurse-visited group vs. 0.56 in the control group).
- 78% fewer days hospitalized for injuries or ingestions (an average of 0.04 days versus 0.18 days).
- No significant effects on children's immunization rates, mental development, or behavioral problems.

Effects on the first-born children of nurse-visited women at age 12 (versus the control group):

- Nurse-visited children in the full sample were –
 - Less likely to have used cigarettes, alcohol, or marijuana in the past month (1.7% of children in the nurse-visited group had used these substances vs. 5.1% of children in the control group).
 - 28% less likely to have an internalizing disorder, such as depression or anxiety (22.1% vs. 30.9%).
 - There were no significant effects on these children's academic performance (e.g. test scores, grade retentions, special education placements), conduct outcomes (including arrests), ability to sustain attention, or mortality.
- Nurse-visited children in the subsample whose mothers had low psychological resources prior to program participation (i.e. were in the lower half of the sample in intelligence, mental health, and self-confidence) made sizable gains in academic performance. These children:
 - Scored 6 percentile points higher on Tennessee state reading and math achievement tests in grades 1-6 than their counterparts in the control group (the nurse-visited group scored in the 41st percentile, versus the 35th percentile for their control group counterparts).
 - Had 8% higher reading and math grade point averages in grades 1-6 (an average GPA of 2.46 vs. 2.27).
 - The effects on academic performance were sustained over the follow-up period, including the final two years (grades 4-6).

- There were no significant effects on these children's conduct outcomes (including arrests), mental health, grade retentions, special education placements, or ability to sustain attention.

Importantly, the above effects on children's substance use may be valid, but could also have appeared by chance due to the study's measurement of a sizable number of child outcomes at age 12. Therefore, we believe these effects need to be confirmed in additional studies. The effects on internalizing disorders for the full sample, and on academic performance of children whose mothers had low psychological resources, are more likely to be valid since similar effects were found in the Denver trial (study 3, below).

Effects on the nurse-visited women when their children reached age 12 (versus the control group):

- 9% reduction in time on welfare during the 12 years (5.0 months per year for the nurse-visited women vs. 5.5 months per year for control group women).
- 9% reduction in time on Food Stamps during the 12 years (6.3 months per year vs. 6.9 months per year).
- \$1,210 (or 10%) reduction in annual government spending per woman on welfare, food stamps, and Medicaid during the 12 years (\$10,349 per year vs. \$11,559, in 2014 dollars). The total government savings over the 12 years more than offset the program's cost (the discounted savings were \$14,500, whereas the program's cost was \$13,600, in 2014 dollars).
- The above effects on use of government assistance resulted mainly from reductions during the first 9 years of the follow-up period; between years 10 and 12, the reductions were smaller and in most cases not statistically significant.
- There was no significant effect on the number of subsequent births over the whole 12 years. However, during the first 6 years – when the women were in their late teens and early twenties – there was a statistically-significant 16% reduction in subsequent births (an average of 1.08 for the nurse-visited women vs. 1.28 for the control group women).
- There were a few other statistically-significant effects, such as an increase in duration of the mother's relationship with her current partner at the three points this was measured (the 6, 9, and 12-year follow-ups), and an increase in the mother's sense of mastery over the full 12 years.
- There were no significant effects on mothers' time employed, likelihood of partnership with or marriage to the child's biological father, experience of intimate partner violence, substance use, arrests, incarcerations, psychological distress, or child foster care placements.

Importantly, the effects noted above on duration of the mother's relationship with her current partner and on her sense of mastery may be valid, but could also have appeared by chance due to the study's measurement of a sizable number of maternal outcomes at the 12-year follow-up. Therefore, we believe these effects need to be confirmed in additional studies. The effects on mothers' use of government assistance and on subsequent births during their teens and early twenties are more likely to be valid since similar effects were found in the Elmira trial (study 1, above).

Discussion of study quality:

- This was a large study with a long-term follow-up (child age 12) and low-to-moderate attrition: Data on the outcomes described above were obtained for 74-85% of the original sample (depending on the outcome), and follow-up rates were similar for the nurse-visited and control groups.
- At all study follow-up points (child age 2, 6, 9, and 12), the women in the nurse-visited group and those in the control group were highly similar in their observable pre-program characteristics (e.g., demographics, self-reported substance use).
- The study measured outcomes for all mothers and children assigned to the nurse-visited group, regardless of whether or how long they actually participated in the program (i.e., the study used an “intention-to-treat” analysis).
- The study used a variety of sources to measure outcomes, including mother, teacher, and child reports (e.g., on child behavior), school records (e.g., achievement test scores, GPA), and state administrative records (e.g., receipt of welfare and other government assistance).
- Research staff gathering outcome data were blind as to whether women were assigned to the nurse-visited group or the control group.
- The study evaluated the program as implemented on a large scale in a low-income community by the county health department, thus providing evidence about the intervention's effectiveness under real-world implementation conditions.

Study 3 (Denver, Colorado)

This was a randomized controlled trial of 490 women in Denver, Colorado. The women, who had agreed to participate in the study, were randomly assigned to (i) a group given the opportunity to participate in the Nurse-Family Partnership or (ii) a control group provided with developmental screening and referral to treatment for their children between birth and age 2.

These women were almost all low-income (their annual household income averaged \$19,700 in 2014 dollars), 46% were Mexican American, 36% were white, 15% were African American, and 84% were unmarried. Their average age was 20.

The study's hypothesis is that the program would produce effects on child outcomes similar to those found in the Memphis trial – namely, improvements in behavioral and emotional outcomes for the full sample of children, and improvements in cognitive and educational outcomes limited to the subsample of children whose mothers had low psychological resources prior to program participation (i.e., low intelligence, mental health, and self-confidence). This subsample was defined the same way in both trials, and in Denver comprised approximately 40% of the full sample.

Effects on the first-born children of nurse-visited women at age 4 (versus the control group):

- The subsample of children whose mothers had low psychological resources prior to program participation made sizable gains in researcher-assessed –

- Language development (standardized effect size of 0.31²);
- Behavioral adaptation – e.g., attention, impulse control, sociability (standardized effect size of 0.38); and
- Executive functioning – e.g., capacity for sustained attention, fine and gross motor skills (standardized effect size of 0.47).

There were no significant effects on emotional regulation (e.g., anxiety, regulation of mood, or mother-reported rule-breaking or aggressive behavior).

- For the full sample of children (as opposed to the above subsample), there were no significant effects on these child outcomes.

Effects on the first-born children of nurse-visited women at ages 6 and 9 (versus the control group):

- Behavioral and emotional outcomes for the full sample: Across various measures, children in the nurse-visited group had consistently better outcomes than children in the control group, but these differences did not reach statistical significance at conventional (0.05) levels, possibly because the study sample was not sufficiently large. As representative examples, at age 9 –
 - 3.6% of nurse-visited children scored in the borderline or clinical range for internalizing problems, such as depression and anxiety, versus 8.2% of control-group children. *This difference was statistically significant at the 0.10 level, but not the 0.05 level.*
 - 6.6% of nurse-visited women scored in the borderline or clinical range for externalizing problems, such as aggression or impulsiveness, compared to 10.2% of control-group children. *This difference was not statistically significant (p=0.25).*

These findings help corroborate the behavioral and emotional effects found in the Elmira and Memphis trials (studies 1 and 2, above), but to a limited degree since they did not reach statistical significance.

- Cognitive and educational outcomes for the subsample of children whose mothers had low psychological resources: The effects on these outcomes generally favored the children in the nurse-visited group, with a few reaching statistical significance. *However, we believe these findings in Denver are only suggestive because of a study limitation for this subsample at the age 6 and 9 follow-ups – namely, a sizable difference in sample attrition between the nurse-visited children and control group children (see “Discussion of Study Quality,” below).*

Effects on the nurse-visited women when their children reached age 4 (versus the control group):

- There were no significant effects on most of the women’s outcomes, including welfare receipt; employment; high school graduation; mental health; substance use; percent married or living with a partner; or number of subsequent births, abortions, miscarriages, or low birth weight newborns.

² To provide a general, intuitive sense of what these “standardized effect sizes” mean, an effect size on child IQ of 0.31 translates to 4.6 IQ points; an effect size of 0.38 translates to 5.7 IQ points, and an effect size of 0.47 translates to 7.1 IQ points.

- There were a few significant effects, as follows:
 - 20% longer interval between the women’s 1st and 2nd births (24.5 months for the nurse-visited women vs. 20.4 months for the control group).
 - Lower percentage of women experienced domestic violence from their partner in the past 6 months (7% versus 14%).

Importantly, the effect on domestic violence may be valid, but could also have appeared by chance due to the study's measurement of a sizable number of maternal outcomes. Therefore, we believe this effect needs to be confirmed in additional studies. The effect on the interval between births is more likely to be valid since similar effects were found in the Elmira and Memphis trials.

Discussion of study quality:

- This was a relatively large study with a long-term follow-up (child age 9).
- At the child age-4 follow-up, the study had low sample attrition: Data were obtained for 82-86% of the original sample (depending on the outcome), and follow-up rates were similar for the nurse-visited and control groups. (Sample attrition was higher at the child age 6 and 9 follow-ups, as discussed below.)
- At the child age 4, 6, and 9 follow-ups, the nurse-visited women and the control group women in the follow-up sample were highly similar in their observable pre-program characteristics (e.g., demographics, self-reported substance use).
- The study measured outcomes for all mothers and children assigned to the nurse-visited group, regardless of whether or how long they actually participated in the program (i.e., the study used an “intention-to-treat” analysis).
- Children's behavioral, emotional, cognitive, and educational outcomes were measured through assessments whose reliability and validity are well-established (e.g., Preschool Language Scales-3, Child Behavior Checklist).
- The research staff administering these assessments and other outcome measures were blind as to whether women were assigned to the nurse-visited or the control group.
- The study evaluated the program as implemented on a large scale in a low-income community, thus providing evidence about the intervention's effectiveness under real-world implementation conditions.
- A limitation of the study at the child age 6 and 9 follow-ups was moderate to high sample attrition. Specifically –
 - For the full sample: The study obtained data on behavioral and emotional outcomes for between 70% and 81% of the sample at the age-6 follow-up (depending on the outcome measure), and between 62% and 72% of the sample at the age-9 follow-up. Although the attrition rates were similar for the nurse-visited versus control group, and the follow-up samples for the two groups were still highly similar in their observable characteristics, the attrition conceivably could have caused *unobservable* differences between the two

groups, possibly leading to inaccurate estimates of the program's effects. (This limitation does not apply to the full-sample findings at child age 4).

- For the subsample of children whose mothers had low psychological resources: Sample attrition was similarly high, and differed by an average of 13 percentage points between the nurse-visited and control groups at the age 6 and 9 follow-ups. This difference in attrition could have created systematic differences in characteristics between the two groups, leading to inaccurate estimates of the program's effects. For this reason, we believe the study's findings for this subsample are only suggestive. (This limitation does not apply to the subsample findings at child age 4).

Other Studies:

Two other randomized controlled trials of the Nurse-Family Partnership have been conducted. Their results, although short-term, are generally consistent with the results of the studies described above. However, these trials fall outside our initiative's criteria and so are not summarized here (e.g., because they did not use an "intention-to-treat" approach to estimate the program's effects, or did not report on the statistical significance of the effects).

IV. Summary of the Intervention's Benefits and Costs:

If taxpayers fund implementation, what benefits to society can they expect to result, and what would be their net cost? The following table provides a summary. This is intended to be a general overview of social benefits in relation to taxpayer cost, rather than a comprehensive benefit-cost analysis. It assigns monetary value to particular benefits and costs only when doing so requires minimal assumptions. All monetary amounts shown are in 2014 dollars.

Benefits To Society

The following benefits were found in at least two of the three trials of NFP

- **20-50% reductions in child abuse, neglect, and/or injuries.**
- **10-20% reduction in mothers' subsequent births during their teens and early twenties.**
- **Improvement in cognitive and/or educational outcomes for children born to mothers with low mental health, confidence, and/or intelligence** (e.g., in the Memphis trial, a 6 percentile point increase in grade 1-6 reading and math test scores).

Net Cost To Taxpayers

- **\$13,600 per woman, to deliver program services** (i.e., three years of home visits by a trained nurse).
- **This cost was offset in two of the trials by reduced government spending on mothers' use of welfare and other public assistance (e.g., \$14,500 in lower spending per woman over 12 years in Memphis).** Both the Elmira and Memphis trials found such lower welfare spending, but the Denver trial did not.

V. References:

Study 1 – Elmira, New York

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- Olds, David L., Charles R. Henderson, Jr., Robert Tatelbaum, and Robert Chamberlin. “Improving the Delivery of Prenatal Care and Outcomes of Pregnancy: A Randomized Trial of Nurse Home Visitation,” *Pediatrics*, vol. 77, no. 1, January 1986, pp. 16-27.

Study 2 – Memphis, Tennessee

- Kitzman, Harriet J., David L. Olds, Robert E. Cole, Carole A. Hanks, Elizabeth A. Anson, Kimberly J. Arcoleo, Dennis W. Luckey, Michael D. Knudtson, Charles R. Henderson Jr., and John R. Holmberg. “Enduring Effects of Prenatal and Infancy Home Visiting by Nurses on Children.” *Archives of Pediatrics and Adolescent Medicine*, vol. 164, no. 5, May 2010, pp. 412-418.
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Study 3 – Denver, Colorado

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Children: Follow-up of a Randomized Trial at Ages 6 and 9 Years.” *JAMA Pediatrics*, in press, December 2, 2013.

Other studies

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Note: Panel members Dan Levy, Steve Raudenbush, and Howard Rolston did not participate in the Advisory Panel’s review of this intervention.