Free Vaccination and Immunization Coverage of Uninsured Children: The Case of the Vaccines for Children Program in the United States

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Research note

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Free Vaccination and Immunization Coverage of Uninsured Children: The Case of the Vaccines for Children Program in the United States

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Abstract

Objective: Vaccines against contagious diseases have strong positive externalities as immunization protects not just the immunized but those around them. Out-of-pocket immunization costs are a common barrier to obtaining vaccines, especially for low-income families or those without health insurance in the United States. The Vaccines for Children (VFC) Program, initiated in October 1994, allows all uninsured children in the United States to receive free vaccinations. Despite its importance, few studies have focused on the effectiveness of this program. Using data from the National Immunization Survey (NIS) from 1995–1997 (N=51902), this study investigates how the introduction of this program affected the immunization coverage of uninsured children aged 19–35 months.

Results: Accounting for variation in a child's exposure to the program, I found that providing free vaccination correlated with an increase in the uptake of the entire spectrum of recommended vaccines, which included hepatitis B (Hep b) vaccine added to the recommended immunization schedule at the time. Further, despite the introduction of the program, uninsured children continue to have low immunization coverage. These findings suggest that improving immunization coverage for uninsured children by only reducing out-of-pocket vaccination costs may be insufficient and other factors may still influence vaccination decisions.

Keywords: childhood immunization, immunization coverage, health insurance, Vaccines for Children Program

Introduction

Vaccines against contagious diseases have strong positive externalities as immunization protects both the immunized and those around them [1]. In the U.S., immunization policies are affected by the large number of Americans lacking adequate health insurance, a major social policy issue affecting the country [2]. Regarding childhood immunization, private and public health insurance cover 52% and 23% of children aged 0–5 years, respectively; the remaining 25% are uninsured or underinsured [3]. The uninsured are less likely to receive vaccinations and care for infectious diseases [4-5]. Out-of-pocket immunization costs are a commonly cited barrier to obtaining vaccines, especially for low-income families or those without health insurance [6].

The Vaccines for Children (VFC) Program was established in 1994 to provide free vaccines to children whose parents could not afford them. Reducing out-of-pocket vaccination costs is effective for improving immunization coverage [7]. Further, the existence of free vaccinations and immunization rates among children aged 19–35 months were found to be correlated when controlling for individual characteristics [8-9]. These studies found that free vaccinations lead to higher vaccination rates. Because immunization data were analyzed for only one year, the program's long-term impact was not evaluated.

This study aims to analyze changes in immunization coverage between insured and uninsured children before and after implementing the VFC program using individual-level data from the National Immunization Survey (NIS). Variations in children's program exposure allow me to use longitudinal data to estimate the program's causal effects.

Main text

Background

Eligibility for the VFC program requires children to be less than 19 years old and meet at least one of the following criteria: be Medicaid-eligible, uninsured, underinsured, American

Indian, or Alaska Native. The Advisory Committee on Immunization Practices recommends the vaccines that are provided in the VFC program, which protect children from preventable diseases. The VFC program is federally funded, and the funds are allocated to the Centers for Disease Control and Prevention (CDC), which buys vaccines at a discount from manufacturers and distributes them to state health departments and local public health agencies. These agencies redistribute the vaccines to private physicians' offices and public health clinics that are registered as providers under the VFC program, which has expanded the public share of vaccine purchases to 41% of all childhood vaccines [10], guaranteeing vaccines to more than 10 million children nationwide [3].

Data

I used individual-level NIS data from 1995–1997. The NIS is an annual CDC-conducted nationally representative survey providing state and national estimates on vaccine coverage levels for children. It collects immunization information for 30,000 children aged between 19–35 months in the U.S.

Households with children in the target age range are identified with a random-digit-dialing (RDD) telephone survey, and questions are asked to the adult most knowledgeable about the child's immunization record. Respondents are asked whether there is a written record (shot card) of the child's vaccination history and whether it is easily accessible[1]. If available, respondents are asked to provide information from it directly. If unavailable, respondents are asked to recall information about the child's vaccinations. With the respondents' consent, the NIS also contacts the provider(s) to request vaccination information from the child's medical records. Provider-reported vaccination histories are used to form vaccination coverage estimates, because provider data are considered the most reliable.

According to the recommended childhood immunization schedules at the time (CDC,

[1] Besides information on the number of vaccines, respondents are asked about the mother's age, her educational attainment, marital status, family income, and other socioeconomic and demographic information.

2016), children were expected to be up-to-date for the 4:3:1:3:3 series vaccines by the age of 18-months: specifically, the series includes 4 doses of diphtheria, tetanus, and pertussis (DTP); 3 doses of polio; 1 dose of measles, mumps, and rubella (MMR); 3 doses of *Haemophilus influenzae* type b (Hib); and 3 doses of hepatitis B (Hep B). This is the most comprehensive vaccination series available during the study period; therefore, changes in immunization rates for this series were analyzed. I also focused on the 4:3:1:3 series (4 DTP, 3 polio, 1 MMR, and 3 Hib) because the Hep B vaccine was added to the recommended immunization schedule in 1994 [11]. Despite the new recommendation, children were immunized according to the previous 4:3:1:3 guidelines. I used dichotomous indicators to determine if a child was up-to-date for either a specific vaccine or vaccine series. As the children may have been behind in their immunization schedule, I also considered the fraction of doses of the recommended vaccines as an outcome variable to capture catch-up effects.

In the 1995 NIS, children aged between 19–35 months were born between February 1992 and May 1994. Overall, in the 1995–1997 NIS, children aged 19–35 months were born between February 1992 and May 1996 and were vaccinated from 1992 through 1996. I restricted the sample period until the 1997 NIS to focus on the impact of the VFC program, as the State Children's Health Insurance Program was established in 1997 [12].

Children's program exposure was determined by their age in the survey period. The NIS does not include the date of birth; thus, individual exposure to the VFC program remains unobserved in the data. To exploit interindividual variation in program treatment, I calculated children's average exposure level for each survey's age categories and used it as exogenous treatment.

Table 1 reports the descriptive statistics for the individual-level NIS data.

[Table 1 about here]

Methods

To evaluate the effect of the VFC program on immunization coverage among uninsured children, I used the following specification of immunization coverage for individual i in state s

and year *t*:

$$UTD_{ist} = \alpha_0 + \alpha_1 Uninsured_{ist} + \alpha_2 \%Program_{it} + \alpha_3 (Uninsured_{ist} \times \%Program_{it}) + \mathbf{X_i \alpha_4} + \delta_s + \gamma_t + \mu_{st} + \epsilon_{ist} \quad (1)$$

where $UTD = 1$ if the child is fully up-to-date for a particular vaccine or on a series and 0 otherwise; $Uninsured$ is an indicator variable of whether the child is covered by health insurance; $\%Program$ denotes exposure to the VFC program; and $\mathbf{X}$ is a vector of the child's individual characteristics, such as age, gender, race/ethnicity, mother's education, number of children, marital status, income levels. Using a fixed-effects model, the state fixed effects capture time-invariant state characteristics that may affect vaccination rates, whereas the year fixed effects capture a nationwide aggregate trend in vaccination rates. The state-year interactions were included to control for other factors changing at the state-year level that could affect the outcomes of interest.

Since the introduction of the VFC program might have enabled children to catch up on their immunization schedule, especially those in low-income or uninsured families, it is important to capture this effect. To do so, I employed the following specification of immunization coverage:

$$\%Dose_{ist} = \beta_0 + \beta_1 Uninsured_{ist} + \beta_2 \%Program_{it} + \beta_3 (Uninsured_{ist} \times \%Program_{it}) + \mathbf{X_i \beta_4} + \delta_s + \gamma_t + \mu_{st} + \epsilon_{ist} \quad (2)$$

where $\%Dose$ is the fraction of doses of the recommended vaccines.

Because the 1995–1997 NIS lacks information on the health insurance status of children[2], I employed a two-stage linear imputation method to fill this data gap, whereby I estimated the probability of becoming uninsured from the March Current Population Survey (CPS) and then imputed this probability in the NIS [13]. I used the 1993–1997 March CPS because it asks about insurance status with a one-year lag, and restricted the sample to children aged 0–3 years.

In the first stage, I regressed $Uninsured$ on the common exogenous variables using data from the March CPS. This estimated relation is used to compute the predicted value of $Uninsured$ in the NIS, using the common variables as observed in the NIS. The predicted values were substituted in the estimating Eq. (1), which now only contained variables observed in the NIS. In Additional file 1, descriptive statistics for the March CPS are reported in Appendix Table 1, and estimation results for the first stage are reported in Appendix Table 2.

Results

I estimated Eq. (1) using ordinary least squares[3]. The estimates used a 400-replications bootstrap standard error. The top panels of Table 2 present the estimates of Eq. (1).

[Table 2 about here]

Table 2 shows that exposure to the VFC program had a positive and significant impact on up-to-date status for the 4:3:1:3:3 series. A child fully exposed to the VFC program obtained 16.5% higher immunization coverage than a child unexposed to the program. However, program exposure seemingly had no impact on completing the 4:3:1:3 series. Columns (3) through (7) show that program exposure had a positive and significant impact on immunization coverage only when the Hep B vaccine is included in the immunization series. While the interaction term between an uninsured status and program exposure positively affected Hep B vaccination, the effect disappears entirely for the 4:3:1:3:3 series. Therefore, the VFC program seems to had a

[2] The health insurance status of the child is collected in the health insurance module (HIM) of the NIS. The HIM was introduced in 2006, and the HIM data were included in the NIS public-use data file for the first time in 2007.

[3] In a nonlinear model, such as a probit model, the coefficient of the interaction term may not be a reliable estimator of the true interaction effect [14].

small overall impact on immunizing children in uninsured families.

Furthermore, immunization rate correlated positively with age, as a person can catch up on his or her immunization later in life. Table 2 reveals that this phenomenon occurs with the 4:3:1:3 but not the 4:3:1:3:3 series, because the Hep B vaccine had just been introduced at the time.

Several demographic factors revealed varying degrees of correlation with immunization rates. Gender had no significant impact on the vaccine uptake. Hispanics and Blacks had a lower uptake rate than Whites (1.7% and 2.6%, respectively). Household conditions also affected immunization rates. The higher the number of children, the lower their likelihood of being fully immunized. Widowed, divorced, or separated mothers had a lower vaccine uptake than currently married mothers, and mother's level of education had a positive and significant effect on vaccination rates. Finally, household income positively affected vaccine uptake.

[Table 3 about here]

The same trends are seen in Table 3. The top panels of Table 3 present the estimates of Eq. (2). Program exposure and the interaction term had a positive and significant impact on the 4:3:1:3:3 series. A child fully exposed to the program received 3.8% more vaccine doses; an uninsured child fully exposed to the program received 1.9% more doses. Columns (3) through (7) show that these results occur because the Hep B vaccine skews the rate. Therefore, these effects on the 4:3:1:3 series were not significant. The other control variables had an almost identical effect on individual vaccination.

In the bottom panel of Tables 2 and 3, I provide alternative specifications. The estimation of panel B excludes all the individual characteristics in panel A, and runs the regression using program exposure, imputed health insurance status, and their interaction term (the regression also includes state fixed effects, year fixed effects, and their interaction term).

Table 2 shows that uninsured children have 4:3:1:3:3 and 4:3:1:3 immunization coverage levels as much as 15% and 17% lower compared to insured children. This is consistent with

182 previous findings [4-5][4]. The coefficients and standard errors of the interaction term of health
183 insurance status and program exposure were estimated to be almost the same as in panel A.
184 Table 3 shows a similar pattern; the fraction of doses of uninsured children is 6% lower
185 compared to that of insured children.
186
187 **Discussion**
188 The VFC program explicitly aims to provide free vaccines to children who lack health
189 insurance or cannot afford the vaccination costs. This is the first study to formally estimate the
190 causal effects of a free vaccination program on the immunization coverage of uninsured
191 children. Using the variation in program exposure as a proxy for access to free vaccination, I
192 found that providing free vaccination was associated with an increase in the uptake of the full
193 spectrum of recommended vaccines, including then newly introduced Hep B vaccine. Despite
194 introducing this program, uninsured children continue to have a low immunization coverage rate.
195 These findings suggest that improving immunization coverage for uninsured children by only
196 reducing out-of-pocket vaccination costs may be insufficient. Although vaccination costs are
197 fully covered by the VFC program, the present results imply that other factors such as access to
198 care [15], imperfect consumer knowledge of vaccination benefits [16], and lack of incentive for
199 vaccination [17] may influence vaccination decisions.
200

201 # Limitations

202 This study has some limitations. Although the analysis identifies significant effects of this
203 program, the results cannot fully explain the channels that transmit this effect. Cost-benefit
204 analysis of the VFC program will require information on children's health status and
205 program-associated costs. These questions are beyond the present scope but should be

[4] Santoli et al. [4] found that the 4:3:1:3:1 coverage rate in 2000 for uninsured children in the 19–35 month age group was 15% lower than that for insured children. Smith et al. [5] found that the 4:3:1:3:3 coverage rate in 2001–2002 for uninsured children in the 19–24 month age group was 20% lower than that for insured children.

206 considered in future research.

207

208 Additional file

209 **Additional file 1**: **Appendix Table 1.** Descriptive Statistics, March CPS (1993–1997).

210 **Appendix Table 2.** Estimation result for March CPS (1993–1997).

211

212 **List of abbreviations**

213 CDC: Centers for Disease Control and Prevention; CPS: Current Population Survey; DTP:

214 diphtheria, tetanus and pertussis; Hep B: hepatitis B; Hib: Haemophilus influenzae type b;

215 MMR: measles, mumps, and rubella; NIS: National Immunization Survey; VFC: Vaccines for

216 Children

217

Declarations

Ethics approval and consent to participate

I did not need state ethics approval for this study because the NIS data are publicly available and deidentified.

Consent for publication

Not applicable.

Availability of data and material

The datasets supporting the conclusions of this article are available at the CDC website in https://www.cdc.gov/nis/datafiles.htm.

Competing interests

The author declares no competing interests.

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Author's contributions

All work with respect to this study was conducted by Akihiro Kawase, the author of this paper.

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305 **Table 1. Descriptive Statistics (N=51902), NIS (1995–1997)**

	Mean	Std. Dev.
UTD (up-to-date)		
4:3:1:3:3 series	0.645	0.479
4:3:1:3 series	0.769	0.422
DTP	0.816	0.388
Polio	0.900	0.301
MMR	0.903	0.296
HIB	0.921	0.269
Hep B	0.779	0.415
Fraction of doses		
4:3:1:3:3 series	0.920	0.156
4:3:1:3 series	0.940	0.152
DTP	0.933	0.167
Polio	0.948	0.175
MMR	0.903	0.296
Hib	0.954	0.173
Hep B	0.845	0.325
Variables of interest		
Exposure to the VFC program	0.470	0.389
Child's age		
19–23 months	0.290	0.454
24–29 months	0.353	0.478
30–35 months	0.357	0.479
Child's gender		
Female	0.485	0.500
Child's race/ethnicity		
Hispanic	0.123	0.329
White, non-Hispanic	0.687	0.464
Black, non-Hispanic	0.139	0.346
All others, non-Hispanic	0.051	0.219
Mother's education		
<12 years	0.095	0.294
12 years	0.326	0.469
>12 years, non-college graduate	0.217	0.412
College graduate	0.362	0.480

Number of children		
1	0.300	0.458
2–3	0.596	0.491
More than 4	0.104	0.305
Mother's marital status		
Widowed/divorced/separated	0.083	0.276
Never married	0.146	0.353
Married	0.771	0.420
Income		
<$10,000	0.116	0.320
$10,000–20,000	0.154	0.361
$20,000–30,000	0.167	0.373
$30,000–50,000	0.261	0.439
>$50,000	0.301	0.459

306

307 **Table 2. Effect of the VFC program on uninsured up-to-date (fully immunized)**

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
UTD (up-to-date)	4:3:1:3:3	4:3:1:3	DTP	Polio	MMR	Hib	Hep B
Panel A							
Variables of interest							
%Program	0.165***	-0.034	-0.015	-0.023	-0.011	-0.005	0.201***
	(0.025)	(0.021)	(0.020)	(0.016)	(0.015)	(0.013)	(0.022)
Uninsured × %Program	0.020	0.015	0.012	0.026**	0.013	0.018	0.050***
	(0.018)	(0.016)	(0.014)	(0.012)	(0.012)	(0.011)	(0.015)
Child's age category							
24–29 months	-0.001	0.066***	0.064***	0.025***	0.031***	0.004	-0.058***
	(0.007)	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)	(0.006)
30–35 months	-0.048***	0.097***	0.095***	0.029***	0.044***	0.002	-0.145***
	(0.010)	(0.008)	(0.008)	(0.007)	(0.006)	(0.005)	(0.009)
Child's gender							
Female = 1	0.007*	0.004	0.000	0.002	0.003	0.003	0.003
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.002)	(0.004)
Child's race/ethnicity							
Hispanic	-0.017**	-0.024***	-0.017**	-0.008	-0.014**	-0.014***	-0.008
	(0.008)	(0.007)	(0.007)	(0.005)	(0.006)	(0.005)	(0.007)
Black, non-Hispanic	-0.026***	-0.030***	-0.022***	-0.024***	-0.007	-0.022***	-0.015**
	(0.007)	(0.007)	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)
All others, non-Hispanic	0.014	-0.012	0.004	0.000	0.003	-0.013**	0.026***
	(0.010)	(0.009)	(0.008)	(0.006)	(0.006)	(0.006)	(0.008)
Mother's education							
12 years	0.011	0.025***	0.021***	0.014**	0.003	0.014***	-0.001
	(0.009)	(0.008)	(0.008)	(0.006)	(0.006)	(0.005)	(0.007)
>12 years, non-college graduate	0.016*	0.028***	0.024***	0.014**	0.006	0.017***	0.006
	(0.009)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)	(0.008)
College graduate	0.044***	0.060***	0.057***	0.031***	0.026***	0.030***	0.016**
	(0.009)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)	(0.008)
Number of children							
2–3	-0.056***	-0.049***	-0.050***	-0.021***	-0.027***	-0.019***	-0.030***
	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)	(0.004)
More than 4	-0.129***	-0.120***	-0.122***	-0.058***	-0.054***	-0.060***	-0.089***
	(0.008)	(0.007)	(0.007)	(0.006)	(0.006)	(0.005)	(0.007)

Mother's marital status							
Widowed/divorced/separated	-0.035***	-0.041***	-0.051***	-0.016***	-0.017***	-0.011**	-0.008
	(0.008)	(0.007)	(0.007)	(0.006)	(0.005)	(0.005)	(0.007)
Never married	-0.022***	-0.014**	-0.026***	-0.001	-0.017***	0.005	-0.016**
	(0.008)	(0.007)	(0.006)	(0.005)	(0.005)	(0.005)	(0.007)
Income							
$10,000–20,000	-0.002	0.000	-0.002	-0.007	-0.002	0.012**	0.008
	(0.009)	(0.008)	(0.007)	(0.006)	(0.006)	(0.006)	(0.008)
$20,000–30,000	0.002	0.006	0.005	0.001	0.008	0.017***	0.017**
	(0.009)	(0.008)	(0.008)	(0.007)	(0.007)	(0.006)	(0.008)
$30,000–50,000	0.031***	0.039***	0.031***	0.017**	0.022***	0.030***	0.031***
	(0.010)	(0.009)	(0.008)	(0.007)	(0.007)	(0.006)	(0.008)
>$50,000	0.055***	0.059***	0.056***	0.029***	0.040***	0.043***	0.053***
	(0.010)	(0.009)	(0.009)	(0.007)	(0.007)	(0.006)	(0.009)
R-squared	0.057	0.039	0.047	0.019	0.023	0.022	0.081
Panel B							
Uninsured	-0.154***	-0.167***	-0.165***	-0.084***	-0.099***	-0.086***	-0.106***
	(0.012)	(0.010)	(0.010)	(0.008)	(0.008)	(0.007)	(0.010)
%Program	0.061***	0.148***	0.164***	0.030***	0.072***	-0.006	-0.090***
	(0.014)	(0.012)	(0.011)	(0.009)	(0.009)	(0.008)	(0.012)
Uninsured × %Program	0.021	0.013	0.010	0.025**	0.012	0.018	0.052***
	(0.018)	(0.016)	(0.015)	(0.012)	(0.012)	(0.011)	(0.015)
R-squared	0.048	0.028	0.034	0.014	0.018	0.017	0.071
Observations	51902	51902	51902	51902	51902	51902	51902

Note: All specifications include year dummies, state dummies, and state-year interaction terms. The omitted categories are child's age 19–23 months, White race, mother's education less than 12 years, 1 child, married, and income less than $10,000. Bootstrap standard errors are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

312 **Table 3. Effect of the VFC program on uninsured fraction of doses (partially immunized)**

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
%Dose	4:3:1:3:3	4:3:1:3	DTP	Polio	MMR	Hib	Hep B
Panel A							
Variables of interest							
%Program	0.038***	-0.007	-0.005	-0.009	-0.011	-0.006	0.202***
	(0.008)	(0.007)	(0.008)	(0.008)	(0.015)	(0.008)	(0.017)
Uninsured × %Program	0.019***	0.012*	0.010	0.015**	0.013	0.010	0.047***
	(0.006)	(0.006)	(0.007)	(0.008)	(0.012)	(0.007)	(0.012)
Child's age category							
24–29 months	-0.004*	0.013***	0.019***	0.009***	0.031***	0.002	-0.066***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.005)	(0.003)	(0.005)
30–35 months	-0.021***	0.016***	0.026***	0.010***	0.044***	0.001	-0.156***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.006)	(0.003)	(0.007)
Child's gender							
Female = 1	0.001	0.001	0.001	0.001	0.003	0.002	-0.000
	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)	(0.003)
Child's race/ethnicity							
Hispanic	-0.006**	-0.008***	-0.008***	-0.004	-0.014**	-0.010***	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.003)	(0.005)
Black, non-Hispanic	-0.008***	-0.010***	-0.009***	-0.010***	-0.007	-0.011***	-0.002
	(0.002)	(0.002)	(0.003)	(0.003)	(0.005)	(0.003)	(0.005)
All others, non-Hispanic	0.003	-0.002	0.001	-0.001	0.003	-0.009**	0.020***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.006)	(0.004)	(0.006)
Mother's education							
12 years	0.005	0.007**	0.010***	0.007**	0.003	0.006*	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.003)	(0.006)
>12 years, non-college graduate	0.008**	0.010***	0.013***	0.008**	0.006	0.008**	0.000
	(0.003)	(0.003)	(0.004)	(0.004)	(0.006)	(0.004)	(0.006)
College graduate	0.016***	0.019***	0.023***	0.016***	0.026***	0.014***	0.006
	(0.003)	(0.003)	(0.004)	(0.003)	(0.006)	(0.004)	(0.006)
Number of children							
2–3	-0.015***	-0.014***	-0.018***	-0.008***	-0.027***	-0.008***	-0.020***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
More than 4	-0.043***	-0.038***	-0.049***	-0.027***	-0.054***	-0.030***	-0.062***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.003)	(0.005)

Mother's marital status							
Widowed/divorced/separated	-0.009***	-0.011***	-0.017***	-0.007**	-0.017***	-0.003	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.006)
Never married	-0.004*	-0.003	-0.007***	-0.001	-0.017***	0.004	-0.008*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.005)
Income							
$10,000–20,000	0.003	0.002	0.002	-0.001	-0.002	0.009**	0.004
	(0.003)	(0.003)	(0.003)	(0.004)	(0.006)	(0.004)	(0.006)
$20,000–30,000	0.008**	0.007**	0.006*	0.003	0.008	0.011***	0.010
	(0.003)	(0.003)	(0.004)	(0.004)	(0.007)	(0.004)	(0.006)
$30,000–50,000	0.017***	0.016***	0.015***	0.012***	0.022***	0.019***	0.020***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.007)	(0.004)	(0.007)
>$50,000	0.028***	0.026***	0.028***	0.018***	0.040***	0.026***	0.037***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.007)	(0.004)	(0.007)
R-squared	0.051	0.030	0.039	0.012	0.023	0.015	0.122
Panel B							
Uninsured	-0.060***	-0.059***	-0.069***	-0.045***	-0.099***	-0.046***	-0.064***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.008)	(0.004)	(0.009)
%Program	-0.005	0.023***	0.043***	0.008	0.072***	-0.006	-0.108***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.009)	(0.005)	(0.009)
Uninsured × %Program	0.019***	0.011*	0.009	0.015**	0.012	0.010	0.049***
	(0.006)	(0.006)	(0.007)	(0.008)	(0.012)	(0.007)	(0.012)
R-squared	0.043	0.024	0.030	0.010	0.018	0.012	0.106
Observations	51902	51902	51902	51902	51902	51902	51902

Note: All specifications include year dummies, state dummies, and state-year interaction terms. The omitted categories are child's age 19–23 months, White race, mother's education less than 12 years, 1 child, married, and income less than $10,000. Bootstrap standard errors are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- 3Additionalfile1.pdf