Maternal Education Is Inversely Related to Vaccination Delay among Infants and Toddlers

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Objective To determine the association between parents' level of education and delay in vaccination among infants and toddlers.

Study design A case–control study done in 2015-2016. Charts of 2- to 4-year-old children vaccinated in 5 neighborhood Maternal-Child Health Centers (MCHCs) in southern Israel were examined for demographic variables. Five vaccination opportunities between age 7 months and 18 months were selected to test for delays. In each MCHC, children vaccinated at the longest time-period after planned vaccination dose (fifth quintile) were compared with those vaccinated during the middle quintile. Using this relative delay approach rather than absolute delay approach permitted us to adjust the findings to the prevailing environmental and to cultural and programmatic variations between the various neighborhoods. Each of the planned vaccination visits and overall, demographic and health behavior-related variables that were significantly associated to delays by univariate analysis were tested by multivariate analysis and further adjusted by using stepwise logistic regression, using goodness of fit measures.

Results Data for 2072 subjects were collected (398-426 per MCHC). Fathers' education was not associated with delays. In contrast, mothers' education was inversely associated with the probability of vaccination delay by 4%-9% (depending on the vaccination visit) for each year of schooling beyond 10 years.

Conclusion Using the relative delay approach, we demonstrated that maternal education, measured by schooling years, was independently inversely associated with risk of vaccination delay. This suggests that education can be regarded as an important positive component of the overall disease prevention planning at national and global levels. *(J Pediatr 2019;205:120-5).*

Timeliness of immunization varies widely between and even within countries.[1] In Israel, the reported vaccination coverage is ≥90% by age 2 years.[2,3] However, despite a high national average coverage, specific subpopulations are underimmunized.[4,5] Outbreaks of vaccine-preventable diseases continue to occur in Israel, as in other developed countries, attributed to age-appropriate underimmunization or to unimmunized subpopulations.[6-10]

Vaccination delays are an important factor undermining the success of immunization programs. A generally accepted method of evaluating vaccine coverage is to measure the proportion of children who received the required vaccine doses by a specific age, regardless of whether these were given on time.[4,11-14] However, as few as 18% of children in the US received all vaccinations at the recommended age or earlier, and more than one-third of the children were underimmunized for a duration of over 6 months during their first 2 years of life.[15,16] Monitoring age-appropriate vaccination status in the population is critically important in estimating the risk of vaccine-preventable disease.[17]

Immunization rates have been designated as one of 10 leading national health indicators.[18] Published studies have examined the association between vaccination status and sociodemographic factors to best identify subpopulations and children at risk. Most studies assessing the risks associated with inadequate immunization have used the overall vaccination status (ie, vaccination coverage in the population) as the outcome measure.[19] Only a few studies have assessed vaccination delays rather than vaccination status as the risk outcome.[20-22] Conflicting results have been reported regarding the association between vaccination delay and parents' (mainly maternal) education level. One study reported an association between low maternal education and vaccination delay,[16] and another showed maternal academic education as a risk for vaccination delay.[23]

No consensus has been reached for defining vaccination delay, specifically in studies examining its association with maternal education, or other health environment indicators. Poorolajal et al defined vaccination delay as a delay of ≥1 day from the planned date, by child birth date and vaccinations schedule.[24] In contrast to this very strict definition, others have defined delay as vaccine delivery ≥1 month after anticipated vaccination date.[16] None of the reviewed studies attempted to define vaccination delay as a relative measure within the population among which the child lived. We assumed that to investigate

DTaP	Diphtheria-Tetanus-acellular Pertussis (with or without Poliovirus vaccine)
HAV	Hepatitis A
MCHC	Maternal-Child Health Center

the association between vaccination delay and health environment, the findings should be adjusted for the local environmental (ie, ecology, ethnicity) and cultural factors, which may equally contribute to delay for the entire group of children served in the same outpatient setting. Adjusting for these factors enables the singling out of individual behavior that might be associated with delay. Therefore, our approach was to adopt a "relative" vaccination delay measurement rather than an "absolute" vaccination delay measurement.

Our objective was to determine the association between parents' education level expressed by years of schooling and vaccination delay in infants and toddlers, adjusted for the family environment. This study examines delays within the group of children who completed the first and second years of the immunization schedule by age 2-4 years, rather than those who did not complete the vaccination program.

Methods

The study was approved by the ethics committee of the Soroka University Medical Center. The Negev district was inhabited by 643 000 individuals in 2012 according to the Israeli Central Bureau of Statistics[25]; of these, 64% were Jews. Of the whole Negev population, 12% were children <4 years old (77 000 children); among them 48% were Jewish children. All children residing in Israel are entitled to receive health services at Maternal-Child Health Centers (MCHCs) free of charge, regardless of the family's legal civil status. These MCHCs serve only children living in the neighborhood where they are located. Therefore, each MCHC appropriately represents a specific neighborhood.

This was a case–control study conducted from January 2015 to December 2016 in 5 vaccination centers in southern Israel. The target population were Jewish children 2-4 years old, born in the Negev district, Israel, and receiving their immunization at their neighborhood's MCHCs. We restricted our study to the Jewish population because of the great variability among the Bedouin population and because findings among the Bedouin population are less extrapolable to other populations both in the rest of Israel and in other developed countries. We only used MCHCs with computerized databases. The study was conducted in children receiving all vaccines planned for the first and second years of life, because our study question was about delays within compliant families. We did not include children born prematurely (<37 weeks of gestational age), those lost to follow-up before the timing of the inclusion, and those with contraindication for ≥1 vaccines.

Cases included children 2-4 years old who met the following conditions: (1) they were in the upper age quintile (>80th percentile) at the time of vaccination in relation to all other children in a given MCHC; and (2) there was an absolute delay of >7 days from planned vaccination. When ≥2 siblings matched the case definition, we included only 1 sibling to avoid bias, selecting the case randomly. Controls included children 2-4 years old from the same MCHC as the cases but who were in the middle age quantile (40th-60th percentile) at the time of vaccination.

We analyzed vaccination status for the following doses: hepatitis B vaccine (3 doses), Diphtheria-Tetanus-acellular Pertussis (with or without Poliovirus vaccine [DTaP]; 4 doses), measles–mumps–rubella–varicella (1 dose), and hepatitis A (HAV; 1 dose: Israeli Ministry of Health schedule; Table I [available at www.jpeds.com]).[26] We did not examine delays in pneumococcal and rotavirus vaccination because they have only been implemented recently. Vaccination date and birth date were used to determine age (expressed in days) at vaccination. Vaccination delay could result in delay for the next dose, due to the need for critical interval between doses required by the Ministry of Health guidelines (ie, 6 months between the third and fourth doses of DTaP). In this case, a further delay was counted only from the date the child was scheduled to receive the next dose(s). In addition to the individual delays, we calculated the cumulative (summative) delays by adding together all delays for the individual study visits, until the planned 18-month-old visits. When ≥1 delays were related to the same visit, we counted only 1 delay. The cumulative delay was calculated as overall days of vaccine delays for the study visits.

For parents' education level, data were self-reported by the parents. We counted all years of schooling as follows; the grade reached at school was considered school years. To this, we added the years at any recognized higher academic institution. For the purpose of the analysis, ≤10 schooling years were counted as 10 years, because only few parents had <10 years of schooling (Figure 1; available at www.jpeds.com).

Study Database and Data Collection

Details were extracted from the computerized national childhood immunization registry (known by Hebrew acronym MAHSHAVA BRIA). The registry has been in place in most of the Negev MCHCs since 1996. The system is based on registering each child individually during the initial clinic visit, using details from the national population demographic database of the Ministry of Interior. The MCHCs staff record details on vaccinated children and their families during the vaccination visit. According to the Ministry of Health, from June 2014 onward, all MCHCs in the Negev district have been computerized (Table II; available at www.jpeds.com). Variables for the health evaluation behavior were chosen as those recognized by World Health Organization or other sites dealing with the association between health environment and vaccination delay.[27-29]

Statistical Analyses

Database analysis was conducted using SPSS, version 20 (IBM Corp, Armonk, New York). We collected overall data from 2624 subjects from 7 MCHCs. After excluding siblings randomly to avoid bias, the overall study population was 2593. We compared MCHCs by sociodemographic measures (such as mean mothers' schooling, mean fathers' schooling, child sex, and mean parents' age). Five MCHCs showed comparable results and 2 MCHCs were different from the other 5 and also different from each other. Furthermore, 1 of these also included a small sample size only. For these reasons, we excluded these 2 MCHCs and analyzed only 5 MCHCs.

For the descriptive analysis, we calculated the distribution of a single variable, central tendency and dispersion, graphical, or tubular format. Univariate comparisons were done by the χ^2 test and Student t test between children defined as relative vaccination delay and controls, for all study sociodemographic variables. We conducted multivariable logistic models for variables associated with a P value <.2 in the univariate analysis. We conducted standard backward elimination by stepwise logistic regression analysis method. For the multivariable analysis, P value of <.05 was considered significant. For all independent variables we ruled out confounding, multicollinearity, and interactions. Similar analytic processes were done for both studied individual vaccines opportunities and for cumulative vaccination delay.

Results

A total of 2072 children (398-426 per MCHC) were studied in the 5 study MCHCs (**Tables III** and **IV**; available at www.jpeds.com); 50% of the individuals were male. Fathers' mean age was 32.4 years, and mothers' mean age was 29.1 years. One-third of the mothers had had ≥1 abortions in the past; 46% of children were admitted to emergency department at least once before 4 years of age, and approximately one-fifth of children in this study were hospitalized at least once before 4 years of age. The distribution of parents' years of schooling is shown in **Figure 1**. The median mothers' and fathers' years of schooling was 12, and only 2.2% and 3.6%, respectively, had <10 years of schooling.

To select for cases of vaccination delay, we first identified those with absolute delay (namely those with vaccination visits that took place >30 days beyond planned visit) (**Table V**). Using this measurement, we defined between 28% and 55% of the children as having vaccination delay, depending on the vaccination visits. We then examined vaccination delay using the relative delay approach. By definition, the relative delay approach selected for 20% of children with the highest age at vaccination within each MCHC on condition that >7 days elapsed from the planned date. For all vaccine opportunities and for the summation of vaccination delays (cumulative vaccination delay), the proportion of children with absolute delay was significantly greater than that calculated by the relative delay approach.

To compare the studied variables between families of children with vaccination delay and those of controls, we first performed a univariate analysis, using all recorded variables, for each vaccine opportunity and for cumulative vaccination delay (**Table VI**). The differences between the groups ($P < .2$) were as follows: parents who had immigrated to Israel were reported more frequently in vaccination delay for DTaP dose 4, HAV, and measles–mumps–rubella visits; the mean parents' age was greater in vaccination delay for all visits; children with vaccination delay were more frequently at a high rank number in the order of birth (ie, first born child rank 1, second born child rank 2, etc); and previous hospitalizations before age of 4 years was more frequent for measles–mumps–rubella delays. A history of ≥1 maternal abortions was associated commonly with a delay in some of the vaccination visits. Fathers' schooling years were significant only for HAV delays.

In a multivariate analysis, using all variables with P value <.2, we found that fathers' years of schooling was not a significant factor (as in most of vaccines opportunities in univariate analyses). Therefore, we focused only on mothers' years of schooling. For each year of schooling beyond 10 years, the probability for vaccination delay was reduced by 4%-9% depending on the vaccination visit (**Table VII**). These results were all statistically significant except for the visit of HAV dose 1 (while still showing similar trend). We modeled the relationship between maternal years of schooling and the probability for vaccination delay for each vaccine opportunity and for cumulative vaccination delay (**Figure 2**). A clear inverse relationship between maternal years of schooling and the probability for vaccination delay was demonstrated for all visits.

Discussion

The childhood vaccination coverage in Israel is well in line with the World Health Organization set goals as well as those in many Western countries.[30,31] However, inadequate timing of childhood immunizations have been reported in several settings and countries,[16,23,32-36] missing a major goal of vaccination programs—to obtain the highest levels of protection against vaccine-preventable diseases at the earliest age possible.[37] Therefore, even in countries with allegedly high vaccination coverage, evaluation of timeliness through receipt of age-appropriate vaccines and its associated risk factors provides valuable insight.

The absolute delay measurement, as used in previous studies, provides an important tool to evaluate overall vaccination rates at a given age in the population and helps to determine

Table V. Number (and proportion) of children with delay for the different vaccine opportunities—comparison between measuring relative delay and absolute delay

Vaccine visits	HBV3		DTaP4		MMR/ MMRV1		HAV1		All vaccination opportunities	
Delay measurement approach	RD	AD	RD	AD	RD	AD	RD	AD	RD	AD
Number of children with delay	381	541	404	1143	410	664	412	879	408	575
Proportion of children with delay, %	20	26	20	55	20	32	20	42	20	28
P value by χ^2	$P < .001$		$P < .001$		$P < .001$		$P < .001$		$P < .001$	

AD, absolute delay; *HBV3*, hepatitis B vaccine, 3 doses; *MMR*, measles–mumps–rubella; *MMRV1*, measles–mumps–rubella–varicella, 1 dose; *RD*, relative delay.

Table VI. Univariable comparison between cases and controls for each visit and all vaccination opportunities

			P value (95% CI)		
Variables	HBV3	DTaP4	MMR/MMRV1	HAV1	All vaccination opportunities
Proportion of males	.3 (0.9-1.6)	.3 (0.9-1.6)	.3 (0.9-1.6)	**.1 (0.95-1.6)**	.5 (0.8-1.4)
Proportion born at the SUMC	**.001 (1.9-4.6)**	**.05 (0.99-2.1)**	**.2 (0.9-1.9)**	.5 (0.8-1.7)	**.03 (1.03-2.2)**
Proportion born in Israel	.3 (0.9-1.6)	.3 (0.1-2.1)	.7 (0.3-4.8)	.3 (0.3-29.5)	**.2 (0.1-1.6)**
Proportion of fathers who immigrated to Israel	.4 (0.8-1.7)	**.03 (1.04-2.1)**	**.08 (0.96-1.9)**	**.01 (1.1-2.1)**	**.1 (0.9-1.8)**
Proportion of mothers who immigrated to Israel	.6 (0.7-1.3)	**.006 (1.1-2.1)**	**.002 (1.2-2.3)**	**.1 (0.96-1.7)**	.8 (0.8-1.4)
Proportion of married parents	.6 (0.7-1.7)	.6 (0.7-1.7)	.8 (0.9-2.2)	**.04 (1.01-2.4)**	.7 (0.6-1.4)
Mean fathers' age	**.04 (0.04-2)**	.9 (−0.9 to 1)	**.2 (−1.6 to 0.3)**	**.06 (−1.8 to 0.04)**	**.2 (−1.5 to 0.4)**
Mean mothers' age	**.006 (0.3-1.9)**	.6 (−0.6 to 1)	.9 (−0.8 to 0.8)	**.1 (−1.4 to 0.1)**	.5 (−1.1 to 0.5)
Mean fathers' schooling, y	**.1 (−0.05 to 0.7)**	.7 (−0.4 to 0.2)	.8 (−0.4 to 0.3)	**.006 (0.1-0.8)**	**.2 (−0.1 to 0.6)**
Mean mothers' schooling, y	**.07 (−0.02 to 6)**	**.09 (−0.04 to 0.5)**	.4 (−0.2 to 0.4)	**.03 (0.03-0.6)**	**.05 (0.002-0.6)**
Mean weight percentile at age ≥1 y old*	.8 (−1.1 to 7)	.4 (−2.1 to 5.6)	**.1 (−0.9 to 6.9)**	.3 (−1.9 to 5.8)	.5 (−2.5 to 5.2)
Mean height percentile at age ≥1 y old*	**.2 (−0.9 to 7.5)**	**.005 (1.8-9.8)**	**.001 (3.2-11.4)**	.4 (−2.2 to 5.9)	**.05 (0.1-8.1)**
Mean head circumference percentile at age ≥1 y old*	**.2 (−3.7 to 4.2)**	.6 (−2.9 to 5)	**.1 (−0.7 to 7)**	.7 (−3.3 to 4.5)	1 (−4 to 3.8)
Median sibling order	**.003 (1.05-1.3)**	**.001 (1.2-1.4)**	**.001 (1.1-1.3)**	**.001 (1.4-1.7)**	**.001 (1.2-1.5)**
Proportion of mothers with gestational diabetes	.8 (0.5-1.6)	.3 (0.8-2.2)	.6 (0.5-1.4)	**.03 (1.05-3)**	**.02 (1.1-3.1)**
Proportion of mothers with gestational hypertension	.3 (0.2-1.6)	.4 (0.3-1.7)	.6 (0.3-2.1)	.6 (0.3-2.1)	**.02 (0.1-0.9)**
Proportion of mothers with ≥1 abortions	.5 (0.8-1.5)	**.02 (1.05-1.9)**	.8 (0.8-1.4)	**.09 (1.1-2)**	**.001 (1.5-2.6)**
Proportion of children with ≥1 admissions to the pediatric emergency department before 4 y of age	**.08 (0.6-1.3)**	.6 (0.7-1.2)	**.1 (0.6-1.1)**	**.1 (0.6-1.1)**	.3 (0.7-1.1)
Proportion of children with ≥1 hospitalizations before 4 y of age	.6 (0.8-1.6)	.5 (0.8-1.6)	**.05 (1.001-2)**	.5 (0.8-1.6)	1 (0.7-1.4)

SUMC, Soroka University Medical Center.
Values in bold indicate *P* value <.2 (eligible for multivariate analysis).
*Mean age at vaccination visit ≥1 y: 14.4 ± 3.5 mo.

age-specific coverage, a measurement that can predict vulnerability of a population to disease or to calculate the threshold for herd protection. These are important determinants for evaluating the relationship between vaccination coverage and impact. However, to evaluate the relationship of vaccination delays to any individual or social behavior, environmental and cultural variations must be taken into consideration, and therefore the best approach is by comparing delays and behaviors within populations of similar culture and environment.

In the current study, our aim was to relate vaccination delays to parental education in southern Israel, where vaccination is given in neighborhood clinics. This provided us with the opportunity to appropriately adjust for various environmental conditions (ie, same vaccinating team [nurses], and methods for each clinic), similar socioeconomic status (within-neighborhood socioeconomic conditions are similar), and cultural variations. The fact that the neighborhood MCHCs were each within walking distance from patients' homes and that

all vaccines are given free of charge helped also to reduce barrier-related bias.

Using a relative delay approach, we compared the children in the fifth quintile (the longest delay, excluding children with ≤7 days delay) with those in the third quintile, which were defined as "normal" for each specific MCHC. Following adjustment for the MCHCs sociodemographic variables and multivariate analysis, we found that each additional year of mothers' schooling beyond 10 years was associated with a 4%–9% reduction in delay (depending on the studied vaccination visit). Because we did not have a sizeable number of mothers with <10 years of schooling, we were not able to determine the effect of education for <10 years of schooling.

The relationship between vaccination delay and maternal education has been somewhat controversial. Some studies demonstrated a direct relationship,[38] although others demonstrated the opposite.[23] We believe that this subject could be more appropriately dealt with by using the relative delay approach.

Table VII. Probability of vaccination delay per each individual study visit and overall summation (cumulative) delays per each year of maternal education

Maternal educations	HBV3	DTaP4	MMR/MMRV1	HAV1	All vaccination opportunities
OR*	0.91	0.93	0.96	0.92	0.93
95% CI	0.85-0.98	0.87-1.00	0.89-1.03	0.86-0.99	0.68-0.99
P value†	.02	.07	.25	.02	.04

DTaP4, fourth dose of Diphtheria–Tetanus-acellular–Pertussis, planned at 12 mo; *HAV1*, first dose of hepatitis A virus vaccine planned at 18 mo; *HBV3*, third dose hepatitis B, planned at 6 mo; *MMR/MMRV1*, first dose of measles–mumps–rubella ± varicella planned at 12 mo.
*The values are for each year of education beyond 10 schooling age.
†Multivariate models adjusting maternal schooling years to the following variables for each vaccine opportunity: for HBV3, sibling order and whether the child was born at the SUMC; for DTaP4, sibling order and whether mother emigrated to Israel; for HAV1, sibling order, whether mother emigrated to Israel, and for history of ≥1 maternal abortions; for cumulative vaccines opportunities, sibling order, whether the child was born at the SUMC, and if there was a history of ≥1 maternal abortions.
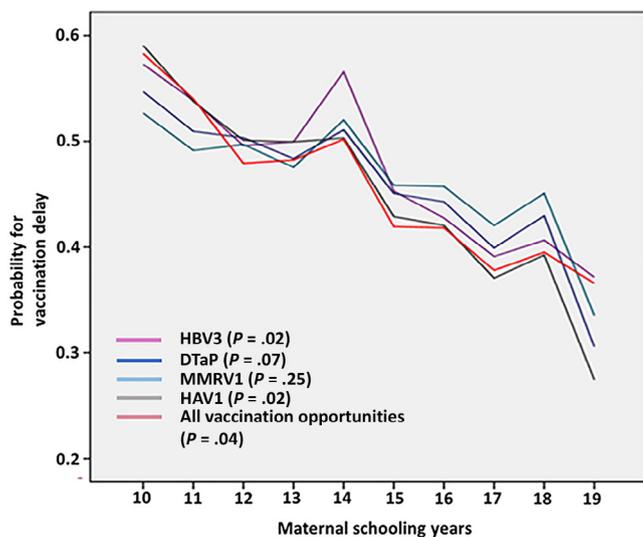
Figure 2. Modeled probability for vaccination delay by mothers' schooling years for different vaccination visits. This was calculated using multivariate analysis. *HBV3*, hepatitis B vaccine, 3 doses; *MMRV1*, measles–mumps–rubella–varicella, 1 dose.

A recently published meta-analysis that reviewed 37 studies found an association between maternal education and completion of childhood vaccination series.[39] Our study differs from the studies included in the meta-analysis because we only included children who fully completed their vaccination course by 2 years of age. Thus, our study clearly demonstrates that even within a well-vaccinated population, timing of vaccination correlates with maternal education. Another important peculiarity of our study is that most of the studies in the meta-analysis were from developing countries, where data are scarce, whereas our study was conducted in a developed country.

A few scholars are uncomfortable with concluding that the correlation between maternal education and child health has causal meaning.[40,41] The authors in 1 study concluded that although there is a strong correlation between maternal education and markers of child health, a causal relationship is far from being established.[42] They opined that maternal education may act as a proxy for the socioeconomic status of the family and geographic area of residence. The current study, using the "relative" approach, suggests that maternal education may not only be a proxy for socioeconomic status but also an independent factor influencing timelines of vaccination.

In addition to maternal schooling years, some other factors seemed independently associated with vaccination delay: sibling order, whether the child was born at the Soroka University Medical Center, whether the mother emigrated to Israel, as well as a history of maternal abortions. The presence of siblings in the household had a strong negative impact on both complete and age-appropriate immunization regardless of other factors.[43-45] Larger numbers of siblings seem to place competing demands on mothers, whereas time and resources available to provide for each child become more limited. Immigration was also a risk factor for vaccination delay in

different studies.[46] We did not find in any other study reporting on the association between maternal abortions history and child vaccination delay. However, the Organization for Economic Cooperation and Development defined maternal abortions as a health indicator,[47] and it may serve as one measure of the child health environment. Further studies are needed to confirm this association.

There are several limitations to our study. First, only children with full vaccination data and almost full demographic data were included. This may have resulted in some underestimation of vaccination delay. However, we believe that using the relative delay approach may reduce such bias. Second, our data were derived from MCHC records, and it is possible that some data were inappropriately documented or not documented at all. Third, children may have died or may have been lost to follow-up in the MCHC and were not included in the survey. This could create some bias, especially when calculating cumulative vaccination delay. Fourth, our study included few mothers with <10 years of schooling. This could represent a somewhat-selective population. Still, we believe that this cutoff is representative of populations of developed countries. Fifth, because we defined our study population as those born after >37 weeks of gestation and who were not lost to follow-up before timing of the data obtained and who did not have contraindication to vaccination, we did not record the number of children who were excluded by this definition in each MCHC. Sixth, the years of schooling were self-reported by the parents. We did not validate this individually for each patient.

We believe that using this novel approach of relative delay in immunization minimized bias in measuring the relationship between maternal education and vaccination delay. Our results emphasize the importance of education on vaccination timeliness, which in its turn might be a proxy for health-related behavior. ∎

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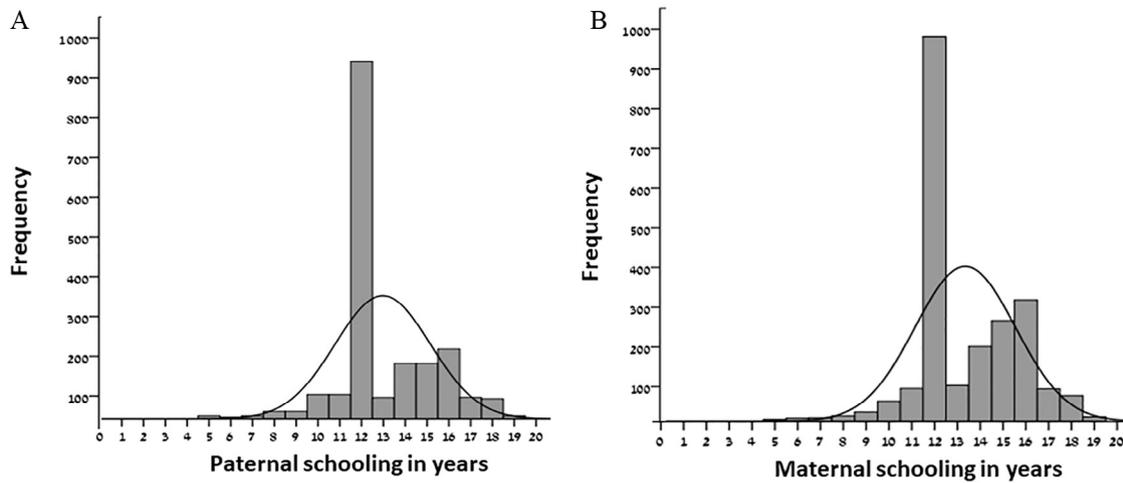
Figure 1. Distribution of parents years of schooling. **A,** Paternal schooling in years. **B,** Maternal schooling in years.

Table I. Immunization schedule of the Israeli Ministry of Health[26]

Ages	Hepatitis B	Diphtheria-Tetanus-acellular Pertussis (with or without Poliovirus vaccine)	Haemophilus influenzae type B	Pneumococcus	Rotavirus	Measles–mumps–rubella–varicella	HAV	Influenza
At birth at hospital	First dose							
1 mo	Second dose							
2 mo		First dose		First dose	First dose			
4 mo		Second dose		Second dose	Second dose			
6 mo	Third dose	Third dose			Third dose			Starting from the age of 6 mo, 2 doses followed by 1 dose per year before flu season
12 mo		Fourth dose		Third dose		First dose		
18 mo							First dose	
24 mo							Second dose	
6 y (first grade)						Second dose		
7 y (second grade)		Booster						
13 y (eighth grade)		Booster						

Table II. Sociodemographic variables tested in the analysis

Sex	Parents education (years of schooling)	Gestational diabetes
Child place of birth (hospital)	Family socioeconomic status	History of maternal abortions
Child immigration	Percentile of weight at age ≥1 y	Number of admission to the pediatric emergency department
Parents immigration	Percentile of height at age ≥1 y	Age at admission to pediatric emergency department
Gestational age	Percentile of head circumference at age ≥1 y	Number of hospitalizations
Apgar at 1 and 5 min	Sibling order	Age at hospitalizations
Parents age	Gestational hypertension	

Table III. Selected sociodemographic data and health indicators among 2072 children studied

Variables*	
Proportion of males, %	50
Proportion born at the Soroka University Medical Center, %	85
Proportion born in Israel, %	98
Proportion of fathers who emigrated to Israel, %	23
Proportion of mothers who emigrated to Israel, %	29
Proportion of married parents, %	86
Mean fathers' age, y, mean ± SD	32.4 ± 6.7
Mean mothers' age, y, mean ± SD	29.1 ± 5.6
Mean fathers' schooling, y, mean ± SD	13 ± 2.2
Mean mothers' schooling, y, mean ± SD	13.3 ± 2.2
Mean weight percentile at age ≥1 y,[†] mean ± SD	56.2 ± 28
Mean height percentile at age ≥1 y,[†] mean ± SD	47 ± 29
Mean head circumference percentile at age ≥1 y,[†] mean ± SD	54 ± 27
Median sibling order (range)	2 (1-15)
Proportion of mothers with gestational diabetes, %	8
Proportion of mothers with gestational hypertension, %	2.4
Proportion of mothers with ≥1 abortion, %	33
Proportion of children with ≥1 admission to the pediatric emergency department before 4 y of age, %	46
Proportion of children with ≥1 hospitalization at the Soroka University Medical Center before 4 y of age	20

*For each variable, 0%-15% were missing data.
†Mean age at vaccination visit >1 y: 14.4 ± 3.5 mo.

Table IV. Selected sociodemographic data and health indicators among 2072 children studied at 7 MCHCS

Demographic data	MCHC names						
	YONATAN (n = 428)	TET (n = 426)	TABENKIN (n = 426)	GIMEL (n = 404)	RAMOT (n = 149)	ARAD (n = 401)	DIMONA (n = 359)
Proportion of males, %	50.9	50.2	47.7	50.5	55.0	50.4	46.5
Proportion born at the Soroka University Medical Center, %	92.5	95.3	89.2	88.9	96.0	60.6	92.2
Proportion born in Israel, %	97.7	98.6	96.9	97.3	99.3	98.5	97.8
Proportion of fathers who emigrated to Israel, %	36.9	9.6	30.5	10.6	5.4	27.2	8.4
Proportion of mothers who emigrated to Israel, %	43.9	14.1	35.7	14.4	9.4	32.7	12.8
Proportion of married parents, %	86.7	95.8	80.3	83.2	91.9	83.5	88.4
Mean fathers' age, y, mean ± SD	32.2 ± 6.2	32.8 ± 5.6	32.9 ± 7.1	32.5 ± 6.8	33.2 ± 4.5	31.5 ± 7.7	33.4 ± 6.9
Mean mothers' age, y, mean ± SD	27.8 ± 5.2	30 ± 4.9	29.2 ± 5.7	28.4 ± 5.5	30.4 ± 4.2	29 ± 6.4	29.6 ± 5.6
Mean fathers' schooling, y, mean ± SD	12.9 ± 2	13.2 ± 1.9	12.8 ± 2.2	12.7 ± 2.7	14.2 ± 2.4	13.1 ± 2.1	12.3 ± 1.5
Mean mothers' schooling, y, mean ± SD	13.2 ± 2.2	13.6 ± 2.1	13.3 ± 2.2	13 ± 2.5	14.8 ± 2.3	13.6 ± 1.9	12.6 ± 1.7
Mean weight percentile at age ≥1 y, mean ± SD	58.4 ± 27.7	56.5 ± 27	56.8 ± 28.2	55.2 ± 26.9	59.9 ± 28.4	53.7 ± 28.1	53.7 ± 29
Mean height percentile at age ≥1 y, mean ± SD	53.3 ± 30	47.6 ± 28.9	48.4 ± 29.1	42.5 ± 27.9	51.4 ± 29.6	42.9 ± 29.1	43.1 ± 29.5
Mean head circumference percentile at age ≥1 y, mean ± SD	53.4 ± 27.1	51.2 ± 28.1	56.7 ± 27.1	55.2 ± 27.1	51.0 ± 25.0	52.2 ± 26.9	51.4 ± 27.2
Median sibling order (range)	2 (1-8)	2 (1-10)	2 (1-15)	2 (1-10)	2 (1-5)	2 (1-11)	2 (1-9)
Proportion of mothers who had gestational diabetes, %	7.7	7.3	8.2	7.9	4.7	6.7	8.4
Proportion of mothers who had gestational hypertension, %	2.8	3.1	0.7	3.2	2.7	2.5	1.7
Proportion of mothers who had ≥1 abortions, %	27.1	30.3	39	33.2	17.4	33.4	38.2
Proportion of children with ≥1 admissions to the pediatric emergency department before 4 y of age	53.7	53.6	48.1	49.5	46.3	22.7	34.8
Proportion of children with ≥1 hospitalizations before 4 y of age	22.7	21.8	19.8	24.8	20.1	13.2	17.0