

Parental Satisfaction With Early Pediatric Care and Immunization of Young Children

The Mediating Role of Age-Appropriate Well-Child Care Utilization

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Objective: To prospectively evaluate the impact of parental satisfaction on childhood immunization and the mediating role of age-appropriate well-child care.

Design: Secondary analyses of cohort data from the National Evaluation of Healthy Steps for Young Children. Data sources included an enrollment questionnaire, parent interview at 2 to 4 months, and medical records.

Setting: Twenty-four pediatric practices across the United States.

Participants: A total of 4896 (85%) of the initial 5565 enrolled families who were interviewed at 2 to 4 months and had abstracted medical records.

Main Exposure: Parental satisfaction with overall pediatric care assessed at 2 to 4 months as excellent, good, or fair/poor.

Main Outcome Measures: Age-appropriate first dose of diphtheria-tetanus-pertussis; third dose of diphtheria-tetanus-pertussis; and measles, mumps, and rubella vaccinations; and up-to-date vaccinations at 24 months (4 diphtheria-tetanus-pertussis, 3 polio, and 1 measles, mumps, and rubella).

Results: The majority of parents were satisfied with their child's health care; only 4% rated overall care as fair or poor. Children whose parents reported fair/poor satisfaction with care had a reduced odds of receiving age-appropriate first dose of diphtheria-tetanus-pertussis vaccination (odds ratio, 0.43; 95% confidence interval, 0.28-0.67); third dose of diphtheria-tetanus-pertussis vaccination (odds ratio, 0.52; 95% confidence interval, 0.36-0.74); and measles, mumps, and rubella vaccination (odds ratio, 0.58; 95% confidence interval, 0.37-0.92); and of being up to date by 24 months (odds ratio, 0.65; 95% confidence interval, 0.43-0.99) compared with children whose parents reported excellent care, independent of sociodemographic and maternal health care-utilization variables. The negative effect of fair/poor satisfaction on immunization was largely explained by reduced utilization of age-appropriate well-child care.

Conclusion: Quality assurance activities that assess parental satisfaction with care may have added value in identifying children who are less likely to receive timely preventive services.

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CHILDHOOD IMMUNIZATION is considered to be among the most effective preventive services, and is therefore critical to monitor and evaluate.¹ Although national immunization levels for a comprehensive series of vaccines among 2-year-olds recently exceeded the Healthy People 2010 goal of more than 80%,² few children receive vaccine doses within age-appropriate windows, exposing a significant problem of delays in immunization. Most children receive at least 1 dose of the routinely recommended vaccines late, and only 42% of children complete a basic series of vaccinations (4 diphtheria-tetanus-pertussis [DTP], 3 polio, and 1 measles, mumps, and

rubella [MMR] vaccinations) at the recommended ages.³ These delays are not trivial; one third of all children are under-vaccinated for more than 6 months.⁴ Immunization delays increase the risk of disease outbreak and are markers for inadequate receipt of other preventive services.⁵ For these reasons, age-appropriate immunization is a more accurate indicator of adequate immunization than whether immunizations have been received by age 2 years.^{3,4,6,7}

Timely immunization depends on both appropriate access to health care and the administration of eligible doses at each visit. Family characteristics related to inadequate immunization include poverty, lack of health insurance, later birth or-

der, young maternal age, low maternal education,⁸⁻¹⁴ and inadequate prenatal care.¹⁵⁻¹⁹ Provider characteristics, including immunization-related practices^{20,21} and structural attributes, such as long clinic waiting times,^{22,23} have also been associated with underimmunization and are potentially modifiable, unlike many personal characteristics.

Parental satisfaction with pediatric care is an indicator of provider quality that has been relatively unexplored in relation to childhood immunization. One prior study reported an association between parental satisfaction with pediatric care and up-to-date immunization at 24 months independent of maternal age, race, and education¹² but did not establish temporal ordering. It is also not clear whether the potential relationship between parental satisfaction and children's immunization is the result of greater age-appropriate well-child care utilization or of some combination of parental and health care provider vigilance. In addition to promoting appropriate utilization, satisfaction may increase engagement in the health care process. Research on parental health beliefs and attitudes often assumes that parents decline immunization or are simply less knowledgeable and persistent in the health care setting without also examining their access and timely utilization of well-child care.²⁴⁻²⁶

The present study prospectively investigates the relationship between parental satisfaction with care and timely childhood vaccination in a large and diverse sample. We examine whether satisfaction with early pediatric care is related to timely and adequate immunization during the first 2 years of life, and if so, whether this relationship is mediated by greater utilization of age-appropriate well-child care.

This study relies on prospective data collected as part of a national evaluation of Healthy Steps for Young Children—a pediatric practice-based intervention designed to promote developmentally appropriate parenting practices by providing enhanced developmental services in the first 3 years of life.²⁷ The evaluation followed a cohort of 5565 families enrolled at 24 pediatric practices across the US from the child's birth to age 3 years.²⁷⁻²⁹ In contrast to other national surveys, such as the National Survey of Early Childhood Health or the Consumer Assessment of Health Plan Satisfaction, this data set provides a unique opportunity to longitudinally evaluate the relationship between parental satisfaction with early pediatric care and subsequent vaccination.

METHODS

PARTICIPANTS

The study sample included 4756 families who enrolled in Healthy Steps between September 1996 and November 1998, completed an interview at 2 to 4 months, and had abstracted medical records. Of the 5565 enrolled families, 4896 were interviewed at 2 to 4 months (88%). Medical records were abstracted for 4756 (97%) of these families, yielding overall inclusion of 85% of the initial cohort.

Institutional review board approval was obtained for this study from The Johns Hopkins Bloomberg School of Public Health Committee on Human Research. Informed consent was

obtained at the time of enrollment and reviewed prior to the interview.

DATA SOURCES

Three data sources inform these analyses: an enrollment parent questionnaire, a parent interview at 2 to 4 months, and medical records. At enrollment (within 28 days of birth), a brief questionnaire provided sociodemographic data about both parents and the infant. At 2 to 4 months, information was obtained through a telephone interview with parents, primarily the mother, regarding services received, satisfaction with services, and maternal health care utilization. The interviews were conducted in English or Spanish by trained interviewers. Medical records were abstracted up to 32 months of age to obtain information on the frequency and timing of well-child visits and immunizations. A random sample of approximately 5% of records was reabstracted at each site with agreement of 87% or higher for visit type, 96% or higher for visit date, 99% or higher for vaccine type, and 98% or higher for vaccine date.

STUDY VARIABLES

Dichotomous age-appropriate immunization measures were constructed according to minimum age and spacing guidelines of the 1997 American Academy of Pediatrics *Red Book*,³⁰ the edition in use when the majority of study children were eligible for immunization (**Table 1**). Three age-appropriate measures—first dose of DTP (DTP1), third dose of DTP (DTP3), and MMR—and 1 up-to-date measure of 4 doses of DTP, 3 doses of polio, and 1 dose of MMR vaccination at 24 months were analyzed. First dose DTP, DTP3, and MMR were chosen to represent different ages at vaccination (2, 6, and 12 months, respectively).

Parental satisfaction with pediatric care was evaluated with a global measure assessed when the child was 2 to 4 months old. Parents were asked to rate doctors and nurses at their site of care in "providing good health care since [their baby] left the hospital after birth," with responses grouped as excellent, good, or fair/poor. This measure corresponds with the global measure included in Consumer Assessment of Health Plan Satisfaction and the National Survey of Early Childhood Health, which asks parents to rate their child's health care on a scale from 0 to 10 (10 indicating the best possible care). The correlation coefficients between the global satisfaction measure and other multiple-item scales of satisfaction with provider listening and time spent with the provider were high in our sample, demonstrating construct validity.

Several sociodemographic^{8-13,16,31,32} and maternal health care-utilization variables¹⁵⁻¹⁹ related to immunization were examined as confounders. Maternal age, education, race/ethnicity, marital status, and first-trimester prenatal care were obtained from the newborn questionnaire at enrollment. Home ownership, the infant's health insurance and health status, household income, number of siblings, and maternal postpartum visit were reported by parents in an interview at 2 to 4 months. Household income was imputed for families with missing data (7%) by using monthly housing costs and a series of covariates. Annual income was divided into earning tertiles: less than \$20 000, \$20 000 to \$49 999, and \$50 000 or more.

The main measures of age-appropriate well-child care utilization were the timely receipt of the 2-month visit and the total number of age-appropriate well-child visits completed by 24 months, as defined by the American Academy of Pediatrics schedule of preventive health care (Table 1).³³ The receipt of early age-appropriate care is strongly related to later up-to-date immunization status.⁷ To control for age-appropriate well-

Table 1. Preventive Services Definitions

Preventive Service	Definition
Age-appropriate vaccinations	
DTP1	Given between 42 d (6 wk) and 92 d (3 mo), inclusive
DTP3	DTP1 given on or after 42 d (6 wk); and DTP2 given at least 28 d after DTP1; and DTP3 given at least 28 d after DTP2 and before 213 d (7 mo) of age, inclusive
MMR	Given between 365 d (12 mo) and 488 d (16 mo), inclusive
Up-to-date vaccination at 24 mo (4 DTP, 3 polio, 1 MMR)	DTP1 given on or after 42 d (6 wk); and DTP2 given at least 28 d after DTP1; and DTP3 given at least 28 d after DTP2; and DTP4 given at least 184 d (6 mo) after DTP3 and between 365 d (12 mo) and 24 mo of age, inclusive; and OPV/IPV1 given on or after 42 d (6 wk); and OPV/IPV2 given at least 28 d after OPV/IPV1; and OPV/IPV3 given at least 28 d after OPV/IPV2 and between 184 d (6 mo) and 24 mo of age, inclusive; and MMR given between 365 d (12 mo) and 24 mo of age, inclusive
Age-appropriate well-child visits	
2 mo	Visit between 42 d (1.5 mo) and 92 d (3 mo), inclusive
4 mo	Visit between 93 d (3 mo) and 151 d (5 mo), inclusive
6 mo	Visit between 152 d (5 mo) and 213 d (7 mo), inclusive
9 mo	Visit between 244 d (8 mo) and 305 d (10 mo), inclusive
12 mo	Visit between 336 d (11 mo) and 426 d (14 mo), inclusive
15 mo	Visit between 427 d (14 mo) and 518 d (17 mo), inclusive
18 mo	Visit between 519 d (17 mo) and 608 d (20 mo), inclusive
24 mo	Visit between 701 d (23 mo) and 851 d (28 mo), inclusive

Abbreviations: DTP, diphtheria-tetanus-pertussis vaccination (number indicates dose); IPV, inactivated poliovirus vaccine (number indicates dose); MMR, measles, mumps, and rubella vaccination; OPV, oral poliovirus vaccine.

child care utilization in regression models of immunization and satisfaction, we used the number of age-appropriate well-child care visits received by the last date possible to receive the immunization age appropriately. Because a visit within the first month of life was nearly universal in our sample (97%), the 1-month age-appropriate well-child care visit was excluded from the total count of age-appropriate well-child care visits.

Denominators for each vaccination and well-child care outcome were determined by the children's time in practice—a measure combining the age at last visit with information provided by parents at 30 to 33 months about their child's regular source of care and when they left the practice, if the Healthy Steps site was no longer their regular source. Time in practice refers to the length of time in days that children were active patients at the Healthy Steps site. Analyses of the age-appropriate vaccination and well-child care—utilization outcomes included children whose time in practice exceeded the oldest age allowable to receive the dose or visit within the recommended age window. This resulted in analysis of children who could be considered patients of the practice throughout the period necessary to receive the dose or visit.

STATISTICAL ANALYSIS

Bivariate associations between reported satisfaction and immunization outcomes; satisfaction and the aforementioned covariates; and immunization and the covariates were examined with χ^2 test statistics. Multivariate regression models were performed to explore the independent association between satisfaction with care and each immunization outcome and mediation by age-appropriate well-child care utilization. Following tests for mediation proposed by Baron and Kenny,³⁴ we first evaluated whether parental satisfaction with care was independently related to the mediator of age-appropriate well-child care utilization using logistic (2-month visit) and Poisson (total num-

ber of age-appropriate visits by 24 months) regression analyses. We next examined the relationship between satisfaction and immunization outcomes adjusting for associated sociodemographic and maternal health care—utilization variables (model 1). We then added the number of age-appropriate well-child visits received (model 2) to evaluate mediation of the relationship between satisfaction and immunization by examining the coefficient change. All models controlled for the receipt of the Healthy Steps intervention and the practice site. Fixed effects were used to control for unobserved differences between sites.

Missing data did not exceed 3% for any variable. Two dichotomous variables were included in adjusted models to account for missing data: unknown prenatal care entry (3%) and unknown for other covariates with less than 1% data missing (2%). All analyses were conducted using SAS (SAS Institute Inc, Cary, NC).

RESULTS

SAMPLE CHARACTERISTICS

Among study mothers, 13% were teenagers, 16% had not completed high school, and 66% were married (**Table 2**). Eighty percent of mothers initiated prenatal care in the first trimester and almost 90% returned for a postpartum visit. Similarly, 88% of infants received the 2-month age-appropriate well-child visit.

Satisfaction with care was high. Two thirds of mothers reported their infant's health care as excellent, 27% as good, and only 4% as fair or poor (Table 2). Immunization levels ranged from more than 90% for age-appropriate initiation of the DTP series to 72% for age-appropriate DTP3 and up-to-date vaccination levels

Table 2. Mother and Infant Characteristics by Satisfaction With Care*

Characteristic	Total, No. (%) (n = 4753)	Excellent, % (n = 3280)	Good, % (n = 1294)	Fair/Poor, % (n = 179)
Sociodemographic characteristics				
Maternal age, y†				
<20	631 (13.3)	13.0	13.1	20.1
20-29	2394 (50.4)	50.5	50.1	51.4
≥30	1722 (36.3)	36.5	36.8	28.5
Maternal education‡				
<High school	762 (16.1)	15.2	17.0	25.8
High school graduate	1253 (26.4)	26.5	26.1	28.7
Some college	1379 (29.1)	29.4	28.0	30.9
College graduate	1344 (28.4)	28.9	29.0	14.6
Income tertile‡				
Low (<\$20 000)	1569 (33.0)	31.5	35.5	42.5
Middle (\$20 000-\$49 999)	1646 (34.6)	35.2	32.5	40.2
High (≥\$50 000)	1538 (32.4)	33.3	32.0	17.2
Home ownership	2472 (52.1)	52.7	51.0	49.2
Race/ethnicity‡				
White, non-Hispanic	2486 (52.6)	55.4	48.0	33.0
Black, non-Hispanic	1098 (23.2)	22.2	24.0	36.3
Hispanic	909 (19.2)	18.1	21.3	24.0
Other	238 (5.0)	4.3	6.7	6.7
Marital status, married‡	3110 (65.7)	66.5	65.8	50.3
Insurance‡				
Private	2630 (55.5)	56.0	55.5	45.3
Medicaid	1919 (40.5)	40.1	39.7	52.0
Uninsured	194 (4.1)	3.9	4.8	2.8
Siblings‡				
0	2280 (48.0)	48.4	46.1	55.3
1	1539 (32.4)	31.5	35.3	27.4
≥2	930 (19.6)	20.1	18.6	17.3
Infant's health status‡				
Excellent	3676 (77.3)	81.9	67.8	62.6
Good	967 (20.4)	16.5	29.3	26.8
Fair/poor	110 (2.3)	1.6	2.9	10.6
Maternal health care utilization				
First-trimester prenatal care§	3607 (80.1)	80.3	80.8	70.8
Postpartum visit§	4258 (89.9)	90.7	88.6	84.9
Child health care utilization				
2-mo well-child visit‡	4184 (88.0)	89.3	86.7	74.3
Mean No. of age-appropriate visits in 24 mo (SD)	2.4 (6.3)	6.5 (2.3)	6.0 (2.4)	4.6 (2.6)
HS intervention‡	2558 (53.8)	56.3	49.7	38.0

Abbreviation: HS, Healthy Steps for Young Children.

* χ^2 Tests of association were used for categorical data; *t* tests were used for continuous data.

†*P* < .05.

‡*P* < .001.

§*P* < .01.

||All pair-wise *t* tests were significant at *P* < .001.

(4 DTP, 3 polio, and 1 MMR by 24 months) (**Table 3**). The up-to-date vaccination level (4 DTP, 3 polio, and 1 MMR) in our sample is somewhat lower than the national estimate in 2000 (78%)³⁵ because of our more stringent inclusion of only valid doses administered according to minimum age and interval guidelines.

STEP 1: BIVARIATE ASSOCIATIONS— SATISFACTION, COVARIATES, AND IMMUNIZATION

Mothers who reported less satisfaction with their infant's health care were younger, unmarried, less educated, nonwhite, uninsured or Medicaid-insured, first-time mothers, had lower incomes, and had reported their

infant's health status as fair/poor (Table 2). In addition, mothers who were less satisfied with their infant's health care were less likely to use health care for themselves and their infant (Table 2). Children whose parents reported fair/poor care averaged 2 fewer age-appropriate well-child visits in the first 2 years of life than children whose parents reported excellent care.

Satisfaction with care was associated with all immunization measures examined, with much lower percentages observed among children whose mothers reported fair/poor care relative to those reporting good or excellent care (Table 3). Only 58% of children whose parents were dissatisfied with their children's health care were up to date at 24 months compared with 73% among those whose parents reported excellent care.

Table 3. Immunization Levels by Satisfaction With Care*

Satisfaction With Care	DTP1, % (n = 4470)	DTP3, % (n = 4377)	MMR, % (n = 3845)	4:3:1 UTD, % (n = 3567)
Total immunization level	91.8	72.2	85.5	72.4
Excellent	92.7†	73.7†	86.2†	73.3†
Good	91.1	70.9	84.9	71.5
Fair/poor	80.5	52.3	73.7	58.3

Abbreviations: DTP1, first dose diphtheria-tetanus-pertussis vaccination; DTP3, third dose diphtheria-tetanus-pertussis vaccination; MMR, measles, mumps, and rubella vaccination; 4:3:1 UTD, up-to-date (4 DTP, 3 polio, 1 MMR vaccinations by 24 months of age).

* χ^2 Tests of association were used.

† $P < .001$.

Table 4. Adjusted Effect Estimates of Satisfaction With Care on Age-Appropriate Well-Child Visit Utilization

Age-Appropriate Well-Child Visit	Satisfaction With Care	Adjusted Effect Estimate*
2 mo (n = 4473), odds ratio (95% CI)	Excellent	1.00
	Good	0.89 (0.72-1.11)
	Fair/poor	0.52 (0.34-0.78)
24 mo (n = 3570), rate ratio (95% CI)	Excellent	1.00
	Good	0.98 (0.96-1.00)
	Fair/poor	0.87 (0.81-0.94)

Abbreviation: CI, confidence interval.

*Adjusted for maternal age, education, race/ethnicity, income tertile, home ownership, insurance, marital status, siblings, infant's health status, maternal postpartum visit, first-trimester prenatal care, provider site, and Healthy Steps for Young Children intervention.

Table 5. Odds Ratios of Immunization Related to Satisfaction Unadjusted and Adjusted for Age-Appropriate Well-Child Care

Immunization	Satisfaction With Care	Model 1 OR (95% CI)*	Model 2 OR (95% CI)†
DTP1 (n = 4470)	Excellent	1.00	1.00
	Good	0.89 (0.69-1.16)	0.99 (0.70-1.42)
	Fair/poor	0.43 (0.28-0.67)	0.53 (0.27-1.04)
DTP3 (n = 4377)	Excellent	1.00	1.00
	Good	0.98 (0.83-1.16)	0.94 (0.75-1.19)
	Fair/poor	0.52 (0.36-0.74)	0.91 (0.53-1.58)
MMR (n = 3845)	Excellent	1.00	1.00
	Good	0.98 (0.79-1.22)	1.12 (0.87-1.44)
	Fair/poor	0.58 (0.37-0.92)	0.85 (0.49-1.47)
4:3:1 UTD (n = 3567)	Excellent	1.00	1.00
	Good	0.96 (0.81-1.15)	1.02 (0.84-1.24)
	Fair/poor	0.65 (0.43-0.99)	0.90 (0.56-1.73)

Abbreviations: CI, confidence interval; DTP1, first dose diphtheria-tetanus-pertussis vaccination; DTP3, third dose diphtheria-tetanus-pertussis vaccination; MMR, measles, mumps, and rubella vaccination; OR, odds ratio; 4:3:1 UTD, up-to-date (4 DTP, 3 polio, 1 MMR vaccinations by 24 months of age).

*Adjusted for maternal age, education, race/ethnicity, income tertile, home ownership, insurance, marital status, siblings, infant's health status, maternal postpartum visit, first-trimester prenatal care, provider site, and Healthy Steps for Young Children intervention.

†Model 2 includes model 1 covariates plus the total number of age-appropriate well-child visits obtained by 92 days for DTP1, 213 days for DTP3, 488 days for MMR, and 730 days for 4:3:1 UTD.

All covariates were significantly associated with each immunization outcome in the anticipated direction at $P < .05$ (data available from authors upon request). Variables positively related to age-appropriate and up-to-

date immunization included older maternal age; higher maternal education; higher income; home ownership; white, non-Hispanic race/ethnicity; being married; private insurance; first birth order; good or excellent infant health status; receipt of first-trimester prenatal care; maternal postpartum visit; 2-month well-child visit; and the Healthy Steps intervention.

STEP 2: MEDIATOR AS OUTCOME—WELL-CHILD CARE IN RELATION TO SATISFACTION

Parental satisfaction with care was related to age-appropriate well-child care utilization independent of associated sociodemographic characteristics and maternal health care utilization (**Table 4**). Compared with children of parents who reported excellent satisfaction with care, children of parents reporting fair/poor satisfaction were significantly less likely to have obtained the age-appropriate 2-month well-child visit and had significantly fewer total age-appropriate visits by 24 months of age. Children of parents who reported good satisfaction with care were not significantly different from children of parents reporting excellent satisfaction in their receipt of age-appropriate well-child care.

STEP 3: MULTIVARIATE REGRESSION MODELS—BEFORE AND AFTER ADJUSTMENT FOR WELL-CHILD CARE

Adjusting for related sociodemographic characteristics and maternal health care utilization, children whose parents reported fair/poor care had markedly lower odds of having received all immunization outcomes relative to children whose mothers reported excellent care (odds ratios, 0.43-0.65) (**Table 5**, model 1). After adjusting for the total number of age-appropriate well-child visits received, fair/poor satisfaction with care was no longer significantly related to any of the immunization outcomes, indicating that the effect of fair/poor satisfaction was mediated by reduced age-appropriate well-child care utilization.

COMMENT

The findings of this analysis suggest that early satisfaction with care is independently related to both age-appropriate and up-to-date immunization, despite associations with a variety of sociodemographic risk factors, reported infant health status, and maternal health care—

utilization patterns. The early nature of this effect is similar to that observed for age-appropriate DTPI vaccination on later immunization^{7,36} and may be useful for the early identification of children at greater risk of inadequate immunization. Infants of parents who were less satisfied with their pediatric care at 2 to 4 months of age had significantly lower odds of immunization for all vaccine outcomes examined through the first 2 years of life. This relationship appeared to be mediated by reduced well-child care utilization; parents who were less satisfied with their children's health care were less likely to bring their children in for age-appropriate care. This finding is consistent with results from the National Survey of Early Childhood Health, which demonstrate a strong negative relationship between parental global satisfaction ratings and missed or delayed pediatric care.³⁷

Dissatisfaction with care was strongly related to inadequate immunization; the population of dissatisfied parents may warrant greater attention. Understanding the sources of dissatisfaction and other barriers to utilization of this subgroup is critical for targeted interventions. Several studies, including our own, have shown that parental global satisfaction is highly related to satisfaction with physician communication skills (eg, listening and answering all questions) and the length of time spent during well-child visits.^{37,38} As the level and sources of dissatisfaction may vary according to provider and setting, investigations should be context specific. A recent survey of personnel at a variety of pediatric settings found that the most common quality improvement initiative involved efforts to increase patient satisfaction through baseline surveys and tailored interventions.³⁹ It is important to note that only inclusion of the total number of age-appropriate well-child visits received, rather than receipt of the 2-month age-appropriate well-child visit alone, accounted for the relationship between satisfaction and immunization outcomes (data not shown). This suggests that interventions designed to improve the immunization of children whose parents are dissatisfied with their care must be sustained and not simply confined to an early period of several months.

The significance of these findings is tempered by the small percentage of parents who were dissatisfied with their child's care. Although the high level of satisfaction with children's health care is consistent with other research,^{37,38,40-42} the Healthy Steps sites may not be representative of all pediatric practices. The level of dissatisfaction varied considerably among the sites, ranging from 2% to 8%, suggesting that the relevance of quality improvement initiatives and/or targeting dissatisfied parents may be site specific. Broader efforts to improve parent satisfaction may also enhance compliance with medical regimens⁴³ and reduce the risk of malpractice litigation,^{44,45} in addition to improving preventive services utilization.

There are several limitations to this study. While we made considerable efforts to establish the temporal sequence between satisfaction and subsequent immunization and to control for predisposing maternal health care-seeking behavior, it is possible that the observed association is the result of other factors related to both satisfaction appraisal and health care utilization. How-

ever, the magnitude of the association amidst a range of control variables highly associated with both satisfaction and immunization reduces the likelihood of this possibility. Regardless of causality, parental dissatisfaction with care identifies a group of children significantly less likely to receive age-appropriate preventive care who warrant greater attention and targeted intervention.

The inability to directly compare the level of satisfaction in our sample with others highlights another study limitation. Our global measure of satisfaction is similar to the questions used by Consumer Assessment of Health Plan Satisfaction and National Survey of Early Childhood Health but has a more restricted response range—from 1 to 4, as opposed to from 0 to 10. The magnitude of the effect of fair/poor satisfaction with care in relation to up-to-date vaccination levels (4 DTP, 3 polio, and 1 MMR by 24 months), however, is similar to the effect of less satisfaction observed by Bates and Wolinsky,¹² supporting the reliability of our results. We also examined other, more specific measures of satisfaction with care, including scales of satisfaction with provider listening, time, help, and advice, but the global measure of satisfaction was more strongly and consistently related to immunization. Thus, use of a global measure of satisfaction with care may be efficient and helpful in identifying children who are less likely to receive preventive services.

CONCLUSIONS

The results of this study show that parents' satisfaction with their child's health care at an early age is related to the child's later immunization, independent of sociodemographic characteristics, infant health status, and patterns of maternal health care utilization. The association between fair/poor satisfaction with care and reduced receipt of timely and up-to-date immunization appeared to be mediated by reduced utilization of age-appropriate well-child care. Although dissatisfaction was relatively uncommon among parents in this study, future research might determine whether other widely used measures of satisfaction yield greater variability and predictive value in relation to immunization. Our global measure of satisfaction was more strongly related to immunization than other measures of satisfaction and is conducive to rapid assessment at clinical sites. Parental satisfaction is frequently measured by providers in some form for quality assessment and may have unanticipated value in identifying children who are less likely to receive age-appropriate preventive care.

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Author Contributions: Ms Schempf had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Schempf, Minkovitz, Strobino, and Guyer. *Acquisition of data:* Minkovitz, Strobino, and Guyer. *Analysis and interpretation of data:* Minkovitz and

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