

# PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

## **Washington State Pediatricians' Attitudes Toward Alternative Childhood Immunization Schedules**

Aaron Wightman, Douglas J. Opel, Edgar K. Marcuse and James A. Taylor

*Pediatrics*; originally published online November 28, 2011;

DOI: 10.1542/peds.2011-0666

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/early/2011/11/22/peds.2011-0666>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2011 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



# Washington State Pediatricians' Attitudes Toward Alternative Childhood Immunization Schedules



**WHAT'S KNOWN ON THIS SUBJECT:** The use of alternative childhood immunization schedules (ACISs) is controversial. There has been no systematic study of pediatricians' attitudes toward ACISs.



**WHAT THIS STUDY ADDS:** More than three-fourths of Washington State pediatricians reported that parents regularly requested ACISs, and more than one-half of the pediatricians surveyed were comfortable using ACISs if requested by parents.

## abstract

**OBJECTIVE:** To determine the frequency of parents' requests for alternative childhood immunization schedules (ACISs) and pediatricians' comfort with and willingness to use ACISs.

**METHODS:** Washington State primary care pediatricians were asked to complete an Internet-based survey on ACISs. The main outcome measures were the frequency of parents' requests for ACISs, pediatricians' comfort with their use, and pediatricians' willingness to use ACISs for individual vaccines. In addition, respondents were asked to characterize their practices and to provide demographic information.

**RESULTS:** Of the 311 respondents (response rate: 65%), 209 met inclusion criteria and were included in analyses. Overall, 77% of eligible respondents reported that parents sometimes or frequently requested ACISs, and 61% were comfortable using an ACIS if requested by a parent. Pediatricians were least willing to consider using ACISs for diphtheria-tetanus toxoids-acellular pertussis vaccine, *Haemophilus influenzae* type b vaccine, and pneumococcal conjugate vaccine. Pediatricians who practiced in a neighborhood or community clinic were less comfortable using ACISs than were those in a 1- or 2-physician practice (odds ratio: 0.10).

**CONCLUSIONS:** Washington State pediatricians are regularly being asked to use ACISs, and most of them are comfortable using them if requested. Pediatricians are least willing to delay *H influenzae* type b vaccine, diphtheria-tetanus toxoids-acellular pertussis vaccine, and pneumococcal conjugate vaccine, which suggests prioritization of immunizations that protect against potentially devastating bacterial infections of infancy and early childhood. *Pediatrics* 2011;128:1094–1099

**AUTHORS:** Aaron Wightman, MD,<sup>a</sup> Douglas J. Opel, MD, MPH,<sup>a,b</sup> Edgar K. Marcuse, MD, MPH,<sup>a,c</sup> and James A. Taylor, MD<sup>a</sup>

<sup>a</sup>Department of Pediatrics, School of Medicine, and <sup>c</sup>Department of Epidemiology, School of Public Health, University of Washington, Seattle, Washington; and <sup>b</sup>Treuman Katz Center for Pediatric Bioethics, Seattle Children's Hospital, Seattle, Washington

### KEY WORDS

immunizations, vaccines, preventive services, primary care

### ABBREVIATIONS

ACIP—Advisory Committee on Immunization Practices

ACIS—alternative childhood immunization schedule

DTaP—diphtheria-tetanus toxoids-acellular pertussis

IPV—inactivated poliovirus

Hib—*Haemophilus influenzae* type b

PCV—pneumococcal conjugate vaccine

WCAAP—Washington Chapter of the American Academy of Pediatrics

CI—confidence interval

A version of this work was presented at the Academic Pediatric Association Region IX and X 2011 Pediatric CARE conference, January 29, 2011, Monterey, CA; and the 2011 Pediatric Academic Societies/Asian Society for Pediatric Research Joint Meeting, April 30–May 3, 2011, Denver, CO.

[www.pediatrics.org/cgi/doi/10.1542/peds.2011-0666](http://www.pediatrics.org/cgi/doi/10.1542/peds.2011-0666)

doi:10.1542/peds.2011-0666

Accepted for publication Aug 19, 2011

Address correspondence to Douglas J. Opel, MD, MPH, Treuman Katz Center for Pediatric Bioethics, Center for Clinical and Translational Research, Seattle Children's Hospital Research Institute, 1900 Ninth Ave, M/S C9S-6, Seattle, WA 98101. E-mail: [djopel@u.washington.edu](mailto:djopel@u.washington.edu)

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2011 by the American Academy of Pediatrics

**FINANCIAL DISCLOSURE:** Dr Taylor has been a paid consultant for Pfizer Pharmaceuticals; Drs Wightman, Opel, and Marcuse have indicated they have no financial relationships relevant to this article to disclose.

In 2007, Robert Sears proposed alternative childhood immunization schedules (ACISs) in a popular book.<sup>1</sup> Those ACISs and others<sup>2,3</sup> are designed to respond to parental concerns regarding vaccine safety and to promote the declination or delay of recommended childhood immunizations. However, ACIS proponents have been criticized in the medical literature for underappreciating the potential severity and sequelae of vaccine-preventable illnesses, inadequately understanding immunization risks, and exploiting community immunity.<sup>4</sup> Furthermore, underimmunized children are at increased risk for both contracting and transmitting vaccine-preventable diseases, such as measles and pertussis.<sup>5–7</sup> Despite these criticisms, there is evidence that some pediatricians are accepting of ACISs.<sup>8,9</sup> To date, however, there has been no systematic study of pediatricians' attitudes toward ACISs. Understanding pediatricians' attitudes toward ACISs is important because pediatricians continue to play an influential role in parents' decision-making regarding immunization.<sup>10–12</sup> Insight into how to communicate better with parents who are hesitant about vaccines, to address their concerns, and to maintain their confidence and trust is vital to reaping the full potential benefits of modern vaccines.<sup>13,14</sup> Currently, however, parental acceptance of childhood immunizations is waning. There was a 17-percentage point increase in the proportion of parents who refused or delayed immunizations for their children in 2008, compared with 2003 (39% vs 22%),<sup>15</sup> and increasing numbers of parents are filing for philosophical exemptions from required childhood vaccinations.<sup>16</sup> Among 19- to 35-month-old children who are underimmunized, ~10% to 15% remain susceptible to vaccine-preventable dis-

eases because of parental attitudes and beliefs.<sup>17,18</sup>

In this context of increasing parental immunization hesitancy and the emergence of ACISs, we conducted a survey of primary care pediatricians in Washington State. We sought to understand the frequency of parents' requests for ACISs from pediatricians, pediatricians' comfort in using ACISs, and pediatricians' willingness to consider using ACISs for individual vaccines. We hypothesized that ACISs would be requested frequently by parents and that pediatricians would be comfortable using them.

## METHODS

### Study Sample

Our target population included members of the Washington Chapter of the American Academy of Pediatrics (WCAAP) who were actively practicing primary care pediatricians and who saw  $\geq 20$  patients younger than 2 years per week. Members of the WCAAP account for ~45% of practicing pediatricians in Washington State (Leena Der Yuen, written communication). By using a 2010 WCAAP administrative database for current members ( $N = 988$ ), we were able to exclude all members who were listed as being a pediatric subspecialist, retired, or in training before survey implementation ( $n = 513$ ) (Fig 1). Of the remaining WCAAP members who received the survey and responded ( $n = 311$ ), we subsequently excluded those who indi-

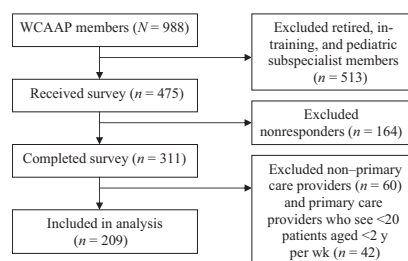
cated that they were not primary care providers ( $n = 60$ ) or saw  $< 20$  patients younger than 2 years per week ( $n = 42$ ). Therefore, responses from a total of 209 pediatricians were included in our analysis.

### Survey Design

We developed the survey by using an iterative process. First, all instrument items were written according to accepted guidelines for survey development<sup>19</sup> and were formatted according to accepted criteria aimed at reducing nonresponses and avoiding measurement errors.<sup>20</sup> Next, the survey was reviewed by a panel of 5 national vaccine experts, to assess content validity and to facilitate item reduction. Finally, we pretested the survey with practicing pediatricians in Idaho ( $n = 13$ ). At each stage of design, comments from experts and participants were reviewed and the survey was revised.

The final survey contained 9 items pertaining to physicians' perspectives on ACISs (Table 1) and 7 sociodemographic items. Six of the 9 ACIS items used 5-point Likert scale response formats expressing either agreement (strongly agree, agree, not sure, disagree, or strongly disagree) or frequency (always, frequently, sometimes, rarely, or never), whereas 1 item used a 4-point ordered response scale (more willing, unchanged, less willing, or unfamiliar), 1 item had a categorical response option, and 1 item used a dichotomous response option. The sociodemographic items used categorical response options.

For the purposes of this study, we defined an ACIS as delaying immunization or not immunizing children with any of the following recommended vaccines, for reasons other than established medical precautions and contraindications: 1 dose of hepatitis B vaccine, 2 doses of *Haemophilus influenzae* type b (Hib), inactivated poliovirus (IPV),



**FIGURE 1**  
Survey population.

**TABLE 1** Physician Survey Items

How often do parents request an alternative immunization schedule from you?
For each of the following vaccines, indicate how willing you are to consider an alternative immunization schedule: HepB, DTaP, PCV, Hib, IPV, rotavirus, MMR, varicella.
On average, how long are you comfortable delaying the following immunizations in response to parents' concerns: HepB, DTaP, PCV, Hib, IPV, rotavirus, MMR, varicella?
If you were to become a new parent in 2010, would you give the following vaccines to your child according to the current recommended schedule or according to an alternative schedule: HepB, DTaP, PCV, Hib, IPV, rotavirus, MMR, varicella?
In 2007, Dr Robert Sears published <i>The Vaccine Book</i> , which describes alternative immunization schedules. How has this book impacted your willingness to utilize alternative immunization schedules?
Indicate your level of agreement with the following statements:
I am comfortable agreeing to use an alternative immunization schedule if requested.
I am willing to offer an alternative immunization schedule for a child even if the parent has not specifically requested one.
I think too many immunizations are given at one visit.
I think there are too many immunizations overall.

HepB indicates hepatitis B; MMR, measles, mumps, rubella.

and rotavirus vaccines, and 3 doses of diphtheria-tetanus toxoids-acellular pertussis (DTaP) vaccine and pneumococcal conjugate vaccine (PCV) at 6 months of age; 1 dose of varicella vaccine at 12 months of age; and 1 dose of measles-mumps-rubella vaccine at 15 months of age. These vaccines and age-specific recommendations are in accordance with the Advisory Committee on Immunization Practices (ACIP) schedule.<sup>21</sup> This definition of an ACIS was provided to pediatricians in the survey. We chose to exclude the birth dose of hepatitis B vaccine in our ACIS definition because of the low rate of uptake of this dose of the vaccine, which is related in part to varying hospital policies regarding administration of hepatitis B vaccine to newborns.<sup>22,23</sup> We also did not include the third Hib vaccine dose, because it is not always required.

### Data Collection

The survey was administered by e-mail in an Internet-based format. No financial incentive was given for participation. A total of 3 weekly e-mail reminders and 1 subsequent telephone reminder were sent to all nonresponders.

### Data Analyses

Responses from items with 5-point Likert scale response formats were di-

chotomized into agree (strongly agree or agree) or disagree (not sure, disagree, or strongly disagree) and high frequency (always, frequently, or sometimes) or low frequency (rarely or never). The primary study outcomes were frequency of parents' requests for ACISs, pediatricians' comfort in using ACISs when requested, and pediatricians' willingness to consider ACISs for specific vaccines. In univariate analyses, we used the Pearson's  $\chi^2$  statistic and logistic regression to test the associations of these primary outcome variables with several individual predictor variables (pediatricians' immunization beliefs and sociodemographic characteristics). McNemar's test was used to test whether those who were willing to delay some vaccines were also willing to delay other vaccines. We used multivariate logistic regression analysis to determine the independent associations between our primary outcome variables and significant predictors with controlling for sociodemographic characteristics. For all tests, differences were considered significant at  $P < .05$  or when the 95% confidence interval (CI) around a point estimate did not include 1.0. This study was approved by the institutional review board of Seattle Children's Hospital.

**TABLE 2** Characteristics of Participating Pediatricians ( $N = 209$ )

Characteristic	<i>n</i> (%)
Female	120 (57)
Race	
White	168 (80)
Hispanic	2 (1)
Black	2 (1)
Asian	29 (14)
Other	8 (4)
County	
King <sup>a</sup>	82 (39)
Other	127 (61)
Practice setting	
1- or 2-physician practice	25 (10)
HMO-based group	11 (4)
Non-HMO-based group	158 (63)
Neighborhood or community health clinic	21 (8)
Medical school-based practice	8 (3)
Hospital-based clinic	26 (10)
Military	2 (1)
Proportion of patients' parents with college degree	
<25%	66 (32)
25%–50%	82 (39)
>50%	61 (29)

HMO indicates health maintenance organization.

<sup>a</sup> Seattle is located in King County, which is the most populous county in Washington State.

## RESULTS

Our response rate was 65% ( $n = 311$ ). Sociodemographic characteristics of the pediatricians included in the analyses ( $n = 209$ ) are summarized in Table 2. Most pediatricians were female, were white, and practiced in a non-health maintenance organization-based group.

The majority of pediatricians reported that parents at least sometimes requested ACISs (Table 3). No pediatricians reported that parents always or never requested ACISs, 11% reported that parents frequently requested ACISs, 66% reported that parents sometimes requested ACISs, and 23% reported that parents rarely requested ACISs. Among those who indicated that parents sometimes, frequently, or always requested ACISs, 64% were comfortable using ACISs. Overall, 61% of respondents agreed that they were comfortable using ACISs if requested.

**TABLE 3** Pediatricians' Perceptions of ACISs (*N* = 209)

Survey Item	Always/Frequently/Sometimes Response, %
How often do parents request an ACIS from you?	77 <sup>a</sup>
For each vaccine below, please indicate how willing you are to consider an ACIS	
Hepatitis B vaccine	87
DTaP vaccine	39
PCV	42
Hib vaccine	36
IPV vaccine	74
Rotavirus vaccine	69
Measles-mumps-rubella vaccine	58
Varicella vaccine	76

<sup>a</sup> No pediatricians reported that parents always requested an ACIS.

More pediatricians were willing to at least sometimes consider ACISs for hepatitis B vaccine (87%), varicella vaccine (76%), and IPV vaccine (74%) than they were for Hib vaccine (36%), DTaP vaccine (39%), and PCV (42%). Willingness to consider an ACIS for 1 vaccine was significantly associated with willingness to consider an ACIS for another. For example, pediatricians who were willing to at least sometimes consider an ACIS for hepatitis B vaccine were more willing to at least sometimes consider ACISs for Hib vaccine (41%), DTaP vaccine (45%), and PCV (48%) than were pediatricians who were not willing to at least sometimes consider an ACIS for hepatitis B vaccine (Hib vaccine: 0%; DTaP vaccine: 0%; PCV: 4%;  $P < .001$ ). The same held true for pediatricians who were willing to consider an ACIS for varicella vaccine (willing to consider ACIS: Hib vaccine: 46%; DTaP vaccine: 51%; PCV: 53%; not willing to consider ACIS: Hib

vaccine: 2%; DTaP vaccine: 2%; PCV: 8%;  $P < .001$ ) and IPV vaccine (willing to consider ACIS: Hib vaccine: 48%; DTaP vaccine: 53%; PCV: 54%; not willing to consider ACIS: Hib vaccine: 2%; DTaP vaccine: 0%; PCV: 7%;  $P < .001$ ).

The 3 vaccines that most pediatricians were comfortable delaying for >4 months were hepatitis B vaccine (69%), varicella vaccine (53%), and IPV vaccine (45%) (Table 4). The 3 vaccines that the fewest pediatricians were comfortable delaying for that length of time were Hib vaccine (7%), PCV (8%), and DTaP vaccine (9%). Most pediatricians were comfortable delaying Hib vaccine, PCV, and DTaP vaccine only for <4 weeks.

Most pediatricians (61%) responded that Sears' book did not change their willingness to use ACISs. Only a minority of pediatricians reported that the book influenced them to become more willing (5%) or less willing (11%) to

use ACISs. Despite reported comfort in using an ACIS if requested by a parent, respondents were overwhelmingly supportive of immunizations and their current schedule. Only 4% of pediatricians indicated that they would offer an ACIS for a child in the absence of a parental request, and nearly all pediatricians (96%) would follow the recommended immunization schedule for their child if they were to become a new parent in 2010. Only 8% of responding pediatricians agreed with the statement that too many immunizations are given at 1 visit, and only 6% agreed with the statement that there are too many immunizations overall.

In univariate analyses, it was determined that pediatricians who worked in a neighborhood or community clinic were less comfortable using ACISs if requested, compared with those who worked in a 1- or 2-physician practice (odds ratio: 0.12 [95% CI: 0.03–0.53]). There was no statistically significant association between pediatricians' comfort using ACISs and any other practice setting or sociodemographic characteristic. Moreover, there was no statistically significant association between pediatricians' comfort using ACISs if requested and their willingness to offer an ACIS if it was not solicited or their belief that there are too many immunizations overall or per visit. Pediatricians who indicated that >50% of children in their practice panel had parents with college degrees reported a higher rate of being asked to use ACISs ( $P = .02$ ). In multivariate models with pediatricians' comfort using ACISs as the dependent variable and sociodemographic characteristics as the predictor variables, the association between neighborhood or community clinic practice setting and being less comfortable using ACISs remained significant (odds ratio: 0.10 [95% CI: 0.02–0.45]).

**TABLE 4** Length of Time Pediatricians Are Comfortable Delaying Immunizations in Response to Parental Concerns (*N* = 209)

	Proportion, %			
	<4 wk	1–2 mo	3–4 mo	>4 mo
Hepatitis B vaccine	13	10	8	69
DTaP vaccine	45	39	7	9
PCV	46	38	8	8
Hib vaccine	50	35	8	7
IPV vaccine	20	18	17	45
Rotavirus vaccine	49	18	7	26
Measles-mumps-rubella vaccine	23	21	26	31
Varicella vaccine	16	11	20	53

## DISCUSSION

To our knowledge, this is the first study to capture pediatricians' attitudes about ACISs. Our results support our hypothesis that parents regularly ask for ACISs and most pediatricians report they are comfortable using ACISs when parents do so. Importantly, however, we found that pediatricians prioritize specific vaccines over others when considering these ACIS requests. We found that pediatricians were least willing to consider using ACISs for DTaP vaccine, PCV, and Hib vaccine and were least comfortable delaying these vaccines for >4 months.

We also found that pediatricians in a neighborhood or community clinic were less comfortable using ACISs if requested than were pediatricians in a 1- or 2-physician practice. Although the reasons for this are unclear, other investigators found associations between practice type and size and timely receipt of childhood vaccinations.<sup>24,25</sup> Perhaps a perception of low continuity of care and administrative and resource constraints may account for the reduced likelihood of pediatricians in some practices being comfortable using ACISs.

Our findings have several implications. First, parents' requests for ACISs from Washington State pediatricians who responded to our survey were common. Also, although we acknowledge that varying definitions of an ACIS have been used, our results seem consistent with those from recently published national surveys in which 13% of parents reported following an alternative schedule<sup>26</sup> and 89% of physicians reported at least 1 request from parents to spread out vaccines in a typical month.<sup>27</sup> This suggests the need for more-comprehensive studies of the use of ACISs for children throughout the nation, as well as investigations into the safety, efficacy, and potential consequences of delaying immunizations.

Second, our findings illustrate reasonable judgments by pediatricians who are faced with a parent who requests an ACIS. Pediatricians must navigate a course that ultimately respects parental authority and decision-making but strives to protect the health of the child and to maintain a therapeutic alliance with the parent. According to our study, pediatricians seem to consider parents' requests for ACISs by generally conceding strict adherence to the recommended immunization schedule but remaining firm in their recommendations for a few vaccines (Hib vaccine, DTaP vaccine, and PCV). By doing so, pediatricians are working to protect the child from diseases that are still common (eg, pertussis) or that are more likely to have severe sequelae in infancy and early childhood (eg, Hib or pneumococcal meningitis), while respecting parental wishes to follow an ACIS.

Third, our findings suggest a need for flexibility in addressing parental immunization requests. One potential approach would be to take advantage of the inherent flexibility in the ACIP schedule for each vaccine dose, denoted by the window in the schedule that reflects the acceptable time period during which that dose can be given. For example, at 2 months of age, there is a 4-week period during which the first doses of DTaP vaccine, Hib vaccine, IPV vaccine, and PCV may be administered.<sup>21</sup> Strict adherence to the ACIP recommended schedule would call for simultaneous administration of these 4 doses at a single visit; however, if the 4 doses were spaced out but still administered within the recommended 4-week period (eg, 2 at the beginning of the interval and 2 at the end of the interval), this would remain compatible with the ACIP schedule and might alleviate some parental immunization concerns (albeit at increased cost).

Although a strategy such as this might be appropriate and helpful, it likely would not be sufficient to address all parental immunization concerns. To this end, the results of our study suggest that there is a need for supporting pediatrician judgment regarding how best to administer all recommended vaccines to children whose parents request an ACIS. At a minimum, evidence of frequent parental requests for ACISs and the approaches of pediatricians who accommodate those requests demonstrate the need for policymakers to consider the challenges faced by primary care clinicians in implementing the recommended immunization schedule. Additional research is needed to elucidate the potential population-level effects of ACISs.

Our study has a number of limitations. Inherent in any survey is the possibility of response bias, which may affect results. Because our results were based on data from a subsample of Washington State pediatricians who completed the survey, the results may not be generalizable to all pediatricians in Washington State, pediatricians in other states, or other types of childhood immunization providers, including family physicians, physician assistants, and nurse practitioners. However, our finding that 61% of responding pediatricians were comfortable using ACISs if asked is similar to the results of a recent national survey in which 64% of responding pediatricians and family physicians would agree to spread out vaccines in the primary series at least sometimes.<sup>27</sup>

An additional limitation of our survey is that we were unable to differentiate providers who were comfortable with ACISs because they thought ACISs were as effective as or superior to the existing recommendations from those who have become comfortable with ACISs because parents of their patients are unwilling to agree to the ACIP-recommended schedule. However, our results clearly show that pediatri-

cians' comfort using ACISs if requested is not associated with the belief that there are too many immunizations per visit or overall, and an overwhelming majority would follow the ACIP-recommended schedule if they were to become new parents in 2010.

## CONCLUSIONS

Parents frequently request ACISs from Washington State pediatri-

cians. Most pediatricians are comfortable using ACISs if requested, although they are less willing to use ACISs for certain vaccines (Hib vaccine, DTaP vaccine, and PCV) than for others. Therefore, primary care clinicians should be recognized for seeking to immunize their patients against common and devastating diseases of infancy while maintaining a therapeutic alliance with par-

ents. There is a need for flexibility when considering clinicians' immunization practices, to allow the exercise of individual clinical judgment in managing parental concerns and protecting patients against vaccine-preventable diseases. Further research is needed for a full understanding of the prevalence of the use of ACISs and the consequences of such use.

## REFERENCES

1. Sears RW. *The Vaccine Book: Making the Right Decision for Your Child*. New York, NY: Little, Brown; 2007
2. Gordon J. Vaccinations today. Available at: <http://drjaygordon.com/pediatrics/vaccinations-today.html>. Accessed December 29, 2010
3. Miller DW. A user-friendly vaccination schedule. Available at: [www.lewrockwell.com/miller/miller15.html](http://www.lewrockwell.com/miller/miller15.html). Accessed December 29, 2010
4. Offit PA, Moser CA. The problem with Dr Bob's alternative vaccine schedule. *Pediatrics*. 2009;123(1). Available at: [www.pediatrics.org/cgi/content/full/123/1/e164](http://www.pediatrics.org/cgi/content/full/123/1/e164)
5. Feikin DR, Lezotte DC, Hamman RF, Salmon DA, Chen RT, Hoffman RE. Individual and community risks of measles and pertussis associated with personal exemptions to immunization. *JAMA*. 2000;284(24):3145–3150
6. Salmon DA, Haber M, Gangarosa EJ, Phillips L, Smith NJ, Chen RT. Health consequences of religious and philosophical exemptions from immunization laws: individual and societal risk of measles. *JAMA*. 1999;282(1):47–53
7. Glanz JM, McClure DL, Magid DJ, et al. Parental refusal of pertussis vaccination is associated with an increased risk of pertussis infection in children. *Pediatrics*. 2009;123(6):1446–1451
8. Cohen E. Should I vaccinate my baby? Available at: [www.cnn.com/2008/HEALTH/family/06/19/ep.vaccines/index.html?iref=newssearch](http://www.cnn.com/2008/HEALTH/family/06/19/ep.vaccines/index.html?iref=newssearch) 2010. Accessed December 29, 2010
9. Kono BP. eLetter re: The Third Rail. Available at: [http://pediatrics.aappublications.org/content/123/1/e164.full/reply#pediatrics\\_el\\_39940](http://pediatrics.aappublications.org/content/123/1/e164.full/reply#pediatrics_el_39940). Accessed December 15, 2009
10. Gust DA, Darling N, Kennedy A, Schwartz B. Parents with doubts about vaccines: which vaccines and reasons why. *Pediatrics*. 2008;122(4):718–725
11. Smith PJ, Kennedy AM, Wooten K, Gust DA, Pickering LK. Association between health care providers' influence on parents who have concerns about vaccine safety and vaccination coverage. *Pediatrics*. 2006;118(5). Available at: [www.pediatrics.org/cgi/content/full/118/5/e1287](http://www.pediatrics.org/cgi/content/full/118/5/e1287)
12. Taylor JA, Darden PM, Slora E, Hasemeier CM, Asmussen L, Wasserman R. The influence of provider behavior, parental characteristics, and a public policy initiative on the immunization status of children followed by private pediatricians: a study from Pediatric Research in Office Settings. *Pediatrics*. 1997;99(2):209–215
13. Diekema DS. Responding to parental refusals of immunization of children. *Pediatrics*. 2005;115(5):1428–1431
14. Omer SB, Salmon DA, Orenstein WA, deHart MP, Halsey N. Vaccine refusal, mandatory immunization, and the risks of vaccine-preventable diseases. *N Engl J Med*. 2009;360(19):1981–1988
15. Smith PJ, Humiston S, Zhao Z, Dorell C, Hibbs B, Howes C. Association between delayed or refused vaccination doses and timely vaccination coverage. E-PAS2010:4401.73
16. Omer SB, Pan WK, Halsey NA, et al. Nonmedical exemptions to school immunization requirements: secular trends and association of state policies with pertussis incidence. *JAMA*. 2006;296(14):1757–1763
17. Gust DA, Strine TW, Maurice E, et al. Underimmunization among children: effects of vaccine safety concerns on immunization status. *Pediatrics*. 2004;114(1). Available at: [www.pediatrics.org/cgi/content/full/114/1/e16](http://www.pediatrics.org/cgi/content/full/114/1/e16)
18. Smith PJ, Humiston SG, Parnell T, Vannice KS, Salmon DA. The association between intentional delay of vaccine administration and timely childhood vaccination coverage. *Public Health Rep*. 2010;125(4):534–541
19. Sudman S, Bradburn NM. *Asking Questions*. San Francisco, CA: Jossey-Bass; 1982
20. Dillman DA. *Mail and Internet Surveys: The Tailored Design Method*. 2nd ed. Hoboken, NJ: Wiley; 2007
21. Centers for Disease Control and Prevention. Immunization schedules: childhood schedule. Available at: [www.cdc.gov/vaccines/recs/schedules/default.htm](http://www.cdc.gov/vaccines/recs/schedules/default.htm). Accessed August 23, 2010
22. Centers for Disease Control and Prevention. Newborn hepatitis B vaccination coverage among children born January 2003–June 2005: United States. *MMWR Morb Mortal Wkly Rep*. 2008;57(30):825–828
23. Clark SJ, Cabana MD, Malik T, Yusuf H, Freed GL. Hepatitis B vaccination practices in hospital newborn nurseries before and after changes in vaccination recommendations. *Arch Pediatr Adolesc Med*. 2001;155(8):915–920
24. Guttman A, Manuel D, Dick PT, To T, Lam K, Stukel TA. Volume matters: physician practice characteristics and immunization coverage among young children insured through a universal health plan. *Pediatrics*. 2006;117(3):595–602
25. Wooten KG, Janssen A, Smith PJ, Pickering LK. Associations between childhood vaccination status and medical practice characteristics among white, black, and Hispanic children. *J Natl Med Assoc*. 2009;101(3):229–235
26. Dempsey AF, Schaffer S, Singer D, Butchart A, Davis M, Freed GL. Alternative vaccination schedule preferences among parents of young children. *Pediatrics*. 2011;128(5):848–856
27. Kempe A, Daley MF, McCauley MM, et al. Prevalence of parental concerns about childhood vaccines: the experience of primary care physicians. *Am J Prev Med*. 2011;40(5):548–555

## Washington State Pediatricians' Attitudes Toward Alternative Childhood Immunization Schedules

Aaron Wightman, Douglas J. Opel, Edgar K. Marcuse and James A. Taylor  
*Pediatrics*; originally published online November 28, 2011;  
DOI: 10.1542/peds.2011-0666

### Updated Information & Services

including high resolution figures, can be found at:  
<http://pediatrics.aappublications.org/content/early/2011/11/22/peds.2011-0666>

### Permissions & Licensing

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:  
<http://pediatrics.aappublications.org/site/misc/Permissions.xhtml>

### Reprints

Information about ordering reprints can be found online:  
<http://pediatrics.aappublications.org/site/misc/reprints.xhtml>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2011 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

