

Cowlitz County Immunization Survey: Final Report on a Birth Certificate Follow-back Analysis of Immunization Rates for 19-35 Month Old Children, September 2004

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Executive Summary

In the fall of 2003 the Cowlitz County Health Department (CCHD) conducted an immunization survey of children aged one-and-a-half years to three years. Interviewers surveyed the parents/guardians of 149 children from a random sample of 200 to determine their immunization status. Five sets of antigens (vaccine components) required for childcare or school entry in Washington State for infants and young children were studied:

- Diphtheria, tetanus and pertussis (DTaP)
- Polio (IPV)
- Measles (usually administered as measles, mumps and rubella (MMR))
- Hepatitis B (Hep B)
- *Haemophilus influenzae* type B (Hib)

The Advisory Committee on Immunization Practices (ACIP) recommends additional vaccines for all children living in Washington State:

- Varicella (VAR)
- Hepatitis A (Hep A)
- Pneumococcal Conjugate Vaccine (PCV7)
- Influenza

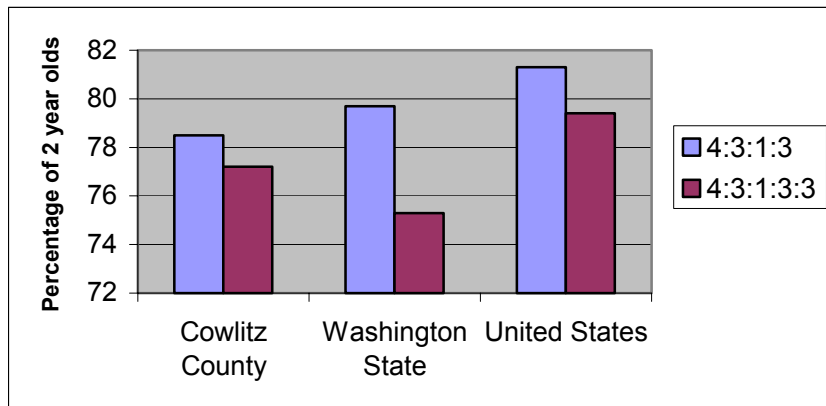
The major findings of the study are:

- In Cowlitz County 78.5% of the children aged one-and-a-half to three years received the correct number of vaccinations for the DTaP, Polio, MMR, and HIB vaccine series. However, only 74.5% of them received immunizations of the first four series (DTaP, Polio, MMR, and HIB) where the dose was considered to be valid by meeting minimum age and spacing guidelines. When hepatitis B is added, the rate of children with valid immunizations drops slightly to 72.5%. The minimum age requirements and intervals between doses that determine a

vaccine dose's validity have been established by ACIP in the *General Recommendations on Immunization*.¹

- Cowlitz County valid immunizations for:
 - DTaP (4 doses) – 81.4%
 - Polio (3 doses) – 91.3%
 - MMR (1 dose) – 91.3%
 - HIB (3 doses) – 94.0%
 - Hepatitis B (3 doses) – 89.3%
 - Varicella (1 dose) – 76.5%
- Children started immunization on time and were up-to-date for immunizations at three months of age (1 DTaP, 1 polio, 1 Hib, and 1 Hep B) were sixteen times more likely to be up-to-date at two years of age (OR=16.1; CI 7.7,33.5).
- Children receiving their first dose of hepatitis B vaccine before hospital discharge (within 5 days of birth) are more likely (OR=2.1; CI 0.8,5.5) to be up-to-date with their immunizations at 2 years of age, the 4:3:1:3 series. This association between keeping your child up-to-date and choosing to start vaccinating him at the earliest age, demonstrates the importance of the hepatitis B birth dose; it provides a safety net to children exposed to the hepatitis B virus at birth and is a predictor of children staying on schedule with recommended vaccines.
- Cowlitz County falls short of the *Healthy People 2010* immunization goal of 90% for DTaP with a valid immunization rate of 81.4%. The fourth dose of DTaP was the most frequently missed or invalid dose of vaccine, 15% of children in the study did not meet the guidelines for this dose which are as follows; administered to a child who is at least 12 months of age, and is at least 116 days after the third dose of DTaP administered (this interval is only valid in retrospective review and includes the 4-day grace period).¹
- Our immunization coverage rates for the 4:3:1:3 series accepting any doses of vaccine regardless of age or interval, was 78.5%, similar to that for Washington State (79.7%) the United States (81.3%), Table A.²
- When adding the hepatitis B vaccine series to the analysis, our immunization coverage rates for the 4:3:1:3:3 series accepting any doses of vaccine regardless of age or interval, dips only slightly to 77.2%, achieving a significantly higher rate than Washington State (75.3%) and slightly lower than the United States which is at 79.4% (Table A) for 2003.³
- We did not observe any significant differences in rates of immunizations in Cowlitz County between ethnic or racial groups, between parents with or without a high school education, among types of immunization providers, or between families above or below the federal poverty level during the child's first year of life.
- The only barrier that was significantly associated with children being up-to-date was children whose parents reported no requirement for a well-child visit in order to access immunization services were twice as likely as parents required to make a well-child visit to be up-to-date on immunizations.

Table A. Immunization Series Coverage Rates for 2 year olds



Recommendations:

- Start all children on time with the ACIP recommended vaccine series. Starting children on time increases their chance of remaining up-to-date through childhood.^{4,5,6}
- Immunization providers should increase their attentiveness to the minimum required intervals for all vaccines, particularly the fourth DTaP dose to minimize the number of invalid doses administered.
- All immunization providers should avoid the classic missed opportunities, such as, not immunizing the child because someone in the house is pregnant, the child has an ear infection with no or a low-grade fever, the child is due for four different injections. Make the best use out of every encounter in the provider's office, review and post in the clinic area ACIP's contraindications and precautions to immunization (<http://www.cdc.gov/nip/recs/contraindications.pdf>).
- We recommend that the State of Washington add varicella, second dose measles, and hepatitis A to preschool and school entry requirements in order to support the routine recommendation of these vaccines and to reduce the burden of these diseases in our community.
- We commend local clinicians for promoting the birth dose and hope that the practice will continue to be supported.
- Public Health should consult community immunization providers on their interest and resources that could be lent towards immunization coalition development, especially in concert with Child Profile promotion activities.

COWLITZ COUNTY IMMUNIZATION SURVEY

Final Report

I. Background

In the summer of 2003 the Cowlitz Health Department (CCHD) obtained funding from the Washington State Department of Health (DOH) to conduct an immunization survey of 1 ½- to 3-year-olds (19 to 35 months of age) born in Cowlitz County. The purpose of the survey was to determine their immunization status and identify problems or barriers related to obtaining immunizations. The survey was to follow the guidelines set forth by the DOH and the Centers for Disease Control and Prevention (CDC).

II. Methods

The Cowlitz County Immunization Project used the Birth Certificate Follow-Back (BCFB) approach to conduct its immunization survey. The Washington State Department of Health provided a random sample of 200 birth certificates from the population of Cowlitz County children born between September 1, 2000, and January 26, 2002. Deaths of children in Cowlitz County who were born during the time frame were checked to ensure they were not on the list; one child death was identified and excluded. The project staff then checked with DSHS staff to determine if any children on the list were in foster care. The two children in foster care remained in the study. Surveyors were given a training session by staff from the Washington Department of Health. An incentive of \$10 gift certificates from Fred Meyer was provided to survey participants. Target donated one \$50 gift certificate that was used as a raffle item at the end of the project. The Immunization Survey Project mailed out postcards to all of the families on the list to inform them about the survey. The Project specified on the postcards that they not be forwarded to a new address by the post office; returned postcards would help staff track families who had moved.

If face-to-face interviews were not possible, phone or mail interviews would be conducted. Interviewing began on August 19, 2003. Surveyors soon realized that many of the families' addresses and phone numbers were no longer current. Because Medicaid pays for approximately 57% of the births in Cowlitz County, the project staff knew that Medicaid updates would be critical for finding a sufficient number of families.⁷ The State Department of Health (DOH) provided those updates between October 18 and November 3. DOH also offered assistance in performing an electronic search for addresses or phone numbers of families not located. The results from that search did not arrive until December 11, but two families were found before interviewing concluded on December 15. Verification of the children's immunization records was conducted after obtaining written parental consent. The first round of consent forms for release of immunization records was sent to medical providers on November 30; the second and last round was sent by December 20.

The following time line shows the project activities:

1. Interviewing through the summer, post cards, home visits, multiple interpreters used,

2. Verified immunizations
3. Child profile provided new addresses, variety of sources for new addresses

Summer 2003:

- CCHD notified of grant award
- DOH workshop in Longview for recipients of grant awards

Fall 2003:

- Random list of 200 children's names were received from DOH
- List distributed to MCH agencies
- Death certificates checked
- List reviewed for children in foster care
- Post cards mailed to families on the list
- Training session conducted for interviewers
- Interviewing began
- First set of address updates sent by DOH

Winter and Spring 2003-2004:

- Last set of address updates sent by DOH
- First round of records requests to medical providers mailed
- DOH sent results of electronic search on families that surveyors could not find
- Interviewing ceased
- Second round of records requests to medical providers mailed
- Last immunization records received from medical providers

Summer 2004

- Data clean-up and analysis
- Report completion

III. Surveying Process

Of the 200 families on the list, 149 (74.5%) were interviewed. Families still residing in Cowlitz County accounted for 135 (90.6%) of the families interviewed. There were 51 families not surveyed (25.5%). If no response was received by phone, surveys were mailed to families whom interviewers were unable to interview in person or by phone; also home visits were used to complete surveys. Ten (4.5% of the total on the list) refused to participate. There were 42 families (21.0%) who were not located by the interviewers.

IV. Data Analysis and Results

This section contains the results of the Cowlitz County Immunization Survey. The demographic data of the participants can be found in Appendix A and results of survey questions about nutrition, physical activity, and tobacco are found in Appendix B. Appendix C contains a copy of the questionnaire.

A. Demographics

One hundred forty-nine persons completed the survey for their individual children. The children were 19-35 months of age at the time of the assessment and 55.7% assessed

were male (n=83). All but one of the children surveyed had at least one dose of vaccine in the past. One interviewee reported that their child was completely unimmunized. The survey did not collect the individual child’s race and ethnicity, instead, the race and ethnicity of the interviewee (primarily biologic parents) is used as a proxy for the child’s, which was collected in all but one interview, Table 1. Of those now living outside of Cowlitz County, 10 were still living within Washington State and 3 had moved to another state. Interviewees, hereafter referred to as “Parents”, reported that the child had moved 0 to 7 times since birth, with the mean number of moves at 0.87. The interviewers conducted 137 surveys (91.9%) in English. The remaining interviews were completed with the assistance of interpreters, eight in Spanish (5.4%), two in Russian (1.3%), and two in Cambodian (1.3%). Parents were queried on the number of siblings currently living in the household, 74.3% of parents reported older siblings in the household; with a range of one to nine older siblings, and a mean and median of one older sibling. Less than a quarter of parents (22.8%) reported younger siblings in the household, and none more than one sibling at the time of the interview.

Table 1. Racial and Ethnic Distribution of Interviewees

Hispanic Ethnicity	Race - interviewee					Total
	White	Black/ African American	Amer. Indian/ Alaskan Nat.	Asian	Other	
Hispanic (Yes)	9	0	0	0	0	9
No	128	3	4	2	2	139
Don’t know if Hispanic	1	0	0	0	0	1
Total Count	138	3	3	2	3	149
Race %	92.6%	2.0%	2.7%	1.3%	1.3%	100.0%

B. Immunization and Health Care History

The parents reported that most often, the mother took the child in for his immunizations, 92.6% (n=137). There was some overlap in the replies to this question; in addition, fourteen fathers took the child in for shots in addition to the mother. Two additional fathers were the only one person who took their child in for shots. Some grandmothers were also reported as taking the child in for immunizations. The vast majority of interviewees reported that the children currently had a primary care provider, or 98.7%. All children who had a primary care provider at the time of birth still had a primary care provider (n=118), unfortunately, the two children without a primary care provider at birth are currently without a primary care provider (7.1%) out of a total of 28 children with no reported medical home. Due to the way the question was asked it is unknown whether they’ve never had a primary care provider or just sporadically have been without a medical home.

Table 2. Child’s Primary Care Provider Status, at birth, at time of Survey

		Child has primary care provider now		Total
		Yes, Has Provider Now	No, No provider now	
At birth, child had a primary care provider	Yes, had a Provider	118	0	118
	No, didn’t have a provider	26	2	28
	Don’t know	1	0	1
Total		145	2	147

C. Required Immunizations

The State of Washington pays for required vaccines for its children using federal funding through the National Immunization Program. Table 3 shows the five immunization series and number of doses currently required in the State of Washington that children should receive during the first year and-a-half of life in preparation for school or daycare entry. When assessing immunization status, 4:3:1:3 refers to 4 diphtheria/tetanus/pertussis, 3 polio, 1 measles mumps/rubella, and 3 *Haemophilus influenzae* type b vaccines. The required doses of Hib vaccine ranges from 3 to 4 doses depending upon formulation used (see Table 3), therefore “3” is used to evaluated completion rates of this series. The configuration 4:3:1:3:3 refers to those same four vaccines in addition to 3 hepatitis B vaccine doses.

Table 3. Immunizations and doses required by the State of Washington for school or childcare entry.

Vaccine Series	Number of Doses for School entry
Diphtheria, tetanus, & pertussis (DTaP)	4
Polio (IPV)	3
Measles, mumps, & rubella (MMR)	1
<i>Haemophilus influenzae</i> type b (Hib)*	3
Hepatitis B (HB)	3

* The required doses of Hib vaccine ranges from 3 to 4 doses depending upon formulation used (Brand name): HbOC (HibTITER), PRO-T (ActHIB) need 4 doses to complete the series, while PRP-OMP (PedvaxHIB & combination vaccine COMVAX) need only 3 doses to complete the Hib series. The Hib series is only required for childcare entry.

Immunizations should be given in accordance with the minimum age and dosage intervals specified by ACIP. These minimum age and dosage intervals may not correspond with the *optimal* recommended ages and intervals for vaccination. However, if a vaccine dose is given prior to the minimum acceptable interval, it is not counted and it should be given again. The ACIP, the American Academy of Pediatrics (AAP), and the

American Academy of Family Physicians (AAFP) have agreed upon these intervals. The sources of information used here are the Red Book 2003, Report of the Committee on Infectious Diseases, 26th Edition, published by the AAP, and the ACIP’s “General Recommendations on Immunization.”

Table 4 details the minimum age and dosage intervals for the ages of children in this study, not the recommended ages at which children are immunized, e.g., 2, 4, 6 months of age. The analysis also took into account the 4-day grace period, established by ACIP in the same edition of the “General Recommendations on Immunization”.

Table 4. The minimum age and dosage intervals defining valid immunizations for children less than four months through 6 years of age.⁸

Dose 1 (Minimum age)	Minimum Interval Between doses			
	Dose 1 to Dose2	Dose 2 to Dose 3	Dose 3 to Dose 4	Dose 4 to Dose 5
DTaP (6 weeks)	4 weeks	4 weeks	6 months	6 months ¹
IPV (6 weeks)	4 weeks	4 weeks	4 weeks ²	
Hepatitis B (birth)	4 weeks	8 weeks ³		
PCV7 (6 weeks)	4 weeks ⁴	4 weeks ⁵	8 weeks ⁶	
Hib (6 weeks)	4 weeks ⁷	4 weeks ⁸	8 weeks ⁹	
MMR (12 months)	4 weeks ¹⁰			
Varicella (12 months) ¹¹	Not applicable			
Hepatitis A (2 years)	6 months			

The grace period allows for additional flexibility in the retrospective review of immunization results. Therefore, if 4 weeks is the minimum spacing between dose 1 and 2 of DTaP, the actual minimum number of days is 24 (28 days – 4 day grace

¹ DTaP: The fifth dose is not necessary if the fourth dose was given after the fourth birthday.

² IPV: For children who received an all-IPV or all-oral poliovirus (OPV) series, a fourth dose is not necessary if third dose was given at age greater than or equal to 4 years. If both OPV and IPV were given as part of a series, a total of 4 doses should be given, regardless of the child's current age.

³ Hep B: The third dose must be 8 weeks after the second dose, 16 weeks after the first dose, and the child must be at least 24 weeks of age. All children and adolescents who have not been immunized against hepatitis B should begin the Hep B immunization series during any visit. Providers should make special efforts to immunize children who were born in, or whose parents were born in, areas of the world where hepatitis B virus infection is moderately or highly endemic

⁴ Pneumococcal conjugate (PCV7): Interval is 4 weeks if first dose was given at age less than 12 months and current age is less than 24 months. Interval is 8 weeks; this is the final dose because the first dose given before 12 months of age and child is less than 5 years. No further doses are needed for healthy children if first dose is given at 24 months of age or older.

⁵ PCV7: Interval is 4 weeks if current age is less than 12 months. If the child is at least 12 months of age, the interval is at least 8 weeks and this is the final dose. No further doses are needed if previous dose was given at age 24 months or greater.

⁶ PCV7: Interval is 8 weeks as the final dose. This dose is only necessary for children 12 months – 5 years who received 3 doses before 12 months of age.

⁷ Hib: Interval is 4 weeks if first dose was given at age less than 12 months. Interval is 8 weeks if this dose is the final dose because the first dose given before 12 months of age. No further doses are needed if first dose is given at 15 months of age or older.

⁸ Hib: Interval is 4 weeks if current age is less than 12 months. Interval is 8 weeks if child is greater than 12 months of age AND the second dose was given at age 15 months or greater. No further doses are needed if previous dose was given at age 15 months or greater.

⁹ Hib: Interval is 8 weeks as the final dose. This dose is only necessary for children 12 months – 5 years who received 3 doses before 12 months of age.

¹⁰ MMR: The second dose of MMR is recommended routinely at age 4 to 6 years but may be given earlier if desired.

¹¹ Varicella: Give 2-dose series to all susceptible adolescents age greater than or equal to 13 years.

period). This permits the inclusion of vaccine doses that would have previously been considered invalid.

D. Optional Immunizations

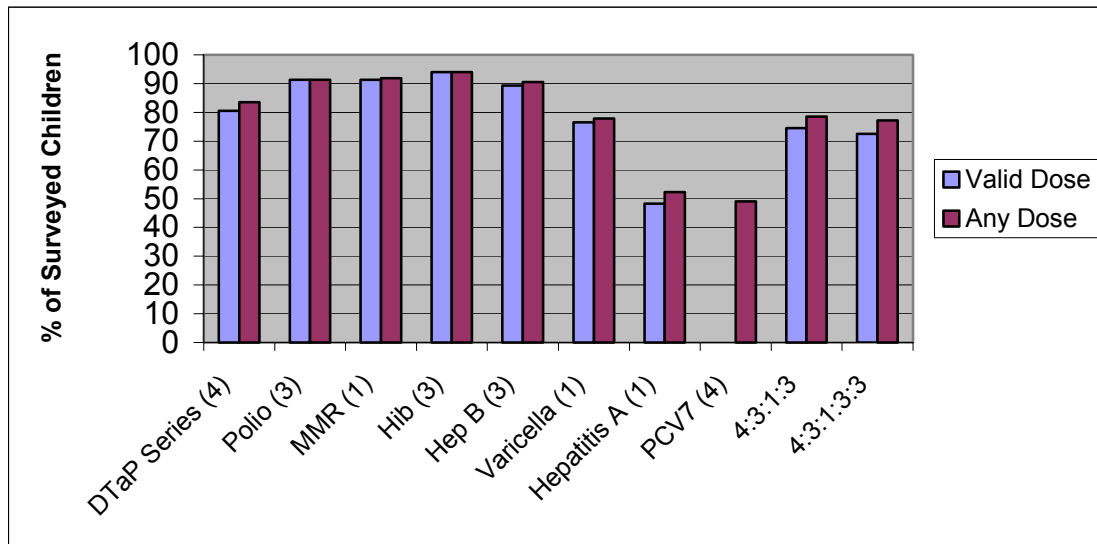
At the current time varicella, hepatitis A, and pneumococcal (conjugate) vaccinations are not required for school entry in Washington State but are recommended and routinely administered in the private and public sectors. The state now pays for these vaccinations using federal funding. The varicella, pneumococcal and hepatitis A vaccines were recorded on the survey forms if they had been given. While the CDC has defined Cowlitz County as a high-risk area for hepatitis A due to a history of high rates of cases reported during the 1990's.⁹ The random sample for this study includes children less than two years of age, the minimum age for giving the hepatitis A vaccine; therefore not all children were eligible for vaccination at the time of the survey.

E. Results on Required Immunizations

This report will present the immunization data for the 19- to 35-month-old children in this study. Data will be presented showing the status of each vaccination series (required and optional), the number of shots that were given for each vaccination series, and whether or not those shots are valid (were given according to the minimum intervals stipulated by the ACIP). Data will also be presented on the percentages of children who have the 4:3:1:3 series and the 4:3:1:3:3 series. Cowlitz County data will be compared with Washington State, United States data, and the immunization goal. The goal set by the CDC for immunization status in *Healthy People 2000* and in *Healthy People 2010* is 90%.

Table 5 presents the immunization status of children in the study for each vaccine series and illustrates the individual antigen coverage rates comparing all doses administered to the percentage of valid vaccine doses administered. Like other counties, Cowlitz County is working towards the *Healthy People 2010* goal of 90% coverage rates for DTaP, polio, MMR, Hib, and Hepatitis B vaccines. The DTaP rates of 80.5% of the children with valid doses and 83.5% with the correct number of doses limit us from meeting this goal. The DTaP rates affect the 4:3:1:3 and 4:3:1:3:3 series percentages more than other vaccines because of the drop off in the number of children with three DTaP doses that go on to receive the fourth as recommended at 15-18 months of age. This is not unique to Cowlitz County, some impact on rates by the 4th dose of DTaP can be observed by nearly every state with similar school immunization requirements. Due to school entry requirements, children often don't pick up the 4th DTaP until school entry at 4 to 5 years of age, a delay of years.¹⁰ This prominent delay in the 4th dose DTaP has a significant impact on our immunization rates. While 78.5% of the children received the correct number of doses for the 4:3:1:3 series, the percentage dropped slightly to 77.2% for the 4:3:1:3:3 series. There were 78.5% children who had valid doses for the 4:3:1:3 series and 72.5% who had valid doses for the 4:3:1:3:3 series.

Table 5: Estimated vaccination coverage with individual vaccines and selected vaccination series among children 19 to 35 months of age*



G. Results on Optional Immunizations

Of the 149 children in the survey, 116 (77.9%) had received the varicella vaccine. Table 5 includes varicella and hepatitis A rates. One hundred fourteen (76.5%) of the children had valid varicella vaccinations, which should be given after a child’s first birthday. Hepatitis A vaccine, which is recommended but not required in Cowlitz County, was given to 78 (52.3%) of the 149 children in the survey. Because of the age range of the survey (19 to 35 months), the number of children eligible for a second hepatitis A dose was significant, 73 had had a valid first dose and were therefore likely eligible for their second dose. Nearly half (48.3%) of eligible children surveyed have had 1 valid dose of hepatitis A vaccine. Fifteen children surveyed had had a hepatitis A second dose (two had a dose given too early. Also, children are routinely seen for well-child care at the second and third birthdays. A logical time for the second dose would be at the well-child visit around the third birthday. No analysis was made of the validity of the pneumococcal series, but the majority had at least three doses (71.8%) and 73 (49%) had received 4 doses of vaccine despite periodic vaccine shortages in recent years.

H. Data Comparison

Cowlitz County data can be compared with Washington State and national data provided by the National Immunization Survey (NIS) conducted by the CDC. Children in the NIS were born between February 2000 and May 2002, while children in the Cowlitz County study were born between September 2000 and February 2002. Both surveys only include children 19 to 35 months of age or “2 year olds”. The following comparisons involve the total number of doses of the vaccines. Table 6 below presents the vaccination coverage with individual vaccines and selected vaccination series for children 19 to 35 months of age. Percentages of children immunized are presented first; beside the percentage is the 95% Confidence Interval.

Table 6. Estimated vaccination coverage with individual vaccines and selected vaccination series among children 19 to 35 months of age (2003)¹¹

	4+DTP	3+Polio	1+MMR	3+Hib	3+HepB	1+Var	3+PCV	4:3:1:3	4:3:1:3:3
US National	80.1±1.1	90.0±0.8	91.3±0.8	93.1±0.7	91.0±0.8	82.9±1.0	66.7±1.3	81.3±0.9	79.4±0.9
Washington State	72.2±5.6	90.4±3.9	92.2±3.5	95.1±2.7	89.2±3.8	61.6±6.0	63.5±5.8	79.7±4.3	75.3±4.6
Cowlitz County	83.5	91.3	91.9	94.0	90.6	77.9	71.8	78.5	77.2

I. Type of Immunization Provider

The majority of parents surveyed with immunized children (n=135 (90.6%)) had received at least one copy of the child’s immunization record and typically received care at a private medical practice, (n=137 (92.6%)). The parents were asked where their child had ever been vaccinated, choices provided were: private medical practice, community health clinic, local health department, urgent care center, military clinic/hospital, Indian Health Service clinic, emergency room, hospital (at birth), or other, see Table 7. The only sites where children were reportedly immunized were at private clinics, community health clinics, the health department, and at the hospital following birth. An additional finding is that the children who received their first hepatitis B dose at the hospital before discharge were more likely to be up-to-date (UTD) at the time of the survey, (OR=2.1; CI 0.8,5.5). This finding has been reported in the literature by others in the past, but is infrequently noted during local assessments.¹²

Table 7. Where the child gets immunized and how well immunized children are by site of Immunization (Parent may have reported more than one site)

Location of Care	Frequency	Percent	Percent of Children UTD for 4:3:1:3
Private provider	134	91.2%	79.1%
Hospital at Birth	96	64.4%	78.1%
Community Health Clinic	13	8.8%	53.8%
Health Department	2	1.2%	50.0%

J. Immunization Status and Demographic Data

Immunization rates in Cowlitz County do not differ significantly when analyzed by families above or below the federal poverty level, parents with or without a high school education, ethnic or racial groups, or participation in the WIC program.

K. Invalid and Missed Immunizations

There were a total of 27 children out of the 149 in the survey who received invalid immunizations or were missing immunizations. The fourth dose of the DTAP vaccine was the most common problem following the too early administration of the hepatitis A vaccine, accounting for 25% of all vaccine problems in the survey.

In Cowlitz County the most common minimum age and interval (MAI) violation was the

interval between the third and fourth DTAP dose. There were three children in the survey (11% of the total with invalid doses) whose only immunization problem was an invalid fourth DTAP dose. One of the three children's fourth DTaP dose was given at the correct interval from DTaP 3, but administered at before the first birthday. The two other children's fourth DTaP were both given too close to the fourth dose but at an appropriate age. The fourth dose should not be given until after a child's first birthday, and at retrospective review there must be a minimum of four months (116 days, 120 days less 4 grace period days) between the third and fourth doses. Should immunization providers look at the recommended time for the fourth dose at the time the vaccine is administered, or being forecasted (15 to 18 months of age) and fail to calculate the minimum interval allowed between doses 3 and 4 (six calendar months), the fourth DTaP might easily be given too early. Although, the more likely reason for the missing dose is the decreased frequency of well-child visits after the first year of life, decreasing the provider's opportunities to provide the 4th dose. Table 4 shows the DTaP intervals and ages.

L. Barriers to Obtaining Immunizations

Several questions were asked regarding barriers to obtaining immunizations. Table 8 shows the answers to those questions. The barrier most often identified was the requirement by the health care provider that to get immunizations, the child must be scheduled for a well-child check-up. Reported problems with scheduling their child for immunizations was a common theme, with a third of parents reporting that they had to take time off work to get their child in for shots, for some that was a challenge (8.7%). The next most common barrier was the parents report not being reminded of when immunizations are due by their health care provider, with 42 participants (28.2%) identifying this as a problem. The only barrier that was significantly associated with children being up-to-date was children whose parents reported no requirement for a well-child visit in order to access immunization services were twice as likely as parents required to make a well-child visit to be up-to-date on immunizations (OR=2.0; CI 0.89,4.7)

Table 8: Potential barriers to obtaining immunizations reported by parents.

Answer	Frequency	Percent
Had to schedule well-child check in order to get immunizations	57	38.3
Took time off work for child's shots	55	36.9
Doesn't receive reminders from provider	42	28.2
It was difficult to get time off work	12	8.1
Lack of adequate transportation	10	6.7
Has problems scheduling appointments	8	5.4
Has problem getting immunizations due to clinic hours	4	2.7
Cost was a problem	4	2.7
Provider sent them elsewhere for immunizations	3	2.0

M. Personal, Philosophical, or Religious Objections to Immunizations

There were nine participants who voiced personal, philosophical, or religious reasons for why some immunizations should not be given to their child. Seven of the parents commented on which vaccines were of concern to them and what their concern was. Of the nine children whose parents voiced these concerns, 44% had missing vaccinations. The reasons they offered for their objections were:

Table 9. Vaccines that should not be given, and why

Vaccine(s)	Reason for not vaccinating	Frequency	Percent	Cumulative Percent
General	Reason not specified	2	22.2	22.2
General	Concern about the relationship between autism & mercury content	1	11.1	33.3
General	Concern about side effects & risks of vaccinating	1	11.1	44.4
General	Vaccines are overused in our "dirty, non moral [immoral], society"	1	11.1	55.5
Hepatitis A	Not really needed for Cowlitz County	1	11.1	66.6
MMR & Varicella	Concerned about side effects. Also, vaccines are not needed because they (the diseases they prevent)) are not a big risk	1	11.1	77.7
MMR	Link to autism	1	11.1	88.8
MMR	Concerned about autism and rash	1	11.1	100.0
Total		9	100.0	

N. Child Did Not Get Immunized When Caregiver Expected

Participants were asked, "During any of the child's doctor or clinic visits, did he/she not get immunized when you expected him/her to be?" There were 30 "yes" responses (20.3%). The most common reason, accounting for 66.7% of the answers, was that the health care provider thought the child was too sick. Table 10 shows the reasons given.

Table 10: Child did not get immunized when caregiver expected

Reason for Deferral	Frequency	Percent
Child was too ill	20	66.7%
Too soon for vaccination	3	10%
Not enough time	1	3.3%
Clinic ran out of vaccines	2	6.7%
Had recent surgery so waited	1	3.3%
Had stitches	1	3.3%
Pregnant – needed MMR	1	3.3%
Don't Know Why	1	3.3%
Total	30	100%

O. Nutrition, Physical Activity, and Tobacco Use Questions

In addition to the immunization related questions, parents were queried about their nutrition, physical activity and tobacco use. The results of these questions are described in Appendix B. In brief, the parents who were surveyed felt themselves to be in very good health or better (56.8%). Many parents also reported good health (30.9%), and only 12% of parents reported being in fair or poor health. While they reported being in good health, many were eating few servings of fruits and vegetables; 40.5% of parents reported eating fruits or vegetables in any amount once a day or less often in the last seven days. Very few parents reported (10.7%) were eating close to the recommended “Five-a-day” at least four servings a day. There was a significant difference between those above and below the poverty level and the consumption of at least 4 servings of fruits and vegetables per day; those parents who exceeded the federal poverty guidelines were more likely to eat four or more servings of fruits and vegetables each day (OR=15.7; CI 4.3, 74.8).

In terms of physical activity, 47.9% of parents reported exercising 4-7 days over the previous seven days. There was no significant correlation between poverty level and physical activity levels. With a high-school education or greater, parents were more than three times more likely to exercise at least four times a week (OR=3.7 CI 1.7, 8.1: p=0.00. Similarly, 60% of parents reported making some effort to lose or maintain their weight during the last month, either by eating less food (7.4%), exercising (8.8%), or both (43.9%). Finally, 41.6% reported having ever smoked cigarettes on a regular basis. These data were used to support the investment of resources into programs focusing on nutrition and physical activity promotion to low-income women and others in the community. There were no correlations found between the child being up-to-date on vaccinations and any of these behaviors.

V. Discussion and Recommendations

Cowlitz County had entered this assessment project with a history of success from the 100% Immunization Project that was formed and took shape in June 1996. The Health

Department partnered with local medical providers and HMO's with a vision of 90% of children to be up-to-date on their immunizations at two years of age, not the 47% that was the baseline at that time. Since then, individual clinics have surpassed that mark. While the project was disbanded after a few years, it remains an excellent example of how collaborations are a win-win situation for the entire community achieving more together than we can do alone. While immunization rates were not at the expected levels of 85-90% coverage for two-year-olds, success in implementing the recommended but not required vaccines (pneumococcal, hepatitis A, and varicella) should be acknowledged. With this successful project in mind, perhaps an immunization coalition still has a place in Cowlitz County to promote immunizations to parents and best practices to providers.

There are many best practices and research findings that can help guide our future efforts in immunizing local children. One of the best ways to increase rates is to focus on increasing participation in Washington's Immunization registry to benefit our local immunization providers, parents and schools by having timely, complete, immunization records available. Accurate and complete immunization records allow children to attend daycare and school, be protected from vaccine-preventable diseases, and prevent over-immunization.

A. Recommendations to Parents and Providers

1. Start vaccinating your child at birth, if not in the hospital, no later than at 2 months of age in order to increase the likelihood of children who will be up-to-date on vaccinations at 2 years of age and at school entry.
2. Encourage and support parents to take their children to their providers at the scheduled well child visits so that the recommended immunization schedule can be followed. When children fall behind in the recommended schedule, they are more likely to be under-immunized.
3. Utilize Child Profile to search for immunization records on children and to forecast or calculate which vaccines should be given at a child's visit to their medical provider.
4. Immunization providers should pay close attention to the minimum required intervals for all vaccines, particularly the fourth DTaP dose. Post recommended and catch-up immunization schedules where shots are administered.
5. Avoid the classic missed opportunities, such as, not immunizing the child because someone in the house is pregnant, the child has an ear infection with no or a low-grade fever, the child is due for four different injections. Make the best use out of every encounter in the provider's office, review and post in the clinic area ACIP's contraindications and precautions to immunization (<http://www.cdc.gov/nip/recs/contraindications.pdf>).
6. This association between keeping your child up-to-date and choosing to start vaccinating him at the earliest age, demonstrates the importance of the hepatitis B birth dose, not only does it provide a safety net to children exposed to the hepatitis B virus at birth, it is also a predictor of children staying on schedule with recommended vaccines. We commend local clinicians for promoting the birth dose.

7. Parents take time to read about immunizations and the current concerns about vaccines. Locate information sources that are scientifically based and who are not funded by the government or pharmaceutical companies, such as the National Immunization Information Network (www.immunizationinfo.org). Clinicians, take time to discuss parental concerns about vaccine safety as they arise.

B. Recommendations to DOH Immunization Program

1. Increase resources allocated to supporting and promoting participation in Child Profile, Washington's Immunization registry.
2. DOH should promote adherence to the Immunization Standards for Child and Adolescent Immunization Practices by health care providers (Appendix D).¹³
3. We recommend that the State of Washington add varicella, second dose measles, and hepatitis A to preschool and school entry requirements in order to support the ACIP's recommendation for the routine administration of these vaccines to all Washington children in order to reduce the burden of these diseases in our community.
4. Use the 4:3:1:3:3 series as a standard measurement rather than the 4:3:1:3 series. Leaving out the required hepatitis B vaccine can give the wrong message to parents and providers that it is not an important immunization.
5. We recommend that the DOH make the following changes in the questionnaire for question #43 (Do you have any personal, philosophical or religious reasons for why some immunizations should not be given to the child?) towards the beginning of the questionnaire. If the answer to the question is yes and the child has not been given any immunizations, many of the questions can be skipped.

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¹Centers for Disease Control and Prevention. General recommendations on immunization: Recommendations of the Advisory Committee on Immunization Practices and the American Academy of Family Physicians. *MMWR* 2002;51(No. RR-2): 1-36.

² Estimated Vaccination Coverage with Individual Vaccines and Selected Vaccination Series Among Children 19-35 Months of Age by State and Immunization Action Plan Area US, National Immunization Survey, 2003. Children in the Q1/2003-Q4/2003 National Immunization Survey were born between February 2000 and May 2002.

³ Estimated Vaccination Coverage with Individual Vaccines and Selected Vaccination Series Among Children 19-35 Months of Age by State and Immunization Action Plan Area US, National Immunization

Survey, 2003. Children in the Q1/2003-Q4/2003 National Immunization Survey were born between February 2000 and May 2002.

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⁵ Ross A, Kennedy AB, Holt E, Guyer B, Hou W, Hughart N. Initiating the First DTP Vaccination Age-appropriately: A Model for Understanding Vaccination Coverage. *PEDIATRICS* 1998; 101(6): 970-974.

⁶ Sabnis SS, Pomeranz AJ, Lye PS, and Amateau MM. Do Missed Opportunities Stay Missed? A 6-Month Follow-up of Missed Vaccine Opportunities in Inner City Milwaukee Children. *PEDIATRICS* 1998; 101(5): p. e5.

⁷ Unpublished data. Correspondence from the Department of Social and Health Services, Research and Data Analysis Division (RDA). Based upon births during 2002.

⁸ Centers for Disease Control and Prevention. Recommended Childhood and Adolescent Immunization Schedule for United States, July - December 2004. *MMWR* 2004;53(16):Q1-Q3.

<http://www.cdc.gov/nip/recs/child-schedule.htm#catchup>

⁹ Centers for Disease Control and Prevention. Prevention of hepatitis A through active or passive immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 1999;48(No. RR-12):1-54.

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¹¹ Estimated Vaccination Coverage with Individual Vaccines and Selected Vaccination Series Among Children 19-35 Months of Age by State and Immunization Action Plan Area US, National Immunization Survey, 2003. Children in the Q1/2003-Q4/2003 National Immunization Survey were born between February 2000 and May 2002.

¹² Yusuf HR, Daniels D, Smith P, Coronado V, Rodewald L. Association between administration of hepatitis B vaccine at birth and completion of the hepatitis B and 4:3:1:3 vaccine series. *JAMA* 2000; 284(8):978-83.

¹³ National Vaccine Advisory Committee. *PEDIATRICS* 2003;Vol. 112(4): 958-963.