Immunization Coverage

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Public Health and Social Services
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The mission of the Grays Harbor County Public Health and Social Services Department is to improve the health and well-being of the people of Grays Harbor.

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Introduction

The Centers for Disease Control and Prevention recommend that children receive immunizations for 11 different diseases by 36 months of age. It is recommended that children receive 4 doses of diphtheria-tetanus-acellular pertussis (DTaP) vaccine, 3 doses of polio vaccine, 1 dose of measles-mumps-rubella (MMR) vaccine, 3 doses of Haemophilus influenzae type b (Hib) vaccine, 3 doses of hepatitis B vaccine, 1 dose of varicella vaccine, 4 doses of pneumococcal vaccine, 2 doses of hepatitis A vaccine, 3 doses of rotavirus vaccine and a yearly flu vaccine (known as 4:3:1:3:3:1:4:2:3+yearly flu coverage).[1] 68% of children aged 24-35 months in the U.S. and 67% in Washington State have 4:3:1:3:3:1:4 coverage.[2] Healthy People 2010 and the Washington State Public Health Improvement Plan have set a goal that 90% of children aged 19-35 months have at least 4:3:1:3:3:1 coverage.[3,4]

To assess the immunization coverage rates of children served by local Vaccine For Children (VFC) providers in Grays Harbor County, public health nurses utilize the AFIX process. The AFIX process includes **a**ssessment of each provider's immunization coverage rates and immunization practices, **f**eedback of the results to the provider along with recommendations for improving coverage rates, **i**ncentives to recognize and reward improved performance and e**x**change of healthcare information and resources to facilitate improvement. During the AFIX process, providers learn the 4:3:1:3:3:1:4 coverage rate of their 24-35 month old patients, but county-wide data is not available as a point of comparison.

This study aims to increase available data on immunization coverage rates among local children in order to increase public health and provider understanding of how their practices contribute to overall county immunization rates and how provider practice rates compare to the county average.

Methods

Sample

The target population for the study is 19-35 month old children residing in Grays Harbor County. The sampling frame, however, was the 1,228 children born between April 1, 2006 and August 31, 2007 to mothers who were Grays Harbor County residents at the time of delivery, regardless of whether or not they currently reside in Grays Harbor County or Washington State.

In cooperation with the Washington State Center for Health Statistics, the Washington State Department of Health Immunization Program selected a random sample of 375 birth certificates from the sampling frame. Children who were deceased before hospital discharge were eliminated. Information was extracted from the certificates on the following variables: name and date of birth for the child (subject), the birth mother, and the father named on the birth certificate and address and phone number recorded at the time of the subject's birth.

Subjects' names were checked against the Early Notification of Childhood Death registry to determine if any subjects were known deceased; all were still living.

Data collection

Immunization data were collected from three sources: parent or guardian of the subject, healthcare providers and the Washington State Department of Health's CHILD Profile registry.

Parents

A parent or guardian of each subject was asked to complete a survey regarding demographic information, the subject's immunization records and his/her experiences obtaining immunizations for the subject.

A week before data collection began, parents were mailed a postcard letting them know their child had been selected to participate in the study.

Interviewers completed surveys with the parents through one of four ways:

- Visiting the parent at his/her home.
- Calling the parent.
- Mailing the survey to the parent.
- Meeting the parent at the Grays Harbor County Public Health Department clinic, immediately after the parent's WIC appointment.

Numerous attempts were made to contact each subject's parents, including evening and weekend phone calls.

After completing the survey, the parent was mailed a "thank you" letter and a children's book for the subject. The parent was also entered into a drawing to win one of two $200 Wal-Mart gift cards.

Providers

After completing the survey, parents were asked for permission to obtain a copy of the subject's immunization records from their child's healthcare providers.

Parents who consented provided a list of all healthcare providers that had vaccinated their child. Interviewers then contacted the healthcare providers to request the child's immunization records.

CHILD Profile

Immunization records for each subject were also obtained from CHILD Profile, an immunization registry managed by Washington State Department of Health that allows healthcare providers to record patients' immunization histories.

Data analysis

A reference date of April 1, 2009 was used to analyze immunization coverage. Data were cleaned to ensure proper spacing between vaccination doses and then the data were analyzed using Epi Info 3.5.1.

Results

Interviewers obtained 223 surveys from the sample - a 59% response rate. Twenty-six participants refused to complete the survey - a 7% refusal rate. Immunization information was obtained from all providers listed for 83% of the subjects who were surveyed. Immunization information was obtained from CHILD Profile for all but one of the subjects in the sample.

The following tables summarize frequencies for all major variables. When appropriate, data from a similar study completed in 1998 is presented as a point of comparison.

Demographics

	2009	1998
Child's gender		
• Male	51%	50%
• Female	49%	50%
Number of older siblings		
• None	41%	36%
• One	32%	36%
• Two	18%	16%
• Three	5%	6%
• Four	5%	3%
• Five	0%	2%
• Six	0%	1%
• Seven	1%	0%
Number of younger siblings		
• None	77%	80%
• One	22%	19%
• Two	1%	1%
Number of moves since birth		
• None	46%	39%
• One	26%	24%
• Two	16%	19%
• Three	7%	9%
• Four or more	5%	9%
Lives in Grays Harbor County		
• Yes	97%	89%
• No	3%	11%
Lives in Washington		
• Yes	98%	94%
• No	2%	6%

	2009	1998
Informant's relationship to child		
• Mother	90%	91%
• Father	5%	5%
• Grandmother	2%	2%
• Other	4%	2%
Person that takes child to immunizations		
• Mother	95%	-
• Father	17%	-
• Grandmother	3%	-
• Foster parent	1%	-
• Aunt	1%	-
• Great aunt	1%	-
Child's primary caregiver		
• Mother	94%	-
• Father	2%	-
• Grandmother	1%	-
• Foster parent	2%	-
• Sister	1%	-
Primary caregiver's age		
• Less than 20	1%	-
• 20-24	26%	-
• 25-29	30%	-
• 30-34	29%	-
• 35-39	9%	-
• 40-44	4%	-
• 45-49	1%	-
• 50-54	0%	-
• 55-59	1%	-
• 60-64	0%	-
• 65-69	1%	-
Primary caregiver's education		
• 1st-8th grade	7%	-
• 9th-12th grade	12%	-
• High school/GED	33%	-
• Some college	23%	-
• College graduate	16%	-
• Graduate/professional school	8%	-
• None	1%	-
Primary caregiver's marital status		
• Married	58%	-
• Single	37%	-
• Separated/divorced	4%	-
• Widowed	1%	-

	2009	1998
Primary caregiver's employment status during child's first year and a half of life		
• Employed full time	35%	-
• Employed part time	20%	-
• Not employed outside the home	37%	-
• Retired	1%	-
• Self-employed	3%	-
Primary caregiver's race		
• Caucasian/white	81%	-
• American Indian/Alaskan Native	12%	-
• Asian/Pacific Islander	2%	-
• Hispanic	2%	-
• African American/Black	1%	-
• Mexican/Mexican American	1%	-
• Native	1%	-
• Native Indian	1%	-
• Other	1%	-
• Don't Know	1%	-
Primary caregiver of Hispanic origin		
• Yes	20%	-
• No	80%	-
Primary language spoken in household		
• English	84%	92%
• Spanish	12%	5%
• Hebrew	1%	-
• Punjebi	1%	-
• Squaxin	1%	-
• Triqui	4%	-
Father's education		
• 1st-8th grade	8%	4%
• 9th-12th grade	14%	18%
• High school/GED	35%	30%
• Some college	21%	40%
• College graduate	10%	17%
• Graduate/professional school	5%	-
• Don't know	8%	8%

	2009	1998
Number of people in household		
• Two	2%	2%
• Three	23%	24%
• Four	31%	38%
• Five	24%	19%
• Six	9%	9%
• Seven	9%	3%
• Eight	0%	2%
• Nine	1%	2%
• Ten	1%	1%
• Eleven	0%	1%
• Twelve or more	1%	2%
Household income during child's first year and a half of life		
• Less than $10,000	22%	-
• $10,000-$14,999	9%	-
• $15,000-$19,999	7%	-
• $20,000-$24,999	6%	-
• $25,000-$29,999	5%	-
• $30,000-$34,999	5%	-
• $35,000-$39,999	6%	-
• $40,000-$44,999	5%	-
• $45,000-$49,999	2%	-
• $50,000-$59,999	6%	-
• $60,000 or more	16%	-
• Don't know	9%	-
• Refused	1%	-

Daycare and social services

	2009	1998
Child regularly attended a childcare program between birth and 19 months of age		
• Yes	31%	34%
• No	69%	66%
Childcare licensed, unlicensed or both		
• Licensed	76%	63%
• Unlicensed	16%	30%
• Both	8%	7%
Childcare provided by friend or family member		
• Yes	54%	58%
• No	46%	42%
Child enrolled in WIC program between birth and 19 months of age		
• Yes	71%	71%
• No	29%	29%

	2009	1998
Child enrolled in AFDC or TANF program between birth and 19 months of age		
• Yes	29%	28%
• No	71%	67%
Number of times child saw health care provider during second year of life		
• None	4%	1%
• One	4%	4%
• Two	14%	13%
• Three	23%	24%
• Four	21%	15%
• Five or more	34%	44%

Healthcare and immunizations

	2009	1998
Health care provider selected at time of child's birth		
• Yes	96%	86%
• No	4%	12%
Child has regular health care provider		
• Yes	99%	95%
• No	1%	5%
Location of child's usual medical care		
• HMO provider/clinic	14%	13%
• Other private provider/clinic	85%	81%
• Public health department	1%	1%
• IHS/Tribal health clinic	1%	1%
• Community health clinic	1%	2%
• Military	1%	1%
• Urgent care	0%	1%
Child's medical insurance between birth and 19 months of age		
• None	1%	3%
• HMO private insurance	12%	11%
• PPO/other private insurance	20%	31%
• Medicaid	60%	43%
• Military/CHAMPUS	1%	1%
• State Basic Health	11%	9%
• Indian Health Service	1%	-
• Don't know	1%	1%
Child ever been given vaccination by mouth or by shot		
• Yes	99%	100%
• No	1%	0%

	2009	1998
Location where child has received vaccinations		
• HMO provider/clinic	12%	-
• Other private provider/clinic	88%	-
• Public health department	5%	-
• Hospital at birth	50%	-
• Community health clinic	3%	-
• Military	.5%	-
• Hospital clinic	.5%	-
• Hospital emergency room	.5%	-
• IHS/Tribal health clinic	0%	-
• Urgent care center	0%	-
Ever received a card or record of your child's immunizations		
• Yes	90%	96%
• No	10%	4%

Immunization experiences

	2009	1998
Respondent knows when it is time for child's immunizations		
• Yes	89%	90%
• No	11%	9%
Respondent keeps copy of recommended immunization schedule at home		
• Yes	54%	65%
• No	47%	34%
Respondent receives CHILD Profile materials		
• Yes	77%	45%
• No	23%	53%
Respondent has received reminder to keep well-baby or immunization appointment		
• Yes	63%	54%
• No	37%	41%
Respondent has had problems scheduling an appointment for child's immunizations		
• Yes	4%	8%
• No	96%	91%
Respondent has had problems getting child's immunizations because of doctor or clinic hours		
• Yes	2%	6%
• No	98%	93%
Respondent has had transportation problems getting child to doctor or clinic for shots		
• Yes	8%	11%
• No	92%	89%

	2009	1998
Respondent or someone else had to take time off of work to go to doctor or clinic for child's shots		
• Yes	48%	34%
• No	52%	65%
It was difficult to obtain time off of work to go to doctor or clinic for child's shots		
• Yes	30%	19%
• No	70%	81%
Respondent has had problems with the cost of obtaining immunizations		
• Yes	6%	4%
• No	95%	96%
Respondent has been sent elsewhere for child's immunizations		
• Yes	1%	6%
• No	99%	93%
Respondent's child did not get immunized when expected		
• Yes	25%	34%
• No	75%	65%
Why weren't those vaccines given when expected?		
• Already had immunization	6%	-
• Child was ill	70%	-
• Child was not at weight	2%	-
• Didn't have problem	2%	-
• Doctor anxiety	2%	-
• Don't know	2%	-
• Conflicted about safety of immunizations	2%	-
• Misunderstood	2%	-
• Not in stock	6%	-
• Suspected egg allergy	2%	-
• Child's arm was just casted	2%	-
• Won't give 4+ shots	2%	-
• Wrong timing	2%	-
Respondent has had other problems obtaining child's immunizations		
• Yes	1%	4%
• No	99%	96%
What were those problems?		
• Doctor	1%	-
• Fighting medical	1%	-
• Missing her last list of shots this year!	1%	-

	2009	1998
Respondent has personal, philosophical or religious reasons for why some immunizations should not be given to child		
• Yes	6%	8%
• No	94%	92%

Immunization coverage

	Provider Records		Parent Records	CHILD Profile
	2009	1998	2009	2009
4:3:1:3				
• 19-35 months old	83%	76%	-	-
4:3:1:3:3:1:4				
• 24-35 months old	75%	-	41%	62%
• 19-35 months old	74%	-	37%	57%
4:3:1:3:3:1:4:2:3:yearly flu				
• 24-35 months old	2%	-	3%	1%
• 19-35 months old	3%	-	4%	2%
1 DTaP				
• 24-35 months old	98%	-	94%	96%
• 19-35 months old	98%	86%	94%	95%
2 DTaP				
• 24-35 months old	95%	-	91%	93%
• 19-35 months old	97%	84%	90%	92%
3 DTaP				
• 24-35 months old	95%	-	91%	90%
• 19-35 months old	97%	81%	90%	89%
4 DTaP				
• 24-35 months old	89%	-	78%	74%
• 19-35 months old	85%	68%	67%	69%
1 polio				
• 24-35 months old	98%	-	91%	96%
• 19-35 months old	98%	86%	90%	95%
2 polio				
• 24-35 months old	95%	-	88%	92%
• 19-35 months old	97%	84%	86%	92%
3 polio				
• 24-35 months old	94%	-	81%	87%
• 19-35 months old	95%	80%	80%	86%
1 MMR				
• 24-35 months old	93%	-	88%	86%
• 19-35 months old	94%	80%	80%	84%
1 Hib				
• 24-35 months old	98%	-	88%	96%
• 19-35 months old	98%	85%	90%	95%

	Provider Records		Parent Records	CHILD Profile
	2009	**1998**	**2009**	**2009**
2 Hib				
• 24-35 months old	95%	-	88%	93%
• 19-35 months old	97%	83%	90%	92%
3 Hib				
• 24-35 months old	94%	-	84%	88%
• 19-35 months old	95%	81%	86%	86%
1 Hep B				
• 24-35 months old	97%	-	88%	96%
• 19-35 months old	98%	86%	92%	95%
2 Hep B				
• 24-35 months old	96%	-	88%	93%
• 19-35 months old	97%	84%	90%	93%
3 Hep B				
• 24-35 months old	91%	-	66%	82%
• 19-35 months old	92%	81%	71%	82%
1 varicella				
• 24-35 months old	90%	-	78%	82%
• 19-35 months old	92%	-	75%	82%
1 pneumococcal				
• 24-35 months old	97%	-	88%	95%
• 19-35 months old	98%	-	90%	95%
2 pneumococcal				
• 24-35 months old	95%	-	88%	88%
• 19-35 months old	96%	-	90%	92%
3 pneumococcal				
• 24-35 months old	94%	-	88%	88%
• 19-35 months old	95%	-	90%	88%
4 pneumococcal				
• 24-35 months old	85%	-	72%	75%
• 19-35 months old	83%	-	65%	72%
1 Hep A				
• 24-35 months old	83%	-	78%	73%
• 19-35 months old	83%	-	71%	69%
2 Hep A				
• 24-35 months old	28%	-	31%	25%
• 19-35 months old	24%	-	27%	20%
1 Rotavirus				
• 24-35 months old	7%	-	9%	5%
• 19-35 months old	22%	-	25%	16%
2 Rotavirus				
• 24-35 months old	5%	-	9%	4%
• 19-35 months old	18%	-	25%	16%

	Provider Records		Parent Records	CHILD Profile
	2009	**1998**	**2009**	**2009**
3 Rotavirus				
• 24-35 months old	5%	-	9%	3%
• 19-35 months old	16%	-	24%	11%
1 flu				
• 24-35 months old	73%	-	59%	66%
• 19-35 months old	76%	-	61%	67%
2 flu				
• 24-35 months old	57%	-	50%	47%
• 19-35 months old	57%	-	45%	47%

Cross tabulations

The following table compares the percentage of children with complete 4:3:1:3:3:1:4 coverage in the 2009 study to the percentage of children with complete 4:3:1:3 coverage in the 1998 study by a variety of key variables. Although the number of recommended immunizations has increased since 1998, this allows us to track trends in percentage of children with immunization coverage that is considered complete. Immunization data is drawn from provider records.

	Complete coverage	
	2009	**1998**
Respondent still resides in Grays Harbor County		
• Yes	76%	66%
• No	75%	36%
Maternal age group		
• 15 thru 17	-	75%
• 18 thru 19	100%	75%
• 20 thru 24	79%	52%
• 25 thru 29	77%	61%
• 30 thru 34	74%	62%
• 35 and older	90%	84%
Maternal educational attainment		
• Less than 9th grade	100%	45%
• Some high school	92%	53%
• High school graduate/GED	70%	67%
• Some college	83%	62%
• College graduate	71%	74%
• Graduate/professional school	64%	80%

	Complete coverage	
	2009	**1998**
Maternal marital status		
• Married	75%	66%
• Unmarried	83%	55%
1. Single	83%	60%
2. Separated/divorced	67%	41%
3. Widowed	0%	-
Maternal employment during child's first eighteen months		
• Employed full time	76%	64%
• Employed part time	74%	77%
• Self-employed	100%	64%
• Homemaker	81%	54%
• Student	75%	83%
• Retired	-	100%
• Unable to work	67%	50%
Number of siblings in household		
• None	72%	72%
• One	80%	65%
• Two	74%	49%
• Three or more	79%	54%
Household income below 150% FPL (approx.)		
• Yes	70%	57%
• No	71%	68%
Health care provider selected at birth		
• Yes	75%	64%
• No	100%	50%
Mother feels she knows when immunizations are due		
• Yes	80%	63%
• No	72%	53%
Copy of immunization schedule in home		
• Yes	75%	64%
• No	77%	60%
Receipt of reminders		
• Yes	83%	60%
• No	64%	65%
History of immunizations not being given when expected		
• Yes	77%	54%
• No	77%	67%
Personal, philosophical or religious objections to vaccination		
• Yes	57%	47%
• No	77%	63%
Enrollment in WIC during child's first eighteen months		
• Yes	76%	59%
• No	77%	71%
Enrollment in daycare during child's first eighteen months		
• Yes	72%	71%
• No	78%	58%
Late onset of immunization (1st DTaP given after age 92 days)		
• Yes	63%	31%
• No	77%	77%

Discussion

Key findings

- Since 1998, the 4:3:1:3 coverage rate for children aged 19-35 months has increased by 7%.
- Since 1998, DTaP coverage rates for 19-35 month olds increased by 17%; polio coverage rates increased by 15%; MMR and Hib coverage rates increased by 14% each; and Hepatitis B coverage rates increased by 11%.
- 4:3:1:3:3:1:4 coverage among Grays Harbor County children aged 19-35 months is 7% higher than children aged 19-35 months in Washington (67%) and 8% higher than children aged 19-35 months in the United States (66%).[2]
- 4:3:1:3:3:1 coverage among Grays Harbor County children aged 19-35 months is 78%, falling just shy of the Healthy People 2010 and Washington Public Health Improvement Plan goal of 80% coverage.
- There is considerable variability in coverage rates dependant on the record source, with provider records generally showing the highest coverage rates and parent records generally showing the lowest coverage rates.
- 4:3:1:3:3:1:4:2:3+yearly flu coverage rates are extremely low due to low Rotavirus vaccine coverage. However, this is to be expected given that the Rotavirus vaccine did not become available until May 2007. This also explains the higher Rotavirus vaccine coverage rates among our youngest subjects; 57% of children aged 19-23 months had received one dose of Rotavirus vaccine, 50% had received two doses, and 43% had received three doses.

- The following variables appear to be associated with higher immunization coverage rates: maternal age of 35 or older, maternal marital status of single, maternal education status of some high school or some college, maternal employment status of homemaker, one sibling in the household, mother feels she knows when immunizations are due and receipt of reminders to keep appointment.

- The following variables appear to be associated with lower immunization coverage rates: not receiving reminders to keep appointment and late onset of immunizations (receiving first DTaP more than 92 days after birth).

Lessons learned

Contacting subjects' parents

The data collection period lasted 9 months – much longer than anticipated. There appear to be a couple reasons why data collection required more time. Many of the phone numbers and addresses provided on the subject's birth certificate were no longer correct. Also, many parents rely solely on a cellular phone; they do not maintain a landline telephone. There is no listing for cell phone numbers and without a landline, current addresses were not listed in the phone book, making it difficult to locate current contact information.

The following sources were used to search for current contact information:

- Address corrections provided by USPS.
- Grays Harbor County Public Health Department's client database.
- WIC and First Steps client databases.
- Various websites, including dex.com and pipl.com.

Through a contract with the Washington State Department of Health Immunization Program, interviewers were provided the contact information listed in CHILD Profile for those subjects who had not been contacted despite numerous attempts. This information was not provided, though, until the end of the data collection period. Access to this information earlier in the data collection period would have likely saved a great deal of time spent searching for subjects' contact information.

Parents were also contacted at the Grays Harbor County Public Health Department, immediately after their WIC appointment. This method of contact was especially effective in completing surveys with those parents.

Because it appeared that a significant proportion of our sample was Spanish-speaking, a bilingual community health worker assisted interviewers by contacting those parents whom we had reason to believe were Spanish-speaking.

Refusal rate

Twenty-six participants actively refused to participate in the study - a 7% refusal rate. A similar study in 1998 had a much lower refusal rate - only 2%. It appears that parents are much more protective of their privacy and future studies should take steps to reassure participants that their information is properly safeguarded.

Data analysis

Data were cleaned to ensure proper spacing between vaccine doses; doses that were administered sooner than recommended by the CDC were deleted. Future studies should record and analyze the number of incorrect doses as this may provide valuable feedback for providers.

Plan for data usage and dissemination

The data produced by this study will be used to create educational materials for local parents and healthcare providers.

The materials targeted toward parents will highlight the importance of immunizing children according to the CDC's recommended schedule in light of recent vaccine-preventable disease outbreaks. The difference in coverage rates among parent, provider and CHILD Profile records will also be highlighted to encourage parents to keep their child's immunization records current.

The materials targeted toward healthcare providers will highlight the coverage rates of local children as compared to children in Washington and the United States. The difference in coverage rates among parent, provider and CHILD Profile records will also be highlighted to encourage better management of immunization histories.

This study will also be used to inform Grays Harbor County Public Health and Social Services Department's immunization program planning.

References and data notes

1. United States Department of Health and Human Services, Centers for Disease Control and Prevention. (2009). *Recommended immunization schedule for persons aged 0 through 6 years.* Retrieved August 2, 2010 from http://www.cdc.gov/vaccines/recs/schedules/downloads/child/2010/10_0-6yrs-schedule-bw.pdf

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