

SCHOOL-BASED IMMUNIZATION COVERAGE IN NOVA SCOTIA: 2014-2015

June 23, 2016



Acknowledgements

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Introduction

Delivery of vaccines via school-based immunization programs is an effective delivery model to reach the adolescent target population. A school-based delivery model provides equal access to immunization for the adolescent population (attending schools) and can reduce disparities in vaccine coverage.

In Nova Scotia, the school based immunization program is the primary method of delivery for the following four publicly funded vaccines:

- Tetanus, Diphtheria, and Acellular Pertussis (Tdap)
- Meningococcal Group C Conjugate (Men-C-C)¹
- Hepatitis B
- Human Papillomavirus (HPV)

The school based immunization program is delivered by Public Health Services to grade seven students within public and private schools as well as students who are home schooled (if known). The program is delivered by community health nurses within First Nations schools on-reserve. The vaccines are administered to both males and females, with the exception of the HPV vaccine, which is administered only to females².

Monitoring immunization coverage rates provides important information for Public Health planning and decision making. Immunization coverage rates are a useful indicator of vaccine uptake within populations and of a population's susceptibility to vaccine-preventable diseases. In 2010-2011, based on national targets for vaccine coverage, the Department of Health & Wellness set the following provincial targets for school-based immunization coverage rates:

Tdap, Men-C-C, Hepatitis B	≥ 90% coverage
HPV	≥ 80% coverage

This report focuses on immunization coverage rates for the school-based program in Nova Scotia for the 2014-2015 school year. On April 1, 2015 the nine former district health authorities (DHAs) were consolidated into one provincial health authority, made up of four management zones. Immunization coverage rates found in this report are presented at the provincial level and the management zone level. Coverage rates are presented by vaccine and by dose.

¹ In the 2015-2016 school year the Men-C-C vaccine will switch to the Meningococcal Quadrivalent (Men-C-ACYW) vaccine

² In the 2015-2016 school year the HPV vaccine will be available to both males and females and will be changing from a 3 dose schedule to a 2 dose schedule.

Methodology

The coverage rates calculated for this report reflect the *proportion of the 2014-2015 grade seven cohort who were immunized in the 2014-2015 school year*.

Immunization coverage rates are calculated as follows:

$$\text{Coverage rate (\%)} = \frac{\text{\# immunized (numerator)}}{\text{\# of students in grade seven (denominator)}} \times 100$$

Numerator:

The number of students in grade seven who received the vaccine between September 1, 2014 and August 31, 2015. Grade level was not available for all immunization records therefore grade seven was estimated based on age at the time of immunization, using a four year age range (11-14). School year was defined as September 1 to August 31 to allow for immunizations administered during the summer months. The numerator data used in this report was extracted from the Application for Notifiable Disease Surveillance (ANDS) on April 11, 2016. All school-based immunizations delivered by Public Health are entered into ANDS. Any notifications (e.g. reciprocal forms) that are received for immunizations delivered by other health care providers are also entered into ANDS by Public Health. Any records identified as home schooled were excluded because they are not reflected in the denominator due to lack of accurate data on the total number of home-schooled children in Nova Scotia.

Denominator:

The number of students enrolled in grade seven as of September 30, 2014 (excluding home-schooled children). This includes all students enrolled, and may include individuals who did not require the immunization at the time of the program delivery (if they had already received the dose previously from a physician or outside of the province, etc.). The data on grade seven enrolment for the school-based program come from the Nova Scotia Department of Education and Early Childhood Development and from the First Nations communities.

For vaccines with multi-dose schedules (HPV and Hepatitis B), coverage is calculated for each valid dose and for the full series. Descriptions for valid doses are presented below (Table 1).

Table 1: Description of valid doses for HPV and Hepatitis B vaccines

	HPV	Hepatitis B
Dose 1	# of students who received a dose of the vaccine in the specified school year.	# of students who received a dose of the vaccine in the specified school year.
Dose 2	# of students who received another dose of the vaccine ≥ 28 days after the first dose, in the specified school year.	# of students who received another dose of the vaccine ≥ 168 days after the first dose
Dose 3	# of students who received a third dose ≥ 84 days after the second dose, in the specified school year.	

*In the 2015-2016 school year HPV will be offered to both males and females as a 2 dose schedule.

Adverse Events Following Immunization (AEFI):

The number of adverse events following immunization (AEFI) related to school-based immunizations are presented in the report. The AEFI data were extracted from ANDS.

Limitations

Coverage rates presented in this report reflect the *proportion of the grade seven cohort immunized during the 2014-2015 school year, not the proportion of the grade seven cohort who have up to date coverage of the four school-based vaccines.*

- The National standard for coverage reporting is to report on up-to-date coverage at 17 years. Given that ANDS was launched in 2008, there is currently insufficient data on childhood immunizations in ANDS to achieve this. For birth cohorts born after 2008 the goal would be to follow the National standard.
- Grade seven students who miss a dose during the school year often receive the missing dose in the following school year (during grade 8) potentially contributing to lower reported coverage rates for multi-dose vaccines.

The numbers of students immunized within the school based program are extracted from ANDS for this report. Immunizations by providers other than Public Health are included if notifications have been received by Public Health and entered into ANDS. Notifications not received by Public Health and/or not entered into ANDS will result in lower coverage rates. However, given that the school-based vaccines are delivered primarily by Public Health the potential impact of this is thought to be minimal.

Denominator data on the number of students was based on September enrolment. By using September enrolment, the movement of students between zones could potentially result in a student immunization being counted in a particular zone, but that student being reflected in the denominator of another zone. This will impact zone-level coverage rates however, provincial coverage rates are not impacted by this potential limitation.

Use of the September enrolment data also assumes that all students who are enrolled in grade seven in the current school year are eligible for immunization. Students who were immunized in a previous school year (e.g. Hepatitis B for travel) have not been removed from the denominator potentially contributing to lower reported coverage rates.

By estimating grade level based on a four year age group the potential exists to capture immunizations for students who may not be captured in the denominator. This could potentially inflate the coverage rates.

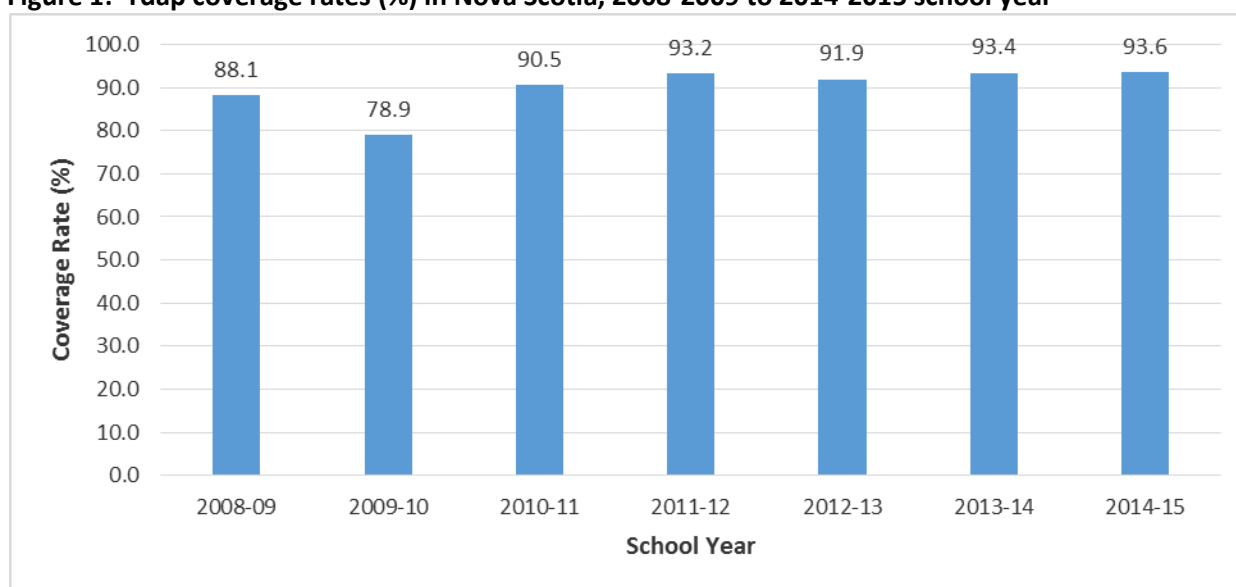
Records identified as home schooled (0.09%) were excluded from the numerator because they are not reflected in the denominator due to lack of accurate data on the total number of home-schooled children in Nova Scotia. However, five percent of all the records were missing school information resulting in the potential for some home schooled records to be included and coverage rate estimates to be higher.

Tetanus, Diphtheria, and Acellular Pertussis (Tdap)

The Tdap vaccine is administered as a single dose and protects against Tetanus (Lockjaw), Diphtheria, and Pertussis (Whooping Cough). There have been no cases of Diphtheria in over a decade and only one case of Tetanus in the past five years (2011-2015: rate of 0.1 per 100,000). The province continues to see pertussis cases each year. There was an increase of cases in 2015 (n=110, rate of ~ 11.7 per 100,000) in comparison to the previous four years (2011 to 2014 combined: n=40, rate of 4.3 per 100,000).

Coverage rates for Tdap vaccine are presented below (Figure 1 and Table 2). For the 2014-2015 school year the provincial coverage rate was **93.6 %**. This is similar to previous years and is above the provincial target of 90 percent. Over the past 7 school years (2008-2009 to 2014-2015) Tdap coverage ranged between 78.9 % and 93.6 %.

Figure 1: Tdap coverage rates (%) in Nova Scotia, 2008-2009 to 2014-2015 school year*



*Between the 2008-2009 and 2012-2013 school years the immunization schedule varied as follows: 2008-2009: grade 7 and 14-16 year olds, 2009-2010: grade 10, 2010-2011: grades 7&8, 2011-2012 and beyond: grade 7. The 2008-2009 NS coverage rate does not include data from Eastern zone because the 14-16 year old cohort were immunized in the 2007-2008 school year and therefore not captured in this analysis.

During the reporting period Tdap coverage rates ranged from 92.4 % (Eastern) to 95.6 % (Northern) across the health authority (Table 2). All zones were above the 90% target.

Table 2: Tdap coverage rates (%) by Zone, 2014-2015

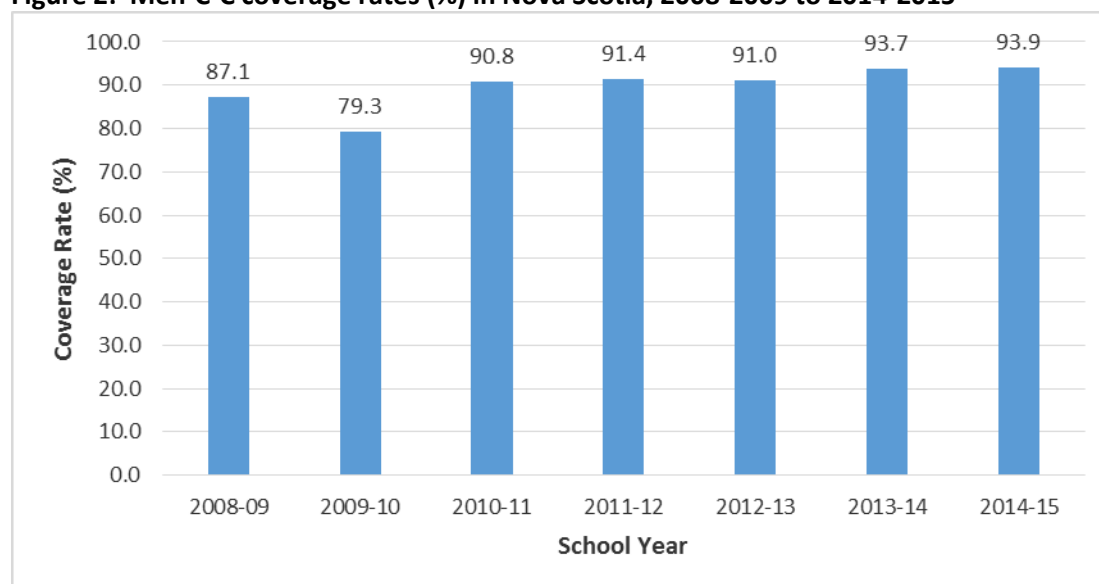
ZONE	Coverage Rate (%)
1-Western	93.7
2-Northern	95.5
3-Eastern	92.4
4-Central	93.4
NS	93.6

Meningococcal Group C Conjugate (Men-C-C)

Meningococcal Group C Conjugate (Men-C-C) vaccine is administered as a single dose and protects against illness caused by serogroup C of the bacteria, *Neisseria meningitides*. It does not protect against other serogroups of this bacteria, or other organisms that cause meningitis or septicaemia. Over the past five years (2011-2015) there were 0 cases of Invasive Meningococcal Disease identified as serogroup C in Nova Scotia.

Coverage rates for Men-C-C vaccine are presented in Figure 2 and Table 3. For the 2014-2015 school year the provincial coverage rate was **93.9 %**. This is similar to previous years and is above the provincial target of 90 %. Over the past 7 school years (2008-2009 to 2014-2015) Men-C-C coverage ranged between 79.3 % and 93.9%.

Figure 2: Men-C-C coverage rates (%) in Nova Scotia, 2008-2009 to 2014-2015*



*Between the 2008-2009 and 2012-2013 school years the immunization schedule varied as follows: 2008-2009: 14-16 year olds, 2009-2010: grade 10, 2010-2011 and beyond: grade 7. The 2008-2009 NS coverage rate does not include data from Eastern zone because the 14-16 year old cohort were immunized in the 2007-2008 school year and therefore not captured in this analysis.

Across the health authority coverage rates ranged from 91.6 % (Eastern) to 96.0 % (Northern) during the reporting period (Table 3). The ninety percent target was achieved in all zones.

Table 3: Men-C-C coverage rates by Zone, 2014-2015

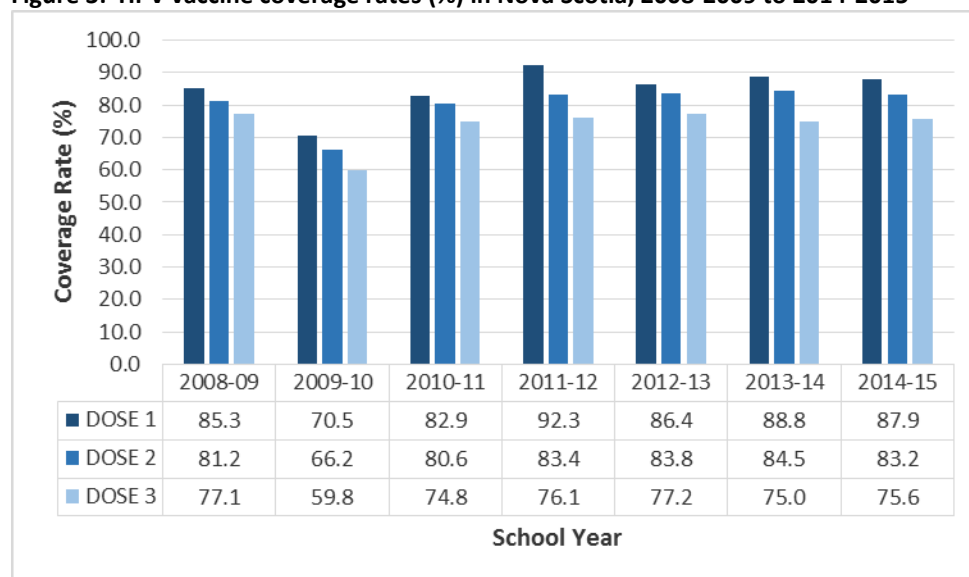
ZONE	Coverage Rate (%)
1-Western	92.7
2-Northern	95.9
3-Eastern	91.6
4-Central	94.8
NS	93.9

Human Papillomavirus (HPV)

Human Papillomavirus (HPV) vaccine is administered to female students as a series of three doses and protects against HPV, a common sexually transmitted infection. HPV vaccine protects against the most common types of HPV that infect the genital area, including the 2 types of HPV that cause 70 % of cervical cancer. HPV infection is not a notifiable disease in Nova Scotia (or Canada), however greater than 70 % of sexually active Canadians are estimated to have a sexually transmitted HPV infection at some point in their lives³. The HPV vaccine was introduced into the school-based immunization program in the 2007-2008 school year for females.

Complete coverage rates per dose for HPV vaccine are presented in Figure 3 and Table 4. Coverage rates decreased for each dose. For the 2014-2015 school year the provincial coverage rate for the complete series was **75.6 %**. This is similar to previous years and is below the provincial target of 80 percent. Over the past 7 school years (2008-2009 to 2014-2015) full HPV coverage (all three doses) ranged between 59.8 % and 77.2%.

Figure 3: HPV vaccine coverage rates (%) in Nova Scotia, 2008-2009 to 2014-2015*



*Between the 2008-2009 and 2012-2013 school years the immunization schedule varied as follows: 2008-2009: grade 7, 2009-2010: grade 10, 2010-2011: grade 7&8, 2011-2012 & beyond: grade 7.

Across the health authority, coverage rates (for the full series) ranged from 72.0 % (Central) to 80.8 % (Northern) during the reporting period (Table 4). One zone (Northern) achieved the 80% target.

Table 4: HPV coverage rates (%) by Zone, 2014-2015

ZONE	Coverage Rate (%)
1-Western	76.0
2-Northern	80.8
3-Eastern	78.9
4-Central	72.0
NS	75.6

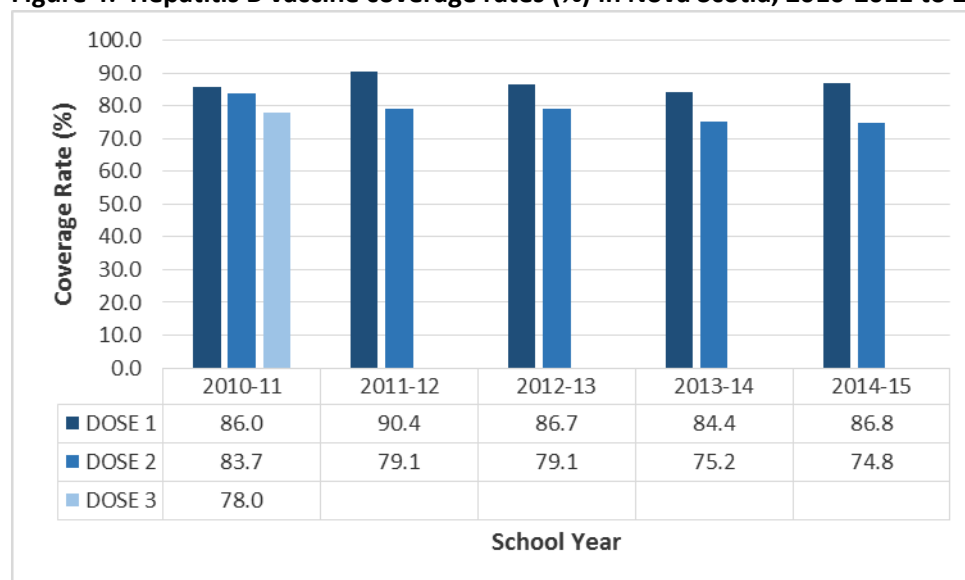
³<http://www.phac-aspc.gc.ca/std-mts/hpv-vph/fact-faits-eng.php#sm>

Hepatitis B

Hepatitis B vaccine is administered in the school program as a series of two doses and protects against the Hepatitis B virus. Hepatitis B is caused by contact with the blood or body fluids of someone who is infected. The annual rate of acute Hepatitis B infection in Nova Scotia is low. Over the past 5 years there has been an average of approximately 4.0 cases per year (rate of 2.0 per 100,000).

Complete coverage rates per dose for Hepatitis B vaccine are presented in Figure 4 and Table 5. Coverage rates for the complete series are lower than the rates for the first dose. For the 2014-2015 school year the provincial coverage rate for the complete series was **74.8 %**. This is similar to previous years and is below the provincial target of 90 percent. Over the past 5 school years (2010-2011 to 2014-2015) the coverage rate for the complete series of Hepatitis B vaccine ranged between 74.8 % and 79.1%.

Figure 4: Hepatitis B vaccine coverage rates (%) in Nova Scotia, 2010-2011 to 2014-2015*



*In the 2010-2011 school year Hepatitis B vaccine was administered as 3 doses of pediatric formulation (due to a global shortage of adult formulate). In the subsequent years it was administered as 2 doses of adult formulation.

Hepatitis B vaccine coverage rates by Zone are presented in Table 5. Full coverage (complete doses) rates ranged from 69.2 % (Central) to 82.3 % (Northern) across the health authority. None of the zones achieved the 90% target rate.

Table 5: Hepatitis B coverage rates (%) by Zone, 2014-2015

ZONE	Coverage Rate (%)
1-Western	78.4
2-Northern	82.3
3-Eastern	77.5
4-Central	69.2
NS	74.8

Adverse Events Following Immunization

An adverse event following immunization (AEFI) is any untoward medical occurrence which follows immunization and which does not necessarily have a causal relationship with the vaccine. The Public Health Agency of Canada (PHAC) collects and monitors data on Adverse Events Following Immunization (AEFI) to identify potential concerns regarding vaccine safety.

During the 2014-2015 school year, there were 9 (0.02 % of all school-based immunizations) AEFIs that met the criteria for reporting to PHAC. Based on the classifications described in the Nova Scotia Immunization Manual (<http://novascotia.ca/dhw/cdpc/documents/immunization-manual.pdf>), the 9 AEFIs were classified as follows:

Classification	Total # Reported	Sub-classification (#)
Local Reaction	2	Pain/Redness/Swelling (1) Abscess at injection site (1)
Systemic Reaction	2	Rash (2)
Allergic Reaction	4	Other Allergic (4)
Neurological Events	0	
Other	1	Other severe/unusual (1)

There were no hospitalizations or deaths associated with the AEFIs.

Discussion

Coverage rates presented in this report are based on immunizations administered within a given school year. As such they reflect the *proportion of the grade seven cohort immunized in that given school year*, rather than the proportion of the grade seven cohort who have up-to-date coverage of the four school-based vaccines. Methods to estimate up-to-date coverage by age will continue to be explored for future reporting.

Immunization targets were achieved for Tdap and Men-C-C in the 2014-2015 school year, but targets were not achieved for HPV and Hepatitis B. Factors that potentially could have had an impact on the immunization coverage rates presented in the report, are described below:

- Hepatitis B vaccine is administered as part of non-publicly funded travel-related immunizations by providers other than Public Health. If Public Health was not notified of these immunizations or if these immunizations did not occur in the 2014-2015 school year they would not have been captured in these analyses. Also, students who have been immunized outside of the current school year cannot be removed from the denominator because the denominator data (grade seven enrolment) is in aggregate form. As a result Hepatitis B coverage may be higher than reflected in the report.
- If a student does not receive a single dose vaccine (Men-C-C, Tdap) on the day the vaccine clinic is held at school (e.g. is absent), it is likely that the student will receive the missed vaccine within the given school year (at a subsequent clinic) and be captured in the data for the report. However, if a student misses the last dose of a multi-dose vaccine (HPV, Hepatitis B) they may not complete the series until the following school year (e.g. when they are in grade 8) and not be captured in the data for the report, resulting in lower reported coverage rates for multi-dose vaccines.
- Concerns regarding vaccine safety, anxiety regarding needles, and parental refusal may also contribute to lower coverage rates.

Currently, the existing provincial application, ANDS, is being replaced by the, Application for Notifiable Disease and Immunization (ANDI). This new application will enhance the data available for reporting immunization coverage and will address the denominator data issue described above.

Between 2010-2011 and 2014-2015 coverage rates for the school-based program were consistent. Rates were lowest in the 2009-2010 school year. In 2009-2010 the school-based program was delivered to grade ten students due to the Public Health response to H1N1. Lower coverage rates for 2009-2010 could be due to lower uptake among older students and/or lower uptake due to the focus on H1N1 immunization.

Appendix – Number of Immunizations & Students Enrolled

ZONE		Vaccine						
		TDAP	MEN-C	HBV		HPV		
				DOSE 1	DOSE 2	DOSE 1	DOSE 2	DOSE 3
WESTERN	# Immunized	1749	1730	1621	1463	738	707	677
	# Eligible	1866	1866	1866	1866	891	891	891
	% Coverage	93.7	92.7	86.9	78.4	82.8	79.3	76.0
NORTHERN	# Immunized	1420	1426	1322	1224	642	629	593
	# Eligible	1487	1487	1487	1487	734	734	734
	% Coverage	95.5	95.9	88.9	82.3	87.5	85.7	80.8
EASTERN	# Immunized	1513	1500	1411	1269	726	707	656
	# Eligible	1638	1638	1638	1638	831	831	831
	% Coverage	92.4	91.6	86.1	77.5	87.4	85.1	78.9
CENTRAL	# Immunized	3735	3789	3448	2768	1771	1628	1410
	# Eligible	3998	3998	3998	3998	1957	1957	1957
	% Coverage	93.4	94.8	86.2	69.2	90.5	83.2	72.0
NS	# Immunized	8417	8445	7802	6724	3877	3671	3336
	# Eligible	8989	8989	8989	8989	4413	4413	4413
	% Coverage	93.6	93.9	86.8	74.8	87.9	83.2	75.6