

**REPORT OF  
THE MEDICAL HEALTH OFFICER**

**IMMUNIZATION  
REPORT**

**Saskatoon Health Region**

**Prepared by Public Health Services**

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## **Acknowledgements**

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## Executive Summary

The Saskatoon Health Region goals include the desire to:

- improve access to quality services
- have healthy communities supported by health promotion and disease prevention.

One of the key areas where attention needs to be directed to achieving these goals is immunization.

The overall rate of 2 year old immunizations is at 73% for the region, ranking the SHR at the 9<sup>th</sup> position out of the 12 health authorities in the province. Furthermore, it is important to note that there are significant variations between neighbourhoods within the health region. While some neighbourhoods have an impressive 93% rate, others are as low as 47%. The national goal for preschool age immunization is 97%. It is therefore important that the gap be narrowed to ensure an optimal healthy community.

The neighbourhoods with low rates in the core of Saskatoon will need special attention. Many other neighbourhoods surrounding this area also need improvement in their coverage rates, but to a somewhat lesser extent.

It is necessary to rethink how we deliver services, and consider re-prioritizing resources toward those areas in greater need to enable these populations to achieve better health. It may be necessary for Public Health and Primary Care to look “Back to the Future”; to take a step back and get back to the basics. As will be seen later in the document, the recommendations made include such suggestions as:

- sending reminders/recalls
- home visiting more postnatal mothers, or offering selected families in-home immunization
- working closely with other perinatal programs such as Healthy Mother, Healthy Baby, Healthy and Home, and Primary Care programs
- having more satellite clinics including a base of operation out of the schools, and expanded hours of operation in key areas
- immunizing in alternative settings such as day cares

These formerly programmed activities have been rolled back over the years due to budgetary constraints.

The low rates in some areas of the region are but one symptom of a much larger problem – that of health disparities associated with inequities in health determinants. It is important to start addressing the root of the problem, and in Public Health we can start by focusing on improvement of immunization rates.

Public Health has been involved in these neighbourhoods over the past months, investigating the possible causes of the poor immunization rates. Common themes have

arisen, such as poverty, a low level of awareness about the importance of immunization, and barriers to access.

There is need for a population health approach to address these factors. Improved immunization, as a start, will contribute to improved health via:

- reducing the incidence of preventable disease
- increasing contact with children and families to form and maintain relationships and create trust
- creating an avenue to promote other services and initiatives offered by public health and its partners that can enable families to make healthy choices.

In a way, vaccines are facing some resistance because of their own success. Vaccine preventable diseases are now so rare that some parents falsely believe that vaccine side effects are worse than the disease that they prevent, since they have never seen the devastating effects these diseases can have and they hear unsubstantiated concerns about vaccine safety. We need to reinforce the importance of everyone receiving vaccine and not only a portion of the population.

The National Advisory Committee on Immunization has identified the following as factors most frequently associated with low immunization coverage levels:

- missed opportunities for administering vaccine
- resource shortfalls in the healthcare delivery system
- inadequate access to healthcare services
- lack of public awareness of the benefits of immunization

This MHO report is based on three internal reports that have come out of investigations into the immunization status, barriers and possible solutions. One is an epidemiological immunization report, another is a report on improving preschool immunization in targeted Saskatoon neighbourhoods recently completed by an Outreach Nurse, and the third is a Master's thesis on prediction of immunization rates that was completed a few years previously. These reports have used immunization coverage data, input from consultations and discussions with PHS staff, staff of other organizations providing service, and stakeholders in the targeted neighbourhoods, as well as reviews of research and evaluations of successful interventions that have improved immunization rates in other jurisdictions. In addition, as a result of these reports, a best-practice review has been done which will form the basis for a grant submission in the near future. Some of the references from this review are also included in this document. Another research study has recently been completed, led by two Family Medicine residents looked into coverage rates in a family practice setting compared to the overall population serviced by Public Health.

In essence, the recommendations that emerge from these reports focus on:

- **Increase access to immunization services**, which will involve adding more clinics, extending clinic hours to improve access, and locating clinics in more accessible locations. The issue of recognizing transportation need and possibly introducing an immunization van also fall in this category.
- **Develop partnerships to promote immunization**, including coalition forming, and strengthening relations with Westside Community Clinic, Care and Share, City of Saskatoon, Open Door Society, local businesses and churches.
- **Increase community participation and community capacity building**, working with advisory groups such as an Elders Council, Community Advisory Network members, and the West Winds Community Advisory Council to get ideas for improvements in service
- **Increase public awareness of immunization**, which will involve liaising with such programs as Kids First, and Aboriginal Head Start home visitors that have good access to high risk families; educational sessions; posters; TV commercials; public service announcements, and articles in local newsprint like the Saskatoon Sun and the Eagle Feather News.
- **Better surveillance and notification of children delayed in immunization**, through expanding SIMS utilization, knowledge and access to include more PHS nurses, WSCC, and other physicians and clinics. Also, re-introducing and expanding the use of client reminder systems and recalls.
- **Client incentives**, e.g. transportation (coupons), healthy snacks, passes to Kinsmen Park, Forestry Farm or other initiatives that could be developed in conjunction with the City and other partners.
- **Improved staffing around immunization programming** via a full time Immunization Nurse Clinician, Community Outreach Workers, and adequate nursing positions along with an ongoing review of staff mix to deliver these services along with the other initiatives necessary to address health disparities.
- **Ensure scalability of the service delivery options introduced.** Service delivery options need to be able to work well as more vaccines are added and the population grows, starting with the new vaccines introduced this past year, and anticipating new vaccines that will be added in the future.

The Public Health Services Strategic Management Team, along with the MHOs, will be implementing these changes over the 2006/07, 2007/08 budget years, and will monitor the impact on improved coverage rates over this time period. This will be a positive step in protecting our children from these preventable diseases, regardless of where they live, or their life circumstances. However, it is important to remember that the reduced

immunization rate is a symptom of a greater problem: the areas SHR has identified as having lowest immunization rates also have significant variations in the underlying determinants of health, including education and income levels, from the rest of the region. These are also neighbourhoods where teenage pregnancy, suicide rates, sexually transmitted disease, and mortality rates are also significantly higher. Therefore, SHR can start with efforts directed at improving immunization coverage but will need to address the whole picture of health disparities in the targeted neighbourhoods to fully address the underlying issues and start to narrow the gap.

## Introduction

Immunization coverage rates are a recognized indicator of population health and health system performance. This report compares childhood coverage rates for selected vaccines within Saskatoon Health Region (SHR) and across Regional Health Authorities in Saskatchewan. The main objectives are to:

- briefly review the purpose of the immunization program
- identify gaps in immunization uptake
- provide a baseline measurement of immunization coverage
- provide an overview of the preschool program delivered by SHR
- review issues in improving vaccine uptake
- make recommendations for changes necessary in order to further improve age – appropriate coverage rates across the Region based on evidence.

Immunization is one of the most efficient and cost-effective means of preventing disease. The principle of “herd immunity” -- the presence of immune groups that limit the likelihood of disease transmission to susceptible individuals-- is very important to disease prevention and control. There is a social responsibility for the individuals to keep vaccinations up-to-date. Incomplete immunization means not only failure to protect the individual but also a lack of protection for families and communities. In SHR the number of vaccine preventable diseases is fairly low (with the exception of pertussis) but not non-existent (see Appendix 1). While this record is encouraging, there are signs that Public Health needs to improve the immunization program in select areas. If coverage rates drop too low in sub-segments of the population, a group of more susceptible people is created within the region from which an outbreak can arise, or previously eliminated diseases can re-emerge. Recent history has given us examples of countries such as the former Soviet Union, whose Public Health infrastructure was neglected, resulting in declining coverage rates and new outbreaks of diseases such as Diphtheria re-emerged. We also have examples in Canada where sub-populations whose ethno-religious beliefs discouraged immunization experienced outbreaks of polio, a disease otherwise not seen in Canada for over a decade.

As can be seen in the following figures taken from the Public Health Agency of Canada website, many vaccine preventable diseases have all but disappeared over the last century, largely due to the introduction of population based immunization programs.

Figures 1,2 and 3 from the PHAC (labeled Fig. 4,6, & 11 in their report)

Figure 1

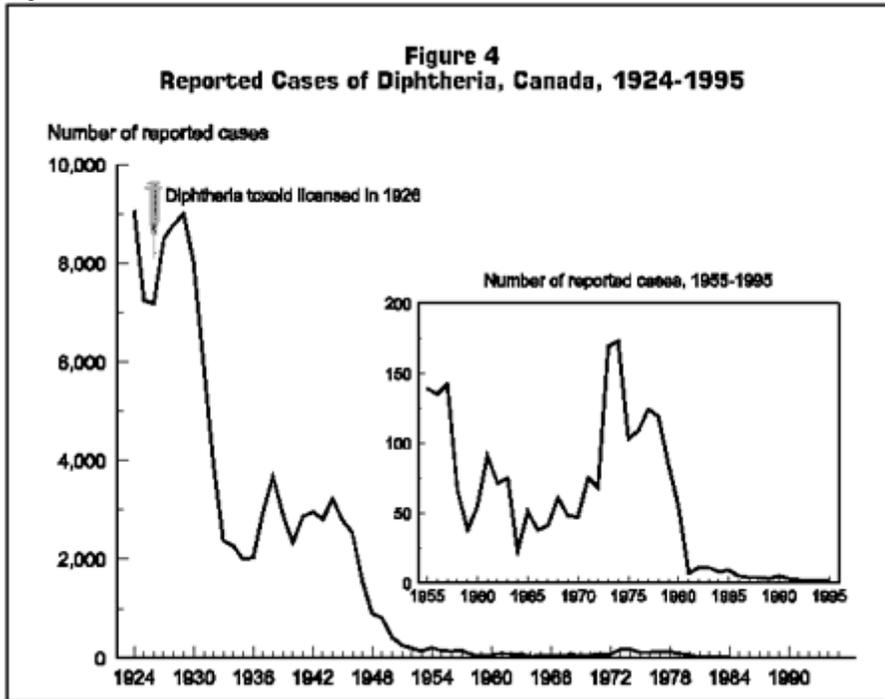


Figure 2

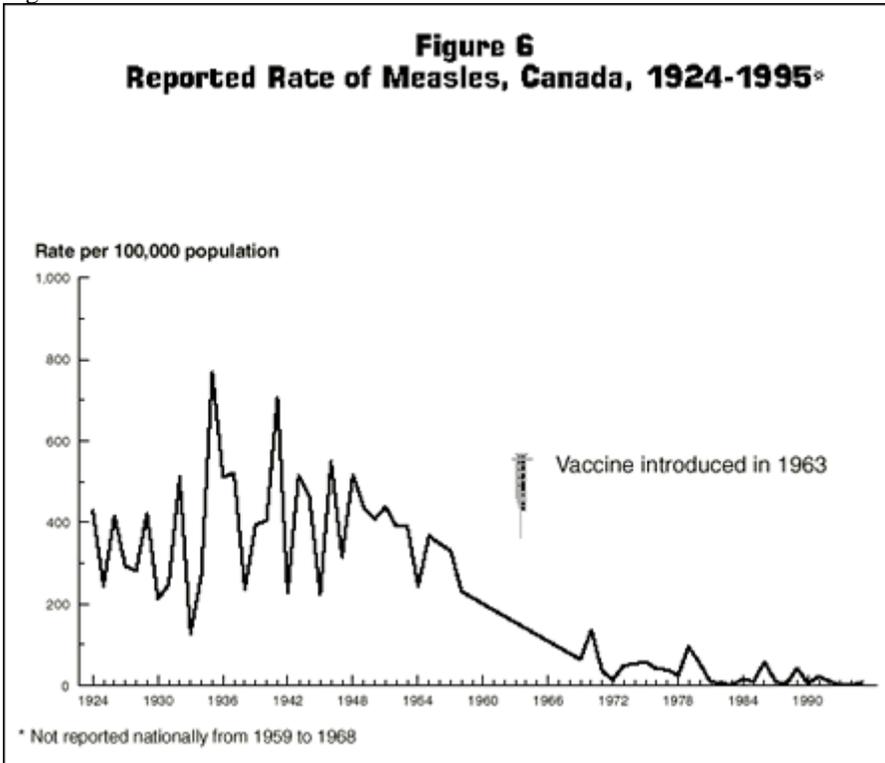
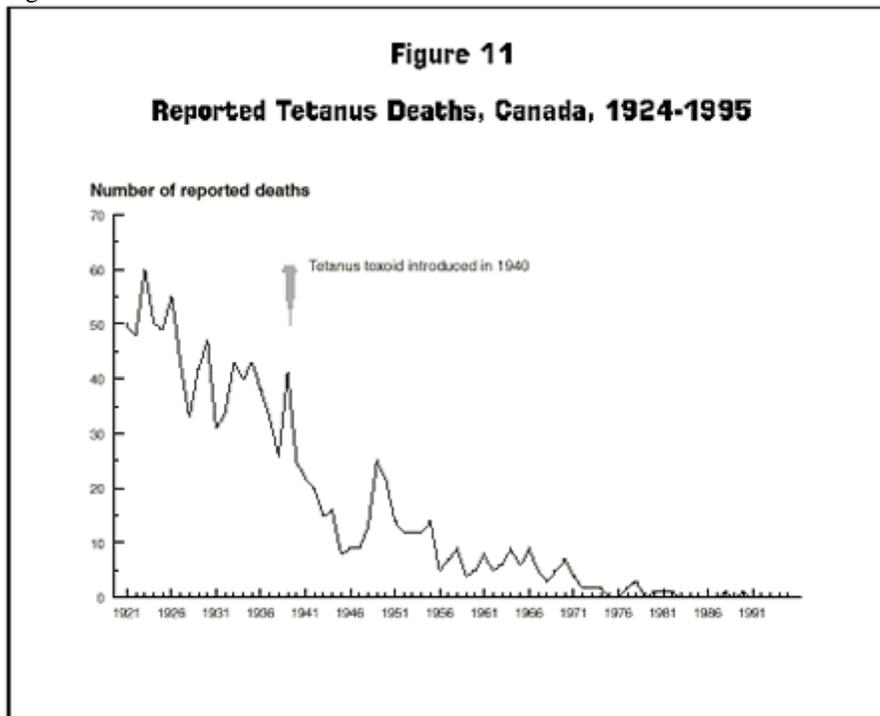


Figure 3



The national targets for immunization coverage in Canada, set by the National Advisory Committee on Immunization (NACI) in 1996 are indicated in Table 1. These targets represent the optimal population coverage required to prevent re-emergence of vaccine preventable disease outbreaks in Canada. To date, few health authorities in Canada have met these targets in the preschool population due to funding shortfalls and competing priorities for resources, but many regions reach these targets for 7 year olds. Unfortunately, this has the potential to leave an unacceptable gap in coverage levels for those most at risk of complications from these diseases, since the lower coverage rates often appear in the young and the disadvantaged.

Elimination of vaccine-preventable diseases is not always possible. A current vaccine may not provide life-long immunity, the disease organism may change, or the characteristics of the non-human disease reservoir may prevent eradication in humans. The increase in pertussis cases across Canada has been attributed in part to waning immunity of the vaccine. Smallpox was eradicated by a massive global vaccination effort since it had no other reservoir besides humans. Influenza changes its structure frequently and can infect multiple species. However, most vaccine preventable diseases can be kept at extremely low levels if coverage rates remain high enough in all segments of the population.

Individual children may be un-immunized or under-immunized for a variety of reasons. A small group of people will refuse vaccination due to religious beliefs or fears about vaccine safety. This has been the case ever since immunization was introduced, and despite continued improvements to vaccines, and many years of research in billions of people, this small percentage of people who refuse vaccine has remained relatively the

same. Social problems in families may result in delayed immunization due to competing issues and the complexities of merely surviving in a disadvantaged setting. There are numerous cultural and socioeconomic barriers to achieving high immunization coverage among subpopulations. Therefore, a major concern for Public Health is improving education about the safety and effectiveness of vaccines in preventing disease and improving access to preschool vaccination, especially in those groups or neighborhoods where coverage rates are relatively low.

Until recently, immunization records in SHR were hand written, making the estimation of coverage rates a manual, time-consuming task fraught with error and inaccuracy. As such, the best that could be done was to report annual estimated coverage rates at a health unit or Regional level for one or two age groups. Estimates were suspected to be falsely high since we could only calculate rates based on the people who visited our clinics, and estimate how many others might live in the region with provincial population estimates. A few years ago, Saskatchewan introduced an electronic immunization reporting system meant to correct this problem. It has taken years for this system to become functional enough for us to generate neighborhood level coverage estimates with enough certainty to use in planning. This report represents the first attempt to analyze the data from this system in a comprehensive way and use it to make recommendations to improve the program.

<b>Definitions used in this report</b>	
SIMS eligible population	Population registered in the Saskatchewan Immunization Management System (SIMS)
Covered population	All residents eligible for health insurance benefits in Saskatchewan, including Registered Indians
Up to Date coverage	Percent of children having the recommended number of doses for that age

Table 1 **Canadian National Immunization Goals and Targets**

Source: Canadian National Report on Immunization 1996<sup>1</sup>

<b>Disease</b>	<b>Goal</b>	<b>Target for 2 year olds</b>	<b>Target for 7 year olds</b>
Diphtheria	Eliminate indigenous cases	97% up-to-date coverage	99% coverage
Invasive Haemophilus influenzae type b (Hib)	Achieve and maintain absence of preventable cases	97% up-to-date coverage Recommended schedule begins at 2 months	
Hepatitis B (HBV)	Reduce prevalence of indigenously acquired chronic HBV by 90% by 2015	Screen 100% pregnant women, establish routine universal immunization by 1997, ensure 95% coverage	
Measles	Eliminate indigenous measles in Canada by 2005	97% coverage 1 <sup>st</sup> dose	99% coverage 2 <sup>nd</sup> dose
Mumps	Maintain prevention program to minimize serious sequelae	97% coverage	99% coverage
Pertussis	Reduce morbidity and mortality related to infection	95% up-to-date coverage	95% up-to-date coverage
Poliomyelitis	Maintain elimination of wild indigenous cases, prevent future import-related cases	97% 3 <sup>rd</sup> dose	99% up-to-date coverage
Rubella	Eliminate infection during pregnancy, congenital rubella syndrome and other serious sequelae; screen/obtain immunization records of pregnant women; ensure women of childbearing age have documented history of rubella immunization	97% up-to-date coverage	99% up-to-date before school entry; 99% up to date coverage in 14-15 year olds
Tetanus	Maintain absence of neonatal & childhood tetanus	97% up-to-date coverage	99% up-to-date coverage

## Childhood Immunization Program in Saskatoon Health Region

Public Health Services, Saskatoon Health Region, provides preschool immunization using free vaccine provided by Saskatchewan Health and according to Saskatchewan Health guidelines. The immunization schedule is indicated in Table 2. The program adheres to the National Advisory Committee on Immunization (NACI) sixteen national guidelines for childhood immunizations (Table 3). Three vaccines, varicella, meningococcal conjugate and pneumococcal conjugate were introduced between Oct 2004 and April 1, 2005 using a staged approach. Coverage rates for these vaccines will be lower for a few years until all children become eligible, and are not included in this report. Every effort is being made to apply the same coverage expectations for new vaccines as they are introduced, so as to avoid a worsening of the coverage rate.

Table 2

<b>Immunization Schedule</b>											
	2 mos	4 mos	6 mos	6-23 mos.	12 mos	18 mos	4-6 yrs	Grade 6	Grade 8	65+	Every 10 yrs
DTaP-Polio	•	•	•			•	•				
Hepatitis B								• •			
Hib	•	•	•			•					
Influenza (every year)						• •				•	
MMR					•	•					
MC*					•						
PC†	•	•	•			•					
Pneumo-23										•	
TdaP									•		
Td											•
V**					•						

DTaP-Polio – Diphtheria, Tetanus, Acellular Pertussis, Polio; MMR – Measles, Mumps, Rubella; Td – Tetanus, Diphtheria; Hib – Haemophilus influenzae type b; PC – pneumococcal conjugate; MC – meningococcal conjugate; V - varicella

- \* Meningococcal conjugate vaccine introduced October 1, 2004. Children born on or after October 1, 2003 are eligible when they turn one year, as are children born on or after October 1, 2000, as they turn 4 years.
- \*\* Varicella vaccine introduced January 1, 2005. Children born on or after January 1, 2004 are eligible when they turn one year.
- † Pneumococcal conjugate vaccine introduced April 1, 2005. Children born on or after February 1, 2005 are eligible as they turn two months of age.

Public Health Nurses provide written and verbal information about vaccines and clinic times and locations during the postnatal visit/contact. Immunization is available by appointment or on a walk-in basis at 12 urban health centers and 46 urban and rural satellite locations. Many of these clinics are only open once or twice a week, or for a few hours a day, and there are virtually no evening or weekend clinics available. Two walk-in clinics are located in the Saskatoon inner city areas, Riversdale and Mayfair for one afternoon per week. Immunization information is entered into the Saskatchewan Immunization Management system, a secure web-based information system, as well as on a paper client record until the electronic system is finalized as the permanent electronic record for the clients.

In previous years Public Health Services contacted by mail the parents of children who were more than 2 months behind in their immunization. Immunization coverage rates were determined manually. In 2005 this manual review was discontinued as a cost saving measure and to encourage the use of the electronic system for this purpose. Public Health Services plans to utilize the Saskatchewan Immunization Management System (SIMS) to generate overdue notices on a regular basis, but this functionality has not yet been implemented. A new National Communicable Disease and Immunization system is being developed, with planned implementation in 2007.

The Disease Control Department of Public Health Services is currently determining what changes can be made to Public Health Services Immunization programs to increase age-appropriate childhood immunization rates. A Preschool Immunization Advisory Committee (PIAC), composed of rural and urban Public Health Nurses, was formed to oversee this task. The committee hired a temporary Outreach Nurse to determine barriers to preschool immunization and to develop strategies to overcome these barriers. The outreach nurse reviewed the National Advisory Committee on Immunizations sixteen guidelines and recommended various options that could improve coverage rates. The Public Health Management Team has reviewed these recommendations along with the Medical Health Officers to determine which of the options to implement.

**Table 3 - Guidelines for Childhood Immunization**

1. Immunization services should be readily available.
2. There should be no barriers or unnecessary prerequisites to the receipt of vaccines.
3. Providers should use all clinical encounters to screen for needed vaccines and, when indicated, vaccinate children.
4. Providers should educate parents in general terms about immunization.
5. Providers should inform parents in specific terms about the risks and benefits of vaccines their child is to receive.
6. Providers should recommend deferral or withholding of vaccines for true contraindications only.
7. Providers should administer all vaccine doses for which a child is eligible at the time of each visit.
8. Providers should ensure that all vaccinations are accurately and completely recorded.
9. Providers should maintain easily retrievable summaries of the vaccination records to facilitate age-appropriate vaccination.
10. Providers should report clinically significant adverse events following vaccination – promptly, accurately, and completely.
11. Providers should report all cases of vaccine-preventable diseases as required under provincial and territorial legislation.
12. Providers should adhere to appropriate procedures for vaccine management.
13. Providers should maintain up-to-date, easily retrievable protocols at all locations where vaccines are administered.
14. Providers should be properly trained and maintain ongoing education regarding current immunization recommendations.
15. Providers should operate a tracking system.
16. Audits should be conducted in all immunization clinics to assess the quality of immunization records and assess immunization coverage levels.

## **Methods**

The data source for the analysis of immunization rates is the Saskatchewan Immunization Management System (SIMS), a confidential, web-enabled, information system that collects immunization data about all children receiving services. SIMS has been used to record immunizations administered in health clinics and doctors offices since 1998, including back entry of data from 1996 onward. In Health Clinics this information is entered into SIMS at the time of service. Information from services provided by other health care providers, such as physicians, are submitted in writing to the Health Region and entered into SIMS by Public Health Services.

In this report childhood immunization coverage was examined for diphtheria, tetanus and measles and rubella vaccine in children turning two and seven years old in 2004 in Saskatoon Health Region. The Immunization Report Steering Committee identified these four antigens as being the best indicators of total preschool immunization coverage, due to the antigenic combinations in which they are normally administered. Children are considered up-to-date if they have received the correct number of doses for the antigen by the second birthday and by the seventh birthday (for each birth cohort respectively). The definitions for up-to-date status for each of the antigens is indicated in Table 4.

Table 4

<b>Up-to-date status definition</b>			
<b>Age</b>	<b>Antigen</b>	<b>Includes</b>	<b>Number of recommended doses</b>
By 2 years	Measles and rubella	MMR or MR	two
By 2 years	Diphtheria and tetanus	DaPtP-Hib, DaPtP, DPT, DT	four
By 7 years	Measles and rubella	MMR, MR	Two MMR or 2 of MMR or MR
By 7 years	Diphtheria and tetanus	DaPtP-Hib, DaPTP, DPT, DT	Five

Postal codes were used to identify the child's geographic location within the eight identified service or catchments areas. For the city of Saskatoon neighbourhood level analysis, postal codes were used to identify neighbourhood of residence. SIMS updates all records to the current address, so immunization that began in one geographic area may be credited to another area based on the current address. Appendix 3 lists the communities included in the catchment area analysis in this report

Immunization rates have been calculated using the SIMS eligible population as the denominator, that is the birth cohort population registered in SIMS. Calculating rates using the covered population as the denominator is problematic due to lapses in time between updating the address information registered on the Personal Registry File and the address registered at the time of immunization service. The area-specific covered population numbers are often inaccurate due to delays, especially for new areas of the city and areas with high mobility, and can result in either inflated or underestimated coverage rates. The percentage of the covered population of children registered in SIMS is very high (97% and higher).

## Results

### **IMMUNIZATION COVERAGE OF TWO YEAR OLDS (CHILDREN TURNING TWO IN 2004)**

A total of 3138 children born in 2002 were registered in SIMS and generated 19,194 service events. **Overall in SHR 73.3% of the SIMS eligible population (2301/3138) were up-to-date for diphtheria and tetanus and 72.3% (2268/3138) of the two-year old children had up to date coverage for measles and rubella.**

Since even a single dose of MMR provides good coverage in most people, the coverage rate for one dose of this vaccine is also reported, even though the national guidelines require two doses to ensure better, longer lasting immunity. The coverage rate for one dose of measles and rubella in all of SHR by age two was 90% (not shown).

At the Health Region level, immunization coverage rates for 2 year olds for both the studied antigens range from a low of 57.3% to a high of 100% with a provincial average of approximately 73%. Saskatoon Health Region’s coverage rates are close to the provincial average. This places Saskatoon Health Region in 9th place out of 13 regions for up to date immunization rates and well below the national targets.

### Immunization by service area

Of the 3,138 clients born in 2002 and registered in SIMS approximately 97% had postal code information that could be can be matched to a catchment area. Table 5 indicates the up to date coverage for diphtheria and tetanus (4 doses) ranges from 66 to 100 percent across the 10 catchment areas. A high percentage of children had three doses by age two, suggesting that “catch-up” is attainable, possibly through earlier reminder or more timely scheduling.

Table 5

Doses	Percentage of SIMS eligible two year old population indicating total number of doses for diphtheria and tetanus immunization				
	0	1	2	3	4
Humboldt		99%	98	96.5	85.5
Lanigan					100
Rosthern		93	92.7	86.7	66.3
Saskatoon	.35	98.9	96	91.6	71.8
Saskatoon Rural	.9	96.8	94.9	93.3	78.6
Strasbourg				100	90.9
Wadena				100	94
Wakaw			100	90	80
Watrous			100	98	71.2
Wynyard		97.2		94	77.8
Grand Total	.4	98.4	92.6	92.1	73.8*

\* Coverage rate is slightly higher than calculated for overall SHR; denominator is 3062 children with postal code information.

Table 5 also indicates that while the Rosthern area had the lowest immunization rate for diphtheria and tetanus, 87% had three of the recommended four doses by age two. Rosthern area includes the Beardy and Okamasis reserves, where children may receive immunization that is not currently registered in SIMS. While caution may be applied in interpreting these estimates, it is believed that only a small portion of the low coverage can be explained by missing data. SHR is currently partnering with various First Nations communities in Saskatchewan to determine the size of this issue. The results of this study will determine whether a regular information sharing mechanism is necessary to jointly achieve higher up to date coverage levels for first nations people who move between the reserves and other parts of SHR.

Table 6

<b>Percentage of SIMS eligible two year old population indicating total number of doses for measles and rubella immunization</b>			
<b>Doses</b>	<b>0</b>	<b>1</b>	<b>2</b>
Humboldt	2.5	97.4	83.7
Lanigan		100	100
Rosthern	3.6	86.7	63.8
Saskatoon	2.7	89.2	71.1
Saskatoon Rural	1.6	92	76.8
Strasbourg		100	100
Wadena		98	86
Wakaw	5	90	75
Watrous	5.7	90.3	75
Wynyard		94	77
Grand Total	2.6	90.2	72.8*

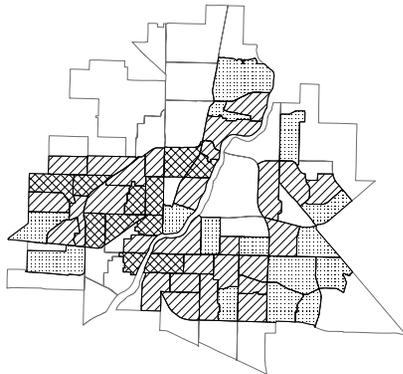
\*Coverage rate is slightly higher than calculated for overall SHR since the denominator is 3,062 children with postal code information.

Table 6 indicates that the up-to-date coverage rate of 2 doses of measles and rubella vaccine ranges from 64% in Rosthern to 100% in Lanigan and Humboldt. Four out of 10 areas achieved the national target of 97% immunization for the 1<sup>st</sup> dose of measles by age two.

Figure 4



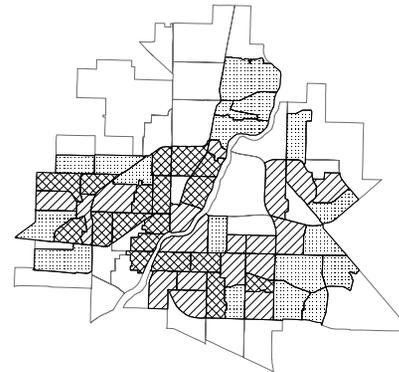
**Percent SIMS eligible two-year-olds  
up-to-date for measles & rubella,  
Saskatoon, 2004**



**Percent immunization coverage**  
46.5 - 60.0  
60.1 - 77.3  
77.3 - 100.0  
Data not available



**Percent SIMS eligible two-year-olds  
up-to-date for diphtheria & tetanus,  
Saskatoon, 2004**



**Percent immunization coverage**  
46.9 - 66.6  
66.7 - 78.0  
78.1 - 100  
Data not available

## City of Saskatoon

Across Saskatoon neighbourhoods two-year-old up-to-date immunization ranges from 46.5% to 100% for measles and rubella and from 46.9 % to 100% for diphtheria and tetanus. The lowest rates are found primarily on the west side of the city, with pockets on the east side. The newly developed areas on the perimeter of the city, south east, north east and south west have the highest immunization rates. A table of individual neighbourhood counts is found in Appendix 2.

### IMMUNIZATION COVERAGE OF SEVEN YEAR OLDS (TURNING 7 IN 2004)

A total of 3846 children born in 1997 were registered in SIMS and generated 27,129 service events. **Overall in SHR 77.2% of the SIMS eligible population (2978/3846) were up to date for diphtheria and tetanus and 92.5% (3558/3846) for measles and rubella by age seven.** Approximately 96% of the seven year old children had postal code information that could be linked to a catchment area.

Table 7

Doses	Percentage SIMS eligible seven year old population indicating total number of doses for diphtheria and tetanus immunization					
	0	1	2	3	4	5
Humboldt		98.5	97.1	97.1	95.7	92.1
Lanigan		100	100	100	100	84.8
Rosthern		96.3	96.3	96.3	78	79.2
Saskatoon	.03	98.9	97.8	96.7	93.2	75.5
Saskatoon Rural		97.8	97	95.9	93.8	85.6
Strasbourg		100	100	100	100	86.3
Wadena		98.2	98.2	98.2	98.2	91.2
Wakaw		100	100	100	100	92
Watrous		98.8	98.8	97.6	94	83.3
Wynyard		97.7	97.7	97.7	95.5	86.6
Grand Total	.02	98.7	97.7	96.7	93.7	78.3*

\*Coverage rate slightly higher than that calculated for overall SHR; denominator is 3739 children with postal code information

Table 7 indicates up-to-date immunization rates for diphtheria and tetanus (5 doses) range across the 10 catchment areas from 75.5 % to 92%. Again, the relatively low uptake in Rosthern deserves closer examination as this location is likely to include a higher proportion of First Nations children whose complete record of immunization may not be registered in SIMS. The same may be true in certain parts of Saskatoon, but is unlikely to completely explain the low neighborhood coverage rates. Since the population of Saskatoon is large compared to the other areas in SHR, the city's relatively low rate brings the overall Regional rate down substantially. It is of particular concern that up to date coverage levels are still low by age seven, however, the vast majority of those who are behind only require one more dose to be caught up for these antigens. Table 9 indicates the up-to-date immunization coverage rates for measles and rubella (2 doses) is very high, ranging from 95% to 100% across the catchment areas. The higher uptake rate for these two antigens is encouraging as these two highly infectious diseases can have devastating implications for public health, it would be better for a higher rate of coverage to be achieved by age 2.

Table 9

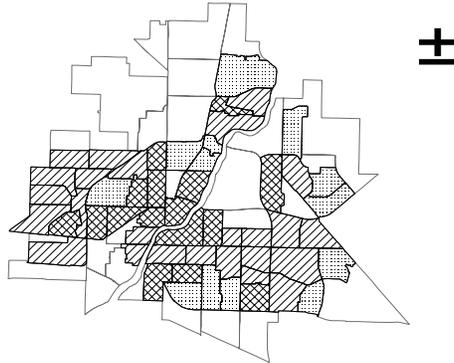
<b>Percentage of SIMS eligible two year old population indicating total number of doses for measles and rubella immunization</b>			
<b>Doses</b>	<b>0</b>	<b>1</b>	<b>2</b>
Humboldt		100	100
Lanigan		100	100
Rosthern		100	100
Saskatoon		99.6	95.2
Saskatoon Rural	.2	99.8	96.7
Strasbourg		100	100
Wadena		100	100
Wakaw		100	100
Watrous	1.2	98.8	97.5
Wynyard		100	100
Grand Total	0.3	99.6	95.9*

\*Coverage rate is higher than that calculated for overall SHR; denominator is 3656 children with postal code information.

Figure 5



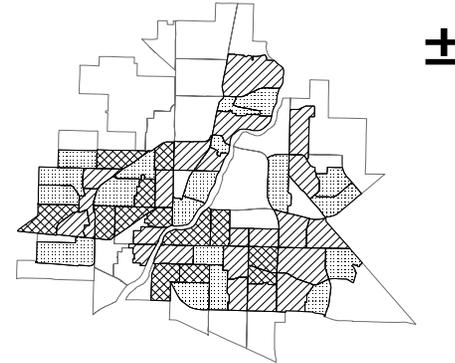
Percent SIMS eligible seven-year-olds up-to-date for diphtheria & tetanus, Saskatoon, 2004



**Percent immunization coverage**  
44.2 - 69.2  
69.3 - 82.1  
82.2 - 100.0  
Data not available



Percent SIMS eligible seven-year-olds up-to-date for measles & rubella, Saskatoon, 2004



**Percent immunization coverage**  
83.5 - 90.7  
90.7 - 95.9  
96.0 - 100.0  
Data not available

## **City of Saskatoon**

Up to date immunization across Saskatoon neighbourhoods ranges from 85% to 100% for measles and rubella, and from 44% to 100% for diphtheria and tetanus. Rates have been divided into tertiles. Maps indicate the levels of immunization are much more heterogeneously distributed throughout the city in this age group, suggesting the reasons for delay are more variable. Mobility of the population will also affect the apparent heterogeneity since immunization that begins in one neighbourhood will be credited to another neighbourhood if the child moves. By seven years of age there is an increased likelihood that a child may move. The need for an accurate and up to date electronic record that is shared between jurisdictions becomes even more important as a child gets older.

## **Core Neighbourhoods**

SHR has identified the core neighbourhoods (Meadowgreen, King George, Pleasant Hill, Riversdale, Westmount and Confederation Suburban Centre) as priority areas for monitoring health services and utilization. These neighborhoods were selected for monitoring and intervention due to significant differences in income, education and employment levels compared to the rest of Saskatoon. The average family income in 2001 for these neighborhoods was \$30,429 compared to \$63,705 for the rest of Saskatoon. A previous SHR study has determined that the rates of chronic disease and sexually transmitted infections are significantly higher in the core neighbourhoods compared to the rest of Saskatoon. Other health indicators such as teenage birth rates, low birth rates and infant mortality show similar health disparities. Information was collected on the eight most common diseases and disorders (ICD9 codes) using hospital discharge data, physician visits, pharmaceutical prescription data, and selected reportable disease notification. The ratio of disease rates in the core neighbourhood compared to the rest of Saskatoon varied from 3 times for suicide attempt (hospitalization) to 7 times for Hepatitis C rates (Lemstra et al. "Socioeconomic Inequalities in Health Status" 2005 pending publication). The rate of infant mortality in the core neighborhoods was almost 5 times greater than the Saskatoon rate .

This study showed that the percentage of up to date immunization in the core neighbourhoods for two year olds in 2004 average 55.8% for diphtheria & tetanus compared to 74% for the rest of Saskatoon. For measles and rubella the coverage was 55.8% compared to 72.9% for the rest of Saskatoon.

The percentage of seven year olds in the core neighbourhood with up to date immunization for diphtheria and tetanus was 56.5% compared with 78.5% for the rest of Saskatoon. For measles and rubella the core neighbourhood had a rate of 88.9% compared to 94.7%.

## **Discussion**

Analysis of the SIMS data has revealed that childhood immunization uptake varies geographically across the Region. The greatest variation in rates is seen within the City of Saskatoon. While analysis of childhood disease has not specifically been undertaken in the region it appears that children most at risk for infectious disease and other health problems are the least likely to be immunized. In a time with limited resources, these findings will provide us with valuable information for targeting our resources to the neighbourhoods most in need. The addition of 4 new vaccines into the childhood immunization program between September 2004 and September 2005 has further stretched our resources. The ability to target our efforts to achieve maximum coverage is essential for continued sustainability.

Two year old up-to-date immunization rates are slightly lower in SHR compared to Canada as a whole. According to the 2002 National Immunization Coverage Survey the national coverage rates for diphtheria and tetanus for two year olds in 2002 was 76.8% and 74.3% respectively<sup>2</sup> slightly higher than that achieved in Saskatoon Health Region (73.3%). National measles and rubella immunization rates for two year olds for one dose were 94.5 and 93.6% respectively compared to 90.2% for SHR. On the other hand, seven year old immunization rates are higher for diphtheria and tetanus in SHR than nationally. SHR rates were 77.% compared to the national rates of 70.5% and 65.9% for diphtheria and tetanus respectively. SHR rates for measles and rubella (92.5%) were also higher than the national average rate.

Due to methodological differences in the two studies, care must be taken in comparing rates. In the national survey, researchers collected information from 629 two-year olds and 602 seven year olds from across Canada by computer assisted telephone survey to assess parental knowledge and attitudes towards childhood immunization, determine availability of immunization records in the home and estimate national and provincial coverage rates of children at ages 2 and 7<sup>3</sup>.

A study of two-year-old MMR immunization trends in Saskatoon found that up-to-date immunization rates remained relatively constant between 1999 and 2002, with approximately 70% receiving two doses before the age of two<sup>4</sup>. The author also found that the inner-city neighborhoods had an average up-to-date coverage rate of approximately 45%.

### **Issues in up to date immunization**

The national survey revealed that only 56.% of parents of 2 year olds and 32.5% of parents of 7 year olds reported that all the recommended doses of diphtheria, pertussis, tetanus, polio measles, mumps, rubella and Hib had been received. Furthermore a decreasing trend in immunization coverage rates was shown for both the 2 year old and 7 year olds from the earlier 1998 to 2002 surveys (although there was also a change in coverage assessment methods which could partly account for this decrease). Some of the common issues identified by a series of questions examining parental knowledge and

attitudes to immunization are highlighted. They are similar to issues found locally by the SHR PHS Outreach Nurse previously mentioned, however her interviews with parents of children who were behind in immunization revealed more concerns about difficulties in accessing immunization services in the core neighborhoods due to issues such as transportation, other competing priorities, and inconvenient hours of operation.

### **Knowledge**

“Parents who believed that their child’s immunizations were up to date were more likely to feel that they had been given enough information than parents who did not think that their child’s immunizations were up to date. The most frequently stated barriers to dissemination of information were lack of detailed complete information providing both benefits and risks, followed by the respondent’s sense that they had not been provided with enough information from a doctor, government etc. When respondents were asked if they had any suggestions to improve the dissemination of information of those with comments more suggested the Internet than other means.<sup>5</sup>

### **Safety**

Vaccines are known to be among the safest tools of modern health care. The benefits of vaccinations far outweigh risks of adverse effects. Social attitudes and concerns about adverse effects of vaccines have threatened disease control of vaccine-preventable diseases since the advent of vaccines. While anti-immunization groups are not a new phenomenon their activities and the unsupported evidence voiced in the media has had an impact on vaccine-preventable disease prevalence. In England in the 1970’s for example, anti-vaccination attitudes caused a major drop in immunization for pertussis, which was followed by two major epidemics of the disease where dozens of children died. In the 1980s when diphtheria immunization rates fell in Russia, diphtheria grew to epidemic proportions.<sup>6</sup> The current controversy over an alleged link between vaccination against measles, mumps and rubella (MMR) and autism has caused some care-givers to reconsider administering the vaccine to their children -- this in spite of the paucity of scientific evidence supporting a causal association, and in spite of the demonstrated effectiveness of the vaccine in preventing life-threatening illness. As the public and health workers become less familiar with dangerous vaccine-preventable diseases, complacency also plays a role in decreasing immunization coverage that could lead to serious outbreaks of disease. More survey research needs to be done locally to assess the impact of attitudes towards immunization on coverage rates and to determine the degree of public education needed to counter these issues.

The Guidelines for Childhood Immunization specify that providers should recommend deferral of vaccination for true contraindications only, which are very rare. More information about the nature of true contraindications among providers may help to ensure that vaccinations are not withheld or postponed due to mild illness.

## **Missed Opportunities**

A review of studies on under-immunization in the USA found that late vaccine initiation and missed opportunities to vaccinate during health care visits were two of the most consistent risk factors for under-immunization.<sup>7</sup> Missed opportunities for childhood immunization was identified as an area of concern in the 2002 National Survey. In that survey less than half of parents who reported taking their child for a check-up or well-baby visit in the previous year reported that either the doctor or nurse discussed their child's immunization with them. In Emergency departments only 21.7% of parents recalled having a doctor or nurse discuss their child's immunization with them at their last hospital, emergency room or special clinic visit.<sup>8</sup> Since PHS does the majority of immunization in SHR, other programs that see children in the home or clinic setting (such as Healthy & Home, primary care, and emergency departments) may also represent missed opportunities for immunization or enquiring about immunization status and reminding parents to immunize their children. Any programs that involve public health visits to homes where there is more than one child may also be used to "catch-up" immunization for all those children in the home.

In SHR it is important to continue to generate reminders to parents of up-coming due dates for immunization. Most coverage rates in SHR fall off for the last age-appropriate dose (for example, fourth dose for two year olds, fifth dose for seven year olds) suggesting that efforts targeted for a specific time frame of the immunization might yield best results. In the United States, where similar problems have been noted, strategies include re-programming electronic systems to call for the 4<sup>th</sup> dose observing the minimum spacing guidelines, and reminding parents and providers about the importance of fully completed vaccine series. While certain areas of SHR might require only letters at six months before age two or seven, other areas may benefit from phone calls or home visits by a public health nurse.

At present SIMS is not available in physician offices. The expanded availability of SIMS would help to increase the awareness of child immunization status during routine primary care visits. While full implementation will take some time, target expansion of the look up capability of the SIMS may be feasible within a short time frame, for example, in the West Winds Primary Health Centre and Community Clinics. In the meantime, in the absence of access to SIMS, a formal notification to the physician with regards to the immunization status of a child may also increase awareness of the importance of making the most of any opportunity to immunize.

## **Access**

Challenges in accessing immunization services is a major contributor to the lower immunization rates in parts of the region, and is similar in nature to difficulties in accessing other types of primary health care. Factors such as a family's economic circumstances, the availability of home visitors, the location and proximity of the clinic, transportation options to the clinic, and the hours of operation of the clinic can all impact immunization rates. Other enabling factors such as confidence in the health provider,

whether the clinic has a comfortable environment and the availability of appropriate information also influence access. Clinics often offer a wide variety of services, convenience, and other “motivators,” however the decision on whether or not to immunize a child at any given time can be influenced by socio-cultural conditions, education attainment and the economic environment outside the clinic’s sphere of influence. Children living in poverty whose parents are dealing with many personal challenges may not receive timely immunization. Public Health Services needs to balance its attempts at improving access to services with addressing health disparities and advocating to eliminate socioeconomic inequities.

Avis’s study of neighbourhood level predictors of immunization rates found that the “proportion of female-headed lone parent families” and the “proportion of vehicles registered” were the two significant census variables that could explain 80% of overall variation in up-to-date immunization rates in Saskatoon neighbourhoods. In her multivariate model, (which included median family income, 1 year mobility, families below the line of poverty, teenage birth rates, education less than grade 9, income less than \$10,000, vehicle registration, male-headed lone parent families and female-headed lone parent families) female headed lone parent families achieved the highest level of significance ( $p < 0.001$ ) followed by proportion of vehicles registered ( $p = 0.0111$ ).

Keeping up with childhood immunization along with other parental responsibilities is an on-going challenge for many single mothers. SHR needs to consider every opportunity to improve access for people dealing with many challenges, from scheduling of clinics and providing more “walk-in” clinic options, to reminders and utilization of alternative sites. The issue of placement of health clinics is highlighted when the availability of a car or access to transportation is in question. As Avis points out, some Saskatoon families may have more problems in attaining on-time vaccinations due to the distance from where they live to where immunizations are offered. While child health clinics are open in two neighbourhoods (Riversdale and Mayfair), their hours are very limited, and more neighborhood level satellite clinics may be necessary to improve access. On September 30, 2005, the West Health Centre (the only permanent Public Health Clinic on the West side) moved from 3118 Laurier Drive to the new Westwinds Primary Health Care Centre on Fairlight Drive. It is not anticipated that this will affect coverage rates west of Circle Drive, but it is unknown what effect, if any, it will have on coverage rates in the core neighborhoods. It is anticipated that this clinic will still be too far away for those in the core neighborhoods with access challenges, and other clinic options are still going to be necessary to improve coverage rates.

### **Study Limitations and Strengths**

Data quality and quantity affects how accurately the immunization rate reflects true immunization coverage. One of the major limitations in interpreting this report is the issue of incomplete data. At present, children who start their immunization with the Health Region and receive subsequent immunization with First Nations clinics will not have all immunizations recorded in SIMS. For example, a child who received the first two immunizations through the Region and the second two immunizations from a First Nations clinic would not be counted as up-to-date in SIMS, even though the full

recommended immunization for age had been received. If this is a common problem, some neighbourhoods with greater proportions of First Nations children may appear to have lower coverage rates. We are currently working with the various bands in our Region to determine the size of this issue. However, if a child receives the first few immunizations on reserve, and then moves to Saskatoon and comes to a PHS clinic for their next doses, PHS can call the reserve clinic and have a copy of the previous record sent over and put into SIMS. At the time of publication immunization information is not shared between First Nations and the Regional Health Authorities routinely. Negotiations are taking place with First Nations health providers to have them use a common system. This is especially important with a transient population in order to make the most of every immunization opportunity.

Electronically capturing immunization records in registries is a challenge that many provinces are grappling with currently. Provincial and territorial comparisons are largely absent from this report either because they are unavailable or not comparable due to different reporting criteria and schedules. There is also an absence of national standard definitions for numerators and denominators. The new National Public Health Surveillance System being developed through Canada Health Infoway is expected to solve this problem, and will be implemented in 2007.

Using the SIMS eligible population for the coverage rate denominator has limitations. Children whose immunization records have not been entered into SIMS are not included in the denominator, nor are those who received immunization from First Nations agencies, or those who arrived from out of province or out of country who have not yet accessed the Regions immunization services. It is believed that only a small fraction of the coverage rate discrepancies between core-neighborhoods and the rest of Saskatoon can be explained by incomplete data. Approximately 97% of the children born in 2002, and 1997 are registered in SIMS. Using the covered population for the denominator would also be problematic for the reasons outlined in the Methods section. Updating personal health registry information at the point of service, rather than every three years would be a distinct advantage. Some families who never update their address for their personal health number will never be accurately represented in their true geographic location.

One of the many features in SIMS is the ability to generate a variety of reports including coverage rate reports at the regional level, and the ability to generate reminders for overdue immunization. At present, the date of the next immunization must be manually updated in the client record. An auto-generated next immunization due-date based on the present date of service would help to eliminate error in this estimation. Until these issues are dealt with, reliance on SIMS generated overdue letters would be risky. Nevertheless, using SIMS to help identify those who are behind in their immunization to allow for some form of reminder system to be re-instituted is recommended.

One of the challenges with SIMS is the need to enhance system functionality. Computers need to be accessible at the point of service to allow for client lookup and data entry, business rules need to be refined to minimize data entry errors, and system access needs

to be expanded to First Nations, Primary Health Care sites, Pediatricians and other clinicians as required.

The major strength of this study is the use of electronic immunization record. The ability to download the SIMS database from the online site allows for detailed analysis over and above what the automated SIMS reports can produce. Analysis of this data can be done in much greater detail than with the manual system, and is valuable in identifying coverage rates by neighbourhood. All Health Regions in the province are now using SIMS (with the exception of on reserve clinics). This facilitates quick and easy access to immunization information as people move from region to region. A test of the system reliability between the hard copy record and SIMS revealed a high rate of accuracy.

## **Summary**

Immunization is one of the cornerstones of traditional public health practice, and it is one of the few health services that is not only preventative, but is cost effective in doing so. The recent move to an electronic immunization record system in SHR has enabled a detailed analysis of the age-appropriate immunization coverage rates by neighborhood. This analysis, along with an overall analysis of health disparities has demonstrated that while the vast majority of children have had at least some immunization, and get the recommended doses by the time they attend school, there are inequities in our Region. In order to meet the National targets set for immunization coverage, we need to improve the percentage of children who get the complete series of recommended doses earlier. This is especially true for certain neighborhoods in the core of our city, and several rural areas, but it also true to a lesser extent in many middle income neighborhoods in Saskatoon. Other cities in North America have dramatically improved coverage rates with several low cost, simple interventions that may be relevant in Saskatoon Health Region. By jointly planning with other parts of the health system, and with our intersectoral partners and the community, changes can be made which should dramatically improve these coverage rates and ensure that all children in SHR have the same level of protection against these childhood diseases.

Also, the health disparities research has shown that lower coverage rates in some parts of the city are only a symptom of the multiple inequities in the determinants of health (such as education, employment, social conditions and supports, and income)for residents in these neighborhoods. Therefore, any interventions aimed at correcting disparities in one area of service need to take this into account, and tie into efforts to reduce these inequities in the underlying determinants as well. This will involve an interdisciplinary approach, and will require the workers who deal with families in the context of immunization to not only be aware of different needs in the way they deliver immunization to this group, but also to be aware of the families' other needs and to refer to other programs and services as necessary. Once the immunization rates improve in these neighborhoods, these indicators will be fed back into the overall intersectoral work being done by the coalition to reduce health disparities as success stories. However, we will need to continually assess whether there are other ways to involve PHS staff in dealing with the root issues that cause disparities as they work with families in need.

## Recommendations

The following recommendations have been summarized from a review done by the Immunization Outreach Nurse early in 2006, as well as from other immunization and health disparities research done in the SHR in the past year. They take into account recommendations from the literature, from staff who work in the area of immunization, and the public who use these services. After deliberation at the Management level within PHS, we recommend that the following actions take place to improve immunization coverage in the SHR:

### 1. Increase accessibility to immunization services where coverage rates are low.

In the context of overall the accessibility planning currently taking place to address health disparities, PHS should:

- increase the number of satellite locations where immunization is provided, including pilot projects in inner city schools in multidisciplinary primary care,
- extend the hours of operation of clinics according to client needs (later afternoon, evening, weekend clinics),
- provide transportation to clinics, or take immunization services into the home when necessary

### 2. Increase Coalitions and Partnerships

Work in partnership with other programs, agencies and groups such as: Westside Community Clinic, Healthy Mother Healthy Baby, Healthy & Home, Kids First, Family Support Centre, Family physicians, local businesses, Open Door Society, City of Saskatoon, Riversdale BID, First Nations Health Agencies, to get assistance in promoting immunization, delivering immunization and reminding clients to get immunized when they are late

### 3. Increase Community Participation and Community Capacity Building

Work with advisory groups such as elders, Community Advisory Network Members, and the West Wind Community Advisory Council to get ideas for improvements in service

### 4. Increased Visibility/Advertising

Utilize advertising including billboards, buses, radio, T.V., especially at key times such as activities during Immunization Awareness week.

### 5. Increased surveillance and notification of delayed immunization.

Ongoing monitoring of neighbourhood coverage rates, and watch for decreasing rates in other groups

Implement reminder systems for those who are behind in immunization utilizing automated reminder systems, and reports from SIMS

Increased access to electronic immunization records for others in primary care (physicians, primary care nurses),

#### 7. Use Incentives

Explore the use of incentives for successful completion of immunization series, especially if they tie into other health promotion activities such as healthy eating (grocery vouchers), physical activity (vouchers to attend community events with children)

#### 8. Increased staffing

Hire an Immunization Nurse Clinician to oversee and implement the various changes proposed in this report, as well as orientation/training/certification of Public Health Nurses for immunization, reviewing lists of those behind in immunization from the SIMS program, tracking coverage rates, problem solving difficult cases, and working with the PHN's to carry out their duties and remove barriers to immunization.

Create a SHR equivalent to the "Community Outreach Worker" position used successfully in Northern Saskatchewan and other countries. This staff position will assist in contacting clients overdue for their immunization and determine what they need (reminders, transportation, education, extended hours clinic, home visit, etc) working closely with primary health care workers. They could also determine other family needs and work to help them solve them (work with DCRE or Sask Tel to arrange for telephones for those without, helping to find work or training)

#### 9. Ensure scalability of the recommended service delivery options

As new immunizations are introduced to the public, delivery systems will need to ensure that coverage rates continue to remain high enough for them as well as those already in the system. Any new service delivery options will need to take this into account, starting with the three new immunizations introduced this past year.

## Appendix 1

<b>Vaccine Preventable Disease*, Saskatoon Health Region 1995-2005</b>						
<b>Year</b>	<b>Haemophilus Influenza</b>	<b>Measles</b>	<b>Mumps</b>	<b>Pertussis</b>	<b>Rubella</b>	<b>Total Vaccine Preventable Diseases</b>
1995	1			54		55
1996	1	2	4	70		77
1997	1		3	129	1	134
1998			1	39		40
1999				150		150
2000			1	125		126
2001			2	148		150
2002				107		107
2003	1			373	1	375
2004	5			137		142
2005				98*		98

\* for routine vaccination in childhood; no tetanus, polio or diphtheria has been reported in the Region since 1995.

Note: while vaccine preventable disease incidence is low the potential for outbreak, as indicated by pertussis, is an important issue.

## Appendix 2

### Saskatoon Neighborhood Sub-analysis

#### City of Saskatoon Neighborhood Analysis, Diphtheria and Tetanus vaccine

Selected Neighborhoods	Total Children	% Receiving 4doses By 2Yrs
Adelaide/Churchill	24	66.7
Agpro Industrial	8	50.0
Airport Industrial	10	70.0
Arbor Creek	87	93.1
Avalon	32	75.0
Brevoort Park	37	67.6
Briarwood	32	84.4
Buena Vista	30	60.0
Caswell Hill	44	52.3
Central Business District	8	75.0
City Park	37	64.9
College Park	40	75.0
College Park East	58	82.8
Confederation Park	105	61.0
Confederation Suburban Centre	33	72.7
Dundonald	57	80.7
Eastview	34	67.6
Erindale	48	77.1
Exhibition	32	68.8
Fairhaven	48	66.7
Forest Grove	72	70.8
Greystone Heights	31	77.4
Grosvenor Park	11	72.7
Haultain	31	61.3
Holiday Park	28	57.1
Holliston	30	73.3
Hudson Bay Park	8	87.5
Kelsey-Woodlawn	12	58.3
King George	24	62.5
Lakeridge	45	80.0
Lakeview	69	84.1
Lawson Heights	57	78.9
Massey Place	58	50.0
Mayfair	26	65.4
Meadowgreen	66	47.0
Montgomery Place	15	80.0
Mount Royal	45	71.1
North Park	25	52.0
Nutana	53	69.8
Nutana Park	27	92.6

Nutana Suburban Centre	6	66.7
Pacific Heights	41	78.0
Parkridge	62	80.6
Pleasant Hill	62	48.4
Queen Elizabeth	25	68.0
Richmond Heights	10	70.0
River Heights	52	82.7
Riversdale	27	66.7
S.E. Development Area	11	81.8
Silverspring	86	88.4
Silverwood Heights	94	78.7
Sutherland	61	68.9
U. of S. Lands South Management Area	12	66.7
University Heights Suburban Centre	6	50.0
Varsity View	19	84.2
Westmount	39	56.4
Westview	53	79.2
Wildwood	36	80.6
Grand Total	2260	71.8

Note: Source is SIMS data for children born in 2002, using SIMS population as the denominator, (excluding Neighborhoods with less than 5 children under 2 yrs of age) where postal code information was available.

### Appendix 3

<b>Percent Up to Date Coverage in Saskatoon Health Region by Catchment Area</b>				
<b>Catchment</b>	<b>7 yr-old D T</b>	<b>2 yr-old D T</b>	<b>7 yr-old MMR</b>	<b>2 yr-old MMR</b>
Humboldt	92.1	85.5	100	83.8
Lanigan	84.8	100	100	100
Rosthern	79.2	66.3	100	63.9
Saskatoon	75	71.8	95.2	71.1
Saskatoon Rural	85.6	78.6	96.7	76.8
Strasbourg	86.3	90.9	100	100
Wadena	91.2	94	100	86
Wakaw	92	80	100	75
Watrous	83.3	71.2	97.6	75
Wynyard	86.6	77.8	100	77
SHR*not based on PC	77.2	72.3	92.5	73.3

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## Endnotes

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