

**RESULTS of the SURVEILLANCE of  
METHICILLIN RESISTANT  
*STAPHYLOCOCCUS AUREUS***

**FROM 1995 TO 2009**

**A PROJECT of the CANADIAN  
NOSOCOMIAL INFECTION  
SURVEILLANCE PROGRAM (CNISP)**



Public Health  
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**RESULTS of the SURVEILLANCE of METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* — FROM 1995 TO 2009 — A PROJECT of the CANADIAN NOSOCOMIAL INFECTION SURVEILLANCE PROGRAM (CNISP)**

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There has been a gradual but continued increase in overall MRSA rates across the country. However, most of the increase is accounted for by greater numbers of colonized patients (reflecting perhaps widespread MRSA screening practices), with little or no increase in MRSA infection rates. This could be viewed as a small measure of success of MRSA infection control in many institutions. However, nosocomial (i.e. originating from reporting acute care facility) infection rates remain significant, and account for nearly two-thirds of all cases. It is also important to note the dramatic increase in community-associated cases (with no traditional risk factors associated with healthcare exposure) in the past 5 years; currently, almost a third of all new MRSA cases appear to be community-associated.

**Nosocomial infections** = Infections associated with the reporting acute care facility;

**Healthcare-associated** = Cases of infections or colonizations originating from exposure to any health procedure carried out in a healthcare facility including long term care facilities or clinics.

**Table 1. Frequency of detection of MRSA in the CNISP network from 1995 to 2009**

Surveillance year	MRSA <sup>1</sup> Infections	MRSA Colonizations	Numerator	Denominator	
				(patient-admissions <sup>2</sup> )	(patient-days <sup>3</sup> )
1995	106	83	189	374,027	2,907,905
1996	192	247	440	405,791	3,801,608
1997	293	358	653	418,465	3,625,997
1998	418	616	1,050	407,297	2,990,598
1999	513	1,381	1,953	510,095	4,078,163
2000	736	1,781	2,553	507,910	3,862,873
2001	696	1,602	2,328	614,421	4,967,214
2002	845	1,849	2,729	583,658	4,732,172
2003	1,064	2,390	3,465	671,240	5,611,833
2004	1,369	2,642	4,019	677,829	5,227,447
2005	2,067	3,427	5,636	764,341	6,493,286
2006	2,011	3,850	5,867	770,118	5,963,506
2007	1,952	4,335	6,287	768,294	5,695,520
2008	2,001	4,364	6,273	678,610	5,441,458
2009	2,036	4,610	6,646	701,477	5,374,036

<sup>1</sup> MRSA = Methicillin Resistant *Staphylococcus aureus*.

<sup>2</sup> Patient-admissions = Number of patients admitted/hospitalized during a surveillance year (one patient can have multiple hospitalizations).

<sup>3</sup> Patient-days = Total number of days that each patient spent hospitalized during a surveillance year.

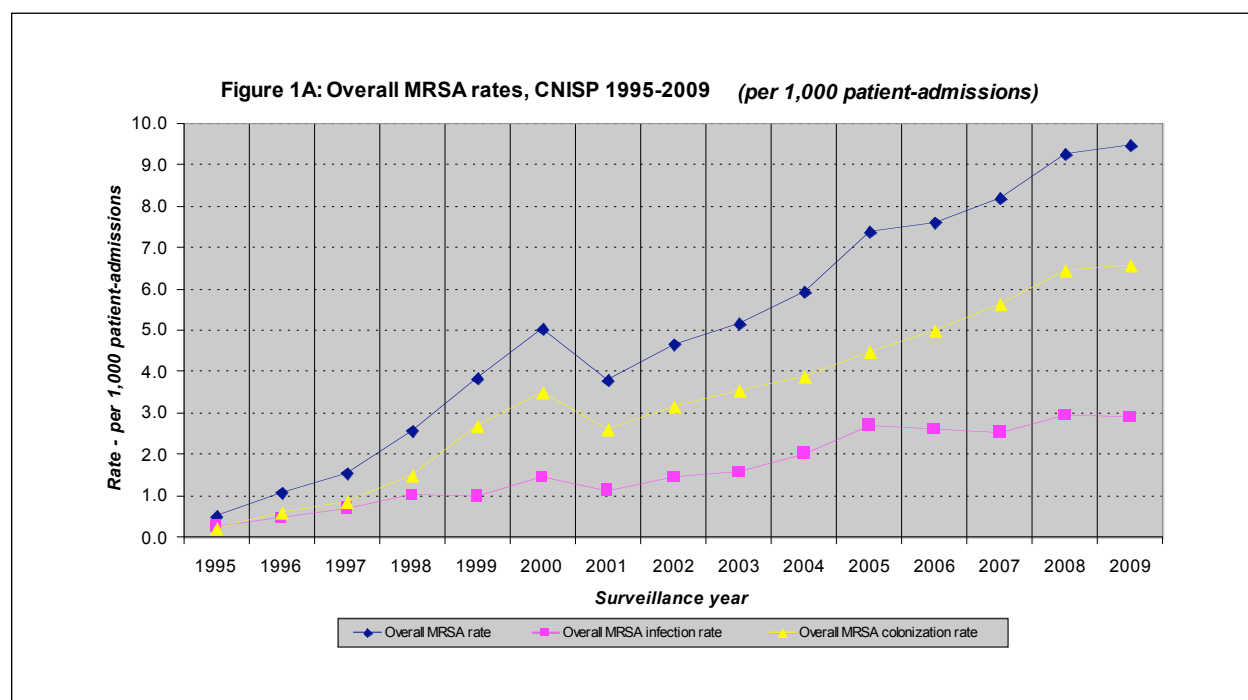
**Table 2. Regional distribution of MRSA infections & colonizations in the CNISP network from 1995 to 2009**

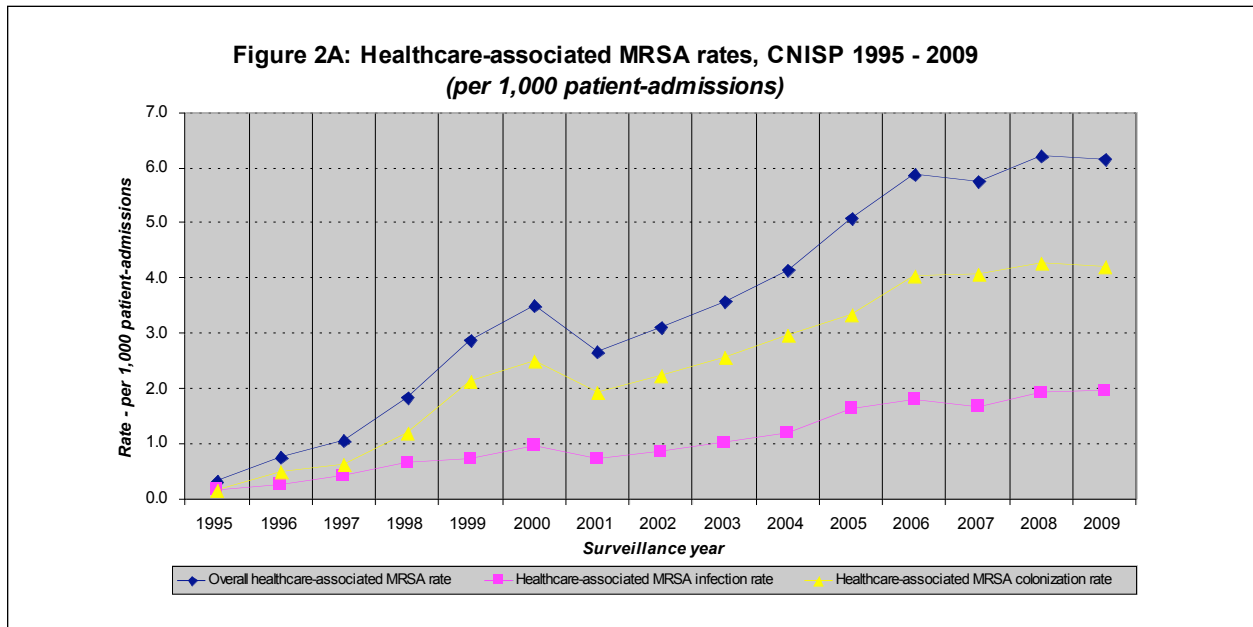
Surveillance year	MRSA INFECTIONS			MRSA COLONIZATIONS		
	East <sup>4</sup>	Centre <sup>5</sup>	West <sup>6</sup>	East	Centre	West
1995	5	56	45	4	55	24
1996	4	137	51	23	191	33
1997	16	171	106	16	293	49
1998	12	226	180	20	437	159
1999	11	371	131	29	998	354
2000	21	410	305	51	1,336	394
2001	28	416	252	50	1,243	309
2002	53	514	278	109	1,408	332
2003	99	592	373	251	1,818	321
2004	106	594	669	249	1,970	423
2005	193	687	1,187	308	2,364	755
2006	189	751	1,071	303	2,662	885
2007	207	618	1,127	312	2,816	1,207
2008	261	659	1,081	452	2,933	979
2009	217	858	961	312	3,176	1,122

<sup>4</sup> East = New Brunswick, Newfoundland & Labrador, and Nova Scotia

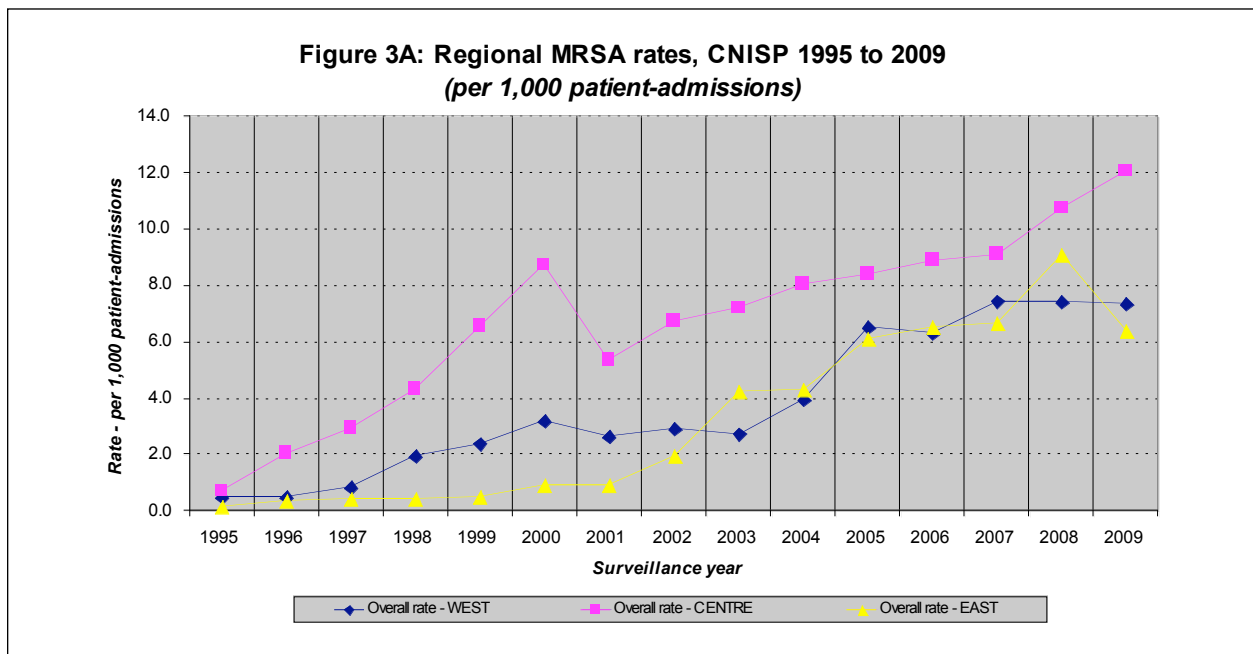
<sup>5</sup> Centre = Québec & Ontario

<sup>6</sup> West = Manitoba, Saskatchewan, Alberta and British Columbia

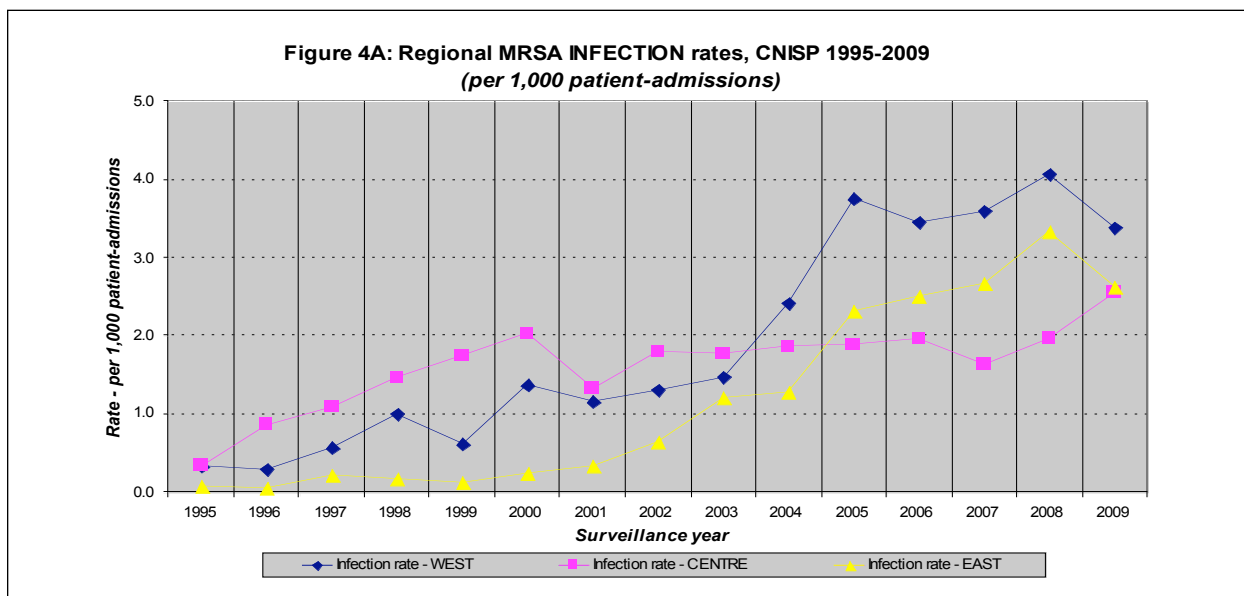




Within healthcare settings, the occurrence of MRSA colonization dominates that of the infection. Over the years, the difference between rates of colonization and infection has steadily been getting wider.

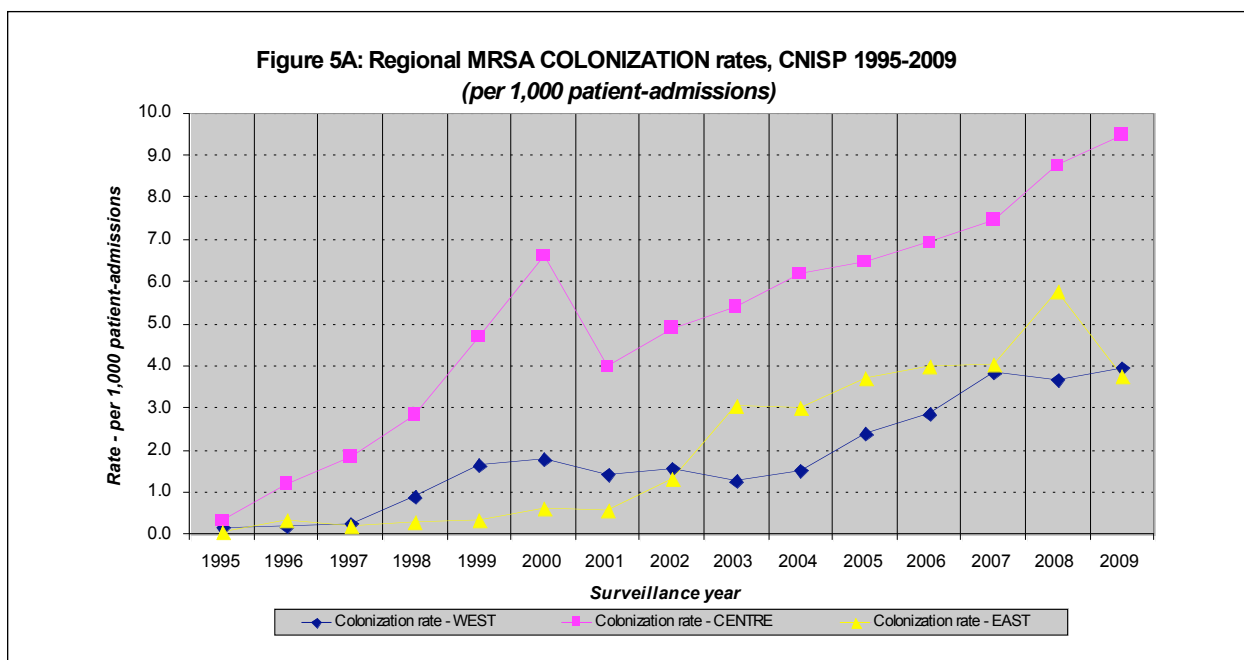


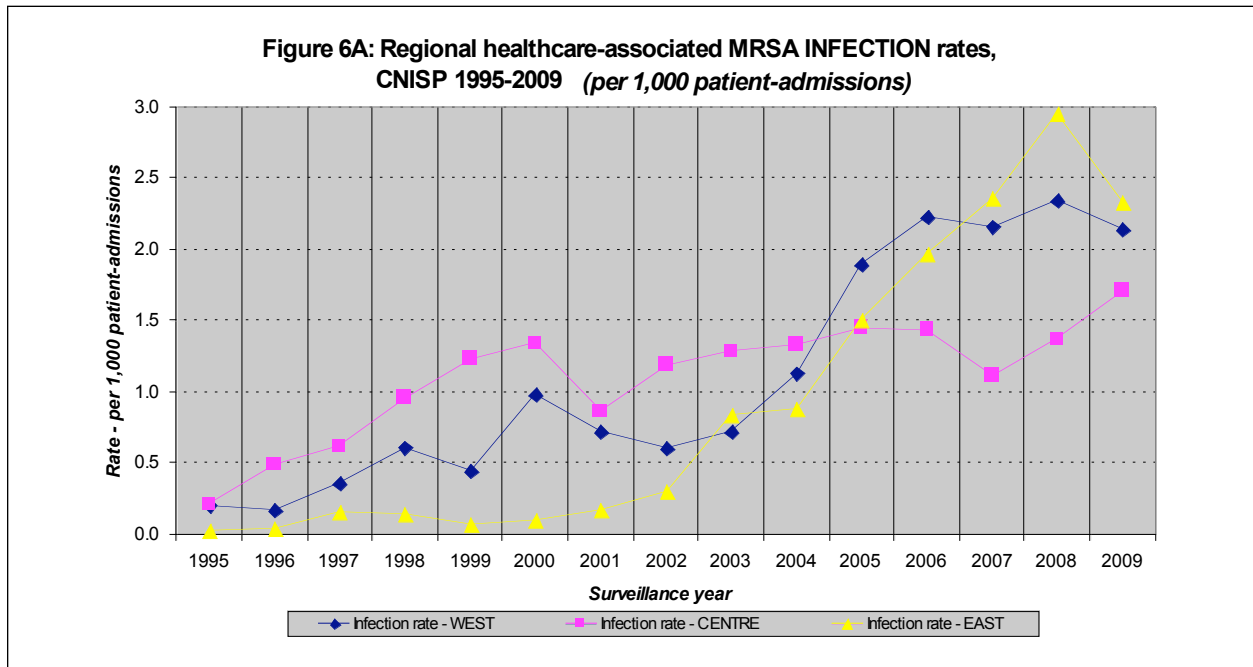
In the early years of surveillance, the East which was the region with the lowest MRSA (colonizations & infections combined) rates, has in the last six years produced rates as high as those reported in the West: an increase mainly driven by colonization. Central Canada on the other hand continues to post the highest rate in the country.



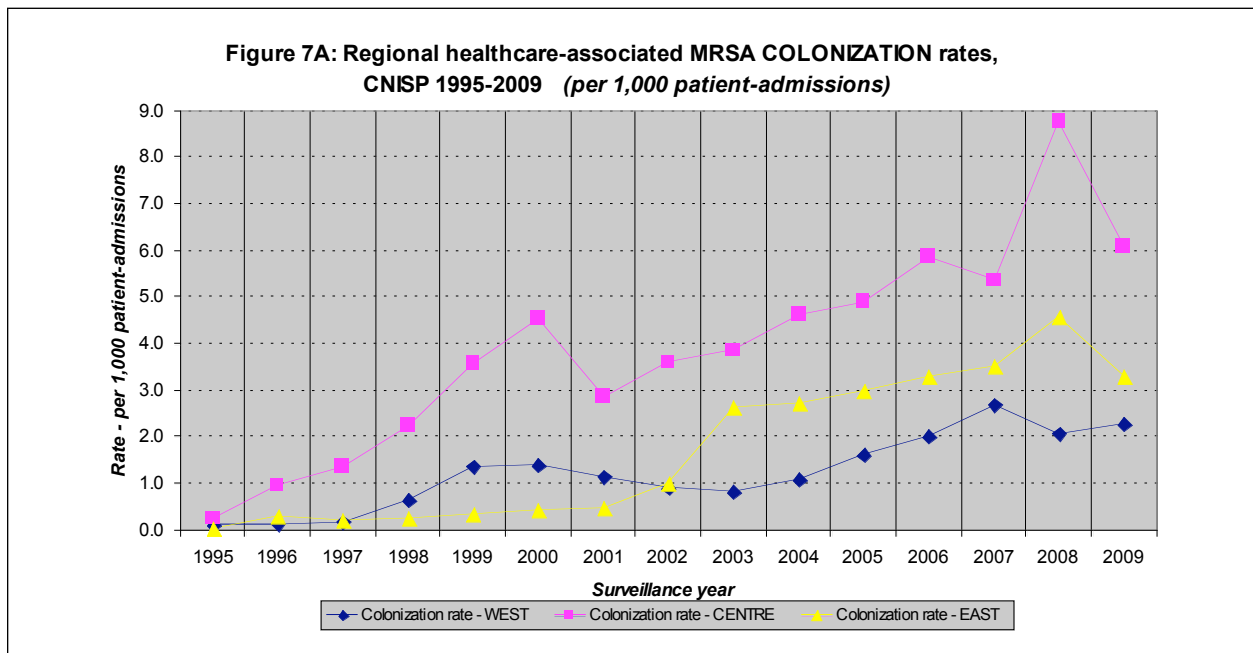
From 2002 to 2007, Central Canada recorded little or no increase in its MRSA infection rate, which by the way became the lowest in the country since 2005. However since 2007, it has been considerably increasing; a tendency opposite to the one seen in Eastern and Western Canada which in 2009 posted significantly lower rates than the year before.

The situation is somewhat reverse with regard to colonization since Central Canada is continuously recording the highest incidence rates in the country, and the West the lowest since 2002. The East is the only region where both colonization and infection patterns are similar.

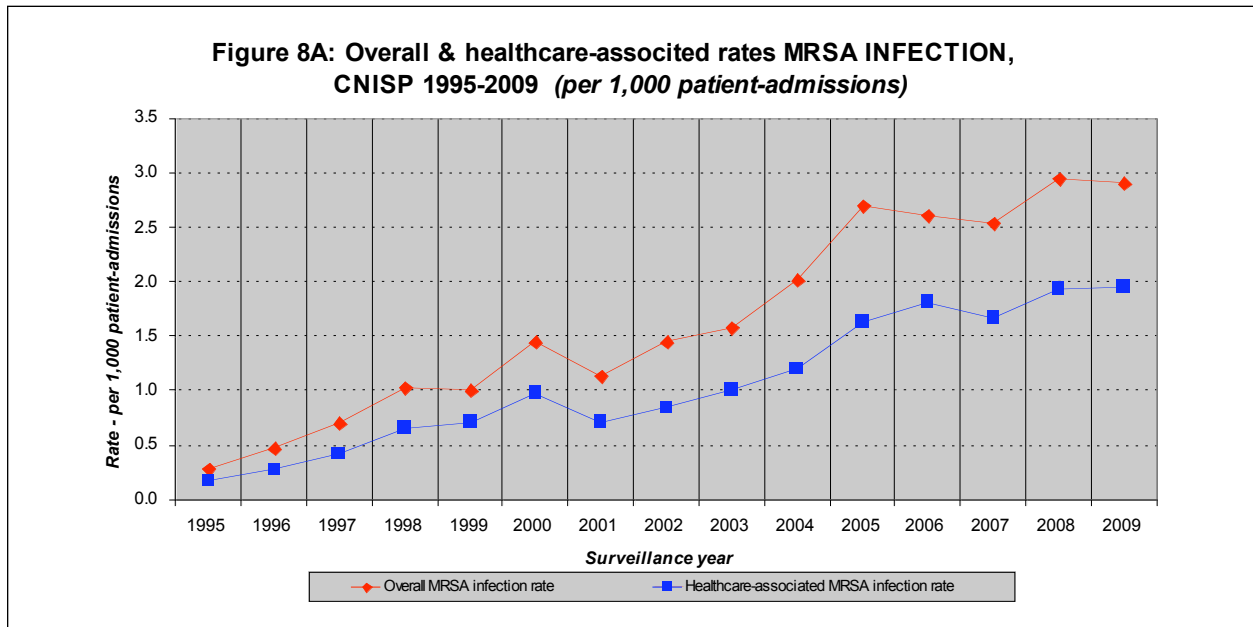




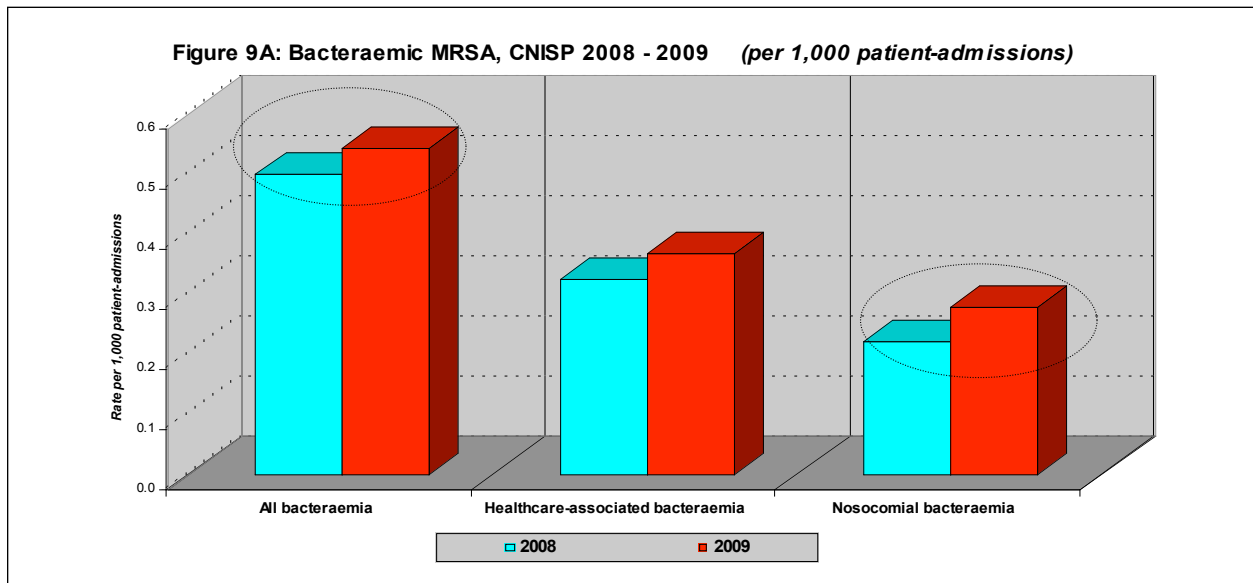
Since 2005, central Canada has been posting the lowest MRSA infection rates in the country, although from 1995 to 2004, it was the region with the highest infection rates.



The slowdown in healthcare-associated MRSA infections rates noted in Central Canada was not seen with their MRSA colonization rates (per *patient-admissions*) which remained the highest in the country. In contrast, the West with the highest infection rates has been posting the lowest colonization rates in the country since 2002.



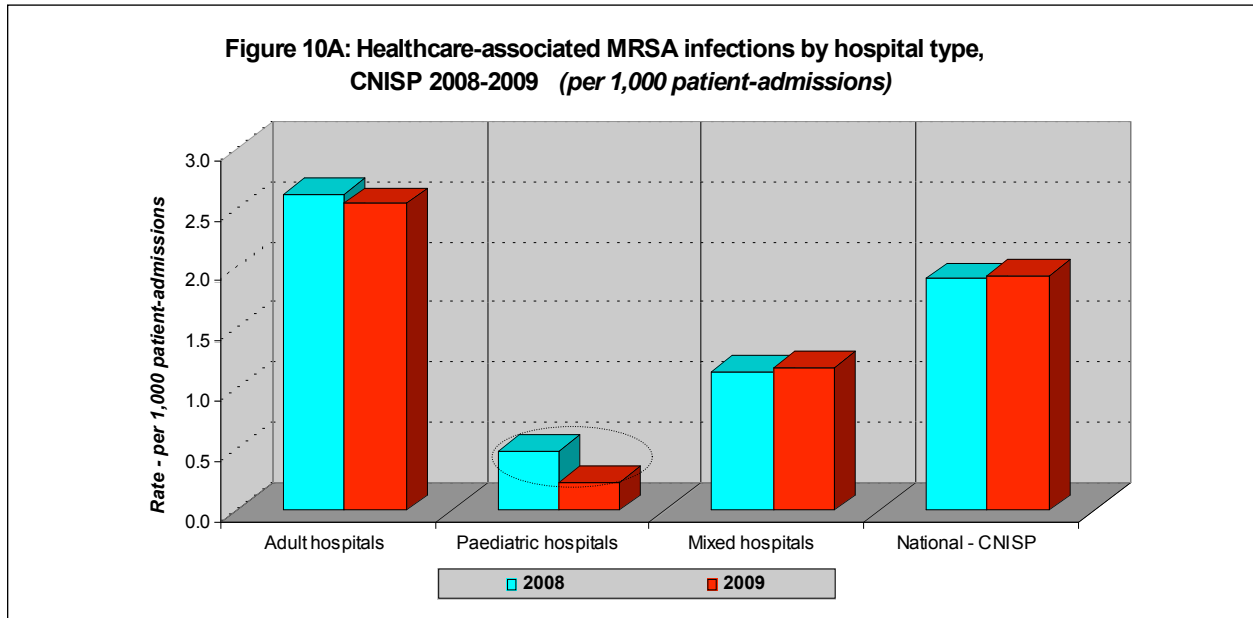
The widening of the margin between the overall MRSA rates and the rates of healthcare-associated MRSA illustrates the growing importance of community-associated MRSA cases being detected in healthcare settings. MRSA bacteraemia was on the rise from 2008 to 2009, recording an overall 8% increase in its rate. A much higher increase (over 27%) was recorded in reporting CNISP acute care facilities (nosocomial).



Surveillance year	All bacteraemia	Healthcare-associated bacteraemia	Nosocomial bacteraemia	Denominator (patient-admissions)	Denominator (patient-days)
1995	338	219	150	678,610	5,441,458
1996	380	258	195	701,477	5,374,036



Healthcare-associated MRSA infections predominate in adult hospitals compared to paediatric hospitals where community-associated infections account for the majority of cases. From 2008 to 2009, healthcare-associated MRSA infection rates (per *patient-admissions*) were significantly lower in paediatric hospitals, whereas in adult and mixed hospitals, the changes were insignificant (Figure 10A).



While a decrease of about 7% was registered in the community-associated MRSA infection rate (per *patient-admissions*) in paediatric hospitals from 2008 to 2009, adult hospitals were experiencing an increase of similar magnitude (Figure 10B).

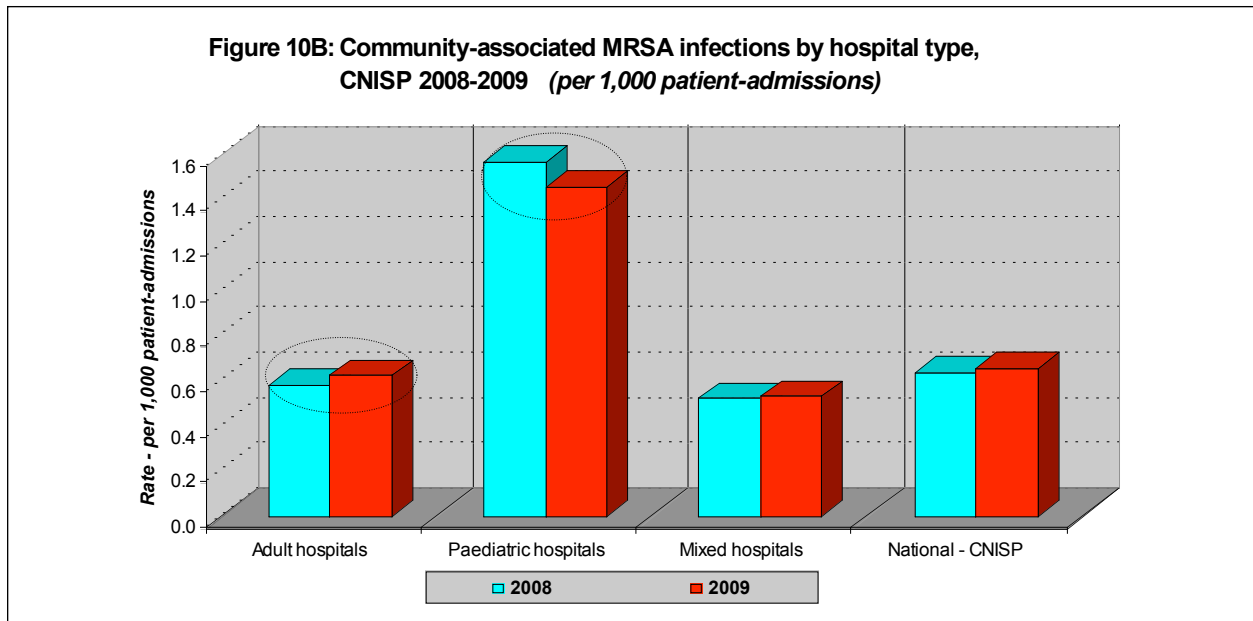


Table 3. Healthcare &amp; community-associated MRSA in paediatric patients

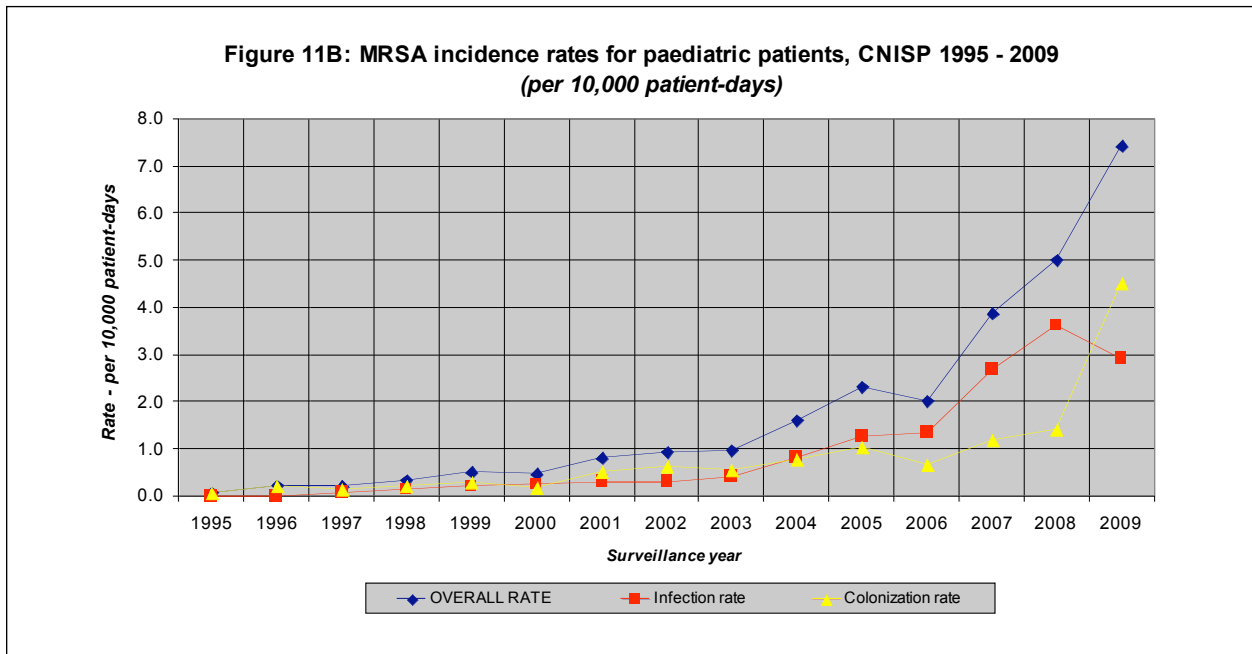
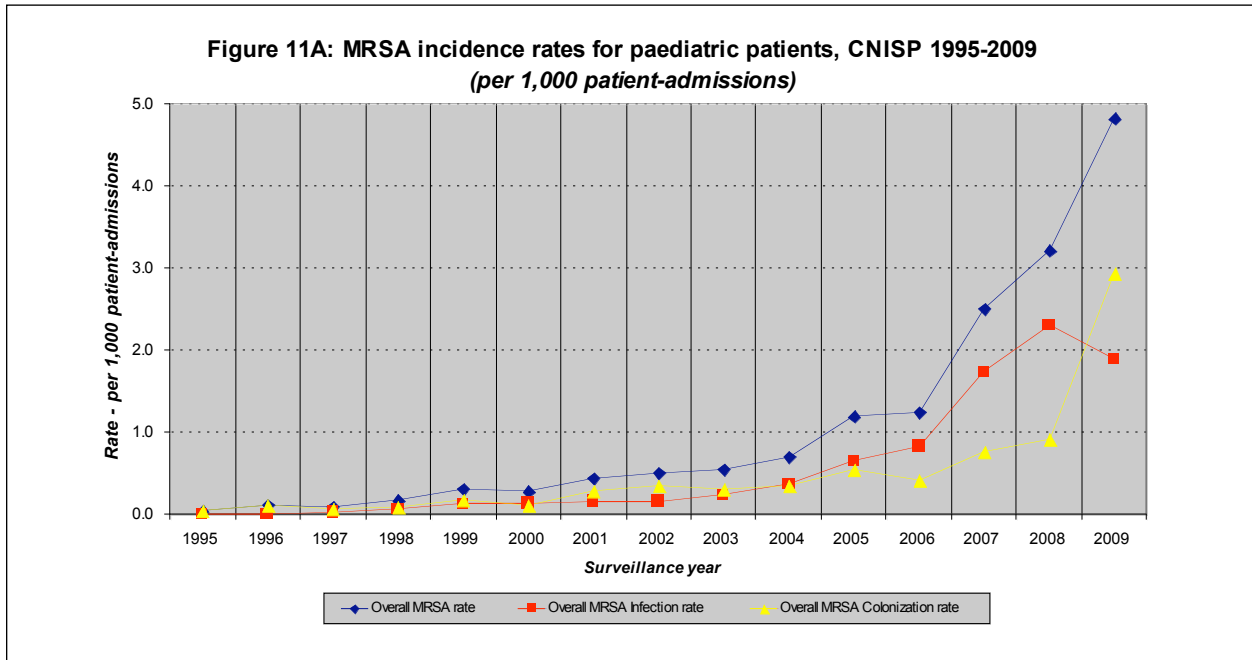
Surveillance year	Healthcare-associated MRSA <sup>7</sup>		Community-associated MRSA		Denominator	
	Infection	Colonization	Infection	Colonization	(patient-admissions)	(patient-days)
1995	0	1	0	0	25,468	131,629
1996	0	1	0	0	24,089	130,348
1997	0	1	0	0	29,952	142,543
1998	1	2	0	1	29,516	144,828
1999	2	3	1	2	31,804	195,434
2000	1	0	2	0	28,443	168,690
2001	2	1	0	2	35,695	199,428
2002	2	3	1	1	37,024	203,770
2003	3	6	1	3	38,170	216,225
2004	6	7	2	2	43,549	193,596
2005	9	16	8	2	44,376	228,621
2006	18	10	16	8	52,661	327,861
2007	12	14	61	22	50,518	327,704
2008	26	23	83	14	52,833	338,950
2009	12	84	76	35	52,204	339,526

<sup>7</sup> MRSA = Methicillin Resistant *Staphylococcus aureus*

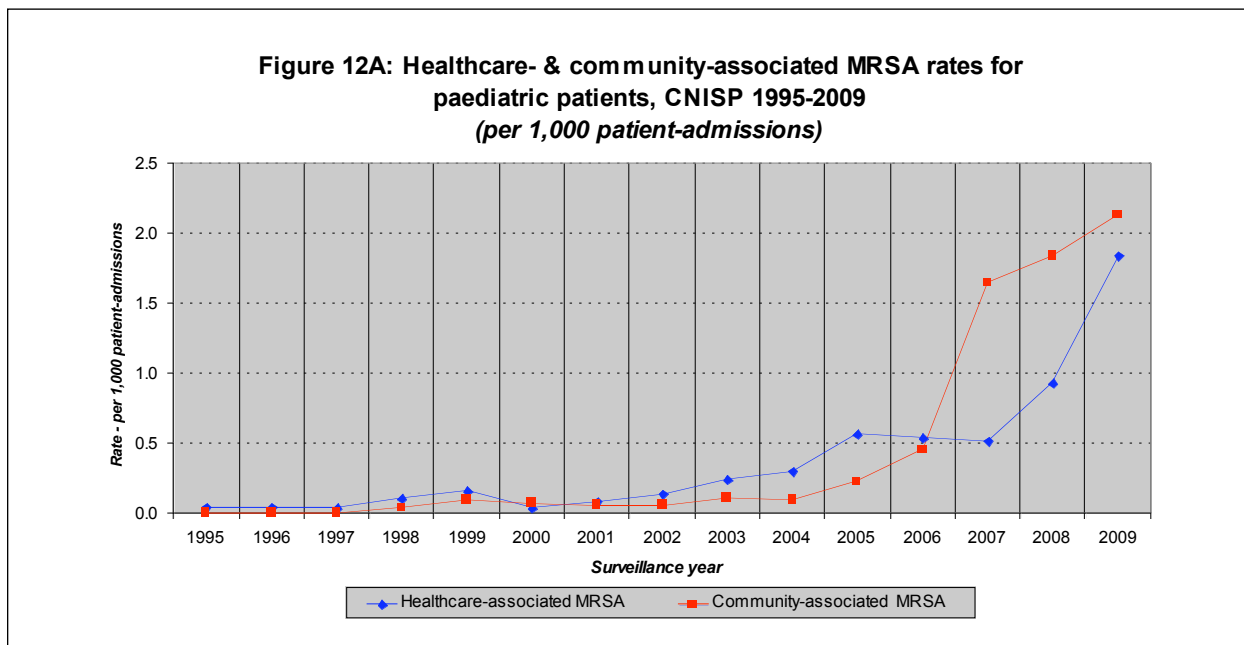
**Nosocomial infections** = Infections associated with healthcare facilities in the CNISP network.;

**Healthcare-associated** = Infections originating from hospitalization for 48 hours or more, or from an exposure to any medical procedure carried out in a hospital, clinic or a long-term care facility.

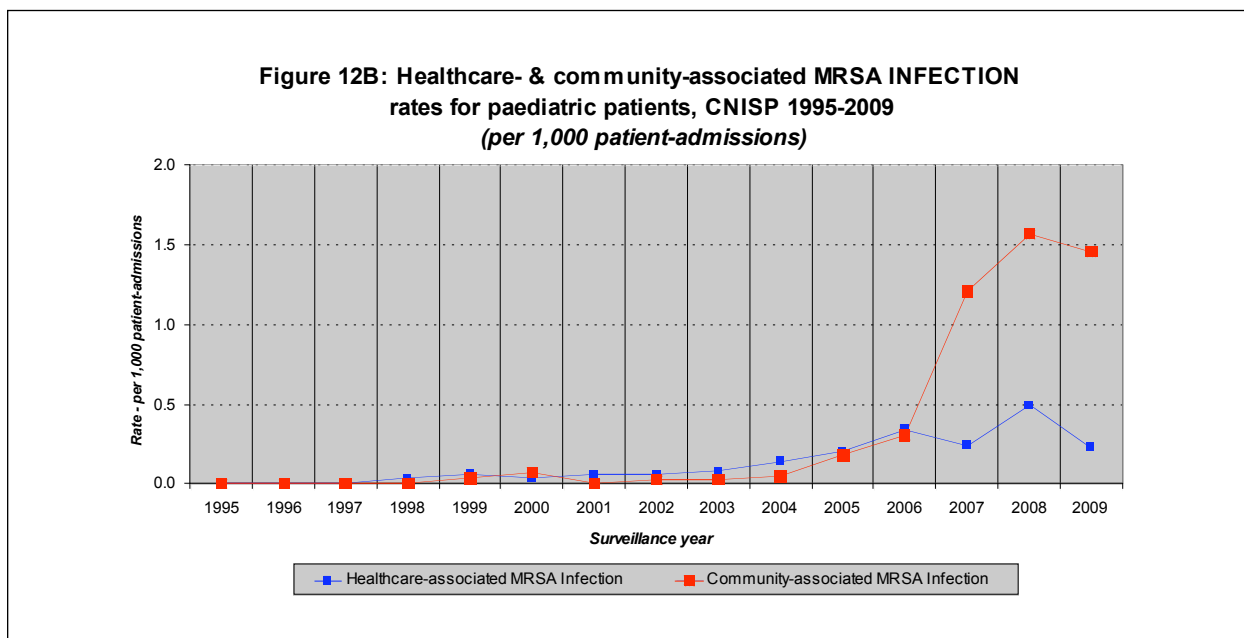
From 1995 to 2005, MRSA infection and colonization in paediatric patients occurred at comparable rates. However in 2006, the rate of infections became significantly higher than that of colonization and remained so until 2008, it's only in 2009 that the patterns reversed considerably (Figures 11).

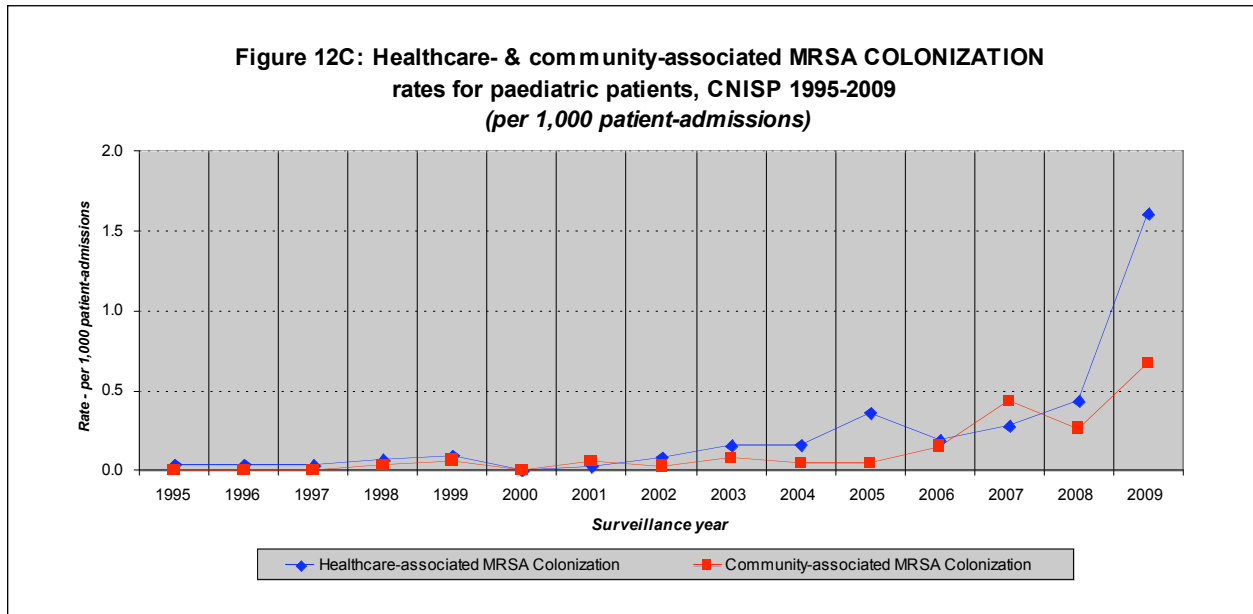


From 1995 to 2006, paediatric healthcare-associated MRSA (both infection & colonization) occurred at a rate slightly lower than community-associated only once (in the year 2000). However in 2007, community-associated rate jumped to a level three times that of healthcare-associated which remained almost unchanged. This difference margin subsequently decreased in the following years (Figure 12A).

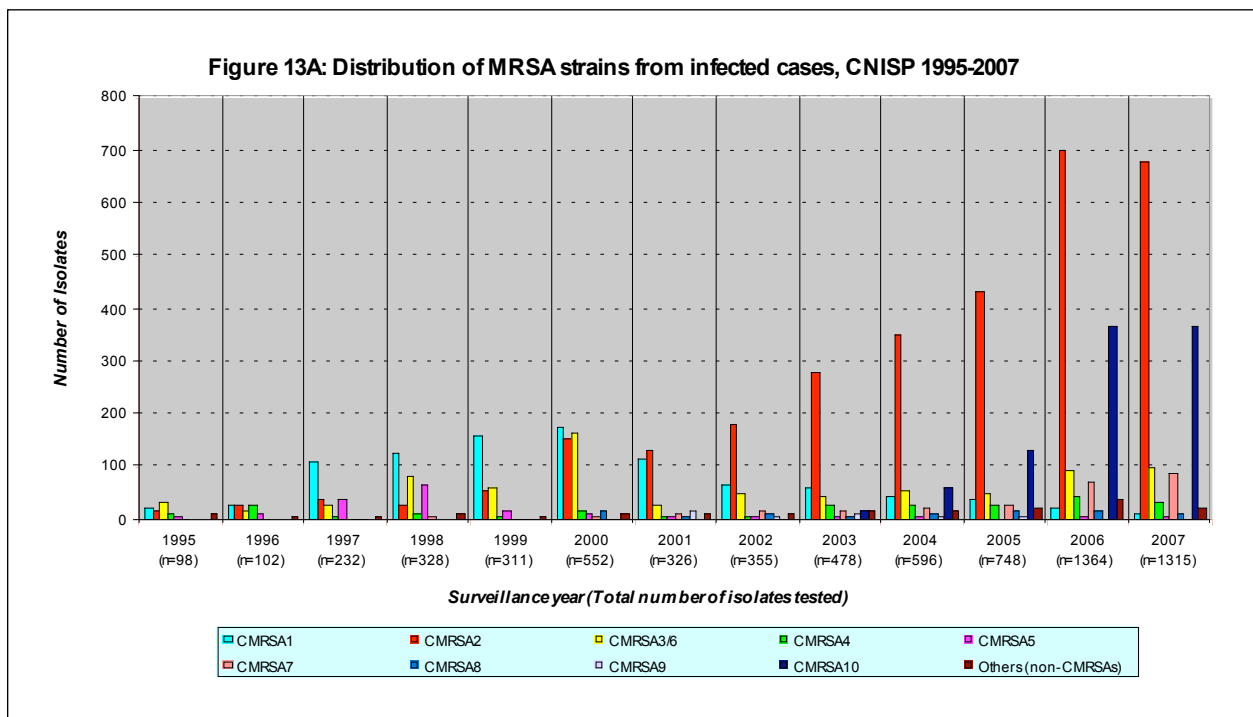


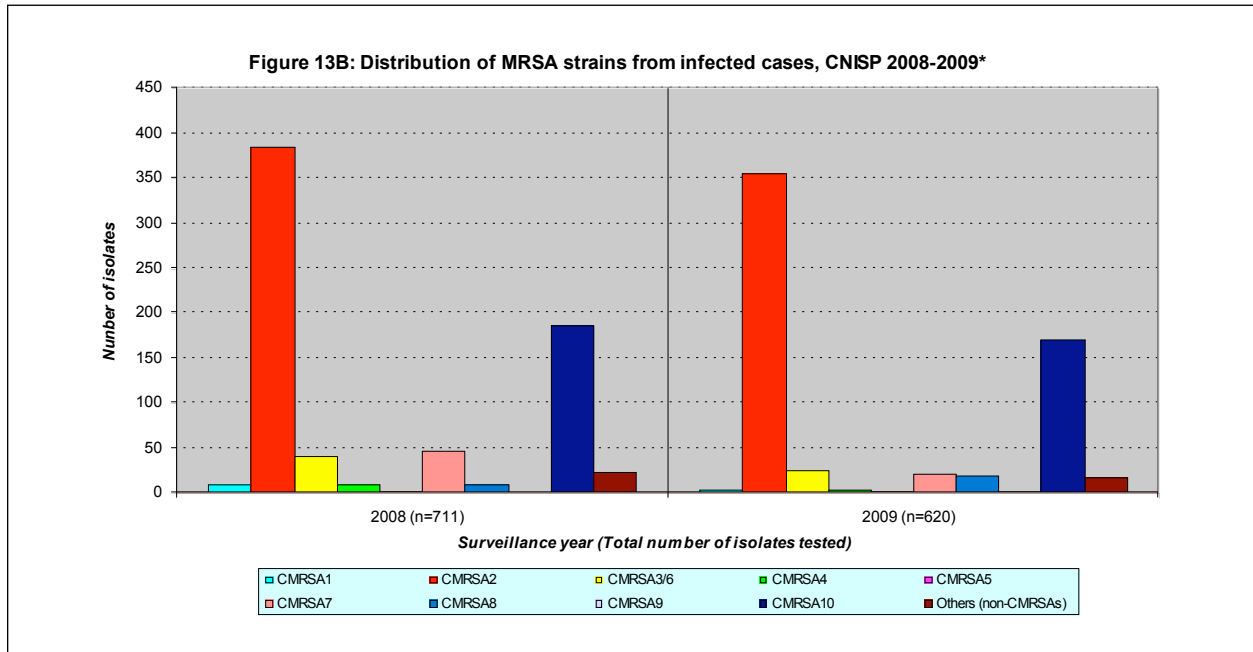
Changes in the overall paediatric MRSA rates observed from 2007 onward have largely been driven by community-associated infection rates (Figure 12B) and those of healthcare-associated colonization (Figure 12C).





CMRSA2 emerged gradually from the early days of the current surveillance to establish itself as the most widely distributed strain in Canada, followed by CMRSA10, which has emerged as an important epidemiological strain only since 2004 (Figures 13A & 13B). CMRSA1 & CMRSA3/6 hit their peak in 2000 and have rapidly declined to insignificant levels although from 2006, infections due to CMRSA3/6 and CMRSA7 significantly increased.





\* Only three-month data for each surveillance year were considered.

N.B. Cautious interpretations of regional differences in the overall MRSA rates and colonization rates are recommended, because screening policies may differ from one province to another.