



**Healthcare-associated Infections  
Annual Report  
2009-2013**

September 2014



# HAI Annual Report

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## Summary

Provincial Infection Control – Newfoundland Labrador (PIC-NL) has collected data on inpatients and outpatients with healthcare-associated infections (HAIs) since 2010. The HAIs targeted for surveillance include methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile*.

The objectives of the surveillance program are to provide rates and trends of HAIs in the province thus enabling comparison of rates (benchmarks) and to provide data that can be used to inform infection control guidelines and practices for the prevention of transmission of these infections.

The following are highlights of this HAI provincial surveillance report.

## MRSA Surveillance Results

- From 2010 to 2013, the incidence rate of MRSA infections in acute care facilities has declined in NL (Figure 1).
- The incidence rate of MRSA infections in long term care facilities is much lower than infection rates in acute care facilities. In NL, the incidence rate of MRSA infections in long term care facilities decreased from 1.1 per 10, 000 RCD's in 2010 to 0.7 per 10, 000 RCDs in 2013 (Figure 2).
- The incidence rate of community and healthcare-associated MRSA infection has remained relatively consistent over the past four years; Central and Western Health shown some variation in the rates; Labrador-Grenfell Health continues to report high rates of community and healthcare-associated MRSA infections (Figure 3).
- Compared to the Canadian Nosocomial Infection Surveillance Program (CNISP) the rates of MRSA infections in acute care facilities in NL are higher than in Canada (Figure 9). However, NL has seen a decline in infection rates since 2010.

## CDI Surveillance Results

- From 2010 to 2013, the incidence rate of CDI in acute care facilities increased from 1.4 per 10, 000 PCD's to 2.0 per 10, 000 PCD's (Figure 4). Eastern Health and Western Health showed slight increases from 2010 to 2013. Over the four year period, Central Health and Labrador-Grenfell Health remained relatively unchanged.
- It is important to note that a more sensitive test for CDI was implemented between 2012 and 2013 in NL. Eastern Health began using this test in September 2012, Western in December 2012, Central in October 2013, and Labrador-Grenfell in February 2013.
- CDI rates in the community have increased in over the past couple years (Figure 7). In 2013, the highest rate was reported in Eastern Health (49.5 per 100, 000 population. Central Health reported the lowest rate of community associated CDI in 2013.
- Compared to the CNISP the rates of CDI in acute care facilities in NL are lower than in Canada (Figure 11).

# HAI Annual Report

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## TABLE OF CONTENTS

MRSA SURVEILLANCE RESULTS .....	i
CDI SURVEILLANCE RESULTS .....	i
<b>INTRODUCTION .....</b>	<b>1</b>
<b>METHICILLIN-RESISTANT <i>STAPHYLOCOCCUS AUREUS</i> INFECTIONS .....</b>	<b>2</b>
MRSA SURVEILLANCE RESULTS - INFECTIONS .....	3
MRSA SURVEILLANCE RESULTS – COLONIZATIONS .....	7
<b><i>CLOSTRIDIUM DIFFICILE</i>-INFECTION .....</b>	<b>8</b>
CDI SURVEILLANCE RESULTS .....	9
<b>CANADIAN NOSOCOMIAL INFECTION SURVEILLANCE PROGRAM .....</b>	<b>13</b>
CNISP – MRSA SURVEILLANCE.....	14
<b>APPENDIX A: MRSA DEFINITIONS.....</b>	<b>18</b>
<b>APPENDIX B: CDI DEFINITIONS .....</b>	<b>20</b>
<b>APPENDIX C: POPULATION BY REGIONAL HEALTH AUTHORITY .....</b>	<b>21</b>
<b>APPENDIX D: REFERENCES .....</b>	<b>22</b>

## List of Figures

Figure 1: Incidence rate of MRSA infections in acute care facilities, Newfoundland and Labrador, 2009 – 2013 .....	3
Figure 2: Incidence rate of MRSA infections in long term care facilities, Newfoundland and Labrador, 2009 – 2013 .....	4
Figure 3: Incidence rate of community and healthcare-associated (not hospitalized cases) MRSA infections, Newfoundland and Labrador, 2009 – 2013 .....	5
Figure 4: Incidence rate of <i>Clostridium difficile</i> infections in acute care facilities, Newfoundland and Labrador, 2009 – 2013.....	9
Figure 5: Incidence rate of <i>Clostridium difficile</i> infections in long term care facilities, Newfoundland and Labrador, 2009 – 2013.....	10
Figure 6: Incidence rate of healthcare associated (not hospitalized cases) <i>Clostridium difficile</i> infections, Newfoundland and Labrador, 2009 – 2013.....	11
Figure 7: Incidence rate of community associated <i>Clostridium difficile</i> infections, Newfoundland and Labrador, 2009 – 2013.....	12
Figure 8: Incidence rate of MRSA infections in acute care facilities, Canada, 2008 – 2012.....	14
Figure 9: Incidence rate of MRSA infections in acute care facilities, Canada and Newfoundland and Labrador, 2008 – 2013.....	15

# HAI Annual Report

---

Figure 10: Incidence rate of <i>Clostridium difficile</i> infections in acute care facilities, Canada, 2007 – 2012.....	16
Figure 11: Incidence rate of <i>Clostridium difficile</i> infections in acute care facilities, Canada and Newfoundland and Labrador, 2007 – 2013.....	17

## List of Tables

Table 1: Number of MRSA infections in acute care facilities, Newfoundland and Labrador, 2009 – 2013.....	4
Table 2: Number of MRSA infections in long term care facilities, Newfoundland and Labrador, 2009 – 2013.....	5
Table 3: Number of community and healthcare-associated (not hospitalized cases) MRSA infections, Newfoundland and Labrador, 2009 – 2013.....	6
Table 4: Number of <i>Clostridium difficile</i> infections in acute care facilities, Newfoundland and Labrador, 2009 – 2013.....	10
Table 5: Number of <i>Clostridium difficile</i> infections in long term care facilities, Newfoundland and Labrador, 2009 – 2013.....	11
Table 6: Number of healthcare-associated (not hospitalized cases) <i>Clostridium difficile</i> infections, Newfoundland and Labrador, 2009 – 2013.....	12
Table 7: Number of community <i>Clostridium difficile</i> infections, Newfoundland and Labrador, 2009 – 2013.....	13

## Introduction

Healthcare-associated infections (HAIs) are infections acquired while receiving health care irrespective of the site: hospital, long-term care facility, ambulatory care, or home. Often preventable, HAIs are considered a major threat to patient safety.<sup>1</sup> It has been estimated that, in Canada, HAIs occur in one in nine hospitalized patients causing longer stays, great pain and even death.<sup>2</sup> Each year about 8,000 Canadians die from hospital-acquired infections; 220,000 others get infected.<sup>3</sup> In addition to the impact on patients, HAIs cause a reduction in patient flow, which results in overcrowded emergency rooms, over capacity crowding on in-patient units, increased workload, frustrated patients and families, and an increased financial burden.<sup>4</sup> The Public Health Agency of Canada reports an annual health care cost for HAIs as significant; for example, *Clostridium difficile* infections (CDIs) cost \$46.1 million and methicillin-resistant *Staphylococcus aureus* (MRSA) cost \$36.3 million per year.<sup>5</sup>

Healthcare-associated infections (HAIs) are caused by a wide range of microorganisms often linked to complications of having received health care. The organisms responsible for causing most angst in health care systems include CDI and MRSA.

Surveillance for HAIs has been identified as providing key information to help identify vulnerable client populations, to inform provincial health departments on emerging resistance trends and the need for and effectiveness of infection prevention and control programs.<sup>12</sup> Provincial Infection Control Newfoundland and Labrador (PIC-NL) identified surveillance for HAIs as a priority initiative and established a surveillance protocol for MRSA infections and colonizations and for *Clostridium difficile* infections.<sup>6</sup> Regional Health Authorities (RHAs) report statistics to the Provincial Department of Health and Community Services.

This report provides an overview of the annual incidence of MRSA infections and colonizations and CDIs in acute care and long-term care facilities in Newfoundland and Labrador from January 01, 2009, to December 31, 2013. Additionally, all MRSA infections and CDIs identified in out-patient settings and in the community are provided. Definitions are provided in Appendix A and B.

## **Methicillin-resistant *Staphylococcus aureus* Infections**

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a strain of *Staphylococcus aureus* resistant to all the beta-lactam classes of antibiotics including commonly-used products such as penicillin, amoxicillin and oxacillin.<sup>7</sup> While MRSA usually causes skin infections in the community setting, more severe infections of the blood and surgical wounds can occur in healthcare settings.<sup>8</sup> The Public Health Agency of Canada reported a 17 fold increase in MRSA rates in Canadian hospitals between 1995 and 2010.<sup>5</sup> During the same time period, the proportion of community-associated MRSA strains increased from 2 per cent to 25 per cent.<sup>5</sup> MRSA has been associated with significant morbidity and mortality, prolonged hospital length of stay and excess costs.<sup>9</sup> Direct health care costs attributable to MRSA averaged \$82 million in Canada in 2004.<sup>5,10</sup>

The Provincial MRSA Surveillance Protocol includes standard case definitions for MRSA infections and colonizations.<sup>6</sup> MRSA infection occurs when micro-organisms are able to multiply within the body and cause a response from the host's immune defences.<sup>11</sup> Symptomatic or clinical infection is one resulting in clinical signs and symptoms (disease). MRSA colonization is the presence of micro-organisms in or on a host with growth and multiplication but without tissue invasion or cellular injury.<sup>11</sup>

In Newfoundland and Labrador, MRSA is reportable to the Provincial Department of Health and Community Services. Each Regional Health Authority (RHA) monitors and reports on MRSA using standard definitions (Appendix A). The population under surveillance is any patient with laboratory-confirmed MRSA. The numerator is the number of infections. The denominator for acute care facilities is the number of patient care days (PCDs) for all acute care facilities in each RHA and for long term care it is the number of resident care days (RCDs) for all long term care facilities in each RHA. The denominator for healthcare-associated (not hospitalized) cases and community cases is based on the population of the RHA (Appendix C).

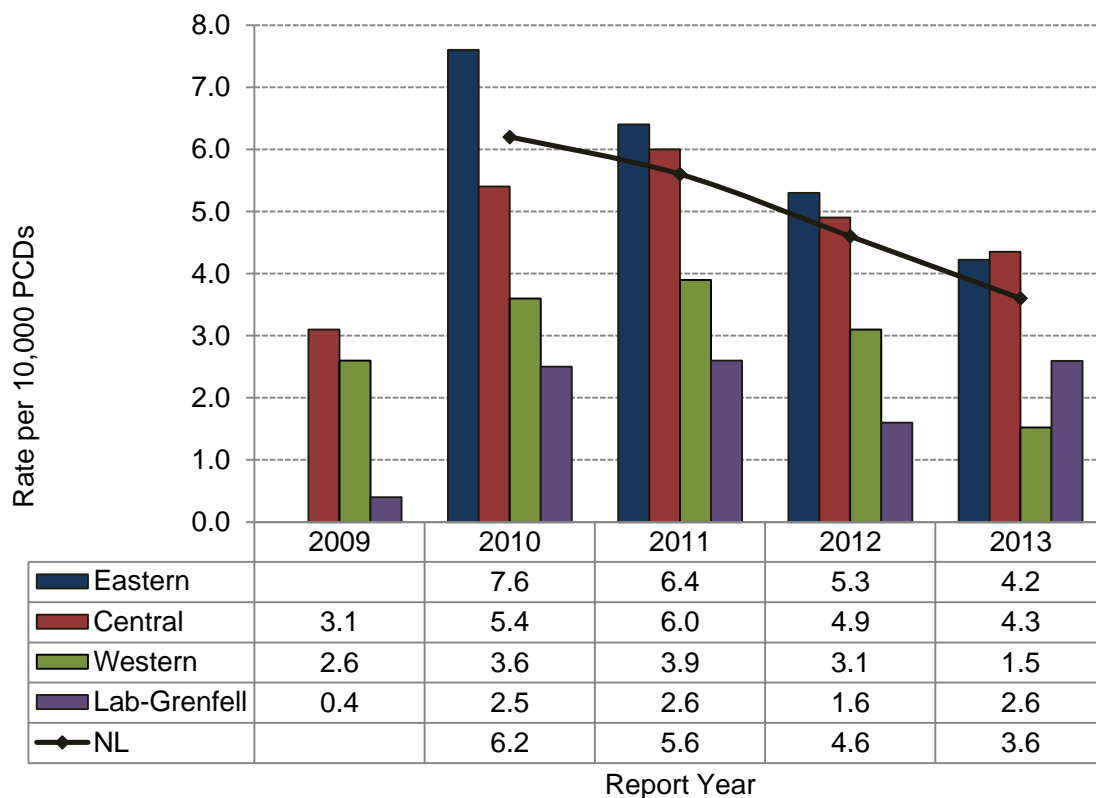
Provincial rates are calculated using total number of infections. The provincial denominator is the total number of PCDs or RCDs for acute care and long-term care facilities in the province. The provincial denominator for healthcare-associated (not hospitalized) cases and community cases is the population of the province.

## MRSA Surveillance Results - Infections

The following figures and tables present MRSA counts and infection rates for acute and long term care facilities, as well as community and healthcare associated infections in NL from 2009 to 2013. It includes i) the rate of MRSA in acute care facilities per 10,000 patient care days (PCDs), ii) the number of MRSA infections in acute care facilities iii) the rate of MRSA in long term care facilities per 10,000 resident care days (RCDs), iii) the number of MRSA infections in long term care facilities, iv) rate of healthcare-associated and community infections (combined) of MRSA based on the population of the RHA and v) the number of healthcare-associated and community MRSA infections (combined).

From 2010 to 2013, the incidence rate of MRSA infections in acute care facilities has declined in NL (Figure 1). The rate in Eastern Health decreased from 7.6 in 2010 to 4.2 in 2013. Both Central Health and Western Health showed similar decreases with rates decreasing from 5.4 to 4.3 and 3.6 to 1.5 respectively. Incidence rates in Labrador-Grenfell remained relatively unchanged over the four years.

**Figure 1: Incidence rate of MRSA infections in acute care facilities, Newfoundland and Labrador, 2009 – 2013**



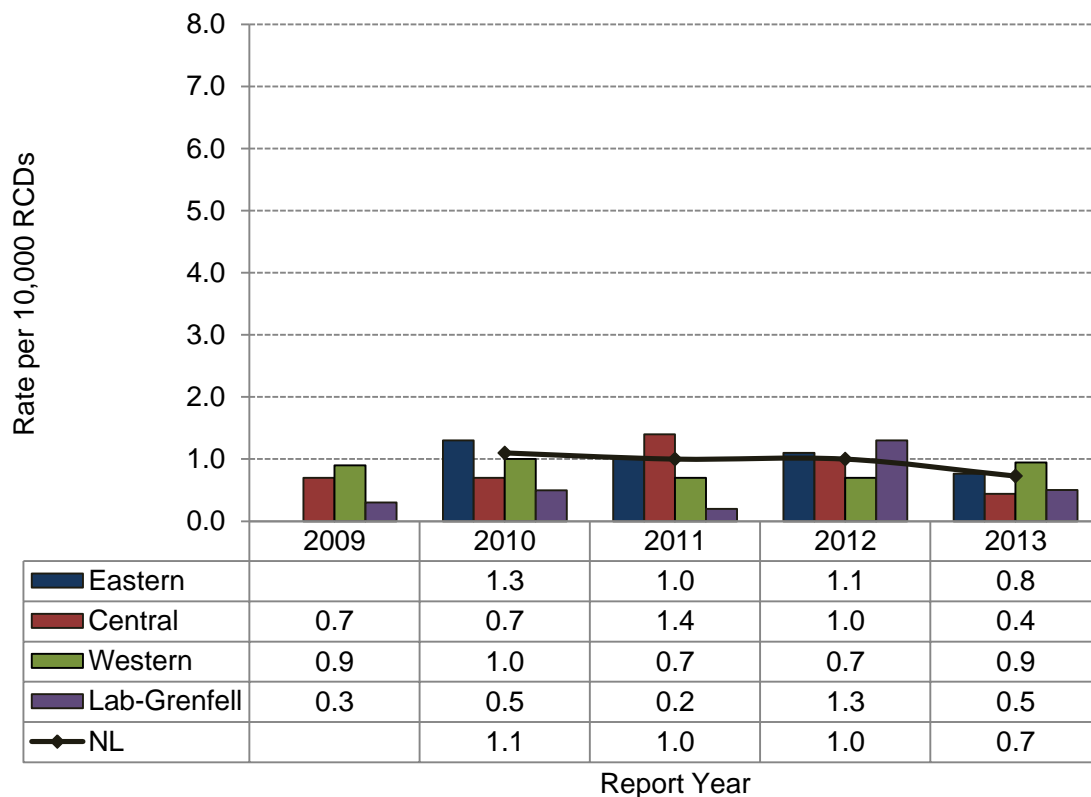


**Table 1: Number of MRSA infections in acute care facilities, Newfoundland and Labrador, 2009 – 2013**

	2009	2010	2011	2012	2013
Eastern		202	167	140	122
Central	23	41	46	39	34
Western	22	31	33	26	14
Lab-Grenfell	1	6	7	4	7
NL	46	280	253	209	177

The incidence rate of MRSA infections in long term care facilities is much lower than infection rates in acute care facilities. In NL, the incidence rate of MRSA infections in long term care facilities decreased from 1.1 per 10, 000 RCD's in 2010 to 0.7 per 10, 000 RCDs in 2013 (Figure 2). In Eastern Health the rate has decreased from 1.3 to 0.8. Western, Central and Labrador-Grenfell Health stayed relatively unchanged.

**Figure 2: Incidence rate of MRSA infections in long term care facilities, Newfoundland and Labrador, 2009 – 2013**



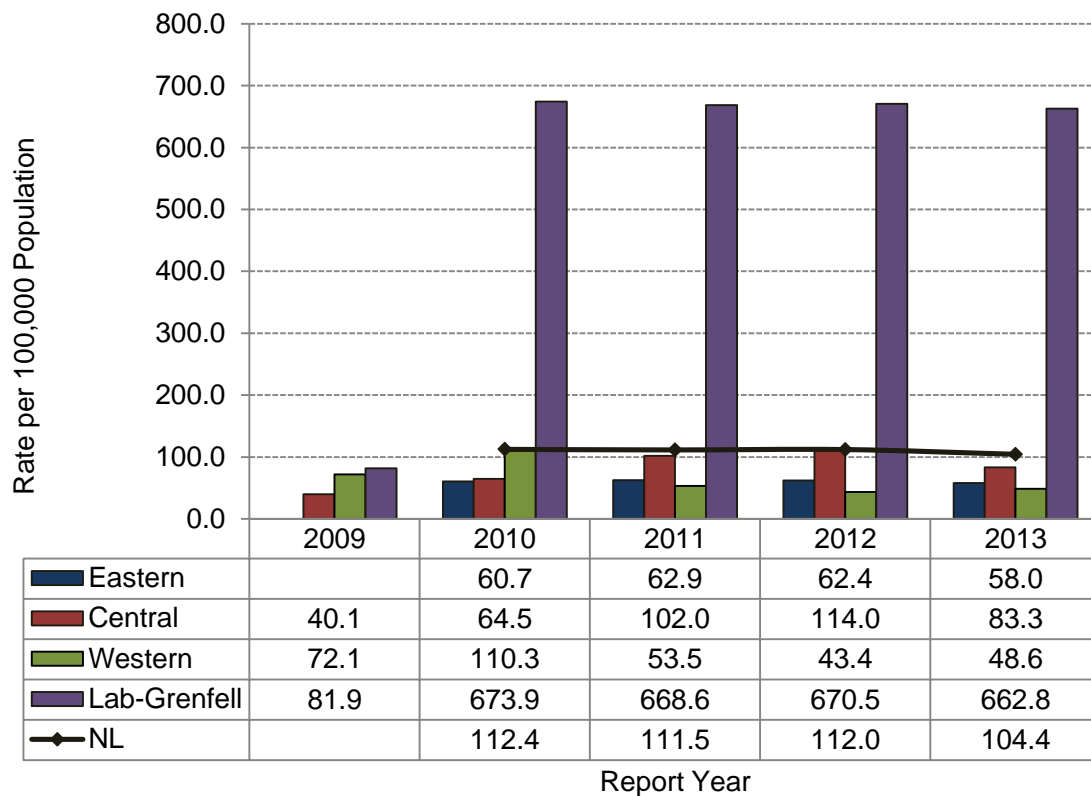
# HAI Annual Report

**Table 2: Number of MRSA infections in long term care facilities, Newfoundland and Labrador, 2009 – 2013**

	2009	2010	2011	2012	2013
Eastern		81	60	63	45
Central	13	12	26	18	8
Western	13	16	12	11	16
Lab-Grenfell	1	2	1	5	2
NL	27	111	99	97	71

Figure 3 presents the incidence rate of community and healthcare-associated (not hospitalized cases) MRSA infections. In Eastern Health, rates have remained relatively consistent over the four years. There have been some variations in the rates in Central and Western Health. While Labrador-Grenfell Health continues to report high rates of community and healthcare-associated MRSA infections.

**Figure 3: Incidence rate of community and healthcare-associated (not hospitalized cases) MRSA infections, Newfoundland and Labrador, 2009 – 2013**



# HAI Annual Report

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**Table 3: Number of community and healthcare-associated (not hospitalized cases) MRSA infections, Newfoundland and Labrador, 2009 – 2013**

	2009	2010	2011	2012	2013
Eastern		187	195	195	183
Central	38	61	96	107	78
Western	57	87	42	34	38
Lab-Grenfell	30	248	246	249	249
NL	125	583	579	585	548

## **MRSA Surveillance Results – Colonizations**

The following section presents MRSA colonization rates for acute and long term care facilities in NL from 2009 to 2013 by RHA. It is important to note that colonization rates are reflective of screening procedures in each health authority. Due to differences in these procedures, comparisons between health authorities are not recommended.

Colonization rates in acute care facilities in Eastern Health increased to 2.0 per 10, 000 PCDs in 2011 from 1.5 per 10, 000 in 2010 but has since decreased to 1.2 per 10, 000 in 2013. In Central Health, the colonization rate in acute care facilities decreased from 2.9 per 10, 000 PCDs in 2010 to 1.7 per 10, 000 PCDs in 2013. The colonization rate in Western Health acute care facilities has varied over the 5-year period. Western Health reported a high of 1.4 per 10, 000 PCDs in 2011 to a low of 0.1 per 10, 000 PCDs in 2013. In 2010, the colonization rate in Labrador-Grenfell was 1.4 per 10, 000 PCDs; the rate has been 0 per 10, 000 PCD's since 2011. Rates of colonization in long term care facilities remain low for all regions.

## ***Clostridium difficile*-Infection**

*Clostridium difficile* infection (CDI) is the most frequent cause of healthcare-associated infectious diarrhea in industrialized countries.<sup>13</sup> Clinical symptoms range from asymptomatic colonization to severe diarrhea, pseudomembranous colitis, toxic megacolon and death.<sup>14</sup> There has been an almost four-fold increase in the *Clostridium difficile* infection attributable mortality rate in Canadian hospitals from 1997 to 2005.<sup>15</sup>

The Provincial CDI Surveillance Protocol includes standard case definitions.<sup>16</sup> In Newfoundland and Labrador CDI is reportable to the provincial Department of Health and Community Services. Each regional health authority (RHA) monitors and reports on CDI using standard definitions (Appendix B). The population under surveillance is any patient with laboratory-confirmed CDI. The numerator is the number of infections. The denominator for acute care facilities is the number of patient care days (PCDs) for all acute care facilities in each RHA and for long term care it is the number of resident care days (RCDs) for all long term care facilities in each RHA. The denominator for healthcare-associated (not hospitalized) cases and community cases is based on the population of the RHA (Appendix C).

Provincial rates are calculated using total number of infections. The provincial denominator is the total number of PCDs or RCDs for acute care and long-term care facilities in the province. The provincial denominator for healthcare-associated (not hospitalized) cases and community cases is the population of the province.

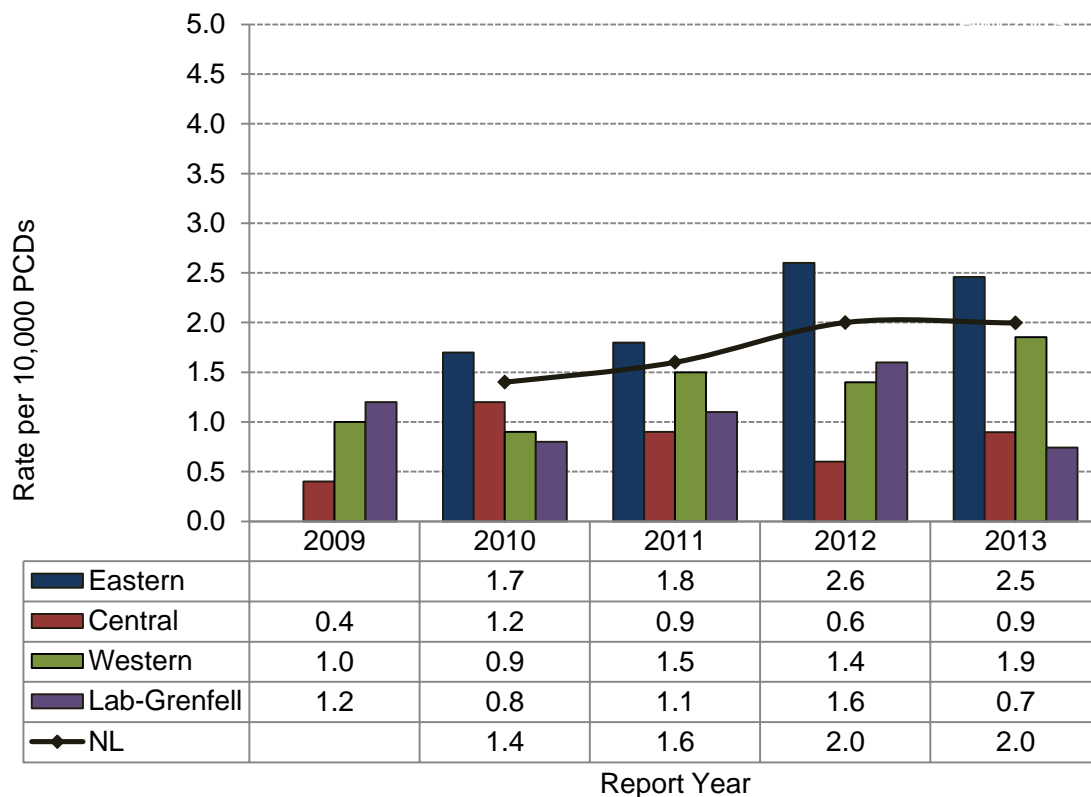
## CDI Surveillance Results

The following graphs and tables provide an overview of annual rates of CDI in NL for January 2009 to December 2013. It includes i) the rate of CDI in acute care facilities per 10,000 patient care days (PCDs), ii) the number of CDI in acute care facilities, iii) the rate of CDI in long term care facilities per 10,000 resident care days (RCDs), iv) the number of CDI in long care facilities v) the rate of healthcare-associated infections vi) the number of healthcare-associated infections, vi) the number of community CDI infections and vii) the rate of community infections of CDI based on the population of the RHA.

It is important to note that a more sensitive test for CDI was implemented between 2012 and 2013 in NL. Eastern Health began using this test in September 2012, Western in December 2012, Central in October 2013, and Labrador-Grenfell in February 2013.

From 2010 to 2013, the incidence rate of CDI in acute care facilities increased from 1.4 per 10, 000 PCD's to 2.0 per 10, 000 PCD's (Figure 4). Eastern Health and Western Health showed slight increases from 2010 to 2013. Over the four year period, Central Health and Labrador-Grenfell Health remained relatively unchanged.

**Figure 4: Incidence rate of *Clostridium difficile* infections in acute care facilities, Newfoundland and Labrador, 2009 – 2013**



Note: A more sensitive test was used in the regions as follows. Eastern Health in September 2012, Western in December 2012, Central in October 2013, and Labrador-Grenfell in February 2013.

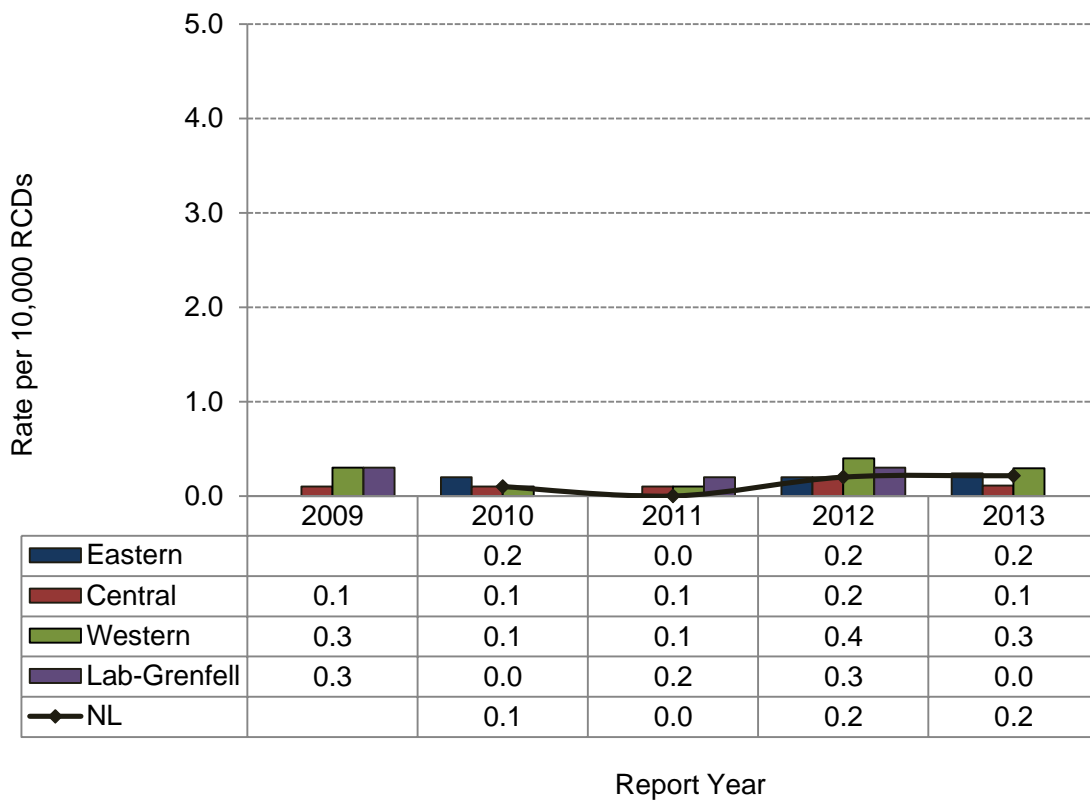
# HAI Annual Report

**Table 4: Number of *Clostridium difficile* infections in acute care facilities, Newfoundland and Labrador, 2009 – 2013**

	2009	2010	2011	2012	2013
Eastern		44	48	68	71
Central	3	9	7	5	7
Western	8	8	13	12	17
Lab-Grenfell	3	2	3	4	2
NL	14	63	71	89	97

Incidence rates of CDI's in long term care remain lower than that of acute care (Figure 5). Incidence rates for all regions remained relatively unchanged over the four year period.

**Figure 5: Incidence rate of *Clostridium difficile* infections in long term care facilities, Newfoundland and Labrador, 2009 – 2013**



Note: A more sensitive test was used in the regions as follows. Eastern Health in September 2012, Western in December 2012, Central in October 2013, and Labrador-Grenfell in February 2013.

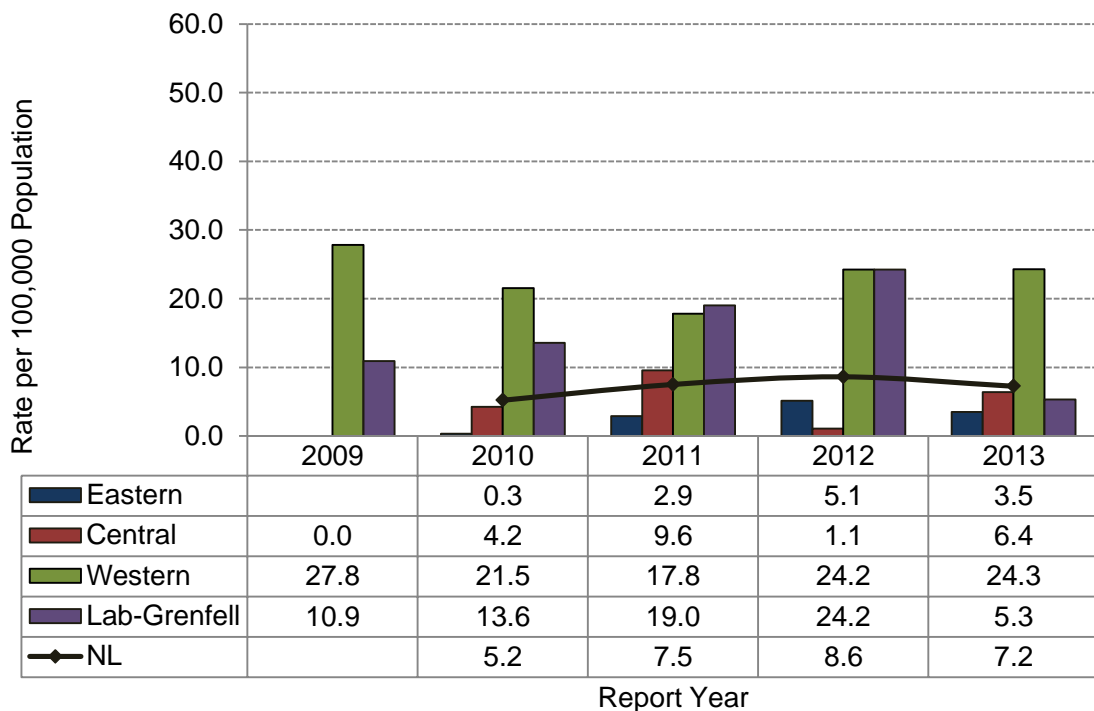
# HAI Annual Report

**Table 5: Number of *Clostridium difficile* infections in long term care facilities, Newfoundland and Labrador, 2009 – 2013**

	2009	2010	2011	2012	2013
Eastern		10	1	10	14
Central	2	2	1	3	2
Western	4	1	1	6	5
Lab-Grenfell	1	0	1	1	0
NL	7	13	4	20	21

In 2013, the incidence rate of healthcare associated (not hospitalized) CDI cases in NL was 7.2 per 100, 000 population. The highest rate was reported in Western Health (24.3 per 100, 000 population) while the lowest rates was reported in Eastern Health (3.5 per 100, 000 population).

**Figure 6: Incidence rate of healthcare associated (not hospitalized cases) *Clostridium difficile* infections, Newfoundland and Labrador, 2009 – 2013**



Note: A more sensitive test was used in the regions as follows. Eastern Health in September 2012, Western in December 2012, Central in October 2013, and Labrador-Grenfell in February 2013.



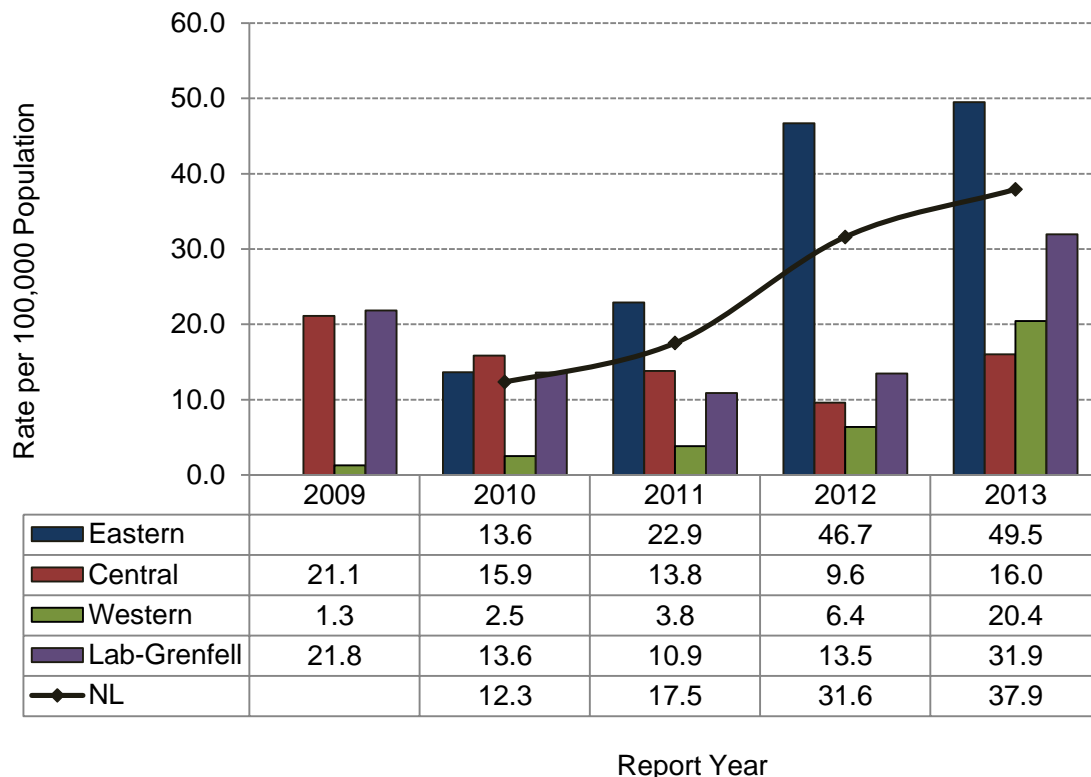
# HAI Annual Report

**Table 6: Number of healthcare-associated (not hospitalized cases) *Clostridium difficile* infections, Newfoundland and Labrador, 2009 – 2013**

	2009	2010	2011	2012	2013
Eastern		1	9	16	11
Central	0	4	9	1	6
Western	22	17	14	19	19
Lab-Grenfell	4	5	7	9	2
NL	26	27	39	45	38

CDI rates in the community have increased in over the past couple years (Figure 7). In 2013, the highest rate was reported in Eastern Health (49.5 per 100, 000 population. Central Health reported the lowest rate of community associated CDI in 2013.

**Figure 7: Incidence rate of community associated *Clostridium difficile* infections, Newfoundland and Labrador, 2009 – 2013**



Note: A more sensitive test was used in the regions as follows. Eastern Health in September 2012, Western in December 2012, Central in October 2013, and Labrador-Grenfell in February 2013.

**Table 7: Number of community *Clostridium difficile* infections, Newfoundland and Labrador, 2009 – 2013**

	2009	2010	2011	2012	2013
<b>Eastern</b>		42	71	146	156
<b>Central</b>	20	15	13	9	15
<b>Western</b>	1	2	3	5	16
<b>Lab-Grenfell</b>	8	5	4	5	12
<b>NL</b>	29	64	91	165	199

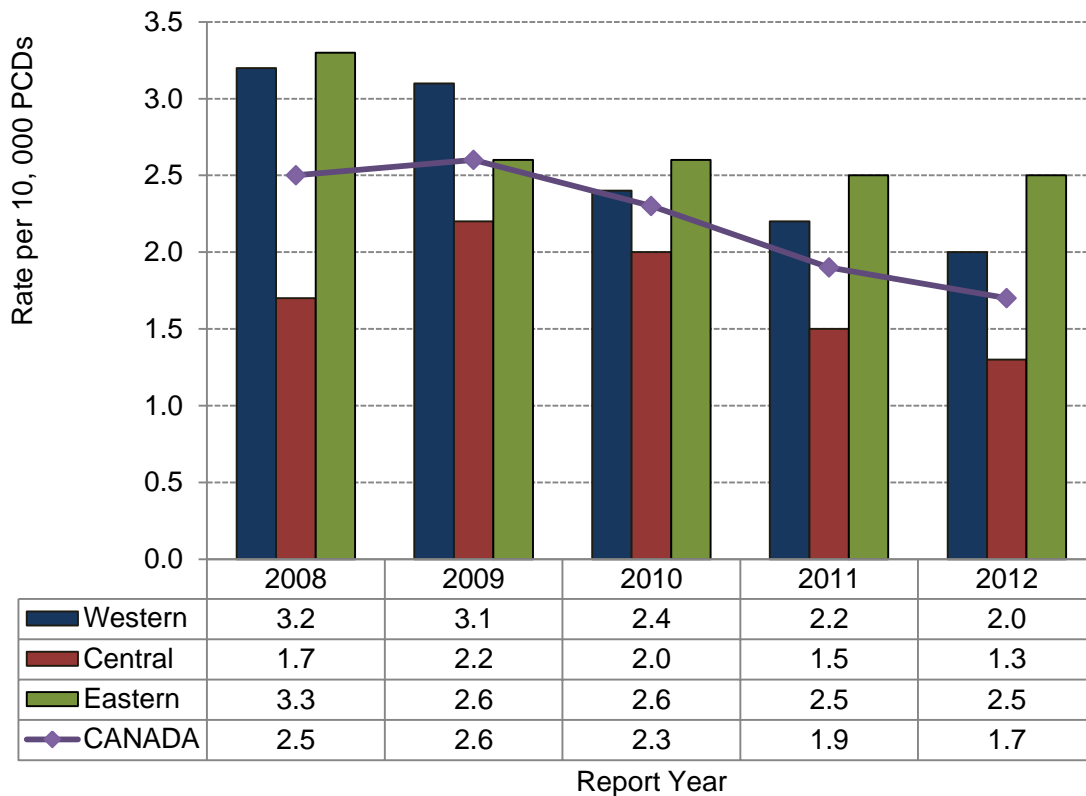
## Canadian Nosocomial Infection Surveillance Program

The Public Health Agency of Canada through the Canadian Nosocomial Infection Surveillance Program (CNISP) collects data on antimicrobial resistant organisms from 57 surveillance sites. The sites are primarily university-affiliated tertiary care hospitals representing ten provinces that have been divided into three regions: Western (British Columbia, Alberta, Saskatchewan, and Manitoba), Central (Ontario and Quebec) and Eastern (Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland and Labrador).<sup>12</sup> Established in 1994, the objectives of CNISP are to provide rates and trends of healthcare-associated infections at Canadian healthcare facilities, thus enabling comparison of rates (benchmarks), and to provide data that can be used in the development of national guidelines on clinical issues related to healthcare-associated infections.<sup>17</sup>

## CNISP – MRSA Surveillance

Western Canada has the highest incidence rates of MRSA infections in Canada (Figure 8). Overall, rates for Canada have declined from 2008 to 2012.

**Figure 8: Incidence rate of MRSA infections in acute care facilities, Canada, 2008 – 2012<sup>1</sup>**

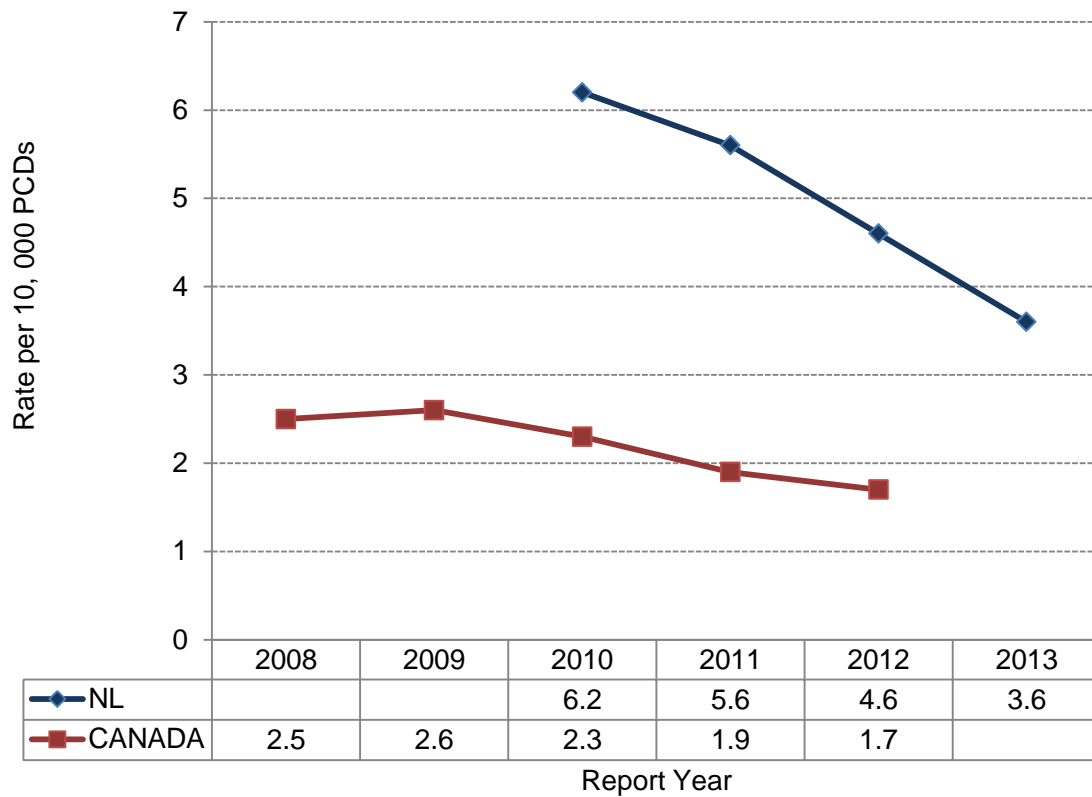


<sup>1</sup> Public Health Agency of Canada. (2013). Antimicrobial resistant organisms surveillance: Surveillance report for data from January 1, 2007 to December 31, 2011. Retrieved April 20, 2014, from [http://www.ammi.ca/media/56468/cnisp\\_aro\\_surveillance\\_pt\\_report\\_v10.pdf](http://www.ammi.ca/media/56468/cnisp_aro_surveillance_pt_report_v10.pdf)  
See Figure 2.6.

# HAI Annual Report

Rates of MRSA infections in acute care facilities in NL are higher than in Canada (Figure 9). However, NL has seen a decline in infection rates since 2010.

**Figure 9: Incidence rate of MRSA infections in acute care facilities, Canada and Newfoundland and Labrador, 2008 – 2013<sup>1</sup>**



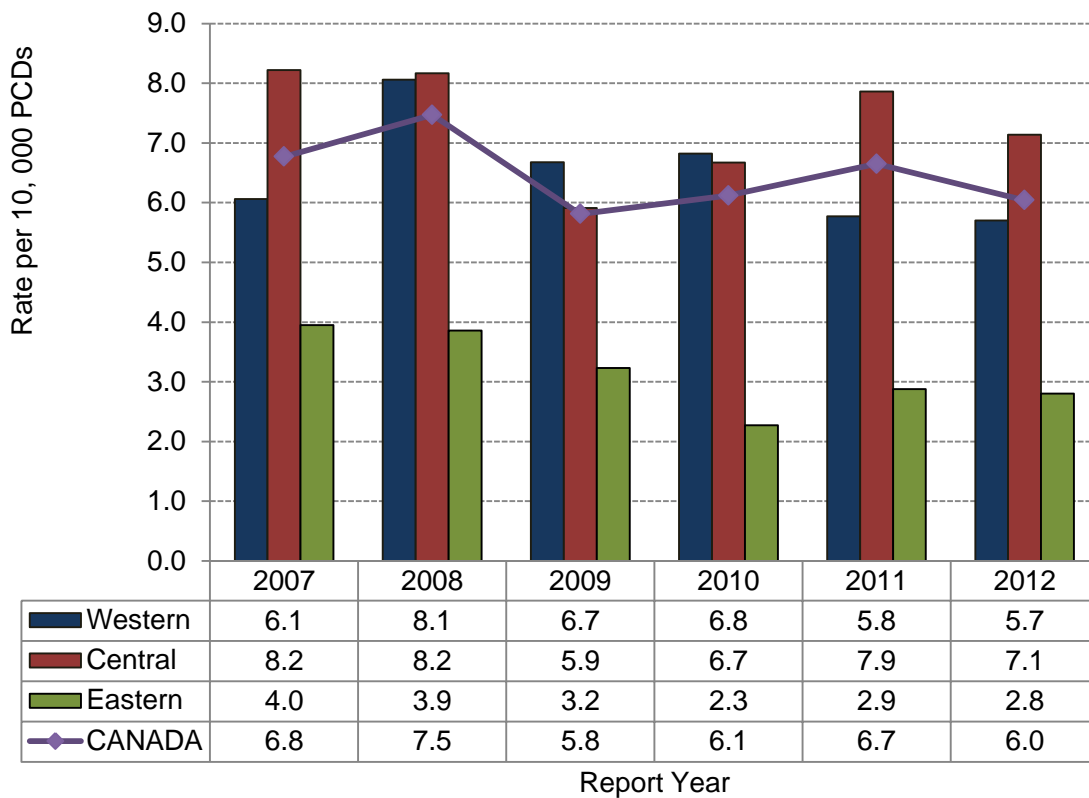
<sup>1</sup> Public Health Agency of Canada. (2013). Antimicrobial resistant organisms surveillance: Surveillance report for data from January 1, 2007 to December 31, 2011. Retrieved April 20, 2014, from [http://www.ammi.ca/media/56468/cnisp\\_aro\\_surveillance\\_pt\\_report\\_v10.pdf](http://www.ammi.ca/media/56468/cnisp_aro_surveillance_pt_report_v10.pdf)  
See Figure 2.6.

# HAI Annual Report

## CNISP – CDI Surveillance

Central Canada has the highest rates of *Clostridium difficile* infections in acute care facilities in Canada (Figure 10). Eastern Canada (Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland and Labrador) has reported much lower rates than the rest of Canada from 2007 to 2012.

**Figure 10: Incidence rate of *Clostridium difficile* infections in acute care facilities, Canada, 2007 – 2012**

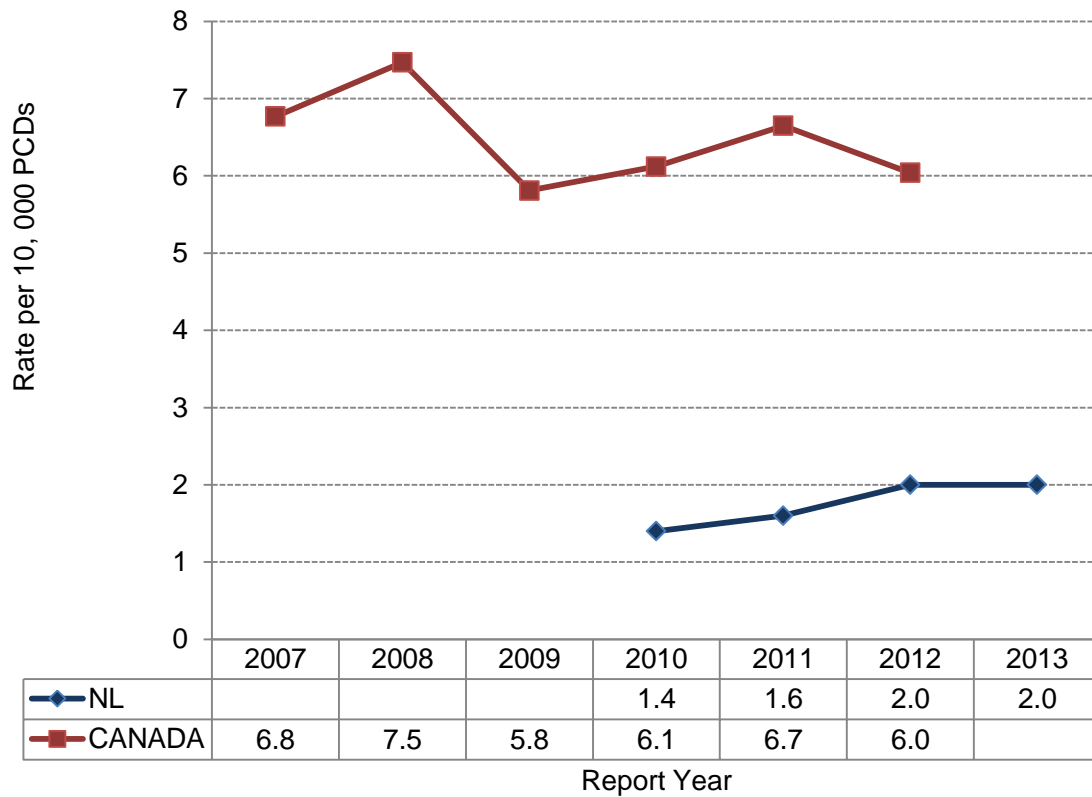


# HAI Annual Report

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Rates of CDI in acute care facilities in NL are lower than in Canada (Figure 11).

**Figure 11: Incidence rate of *Clostridium difficile* infections in acute care facilities, Canada and Newfoundland and Labrador, 2007 – 2013**



## Appendix A: MRSA Definitions

**MRSA case:** Laboratory-reported isolation of *Staphylococcus aureus* from any body site and resistance of the isolate to oxacillin.

**MRSA infection:** The organism is present in or on the body and is causing symptomatic illness.

**MRSA colonization:** The organism is present on the body but no cellular injury is occurring and there are no signs or symptoms of infection present. The infection or colonization must be related to identification of *Staphylococcus aureus* from any body site and is a newly identified MRSA case.

### Infected cases

**Healthcare-associated – (hospitalized) case:** The infection was not present on admission with onset of symptoms  $\geq 48$  hours after admission to the acute care facility OR the infection was present at the time of admission but is related to a previous admission to the same facility within the last 12 months.

**Healthcare-associated – (long-term care) case:** The infection was not present on admission, with onset of symptoms  $\geq 48$  hours after admission to the long-term care facility. If the infection is identified in a resident who has transferred from acute care within the last 48 hours, the infection would be attributed to that acute care facility.

**Healthcare-associated – Other (previous definition 2009-2011):** Healthcare-associated – refers to infections that occur as a result of contact with the health care system for care provided in any of the following locations: emergency room, ambulatory clinics, personal care homes, doctor's offices, nursing clinics, or care provided in the home within the past 12 months. This definition proved to be problematic for the collection of the data on cases not identified in the hospital or long-term care facility. An updated definition was provided in 2012 see below.

**Healthcare-associated - Other (current definition):** A case that does not meet the definition for healthcare-associated (hospitalized), healthcare-associated (long-term care) or community-associated infection.

**Community-associated case:** A case must meet all of the following criteria:

- If admitted, MRSA identified <48 hours after hospital admission.
- No previous history of MRSA.
- No history of hospitalization, surgery or dialysis within one year of MRSA culture.
- Not in residence at a long-term care facility within one year of MRSA culture.

# HAI Annual Report

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- No indwelling catheter or medical devices (e.g., Foley catheter, IV line, tracheotomy, feeding tube) within one year of MRSA culture

## **Colonized cases**

**Healthcare-associated – (hospitalized) case:** A case in whom colonization was not present on admission who is identified as part of a screening endeavor  $\geq 48$  hours after admission to the acute care facility.

**Healthcare-associated – long term care case:** A case in whom the colonization was not present on admission who is identified as part of a screening endeavor  $\geq 48$  hours after the admission to the long-term care facility.

**Health care-associated - Other:** A case that is identified as part of a screening endeavor (e.g., admission screen) to a health care facility or long term care facility and the case does not meet the definition for healthcare-associated (hospitalized) or healthcare-associated (long term care) colonization.



## Appendix B: CDI Definitions

**CDI case:** Clinical illness\* and laboratory confirmation of infection:

- a positive *C. difficile* toxin assay (enzyme immunoassay, nucleic acid amplification test or toxigenic cell culture assay) or
- Diagnosis of pseudomembranes on sigmoidoscopy or colonoscopy, or histological/pathological diagnosis of *C. difficile* infection

\*Clinical illness consists of diarrhea or fever, abdominal pain and/or ileus. Diarrhea is defined as one of the following:<sup>18</sup>

- Six, watery stools in past 36 hours;
- Three, unformed stools in 24 hours for at least 1 day; or,
- Eight unformed stools over 48 hours.

**Healthcare-associated nosocomial (hospital) acquired:** A case in which symptoms occur at least 72 hours or more after the current admission OR symptoms occur in a patient who has been hospitalized at your hospital and discharged within the previous four weeks.

**Long-Term Care acquired:** A case in which symptoms occur at least 72 hours after the admission and the resident has not had a hospital admission within the last four weeks.

**Recurrent CDI:** Recurrence of diarrhea within four weeks of a previous *C. difficile* infection episode. A recurrent infection is to be considered a continuation of the previous episode and not a new infection.

**Reinfection:** A case in which symptoms started more than four weeks from a previous *C. difficile* infection episode.

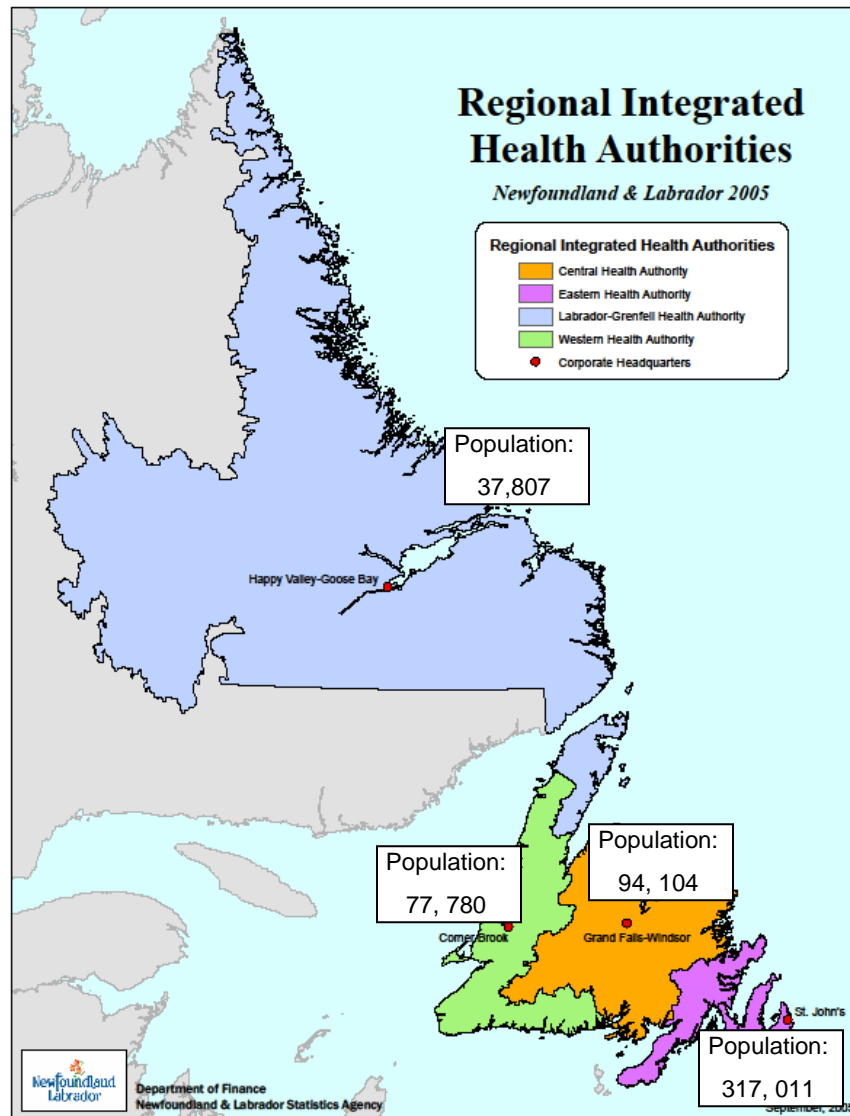
**Episode:** The time from the start to the end of symptoms.

**Healthcare-associated - Other:**

A case that does not meet the definition for healthcare-associated (hospitalized), healthcare-associated (long-term care) or community-associated infection.

**Community-associated CDI:** A case with symptom onset in the community or three calendar days or less after admission to a healthcare facility, provided that symptom onset was more than four weeks after the last discharge from a healthcare facility.

## Appendix C: Population by Regional Health Authority



**Source:** Statistics Canada. *Table 109-5335 - Estimates of population (2011 Census and administrative data), by age group and sex for July 1st, Canada, provinces, territories, health regions (2013 boundaries) and peer groups, annual (number), CANSIM (database).*

## Appendix D: References

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