Healthcare-associated Infections
Annual Report
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TABLE OF CONTENTS

SUMMARY 1

MRSA Surveillance Results 1
CDI Surveillance Results 1

INTRODUCTION 2

METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* INFECTIONS 3

MRSA Surveillance Results - Infections 4
MRSA Surveillance Results – Colonizations 8

***CLOSTRIDIUM DIFFICILE*-INFECTION 9**

CDI Surveillance Results 10

CANADIAN NOSOCOMIAL INFECTION SURVEILLANCE PROGRAM 15

CNISP – MRSA Surveillance 16
CNISP – CDI Surveillance 18

APPENDIX A: MRSA DEFINITIONS 20

APPENDIX B: CDI DEFINITIONS 22

APPENDIX C: POPULATION BY REGIONAL HEALTH AUTHORITY 2015 23

APPENDIX D: REFERENCES 24

List of Figures

Figure 1: Incidence rate of MRSA infections in acute care facilities, Newfoundland and Labrador, 2009 – 2015 4
Figure 2: Incidence rate of MRSA infections in long term care facilities, Newfoundland and Labrador, 2009 – 2015 6
Figure 3: Incidence rate of community and healthcare-associated (not hospitalized cases) MRSA infections, Newfoundland and Labrador, 2009 – 2015 7
Figure 4: Incidence rate of *Clostridium difficile* infections in acute care facilities, Newfoundland and Labrador, 2009 – 2015 10
Figure 5: Incidence rate of *Clostridium difficile* infections in long term care facilities, Newfoundland and Labrador, 2009 – 2015 12
Figure 6: Incidence rate of healthcare associated (not hospitalized cases) *Clostridium difficile* infections, Newfoundland and Labrador, 2009 – 2015 13

Figure 7: Incidence rate of community associated *Clostridium difficile* infections, Newfoundland and Labrador, 2009 – 2015 14
Figure 8: Incidence rate of MRSA infections in acute care facilities, Canada, 2009 – 2014 16
Figure 9: Incidence rate of MRSA infections in acute care facilities, Canada and Newfoundland and Labrador, 2009 – 2014 17
Figure 10: Incidence rate of *Clostridium difficile* infections in acute care facilities, Canada, 2009 – 2014 18
Figure 11: Incidence rate of *Clostridium difficile* infections in acute care facilities, Canada and Newfoundland and Labrador Incidence rate of *Clostridium difficile* infections in acute care facilities, Canada, 2009 – 2014 19

List of Tables

Table 1: Number of MRSA infections in acute care facilities, Newfoundland and Labrador, 2009 – 2015 5
Table 2: Number of MRSA infections in long term care facilities, Newfoundland and Labrador, 2009 – 2015 6
Table 3: Number of community and healthcare-associated (not hospitalized cases) MRSA infections, Newfoundland and Labrador, 2009 – 2015 7
Table 4: Number of *Clostridium difficile* infections in acute care facilities, Newfoundland and Labrador, 2009 – 2015 11
Table 5: Number of *Clostridium difficile* infections in long term care facilities, Newfoundland and Labrador, 2009 – 2015 12
Table 6: Number of healthcare-associated (not hospitalized cases) *Clostridium difficile* infections, Newfoundland and Labrador, 2009 – 2015 13
Table 7: Number of community *Clostridium difficile* infections, Newfoundland and Labrador, 2009 – 2015 14

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* infections (CDIs).

The objectives of the HAI surveillance program are to provide rates and trends of HAIs at the regional level across the province thus enabling comparison of rates (benchmarks). Additionally, the provided data may 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 for 2015.

MRSA Surveillance Results

- From 2010 to 2015, 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 resident care days (RCD's) in 2010 to 0.5 per 10,000 RCDs in 2015 (Figure 2).
- Labrador-Grenfell Health continues to report high rates of community and healthcare-associated MRSA infections, however a declining trend was observed in 2014 and 2015.
- Compared to the Canadian Nosocomial Infection Surveillance Program (CNISP) the rates of MRSA infections in acute care facilities in NL are higher than the Canadian national rate from 2010 to 2014 (Figure 9). However, NL has seen a greater reduction in rates of MRSA infection since 2010 relative to the national infection rate.

CDI Surveillance Results

- From 2010 to 2015, the incidence rate of CDI in acute care facilities increased from 1.4 per 10,000 patient care days (PCD's) to 2.6 per 10,000 PCD's in NL (Figure 4). Rates in Eastern, Central and Western Regional Health Authorities increased from 2013 to 2015. Comparatively, rates in Labrador-Grenfell decreased over the same time period.
- Incidence rates of CDI's in long term care remain consistently lower than that of acute care (Figure 5). From 2010 to 2015, the incidence rates of CDI's in long term care remained relatively unchanged.
- The overall provincial CDI rates at the community level have decreased from 2013 to 2015 (Figure 7). Notably, the rate in Labrador-Grenfell Health (15.8 per 100, 000 population) was much lower than that of previous years.
- Compared to the CNISP the rates of CDI in acute care facilities in NL are lower than the Canadian rate from 2010 to 2014 (Figure 11).

Introduction

Healthcare-associated infections (HAIs) are infections acquired while receiving health care whether the individual is in a hospital, long-term care facility, ambulatory care, or home. HAIs are a common adverse event affecting hospitalized patients. In Canada, an estimated one in nine hospitalized patients acquire a HAI which leads to longer stays, complications and even death.[1] Approximately 8,000 people die each year from HAIs while approximately 200,000 others get infected.[2] HAIs can pose a major risk to patient safety.[3] In recent years the occurrence of HAIs has been an increasing concern to healthcare professionals, patient safety advocates and the public.[3] In addition to the impact on patients, HAIs place a burden on the health care system. HAIs contribute to a reduction in patient flow, overcrowded emergency rooms, over capacity crowding on in-patient units, increased workload, frustrated patients and families, and an increased financial burden.[4] As reported by the Public Health Agency of Canada, health care costs for HAIs are substantial; in particular, *Clostridium difficile* infections (CDIs) cost $46.1 million and methicillin-resistant *Staphylococcus aureus* (MRSA) cost $36.3 million per year.[5]

Healthcare-associated infections (HAIs) are caused by a wide range of microorganisms often linked to complications of having received health care. In Canada, the organisms responsible for causing the largest burden for the healthcare system are CDI and MRSA.[1]

The emphasis on HAIs as a public health and patient safety problem has highlighted the importance of HAI surveillance as contributing to a broad-based infection prevention and control strategy.[6] Surveillance of HAIs provides important information to help identify at risk populations, inform provincial health departments on emerging resistance trends as well as the need for and effectiveness of infection prevention and control programs.[6] Since 2010, 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.[7] Regional statistics are reported to the Provincial Department of Health and Community Services by the Regional Health Authorities (RHAs).

This report presents 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, 2015. MRSA infections and CDIs identified in out-patient settings and in the community are also provided. Definitions are included in Appendix A and B.

Methicillin-resistant *Staphylococcus aureus* Infections

Although *Staphylococcus aureus* is a bacterium that can be found in an individual's nares not causing harm; it has the potential to cause severe infections including pneumonia, bloodstream and bone infections.[8] 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.[9] While MRSA usually causes skin infections in the community setting, more severe infections occur in hospital settings.[10] Patients infected with MRSA tend to have more co-morbidities, longer lengths of stay and greater exposure to antibiotics than patients infected with methicillin-sensitive *Staphylococcus aureus*.[11]

The Public Health Agency of Canada reported a 17 fold increase in MRSA rates in Canadian hospitals between 1995 and 2010.[5] During the same time period, the proportion of community-associated MRSA strains increased from 2 per cent to 25 per cent.[5] Direct health care costs attributable to MRSA averaged $82 million in Canada in 2004.[5,12]

The Provincial MRSA Surveillance Protocol includes standard case definitions for MRSA infections and colonizations.[7] MRSA infection occurs when micro-organisms are able to multiply within the body and cause a response from the host's immune defences.[13] 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.[13]

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 reported infections. The denominator for acute care facilities is the number of patient care days (PCDs) for all acute care facilities (Appendix C) in each RHA and for long term care it is the number of resident care days (RCDs) for all long term care facilities (Appendix D) in each RHA. The denominator for healthcare-associated (not hospitalized) cases and community cases is based on the population of the RHA (Appendix E and F).

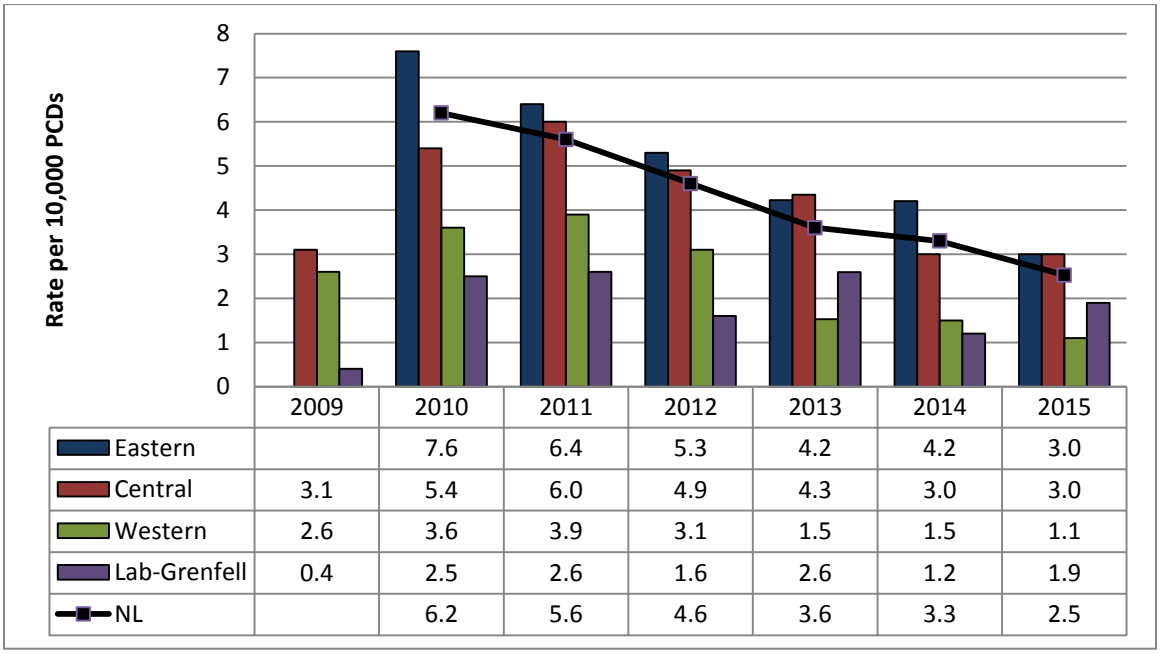
Provincial rates are calculated using total number of infections. The provincial denominator is the total number of PCDs or RCDs for acute care and long-term care facilities in the province. The provincial denominator for healthcare-associated (not hospitalized) cases and community cases is the population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

MRSA Surveillance Results - Infections

The following figures and tables present MRSA infection rates and counts for acute and long term care facilities, as well as community and healthcare associated infections in NL from 2009 to 2015. 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 2015, the incidence rate of MRSA infections in acute care facilities has declined by approximately a half in NL (Figure 1). The rate in Eastern Health decreased from 7.6 per 10,000 PCDs in 2010 to 3.0 per 10,000 PCDs in 2015. Both Central Health and Western Health showed a similar trend. Incidence rates in Labrador-Grenfell Health varied over the same time period which was primarily driven by the low case counts. Labrador-Grenfell Health reports very small numbers of MRSA infections in acute care facilities; since 2010 the counts ranged from three cases in 2014 to seven cases in 2011 and 2013.

Figure 1: Incidence rate of MRSA infections in acute care facilities, Newfoundland and Labrador, 2009 – 2015



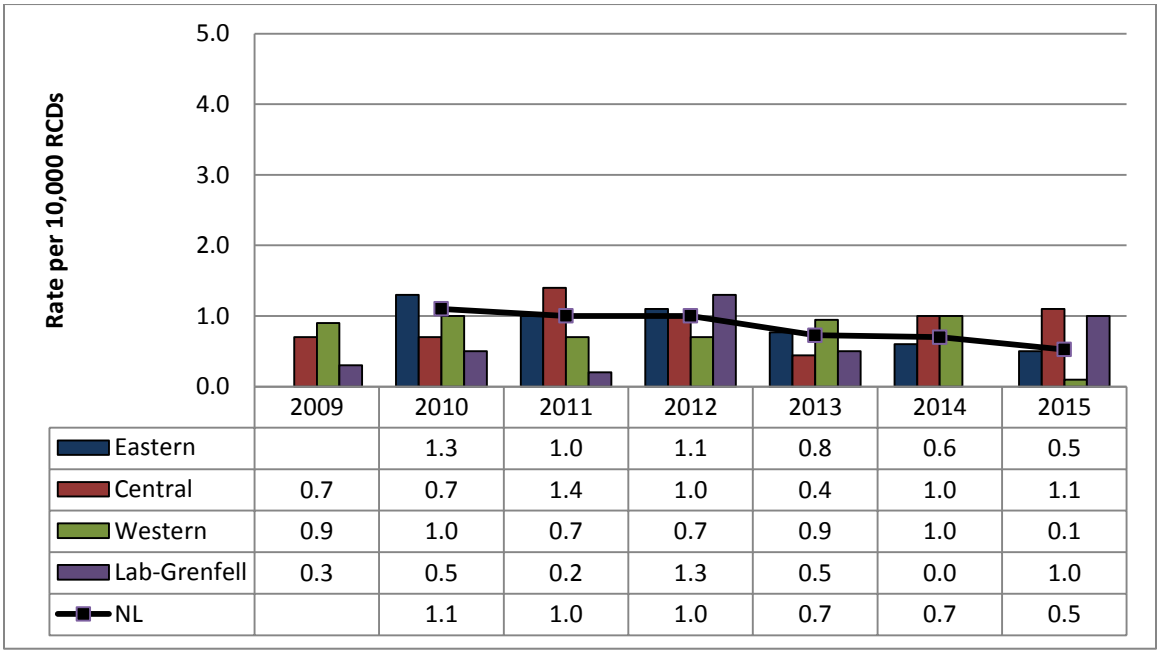
	2009	2010	2011	2012	2013	2014	2015
Eastern		7.6	6.4	5.3	4.2	4.2	3.0
Central	3.1	5.4	6.0	4.9	4.3	3.0	3.0
Western	2.6	3.6	3.9	3.1	1.5	1.5	1.1
Lab-Grenfell	0.4	2.5	2.6	1.6	2.6	1.2	1.9
NL		6.2	5.6	4.6	3.6	3.3	2.5

Table 1: Number of MRSA infections in acute care facilities, Newfoundland and Labrador, 2009 – 2015

	2009	2010	2011	2012	2013	2014	2015
Eastern		202	167	140	122	124	83
Central	23	41	46	39	34	25	25
Western	22	31	33	26	14	14	11
Lab-Grenfell	1	6	7	4	7	3	5
NL	46	280	253	209	177	166	124

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 RCDs in 2010 to 0.5 per 10,000 RCDs in 2015 (Figure 2). In Eastern Health the rate has also decreased. Rates in Central Health and Labrador-Grenfell Health varied during the same period. Rates in Western Health remain relatively unchanged.

Figure 2: Incidence rate of MRSA infections in long term care facilities, Newfoundland and Labrador, 2009 – 2015



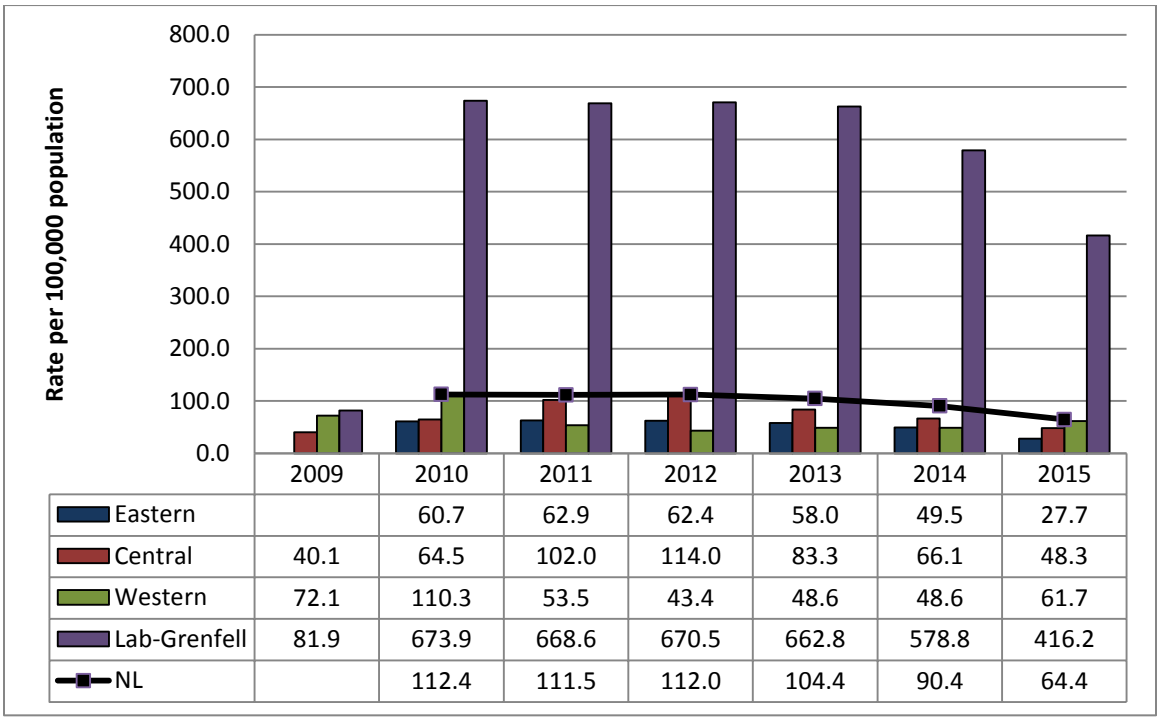
	2009	2010	2011	2012	2013	2014	2015
Eastern		1.3	1.0	1.1	0.8	0.6	0.5
Central	0.7	0.7	1.4	1.0	0.4	1.0	1.1
Western	0.9	1.0	0.7	0.7	0.9	1.0	0.1
Lab-Grenfell	0.3	0.5	0.2	1.3	0.5	0.0	1.0
NL		1.1	1.0	1.0	0.7	0.7	0.5

Table 2: Number of MRSA infections in long term care facilities, Newfoundland and Labrador, 2009 – 2015

	2009	2010	2011	2012	2013	2014	2015
Eastern		81	60	63	45	32	29
Central	13	12	26	18	8	18	20
Western	13	16	12	11	16	18	2
Lab-Grenfell	1	2	1	5	2	1	4
NL	27	111	99	97	71	69	55

Figure 3 presents the incidence rate of community and healthcare-associated (not hospitalized cases) MRSA infections. In Eastern Health, rates have decreased from 62.9 per 100, 000 population in 2011 to 49.5 per 100, 000 population in 2014. There have been some variations in the rates in Central and Western Health. Labrador-Grenfell Health continues to report high rates of community and healthcare-associated MRSA infections; however the provincial rate decreased from 104.4 in 2013 to 64.4 in 2015.

Figure 3: Incidence rate of community and healthcare-associated (not hospitalized cases) MRSA infections, Newfoundland and Labrador, 2009 – 2015



	2009	2010	2011	2012	2013	2014	2015
Eastern		60.7	62.9	62.4	58.0	49.5	27.7
Central	40.1	64.5	102.0	114.0	83.3	66.1	48.3
Western	72.1	110.3	53.5	43.4	48.6	48.6	61.7
Lab-Grenfell	81.9	673.9	668.6	670.5	662.8	578.8	416.2
NL		112.4	111.5	112.0	104.4	90.4	64.4

Table 3: Number of community and healthcare-associated (not hospitalized cases) MRSA infections, Newfoundland and Labrador, 2009 – 2015

	2009	2010	2011	2012	2013	2014	2015
Eastern		187	195	195	183	157	88
Central	38	61	96	107	78	62	45
Western	57	87	42	34	38	38	48
Lab-Grenfell	30	248	246	249	249	219	158
NL	125	583	579	585	548	476	339

MRSA Surveillance Results – Colonizations

The MRSA colonization rates for the RHAs will not be reported in a detailed format. This is due to the differences in the screening protocols in the RHAs. It is important to note that colonization rates are reflective of screening procedures in each health authority.

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 PCDs in 2010. However, the rate has since decreased to 1.0 in 2015. In Central Health, the colonization rate in acute care facilities decreased from 2.9 in 2010 to 1.2 in 2015. The colonization rate in Western Health acute care facilities was 0.7 in 2015 and the rates have varied over the 6-year period. In 2010, the colonization rate in acute care facilities in Labrador-Grenfell Health was 1.2; no colonizations have been reported since 2011. Rates of colonization in long term care facilities remain low, ranging from 0 to 0.1 in 2015 across the province.

Clostridium difficile-Infection

Clostridium difficile (*C. difficile*) is a bacterium that causes mild to severe diarrhea and intestinal conditions like pseudomembranous colitis (inflammation of the colon). *Clostridium difficile* infection (CDI) is the most frequent cause of healthcare-associated infectious diarrhea in industrialized countries.[14] Clinical symptoms range from asymptomatic colonization to severe diarrhea, pseudomembranous colitis, toxic megacolon and death.[15] A major risk factor for the development of CDI is the use of antibiotics; 85% of CDI cases have an antibiotic history.[16] Certain antibiotics have been more strongly associated with CDIs; clindamycin, broad spectrum cephalosporins and fluoroquinolones.[16] Other risk factors for CDI include the number of times admitted to hospital and the duration of hospitalization.[16] Hospitalization complicated with a CDI can increase the length of stay from 3-20 days.[16] There has been an almost four-fold increase in the *CDI* attributable mortality rate in Canadian hospitals from 1997 to 2005.[17]

The Provincial CDI Surveillance Protocol includes standard case definitions.[18] In Newfoundland and Labrador CDI is reportable to the provincial Department of Health and Community Services. 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.

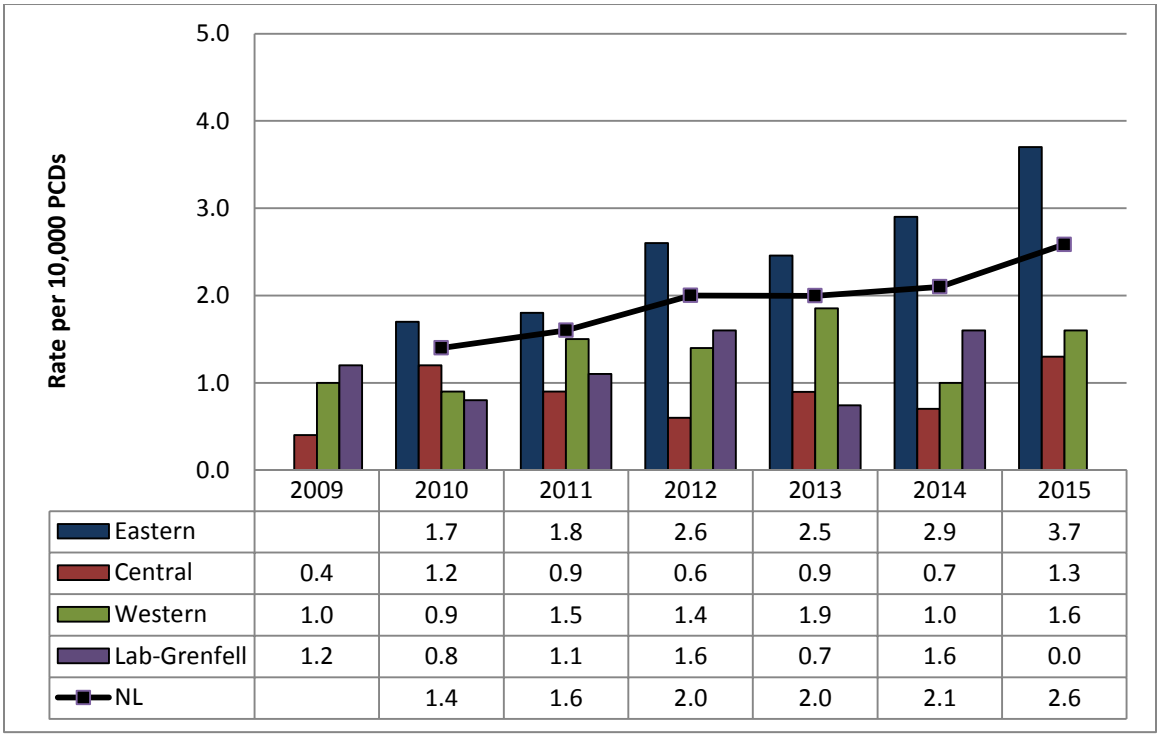
CDI Surveillance Results

The following graphs and tables provide an overview of annual rates of CDI in NL for January 2009 to December 2015. It includes i) the rate of CDI in acute care facilities per 10,000 patient care days (PCDs), ii) the number of CDIs 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 rate of community infections of CDI based on the population of the RHA and vii) the number of community CDI infections.

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 2015, the provincial incidence rate of CDI in acute care facilities increased from 1.4 per 10,000 PCDs to 2.6 per 10,000 PCDs (Figure 4). Rates in Eastern, Central and Western Health increased from 2014 to 2015. Comparatively, the rate in Labrador-Grenfell Health decreased from 2014 to 2015. Labrador-Grenfell Health reported zero cases of CDI in 2015 and four cases in 2014.

Figure 4: Incidence rate of *Clostridium difficile* infections in acute care facilities, Newfoundland and Labrador, 2009 – 2015



	2009	2010	2011	2012	2013	2014	2015
Eastern		1.7	1.8	2.6	2.5	2.9	3.7
Central	0.4	1.2	0.9	0.6	0.9	0.7	1.3
Western	1.0	0.9	1.5	1.4	1.9	1.0	1.6
Lab-Grenfell	1.2	0.8	1.1	1.6	0.7	1.6	0.0
NL		1.4	1.6	2.0	2.0	2.1	2.6

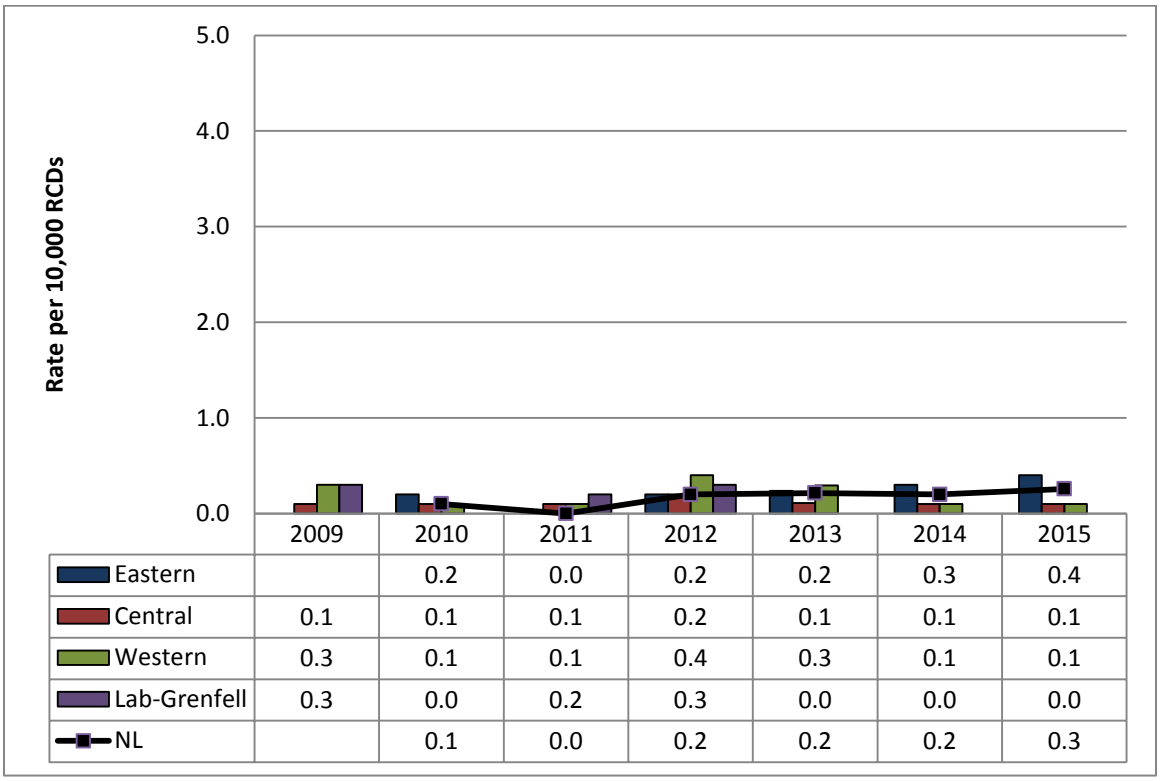
Note: A more sensitive test was used in the regions as follows. Eastern Health in September 2012, Western in December 2012, Central in October 2013, and Labrador-Grenfell in February 2013.

Table 4: Number of *Clostridium difficile* infections in acute care facilities, Newfoundland and Labrador, 2009 – 2015

	2009	2010	2011	2012	2013	2014	2015
Eastern		44	48	68	71	87	102
Central	3	9	7	5	7	6	11
Western	8	8	13	12	17	10	14
Lab-Grenfell	3	2	3	4	2	4	0
NL	14	63	71	89	97	107	127

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 six year period.

Figure 5: Incidence rate of *Clostridium difficile* infections in long term care facilities, Newfoundland and Labrador, 2009 – 2015



	2009	2010	2011	2012	2013	2014	2015
Eastern		0.2	0.0	0.2	0.2	0.3	0.4
Central	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Western	0.3	0.1	0.1	0.4	0.3	0.1	0.1
Lab-Grenfell	0.3	0.0	0.2	0.3	0.0	0.0	0.0
NL		0.1	0.0	0.2	0.2	0.2	0.3

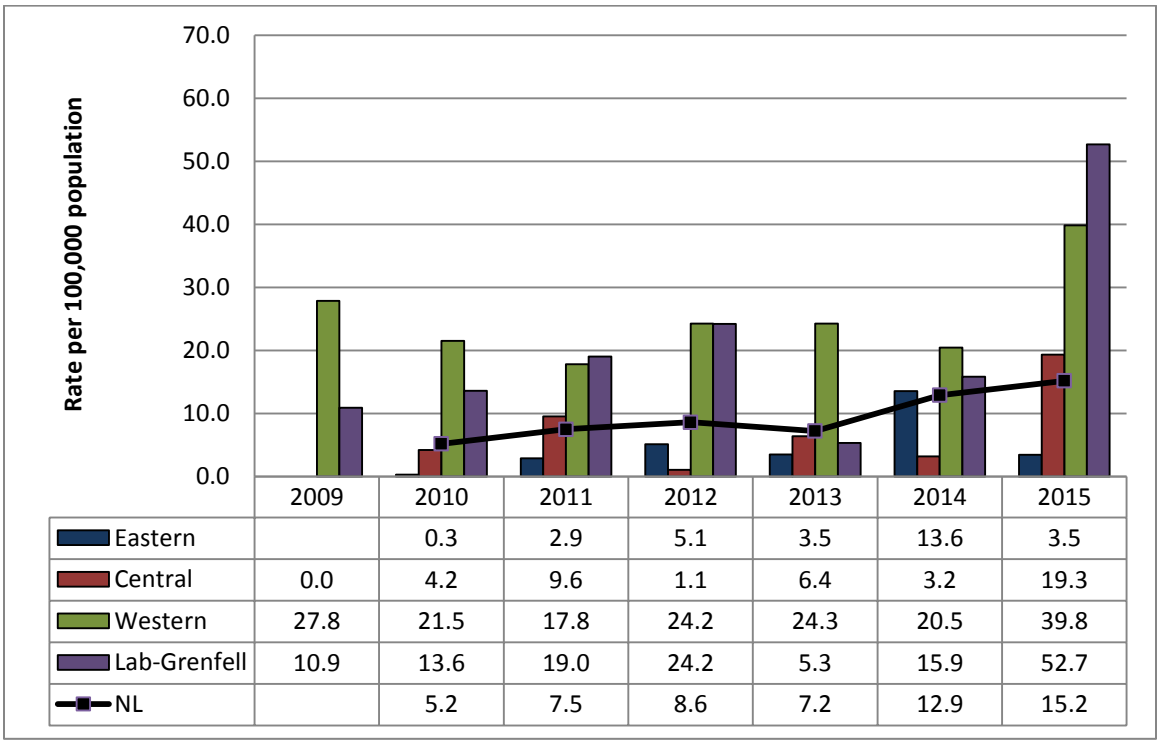
Note: A more sensitive test was used in the regions as follows. Eastern Health in September 2012, Western in December 2012, Central in October 2013, and Labrador-Grenfell in February 2013.

Table 5: Number of *Clostridium difficile* infections in long term care facilities, Newfoundland and Labrador, 2009 – 2015

	2009	2010	2011	2012	2013	2014	2015
Eastern		10	1	10	14	16	24
Central	2	2	1	3	2	1	1
Western	4	1	1	6	5	1	2
Lab-Grenfell	1	0	1	1	0	0	0
NL	7	13	4	20	21	18	27

In 2015, the incidence rate of healthcare associated (not hospitalized) CDI cases in NL was 15.2 per 100, 000 population. The highest rate in 2015 was reported in Labrador-Grenfell Health while the lowest rate was reported in Eastern Health.

Figure 6: Incidence rate of healthcare associated (not hospitalized cases) *Clostridium difficile* infections, Newfoundland and Labrador, 2009 – 2015



	2009	2010	2011	2012	2013	2014	2015
Eastern		0.3	2.9	5.1	3.5	13.6	3.5
Central	0.0	4.2	9.6	1.1	6.4	3.2	19.3
Western	27.8	21.5	17.8	24.2	24.3	20.5	39.8
Lab-Grenfell	10.9	13.6	19.0	24.2	5.3	15.9	52.7
NL		5.2	7.5	8.6	7.2	12.9	15.2

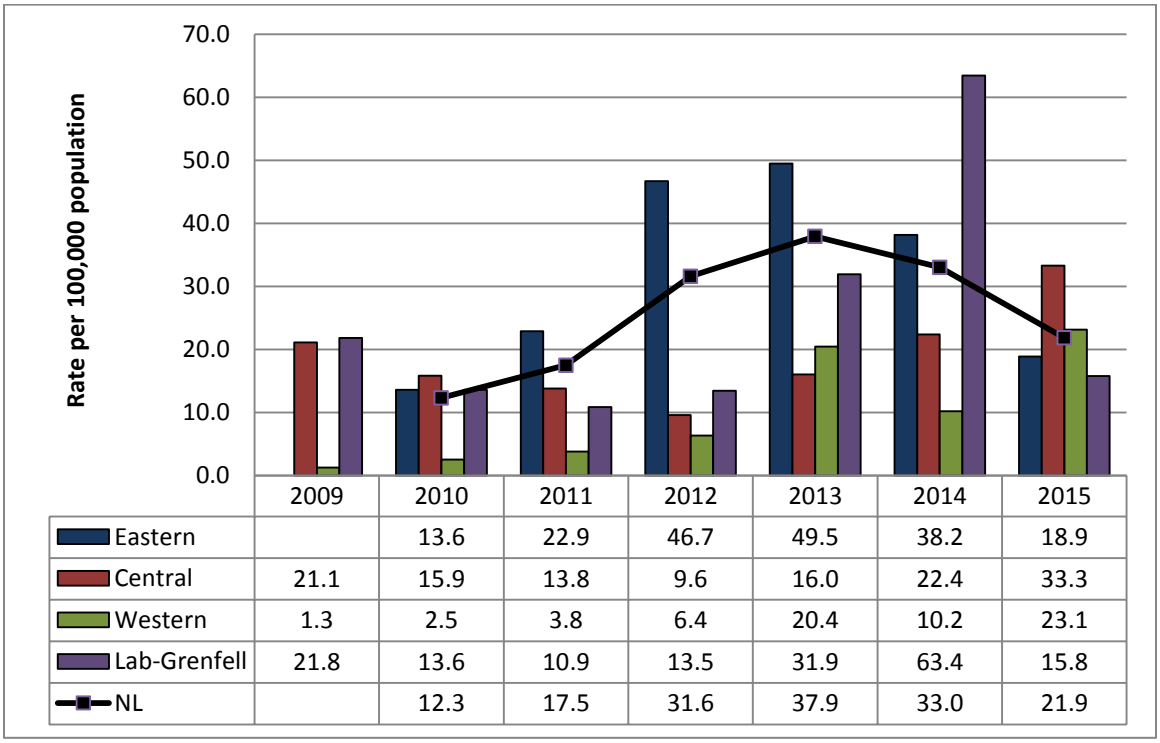
Note: A more sensitive test was used in the regions as follows. Eastern Health in September 2012, Western in December 2012, Central in October 2013, and Labrador-Grenfell in February 2013.

Table 6: Number of healthcare-associated (not hospitalized cases) *Clostridium difficile* infections, Newfoundland and Labrador, 2009 – 2015

	2009	2010	2011	2012	2013	2014	2015
Eastern		1	9	16	11	43	11
Central	0	4	9	1	6	3	18
Western	22	17	14	19	19	16	31
Lab-Grenfell	4	5	7	9	2	6	20
NL	26	27	39	45	38	68	80

Overall, CDI rates in the community have decreased from 2013 to 2015 (Figure 7). In 2015, the highest rate was reported in Central Health. Labrador-Grenfell reported the lowest rate of community associated CDI in 2015.

Figure 7: Incidence rate of community associated *Clostridium difficile* infections, Newfoundland and Labrador, 2009 – 2015



	2009	2010	2011	2012	2013	2014	2015
Eastern		13.6	22.9	46.7	49.5	38.2	18.9
Central	21.1	15.9	13.8	9.6	16.0	22.4	33.3
Western	1.3	2.5	3.8	6.4	20.4	10.2	23.1
Lab-Grenfell	21.8	13.6	10.9	13.5	31.9	63.4	15.8
NL		12.3	17.5	31.6	37.9	33.0	21.9

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 – 2015

	2009	2010	2011	2012	2013	2014	2015
Eastern		42	71	146	156	121	60
Central	20	15	13	9	15	21	31
Western	1	2	3	5	16	8	18
Lab-Grenfell	8	5	4	5	12	24	6
NL	29	64	91	165	199	174	115

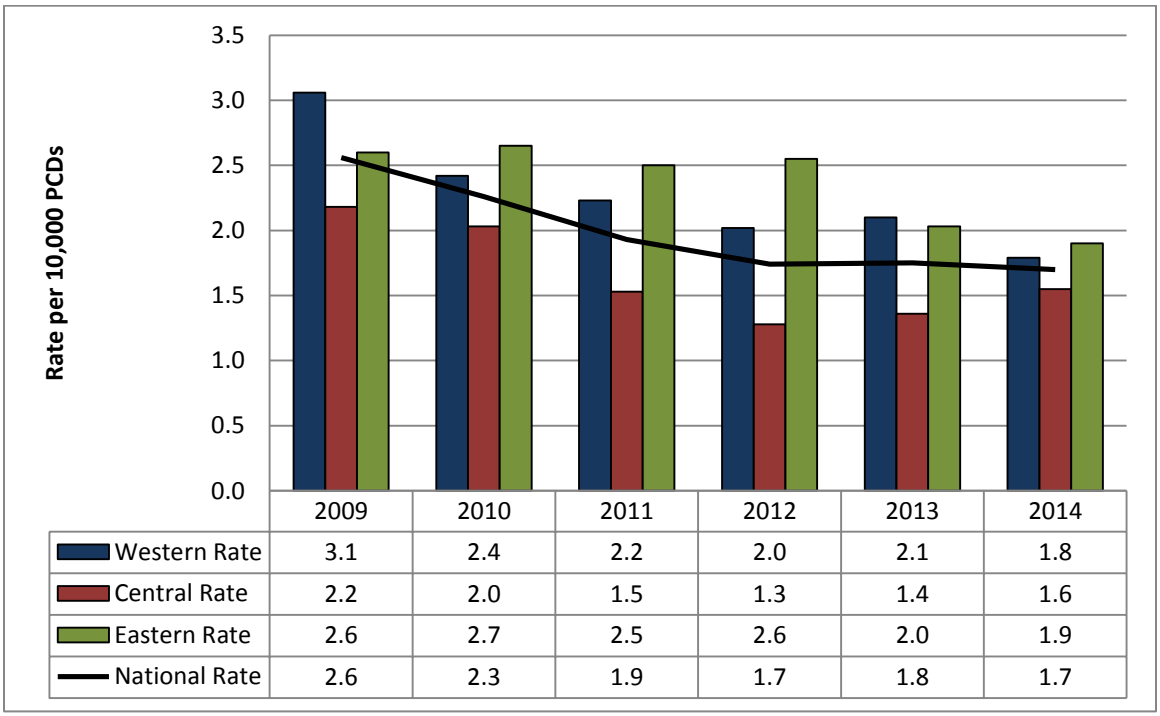
Canadian Nosocomial Infection Surveillance Program

The Public Health Agency of Canada through the Canadian Nosocomial Infection Surveillance Program (CNISP) collects data on antimicrobial resistant organisms from 62 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).[19] Established in 1994, the objectives of CNISP are to provide rates and trends of healthcare-associated infections in 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.[20]

CNISP – MRSA Surveillance

In 2014, Eastern Canada marginally has the highest incidence rates, 1.9 per 10,000 PCDs, of MRSA infections in acute care facilities within Canada (Figure 8). Overall, rates for Canada have declined from 2009 to 2012 and remain stable around 1.7 from 2012 to 2014.

Figure 8: Incidence rate of MRSA infections in acute care facilities, Canada, 2009 – 2014[1]

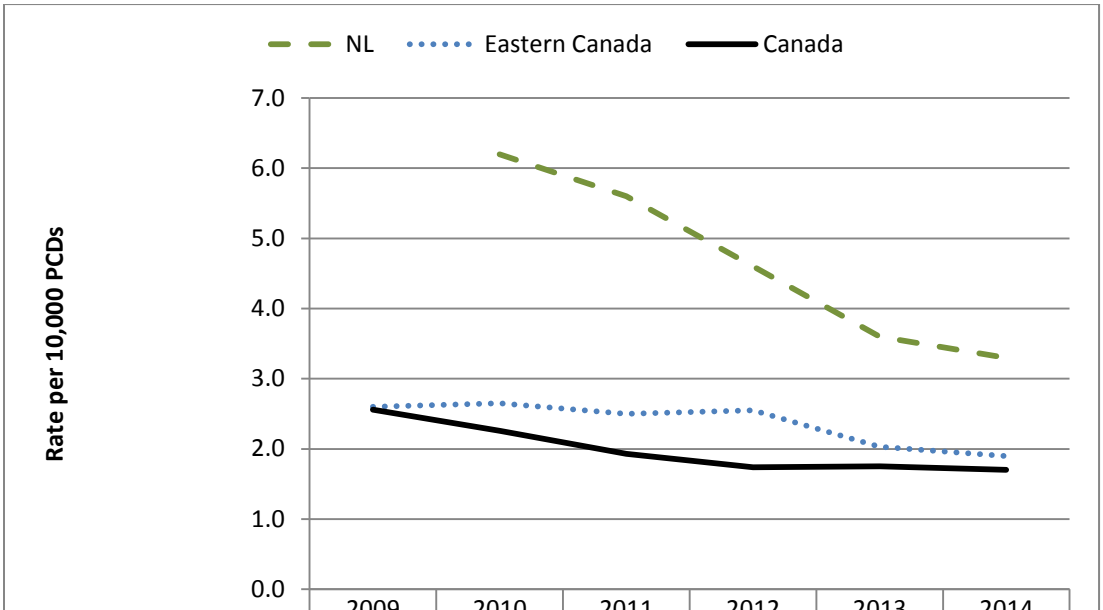


	2009	2010	2011	2012	2013	2014
Western Rate	3.1	2.4	2.2	2.0	2.1	1.8
Central Rate	2.2	2.0	1.5	1.3	1.4	1.6
Eastern Rate	2.6	2.7	2.5	2.6	2.0	1.9
National Rate	2.6	2.3	1.9	1.7	1.8	1.7

[1] Public Health Agency of Canada. (2015). Antimicrobial Resistant Organisms (ARO) Surveillance: Summary Report for Data from January 1, 2009 to December 31, 2014. See Table 2.6.

Rates of MRSA infections in acute care facilities in NL are higher than in Canada and the entire Eastern region (Figure 9). However, NL has seen a decline in infection rates from 6.2 per 10,000 PCDs in 2010 to 3.3 per 10,000 PCDs in 2014.

Figure 9: Incidence rate of MRSA infections in acute care facilities, Canada and Newfoundland and Labrador, 2009 – 2014[1]



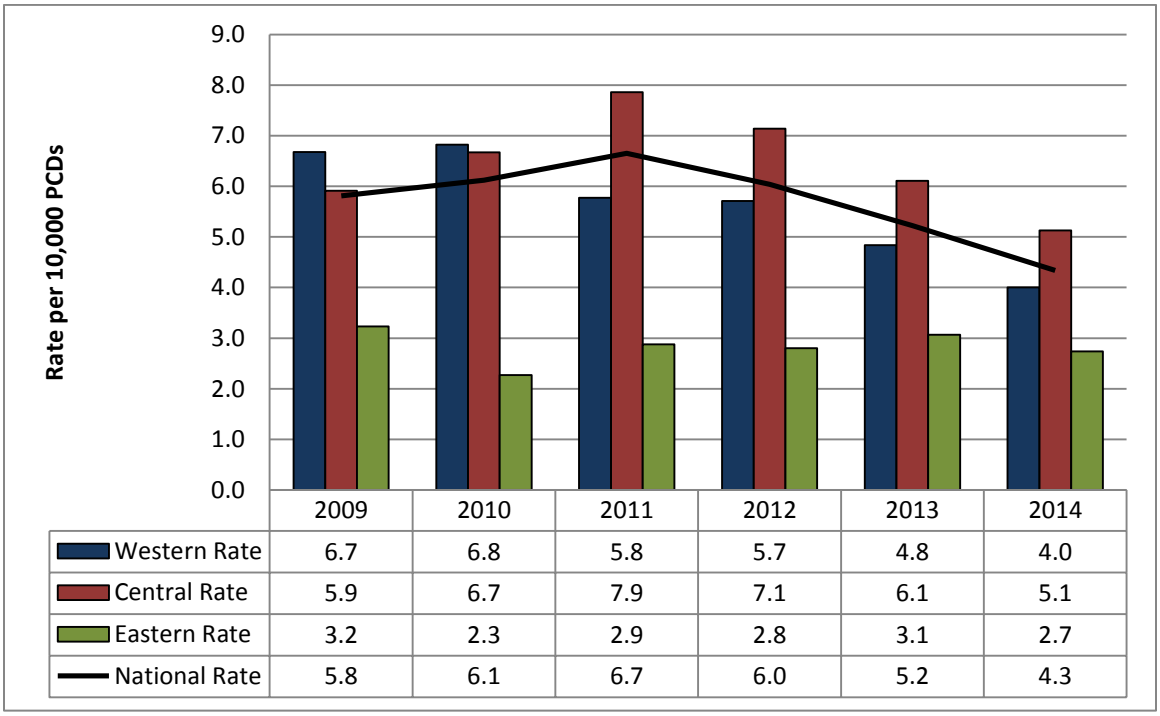
	2009	2010	2011	2012	2013	2014
NL		6.2	5.6	4.6	3.6	3.3
Eastern Canada	2.6	2.7	2.5	2.6	2.0	1.9
Canada	2.6	2.3	1.9	1.7	1.8	1.7

[1] Public Health Agency of Canada. (2015). Antimicrobial Resistant Organisms (ARO) Surveillance: Summary Report for Data from January 1, 2009 to December 31, 2014. See Table 2.6.

CNISP – CDI Surveillance

Central Canada has the highest rate 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 rates much lower than the rest of Canada from 2009 to 2014.

Figure 10: Incidence rate of *Clostridium difficile* infections in acute care facilities, Canada, 2009 – 2014[2]

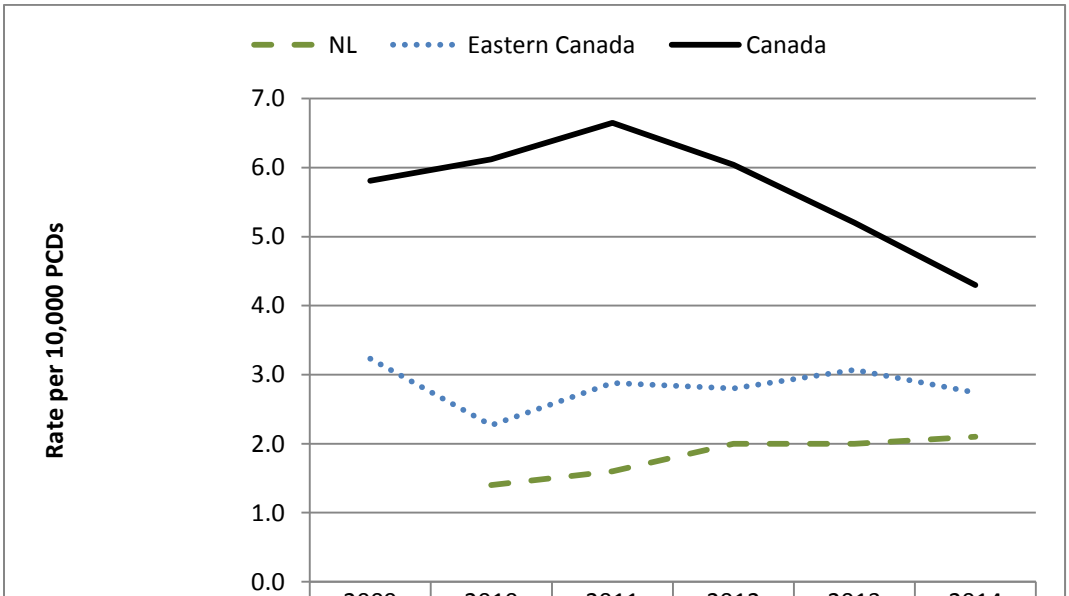


	2009	2010	2011	2012	2013	2014
Western Rate	6.7	6.8	5.8	5.7	4.8	4.0
Central Rate	5.9	6.7	7.9	7.1	6.1	5.1
Eastern Rate	3.2	2.3	2.9	2.8	3.1	2.7
National Rate	5.8	6.1	6.7	6.0	5.2	4.3

[2] Public Health Agency of Canada. (2015). Antimicrobial Resistant Organisms (ARO) Surveillance: Summary Report for Data from January 1, 2009 to December 31, 2014. See Table 1.2.

Rates of CDI in acute care facilities in NL are consistently lower than in Canada and the broader Eastern region from 2010 to 2014 (Figure 11).

Figure 11: Incidence rate of *Clostridium difficile* infections in acute care facilities, Canada and Newfoundland and Labrador Incidence rate of *Clostridium difficile* infections in acute care facilities, Canada, 2009 – 2014[3]



	2009	2010	2011	2012	2013	2014
NL		1.4	1.6	2.0	2.0	2.1
Eastern Canada	3.2	2.3	2.9	2.8	3.1	2.7
Canada	5.8	6.1	6.7	6.0	5.2	4.3

[3] Public Health Agency of Canada. (2015). Antimicrobial Resistant Organisms (ARO) Surveillance: Summary Report for Data from January 1, 2009 to December 31, 2014. See Table 1.2.

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 ≥ 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 ≥ 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.
- 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 ≥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 ≥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: [21]

- 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.

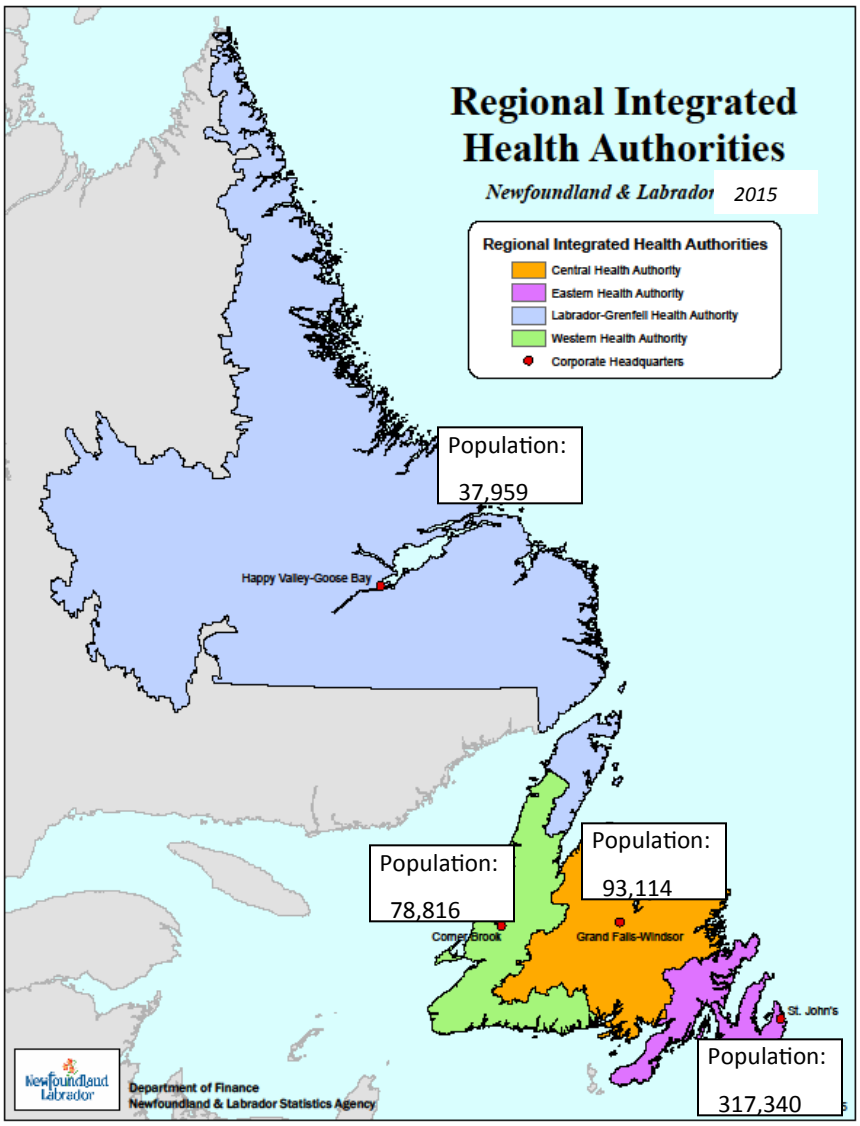
Reinfection: A case in which symptoms started more than four weeks from a previous *C. difficile* infection episode.

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 2015



Source: Population Projections (Medium Growth Scenario), Government of Newfoundland Labrador. Retrieved May 20, 2016, from http://www.economics.gov.nl.ca/POP-projections.asp

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