

INVESTIGATING *CLOSTRIDIUM DIFFICILE* INFECTION IN WESTERN AUSTRALIA USING LINKED DATA

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BACKGROUND

- Since January 2010, mandatory reporting of *Clostridium difficile* infection (CDI) has occurred in all public hospitals in Western Australia (WA), through the Healthcare Infection Surveillance WA (HISWA) program¹.
- Mandatory reporting data can be linked using a unique medical record number (UMRN) with many medical administrative datasets available for research purposes, including patient administration systems and laboratory data.

AIMS

- To describe incidence rates and molecular epidemiology of CDI in WA.
- To describe characteristics of CDI patients in WA, with a particular focus on patients experiencing recurrent CDI.

METHODS

- All CDI cases recorded from 1 July 2012 – 30 June 2014 in the HISWA database for three hospitals in the Perth North Metropolitan Health Service were included in the study.
- CDI case records and molecular typing data were linked with their corresponding hospital morbidity records on the Patient Administration System.
- Where available, isolates for each CDI episode were PCR ribotyped².
- Incidence rates were calculated, considering CDI episodes recorded ≥ 12 weeks apart for the same patient as new cases. Hospital-acquired (HA) and community-acquired (CA)-CDI were defined according to previous descriptions³.
- Recurrent CDI was defined as ≥ 2 CDI episodes recorded within a 1-12 week period. These were further defined as relapse when corresponding *C. difficile* isolates were of the same ribotype (RT), and reinfection where isolates were different RTs.

INCIDENCE RATES AND DEMOGRAPHIC CHARACTERISTICS

- The overall incidence rate of CDI was 4.82/10,000 patient days (PD).
- Incidence rates for HA-CDI were 3.24/10,000 PD and 1.33/10,000 PD for CA-CDI.
- 67.2% of cases were HA-CDI, 27.6% CA-CDI.
- The median age of cases was 66.3 years.
- 58.0% were female.
- 15.2% experienced recurrent CDI; 10.0% were relapse and 2.6% reinfection.

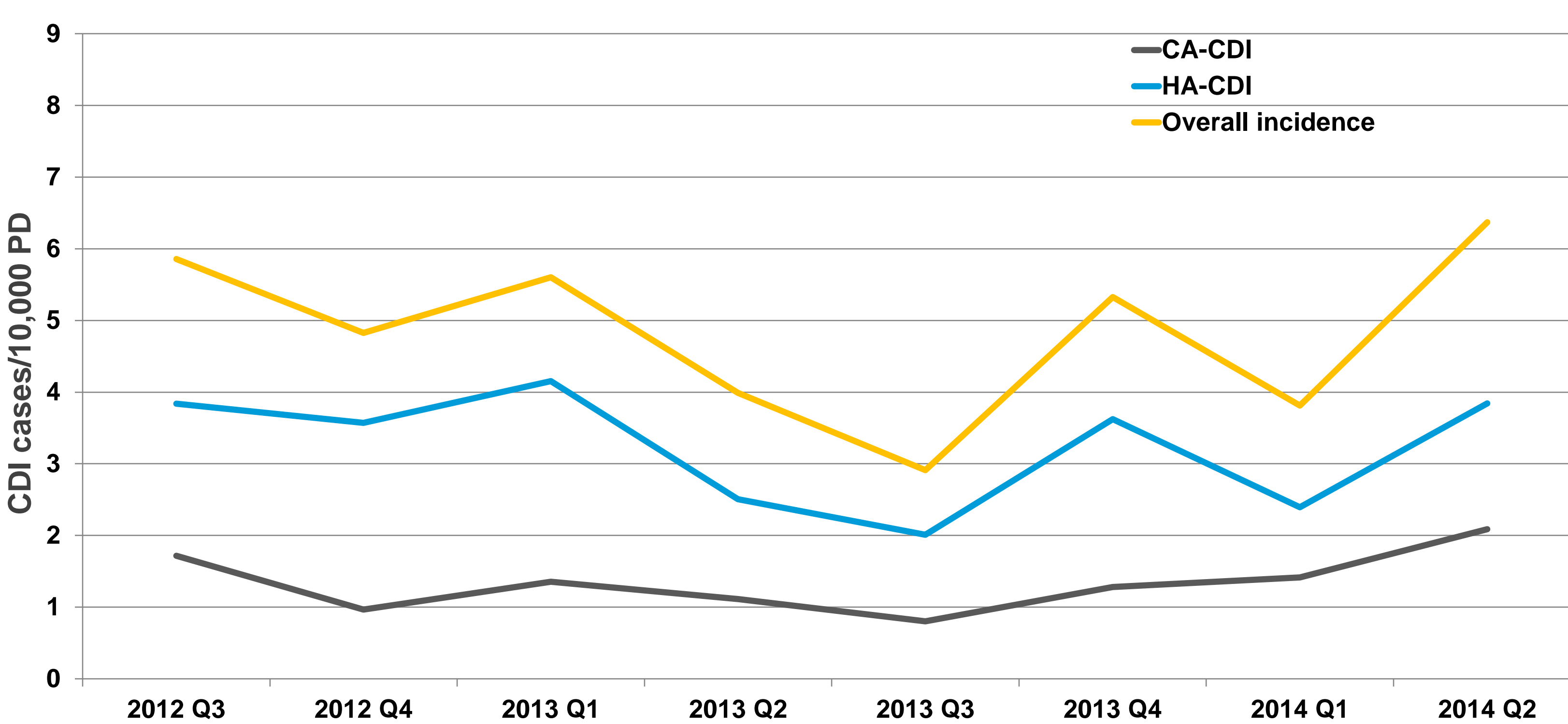


Figure 1. Incidence rates for all CDI, HA- and CA-CDI over time.

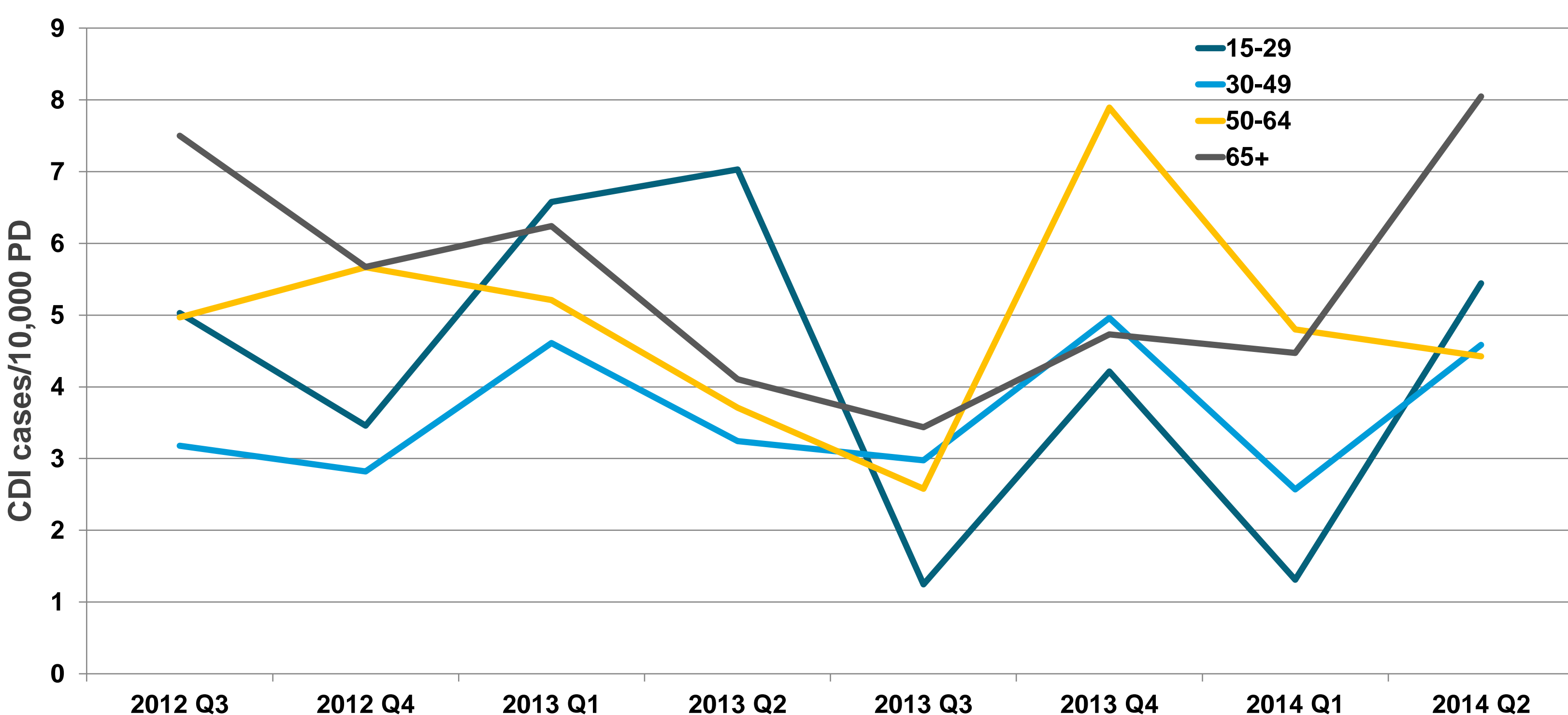
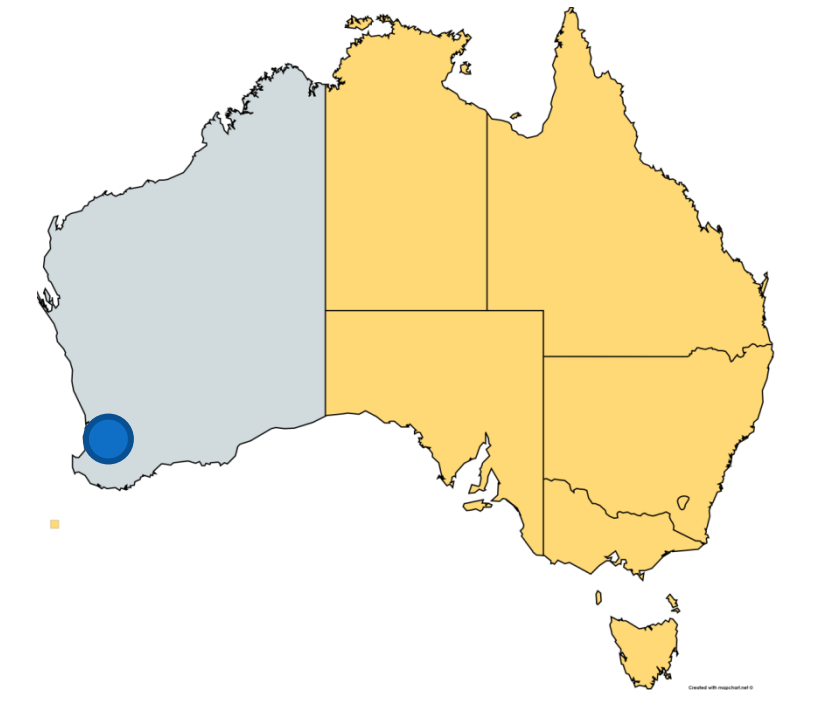


Figure 2. Incidence rates by age group.

STUDY SETTING

- The Perth North Metropolitan Health Service has a 3,000km² catchment, covering almost 1 million population – 40% of the State of Western Australia overall.
- The study sites included a 600-bed tertiary hospital, and two 200-bed community general hospitals.



RIBOTYPE DISTRIBUTION

Ribotype	n (%)				Ribotype	n (%)			
	CA-CDI	HA-CDI	Indeterminate	Total		CA-CDI	HA-CDI	Indeterminate	Total
RT 014/020	41 (45.5)	85 (36.2)	7 (50.0)	133 (39.2)	QX 170	1 (1.1)			1 (0.3)
RT 056	5 (5.5)	21 (8.9)		26 (7.7)	RT 280		1 (0.4)		1 (0.3)
RT 002	8 (8.8)	12 (5.1)		20 (6.9)	QX 200	1 (1.1)			1 (0.3)
RT 017	4 (4.4)	5 (2.1)	1 (7.1)	10 (2.9)	QX 214		1 (0.4)		1 (0.3)
RT 012	2 (2.2)	7 (3.0)		9 (2.7)	QX 305		1 (0.4)		1 (0.3)
RT 046	1 (1.1)	7 (3.0)		8 (2.4)	QX 417		1 (0.4)		1 (0.3)
RT 054	2 (2.2)	6 (2.6)		8 (2.4)	QX 079		1 (0.4)		1 (0.3)
RT 018	8 (3.4)	8 (3.4)		8 (2.4)	QX 421		1 (0.4)		1 (0.3)
RT 103	3 (3.3)	4 (1.7)	1 (7.1)	8 (2.4)	QX 142		1 (0.4)		1 (0.3)
RT 005	2 (2.2)	4 (1.7)		6 (1.8)	QX 430		1 (0.4)		1 (0.3)
RT 010	1 (1.1)	4 (1.7)		5 (1.5)	QX 234		1 (0.4)		1 (0.3)
QX 076	1 (1.1)	3 (1.3)	1 (7.1)	5 (1.5)	QX 433	1 (1.1)			1 (0.3)
QX 014		3 (1.3)	1 (7.1)	4 (1.2)	QX 032			1 (7.1)	1 (0.3)
RT 070	3 (3.3)	1 (0.4)		4 (1.2)	QX 113		1 (0.4)		1 (0.3)
RT 043	1 (1.1)	3 (1.3)		4 (1.2)	QX 069		1 (0.4)		1 (0.3)
RT 251	1 (1.1)	2 (0.9)	1 (7.1)	4 (1.2)	RT 075		1 (0.4)		1 (0.3)
RT 053		3 (1.3)		3 (0.9)	RT 049		1 (0.4)		1 (0.3)
RT 087		3 (1.3)		3 (0.9)	QX 221		1 (0.4)		1 (0.3)
RT 064		3 (1.3)		3 (0.9)	QX 150	1 (1.1)			1 (0.3)
RT 001/271	1 (1.1)	2 (0.9)		3 (0.9)	QX 180		1 (0.4)		1 (0.3)
QX 024	2 (2.2)		1 (7.1)	3 (0.9)	QX 328		1 (0.4)		1 (0.3)
RT 244	2 (2.2)	1 (0.4)		3 (0.9)	RT 003		1 (0.4)		1 (0.3)
RT 015/193		2 (0.9)		2 (0.6)	QX 210		1 (0.4)		1 (0.3)
QX 121	1 (1.1)	1 (0.4)		2 (0.6)	QX 015		1 (0.4)		1 (0.3)
QX 086	1 (1.1)	1 (0.4)		2 (0.6)	QX 175		1 (0.4)		1 (0.3)
QX 199		2 (0.9)		2 (0.6)	QX 138		1 (0.4)		1 (0.3)
QX 029		2 (0.9)		2 (0.6)	RT 106		1 (0.4)		1 (0.3)
QX 256		2 (0.9)		2 (0.6)	QX 141		1 (0.4)		1 (0.3)
QX 013		2 (0.9)		2 (0.6)	QX 011		1 (0.4)		1 (0.3)
QX 353	1 (1.1)	1 (0.4)		2 (0.6)	QX 435		1 (0.4)		1 (0.3)
QX 005		2 (0.9)		2 (0.6)	QX 488		1 (0.4)		1 (0.3)
RT 137	1 (1.1)	1 (0.4)		2 (0.6)	QX 399	1 (1.1)			1 (0.3)
QX 025		1 (0.4)		1 (0.3)	RT 369	1 (1.1)			1 (0.3)
RT 051		1 (0.4)		1 (0.3)	QX 408		1 (0.4)		1 (0.3)
QX 064		1 (0.4)		1 (0.3)	QX 414		1 (0.4)		1 (0.3)
RT 247		1 (0.4)		1 (0.3)	Total	90 (100)	235 (100)	14 (100)	339 (100)

RECURRENT CDI CASES

	n (%)			
	Reinfection (N=10)	Relapse (N=38)	Unknown (N=10)	Total (N=58)
Female	4 (40.0)	20 (52.6)	6 (60.0)	30 (51.7)
15-29	1 (10.0)		1 (10.0)	2 (3.4)
30-49	1 (10.0)	3 (7.9)	1 (10.0)	5 (8.6)
50-64		5 (13.2)	1 (10.0)	6 (10.3)
65+	2 (20.0)	12 (31.6)	3 (30.0)	17 (29.3)
Male	6 (60.0)	18 (47.4)	4 (40.0)	28 (48.3)
15-29		1 (2.6)		1 (1.7)
30-49	1 (10.0)	1 (2.6)		2 (3.4)
50-64	1 (10.0)	3 (7.9)	2 (20.0)	6 (10.3)
65+	4 (40.0)	13 (34.2)	2 (20.0)	19 (32.8)
CA-CDI	1 (10.0)	11 (28.9)	3 (30.0)	15 (25.9)
HA-CDI	8 (80.0)	24 (64.2)	6 (60.0)	38 (65.5)
Indeterminate	1 (10.0)	3 (7.9)	1 (10.0)	5 (8.6)
RT 014/020	2 (20.0)	13 (34.2)	7 (70.0)	22 (37.9)
RT 002		6 (15.8)		6 (10.3)
RT 056		5 (13.2)		5 (8.6)
RT 064	2 (20.0)			2 (3.4)
RT 017	1 (10.0)	1 (2.6)		2 (3.4)
RT 251		2 (5.3)		2 (3.4)
QX 076		1 (2.6)		1 (1.7)
RT 053		1 (2.6)		1 (1.7)
RT 043			1 (10.0)	1 (1.7)
QX 353		1 (2.6)		1 (1.7)
QX 150	1 (10.0)			1 (1.7)
QX 399		1 (2.6)		1 (1.7)
RT 018		1 (2.6)		1 (1.7)
QX 488			1 (10.0)	1 (1.7)
RT 046		1 (2.6)		1 (1.7)
RT 070		1 (2.6)		1 (1.7)
QX 079	1 (10.0)			1 (1.7)
RT 103			1 (10.0)	1 (1.7)
QX 256	1 (10.0)			1 (1.7)
QX 014	1 (10.0)			1 (1.7)
QX 025	1 (10.0)			1 (1.7)
QX 005		1 (2.6)		1 (1.7)
RT 003		1 (2.6)		1 (1.7)

KEY FINDINGS

- The incidence rate of CDI in WA remains relatively high (3.24/10,000 PD for HA-CDI in Europe)⁴.
- RTs 014/020, 056 and 002 remain predominant among an extremely diverse pool of strains. RTs 017, 046 and 018, often found in Asia^{5,6}, appear to be more common than previously in WA⁷.
- The majority of recurrent CDI cases in WA were due to relapse (but some may be reinfection with same RT).

1. Health Department of Western Australia, 2016. Healthcare Infection Surveillance Western Australia Annual Summary Report 2014-2015. 2. O'Neill G, et al. Anaerobe. 1996;2:205-9. 3. McDonald LC, et al. Infect Control Hosp Epidemiol. 2007;28:140-5. 4. European Centre for Disease Prevention and Control. 2019. Healthcare-associated infections: *Clostridium difficile* infections. ECDC Annual epidemiological report for 2016. 5. Collins DA, et al. Antimicrob Resist Infect Control. 2013;2:21. 6. Collins DA, et al. 27th European Congress of Clinical Microbiology and Infectious Diseases; 2017 April 22-25; Vienna, Austria. 7. Collins DA, et al. Pathology. 2017;49(3):309-13.