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**Surveillance:** *Clostridium difficile*

**Report:** **PCR Ribotype Surveillance**

**Time period:** **2013**

**Health Board:** **All Wales**

**Content:**  
**Pg 1** – Summary  
**Pg 2** – Introduction  
**Pg 3** – Methods

Results

**Pg 4** – 1 month snapshot surveillance  
**Pg 8** – Trends over time  
**Pg 10** – 3 month snapshot surveillance  
**Pg 13** – Other ribotyping results for 2013  
**Pg 15** – Acknowledgements

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## SUMMARY

- 101 *C. difficile* samples from healthcare organisations in Wales with sample dates in November 2013 were PCR ribotyped as part of the snapshot survey.
- A total of 32 PCR ribotypes were identified. PCR ribotype 027 was the most commonly isolated strain, accounting for 23% of the sample.
- PCR ribotype 027 was the most common ribotype in 4 healthcare organisations. The proportion of samples that were 027 varied from 38% in Aneurin Bevan UHB to 0% in Cwm Taf UHB, Hywel Dda UHB, Powys Teaching HB and Velindre NHST.
- The proportion of the 2013 sample that was PCR ribotype 027 was slightly lower than in 2012.
- Three healthcare organisations extended their snapshot surveillance from one to three months and their results for three months are presented separately.
- A total of 431 *C. difficile* samples from healthcare organisations in Wales were PCR ribotyped during 2013 as part of the Anaerobe Reference Unit outbreak/increased incidence response work.
- For Wales, the proportion of 027 (26%) in the data submitted outside of the snapshot survey was similar to the proportion in the 1 month snapshot, but there were bigger differences at a healthcare organisation level.
- Data from the *C. difficile* Ribotyping Network in England, shows that regularly less than 10% of the samples submitted to the network are ribotype 027, but there is some regional variation. The previously predominant strains in England have been replaced by a more heterogeneous pattern. (Public Health England *C. difficile* Ribotyping Network Report, 2011 – 2013. Available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/329156/C\\_difficile\\_ribotyping\\_network\\_CDRN\\_report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/329156/C_difficile_ribotyping_network_CDRN_report.pdf) )

## INTRODUCTION

Because of increasing concerns regarding the incidence and severity of cases of *Clostridium difficile* (*C. difficile*) across the UK, a *C. difficile* Task Group was set up in Wales by the Welsh Healthcare Associated Infection Sub-Group (WHAISG) of the Welsh Assembly Government. The task group made recommendations regarding changes to the surveillance of *C. difficile* in Wales, which were agreed by the WHAISG in May 2008. One of the changes was to develop a regular survey of the *C. difficile* PCR ribotypes that are causing disease in Wales, coupled with enhanced surveillance of the severity and outcome of disease. This would allow some understanding to be gained on the contribution different PCR ribotypes of *C. difficile* are currently making to the epidemiology of *C. difficile* in Wales.

A pilot snapshot PCR ribotyping survey took place in 2005 and there have been subsequent surveys in 2008, in the winter of 2009/2010, in 2011 and 2012. This report presents the ribotyping results of the snapshot surveillance that took place in autumn 2013. Additionally, the results of the PCR ribotyping conducted during 2013 by the Anaerobe Reference Unit (ARU) in response to requests by healthcare organisations in Wales are presented.

## **METHODS**

Healthcare organisations in Wales were requested to culture all non-duplicate stool samples that were GDH and *C. difficile* toxin positive in November 2013 and submit the pure isolates to the ARU in Cardiff. Healthcare organisations were given the option to extend the surveillance period to include samples from October and December 2013, but only three organisations chose to do this. The general results presented are therefore for the samples from November only. Separate additional analyses have been carried out for the organisations which submitted for 3 months and for the isolates submitted to ARU during 2013 outside of this survey.

## RESULTS

### 1. 1-month Snapshot Surveillance

All healthcare organisations submitted samples to the survey but one laboratory in one of the health boards did not participate. 211 *C. difficile* samples were submitted to the ARU for the three month period. One hundred and six samples were from October and December, so have not been included in this part of the analysis. Three samples were not processed because *C. difficile* was not identified or they were identified as duplicates. PCR ribotyping results were therefore available for 101 samples from November. A breakdown by healthcare organisation is provided in Table 1.1.

**Table 1.1 Number of *C. difficile* samples PCR ribotyped by healthcare organisation for the PCR ribotyping survey in Wales, Nov 2013**

Healthcare Organisation	Number of Samples
ABM UHB	21
Aneurin Bevan UHB	20
Betsi Cadwaladr UHB	34
C&V UHB	13
Cwm Taf UHB	7
Hywel Dda UHB	4
Powys Teaching HB	1
Velindre NHS Trust	1

The specimen source was provided for all samples. 68% (69/101) of samples originated from patients in major acute hospitals, 16% (16/101) from other hospitals and 16% (16/101) were from patients in the community. These proportions are similar to those for the 2012 snapshot survey (major acute hospital – 66%, other hospital – 15%, community – 18%).

The proportion of each varied by Health Board (Table 1.2). The location of the patient when the sample was submitted does not necessarily reflect the location of acquisition of the *C. difficile*.

The age of the patients in the survey ranged from 32 to 107 years, with a mean age of 75 and a median of 76 years.

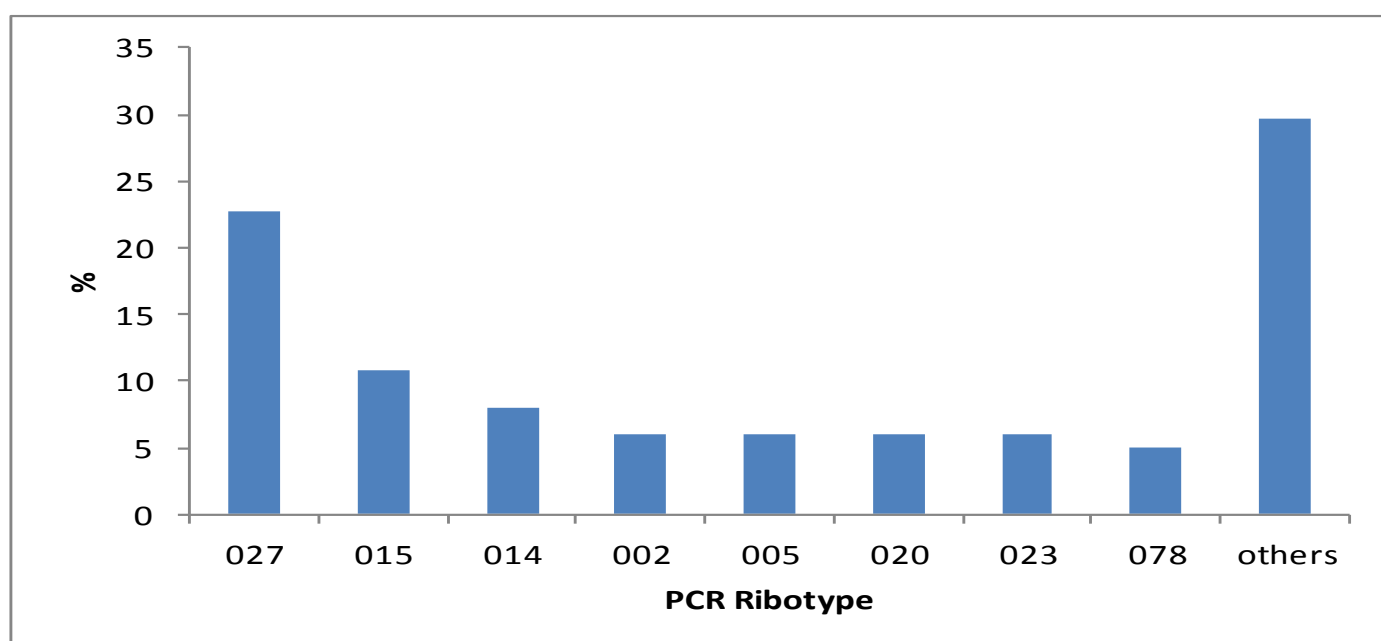
**Table 1.2 Proportion\* of Health Board *C. difficile* samples by source location for the PCR ribotyping survey in Wales, Nov 2013**

Healthcare Organisation	% Major Acute Hospital	% Other Hospital	% Community
ABM UHB (N=20)	90	0	10
Aneurin Bevan UHB (N=21)	52	19	29
Betsi Cadwaladr UHB (N=34)	65	12	24
C&V UHB (N=13)	62	38	0
Cwm Taf UHB (N=7)	71	29	0
Hywel Dda UHB (N=4)	100		
Powys Teaching HB (N=1)		100	
Velindre NHS Trust (N=1)	100		

\*Please note because of rounding totals may not add up to 100%.

A total of 32 PCR ribotypes were identified. PCR ribotype 027 was the most commonly isolated strain, accounting for 23% (23/101) of the sample (Figure 1.1).

**Figure 1.1 Percentage distribution of PCR ribotypes of *C. difficile* in the PCR ribotyping survey in Wales, Nov 2013**



NB "Others" encompasses 24 PCR ribotypes with <5 samples each (N=30).

PCR ribotype 027 was the most common ribotype in the samples from major acute hospitals, other hospitals and community locations (Table 1.3). The proportion of 027 in specimens from major acute hospitals in 2013 was lower than in previous surveys (2010 – 51%, 2011 – 45%, 2012 – 23%, 2013 – 17% ), whereas the proportion in other hospitals was slightly higher in 2013 compared to 2012 (2010 – 63%, 2011 – 59%, 2012 – 29%, 2013 – 31%) and substantially higher in community locations (2010 - 25%, 2011 – 52%, 2012 – 20%, 2013 – 38%) compared to 2012.

**Table 1.3 Percentage\* distribution of the common *C. difficile* PCR ribotypes by location of patient in the PCR ribotyping survey in Wales, Nov 2013**

PCR Ribotype	Major Acute Hospital (n=69)	Other Hospital (n=16)	Community (n=16)
<b>027</b>	<b>17%</b>	<b>31%</b>	<b>38%</b>
<b>015</b>	13%	0	13%
<b>014</b>	12%	0	0
<b>002</b>	6%	6%	6%
<b>005</b>	7%	0	6%
<b>020</b>	3%	19%	6%
<b>023</b>	7%	0	6%
<b>078</b>	4%	6%	6%
<b>others</b>	30%	38%	19%

\*Please note because of rounding totals may not add up to 100%.

In the 85 samples submitted from hospital locations, 86% (73/85) were from inpatient wards, 12% (10/85) from A&E or Admission wards and 2% (2/85) from day case/outpatient wards. 11% (8/73) of the inpatient samples were from augmented care wards (critical care/haematology/oncology/renal). A comparison of the proportions of the most frequent ribotypes in inpatient versus other ward types is provided in Table 1.4.

**Table 1.4 Percentage\* distribution of the common *C. difficile* PCR ribotypes by ward type in the PCR ribotyping survey in Wales, Nov 2013**

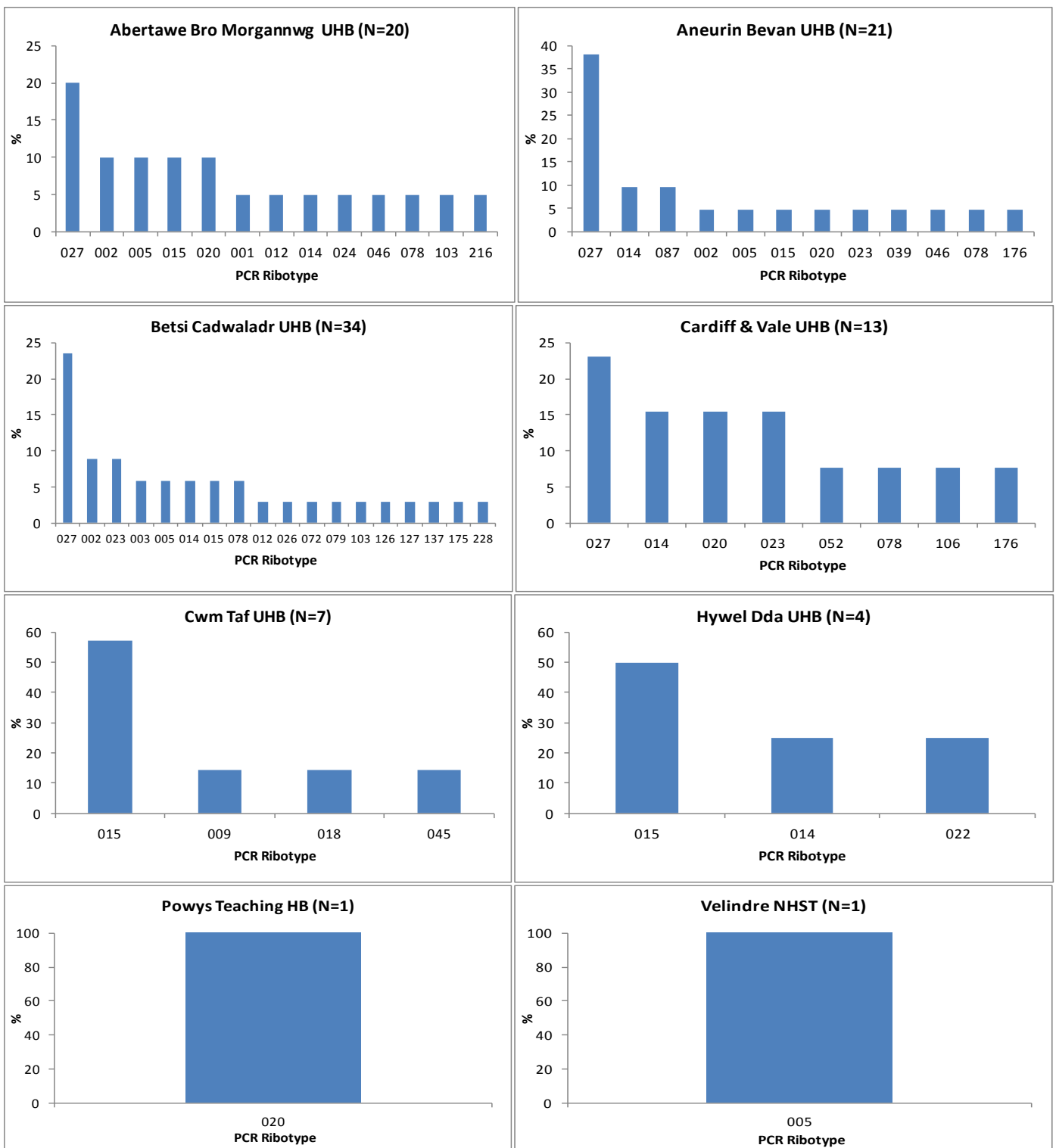
PCR Ribotype	Inpatient wards (n=73)	A&E/Admissions/Day/Outpatient Units (n=12)
<b>027</b>	<b>22%</b>	<b>8%</b>
<b>015</b>	10%	17%
<b>014</b>	7%	25%
<b>002</b>	7%	0
<b>005</b>	7%	0
<b>020</b>	7%	0
<b>023</b>	5%	8%
<b>078</b>	5%	0
<b>others</b>	30%	42%

\*Please note because of rounding totals may not add up to 100%.

In the 16 samples submitted from community locations, 10 had been discharged from hospital within the previous three months (6 within the previous month), so may have been healthcare associated. The PCR ribotypes of the 6 samples from patients who had previously been in hospital more than 3 months before the specimen or had no hospital admissions in the 12 months preceding the included 3 samples of PCR 027 and 1 each of 002, 005 and 015.

The distributions of ribotypes were not uniform across healthcare organisations (Figure 1.2). PCR ribotype 027 was not reported from Cwm Taf UHB, Hywel Dda UHB, Powys Teaching HB or Velindre UHB. It was the most common PCR ribotype in the four other health boards during November. The proportion of the sample that was 027 varied, with the highest proportion in Aneurin Bevan UHB at 38%.

**Figure 1.2 Percentage distribution of PCR ribotypes of *C. difficile* by Healthcare Organisation in the PCR ribotyping survey in Wales, Nov 2013**





## 1.2 Trends over Time

The proportion of PCR 027 in the 2013 sample was slightly lower than the proportion in 2012 (Figure 1.3).

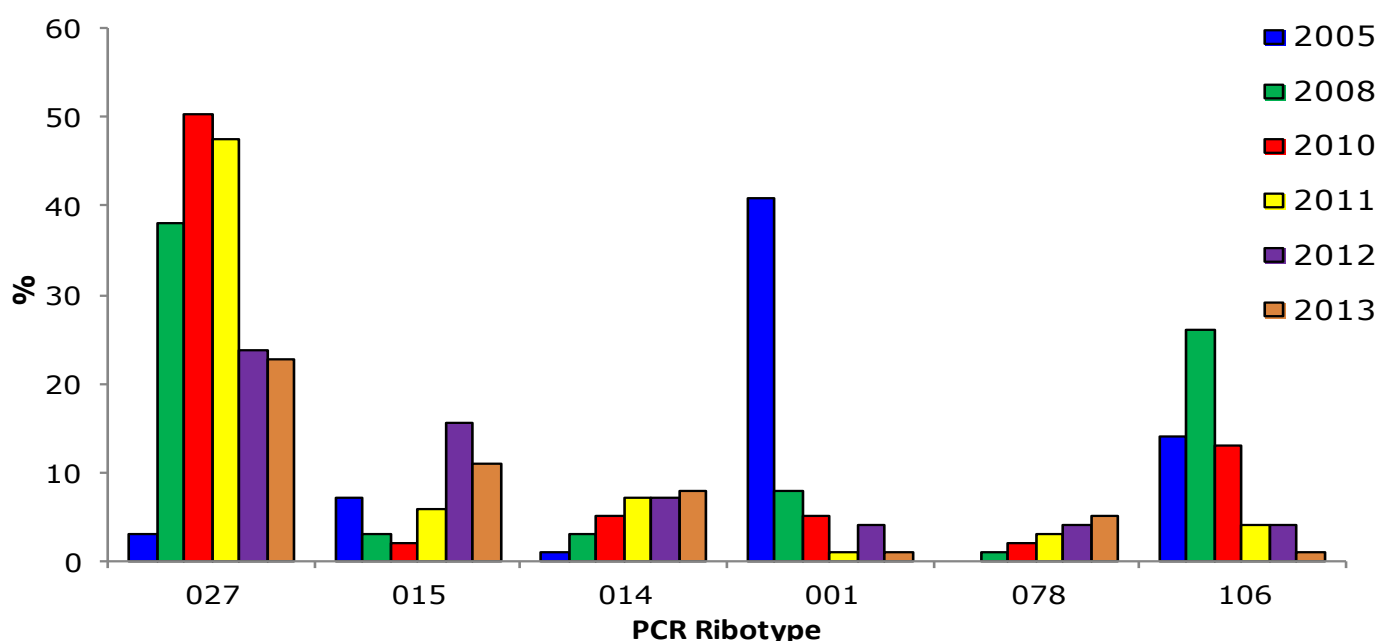
PCR ribotype 015 was the second most common ribotype overall, constituting 11% of the sample. It was reported from 5 health boards and was the most common ribotype in Cwm Taf UHB (4/7) and Hywel Dda UHB (2/4). The proportion of the sample attributable to ribotype 015 is lower than in 2012, but is still higher than in the earlier surveys (Figure 1.3).

PCR ribotype 014 was the third most common ribotype overall, constituting 8% of the sample, a similar proportion to 2012. It was reported from 5 health boards (Figure 1.3).

The proportions of the previously common PCR ribotypes of 001 and 106 are lower again compared to 2012 (Figure 1.3).

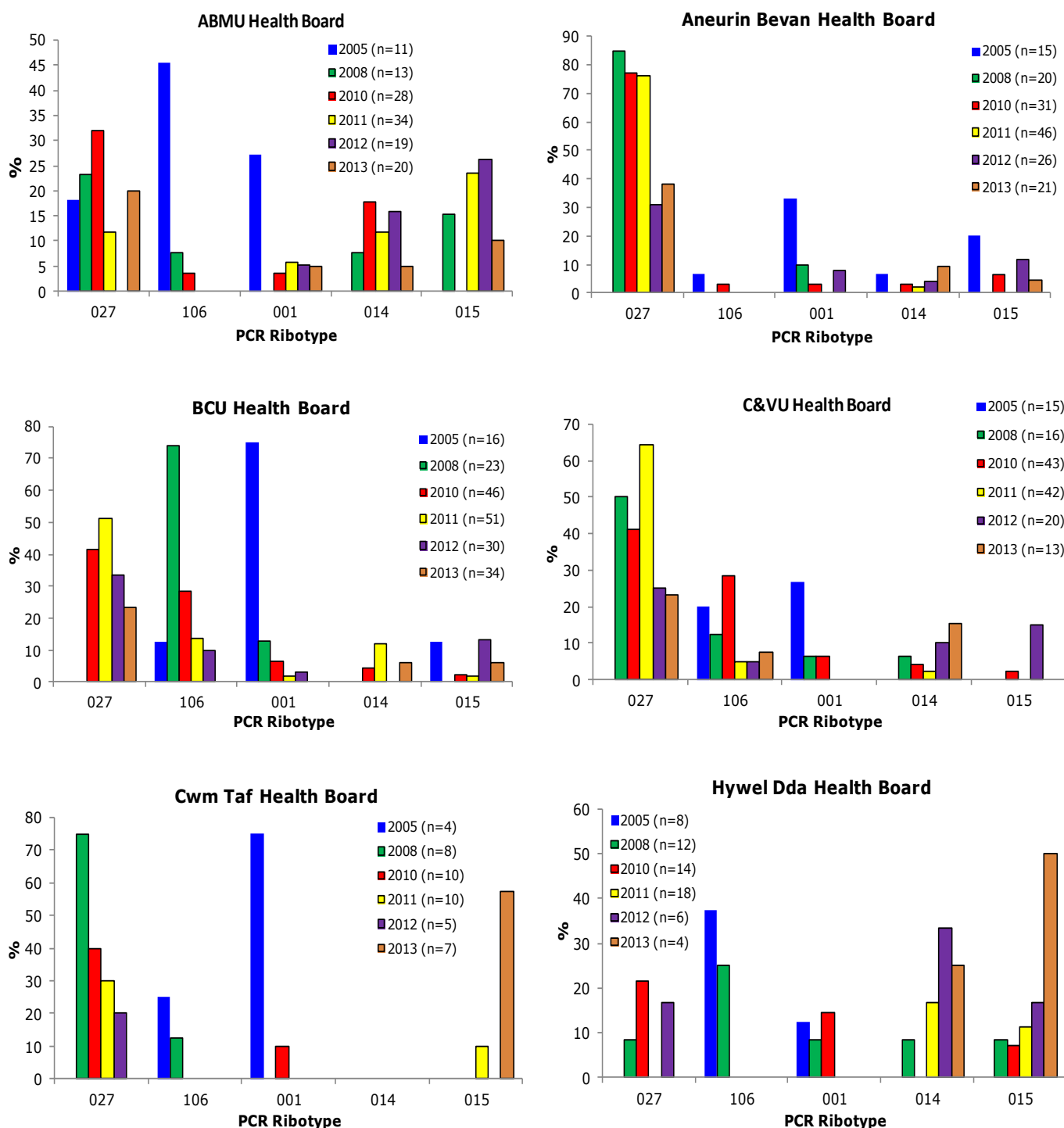
PCR ribotype 078 has increasingly been reported from other parts of the UK. The proportion of 078 has been higher in each successive survey; this trend continued in 2013. It was reported in four of the health boards in 2013.

**Figure 1.3 Changes in the percentage distribution of *C. difficile* PCR ribotypes 027, 015, 014, 001, 078 and 106 in the PCR ribotyping surveys in Wales, 2005, 2008, 2010, 2011, 2012 and 2013**



Changes in distribution of PCR ribotypes have not been uniform across Wales. The changes in the frequencies of PCR ribotypes 027, 015, 014, 106 and 001 by current Health Board areas are provided in Figure 1.4. The proportion of PCR ribotype 027 in Abertawe Bro Morgannwg UHB and Aneurin Bevan UHB was higher in 2013 than in 2012.

**Figure 1.4 Changes in the % distribution of *C. difficile* PCR ribotypes 027, 015, 014, 106 and 001 by current Health Board areas in the PCR ribotyping surveys in Wales, 2005 - 2013**



## 2. 3-Month Snapshot Surveillance

Aneurin Bevan UHB, Cardiff & Vale UHB and Velindre NHST submitted all non-duplicate *C. difficile* samples over the three month period Oct to Dec 2013, rather than just during November. The number of samples that were ribotyped is presented in Table 2.1.

**Table 2.1 Number of *C. difficile* samples PCR ribotyped by healthcare organisation for the PCR ribotyping survey in Wales, Oct to Dec 2013**

Healthcare Organisation	Number of Samples
Aneurin Bevan UHB	81
C&V UHB	56
Velindre NHS Trust	3

The number of samples ribotyped by the location type is presented in Table 2.2. Comparing the two health boards, a much higher proportion of samples from Aneurin Bevan UHB were from community locations compared to Cardiff & Vale UHB.

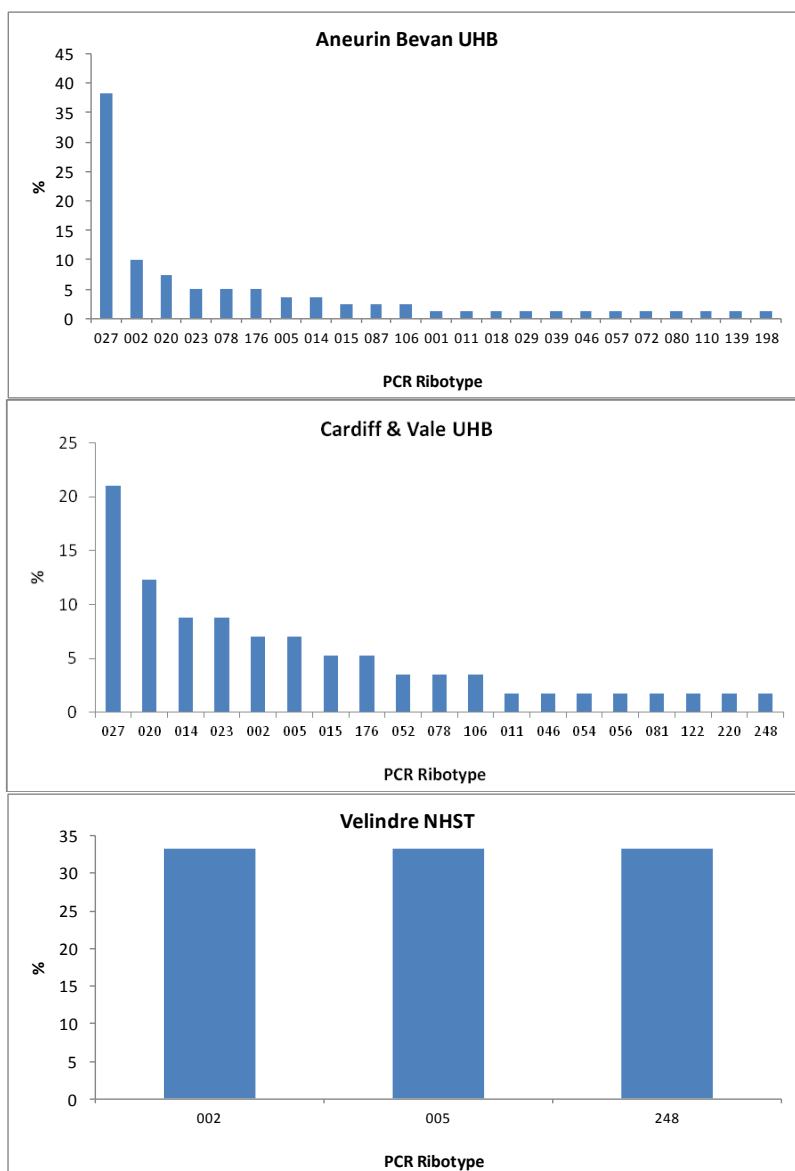
**Table 2.2 Proportion\* of Health Board *C. difficile* samples by source location for the PCR ribotyping survey in Wales, Oct to Dec 2013**

Healthcare Organisation	% Major Acute Hospital	% Other Hospital	% Community
Aneurin Bevan UHB (N=81)	54	22	23
C&V UHB (N=56)	84	14	2
Velindre NHS Trust (N=3)	100	0	0

\*Please note because of rounding totals may not add up to 100%.

The ribotyping results for the 3 month period are presented in Figure 2.1. The proportion of PCR ribotype 027 was very similar for the 1 month and 3 month periods in both Aneurin Bevan UHB and Cardiff & Vale UHB. There was more variability between the two surveillance periods in the ribotypes with fewer samples.

**Figure 2.1 Percentage distribution of PCR ribotypes of *C. difficile* in the PCR ribotyping survey in Wales, Oct to Dec 2013**



The proportions of the 5 most common ribotypes by patient location in Aneurin Bevan UHB and Cardiff and Vale are presented in Table 2.3. In Aneurin Bevan UHB, the proportion of 027 in samples from major acute hospitals was 32%. This was the same as the proportion of 027 in samples from community locations, whereas the proportion in samples from other hospital types was much higher at 61%. In Cardiff and Vale UHB, the proportion of 027 was 26% in the major acute hospitals, but was not identified in the other types of hospital; only one sample was submitted from a community location and that was ribotype 002.

**Table 2.3 Comparisons of the proportions of the most common PCR ribotypes in Aneurin Bevan UHB and Cardiff & Vale UHB by location type, Oct to Dec 2013**

Healthcare Organisation	PCR Ribotype	% Major Acute Hospital	% Other Hospital	% Community
Aneurin Bevan UHB	027	32	61	32
	002	9	0	21
	020	9	0	11
	023	2	17	0
	078	5	0	11
	176	5	11	0
C&V UHB	027	26	0	
	020	11	25	
	014	9	13	
	023	11	0	
	002	4	13	100
	005	6	13	

\*Please note because of rounding totals may not add up to 100%.

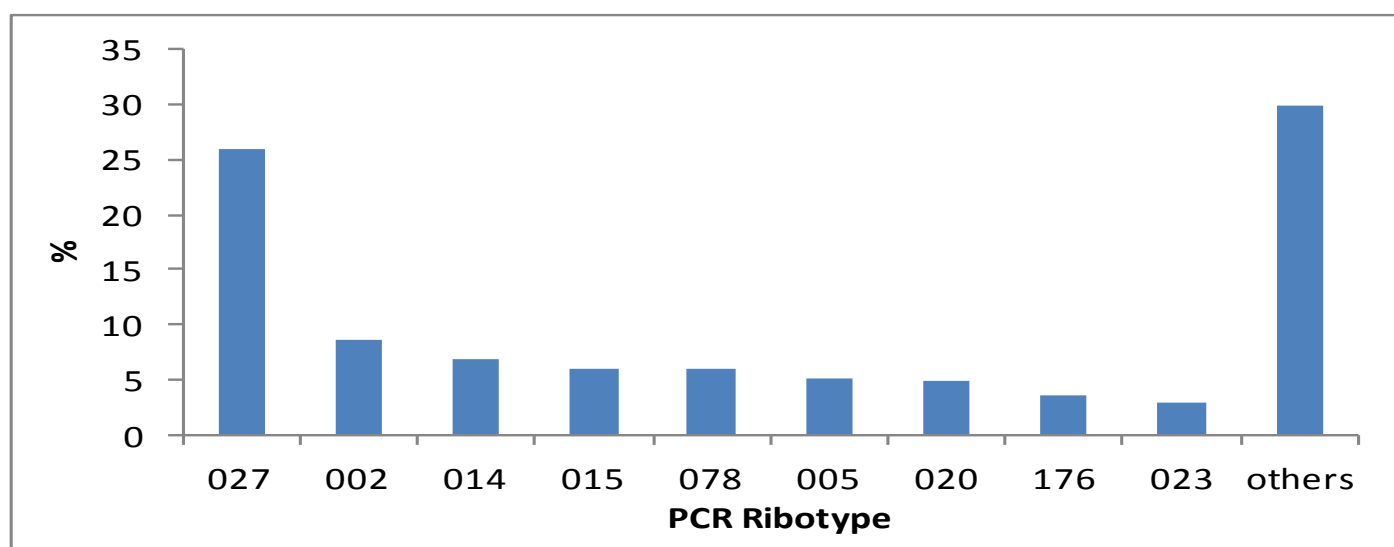
### **3. ARU PCR Ribotyping Results 2013**

A total of 496 *C. difficile* samples were submitted to the ARU for PCR ribotyping in 2013, excluding the snapshot survey samples. 65 of the samples were part of a study and 38 were part of a look-back exercise. The results of both the study samples and the look-back exercise have been included in these results.

There were no ribotyping results for 65 of the 496 samples submitted, either because *C. difficile* was not isolated or the samples were not processed because they were duplicates. This gave 431 samples available for analysis.

A total of 58 PCR ribotypes were identified in the 431 samples. The most common PCR ribotype identified was 027, accounting for 26% (112/431) of the samples. Much lower numbers of all other PCR ribotypes were identified; each accounting for less than 10% of the sample. Figure 3.1 presents the PCR ribotypes identified in more than 10 samples. The most common ribotypes were similar to the 1-month snapshot, although the order was different.

**Figure 3.1 Percentage distribution of PCR ribotypes of *C. difficile* in the routine samples submitted for PCR ribotyping in Wales, 2013**

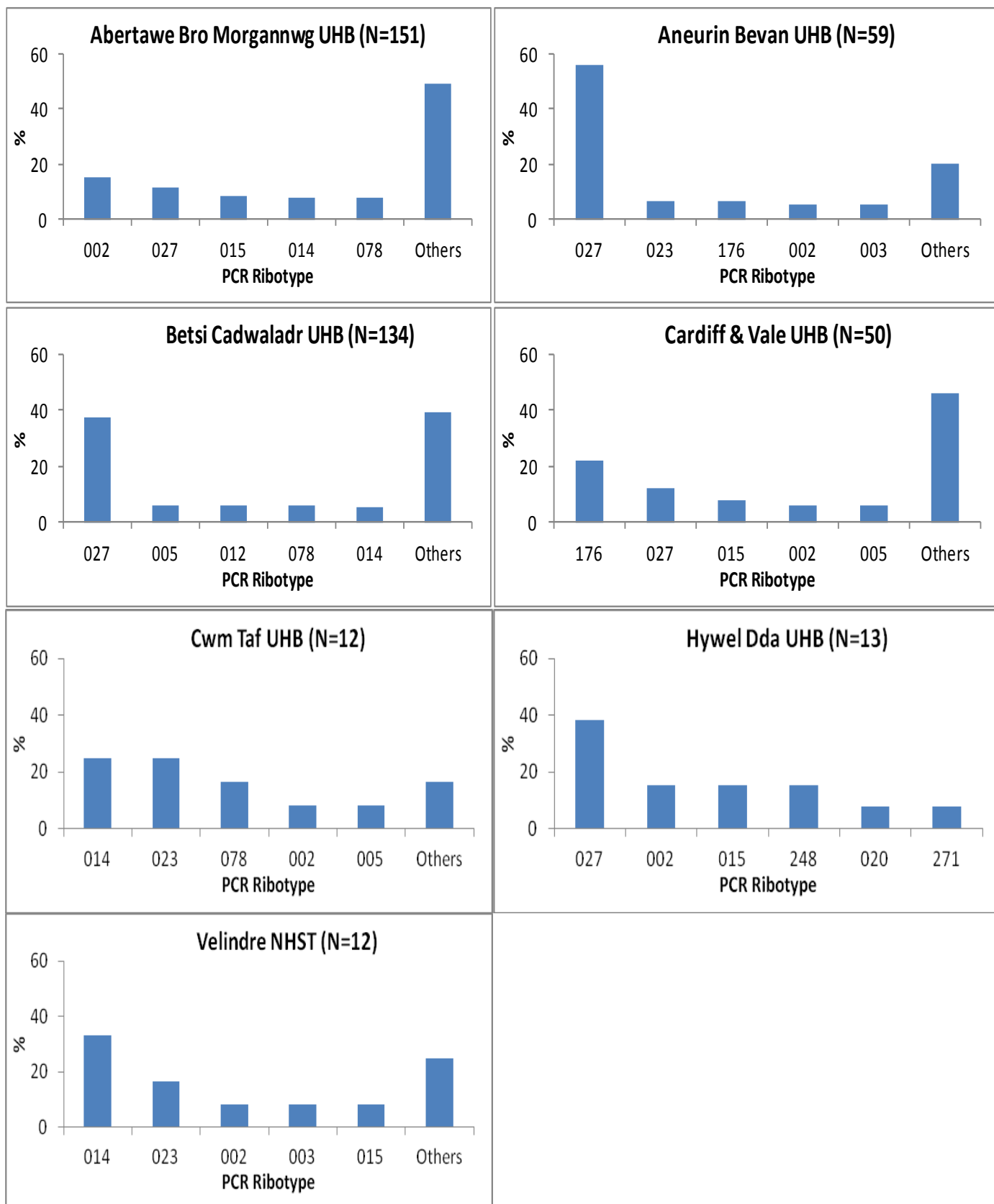


NB Others includes 49 ribotypes with between 1 and 9 samples each.

Samples were submitted from seven of the eight healthcare organisations in Wales. The five most common PCR ribotypes in each healthcare organisation are provided in Figure 3.2. PCR ribotype 027 was the most common ribotype in three healthcare organisations; the proportion of 027 ranged from 0 to 56% of the samples in each healthcare organisation. PCR ribotype 014 was the most common in two healthcare organisations, 002 and 176 were the most common in one organisation each.

The overall proportion of ribotype 027 was similar in the regular data (26%) to the one month snapshot (23%), however within some of the healthcare organisation there was a more substantial difference. For some organisations the proportion of 027 was substantially higher in the regular data (Aneurin Bevan, Betsi Cadwaladr, Hywel Dda), whereas in others it was substantially lower (Abertawe Bro Morgannwg, Cardiff & Vale).

**Figure 3.2 Percentage distribution of the five most common PCR ribotypes of *C. difficile* for each Healthcare Organisation in the samples submitted to ARU during 2013**



NB 'Others' encompassed the following: ABMUHB – 74 samples, 29 ribotypes; ABUHB – 12 samples, 10 ribotypes; BCUHB – 53 samples, 27 ribotypes; CVUHB – 23 samples, 17 ribotypes; CTUHB – 2 samples, 2 ribotypes; VNHST – 3 samples, 3 ribotypes.

## **ACKNOWLEDGEMENTS**

We would like to acknowledge the staff of the ARU, SACU, WHAIP, the microbiology laboratories and infection prevention and control teams in the health boards/trust in Wales, for their contributions to this report.