



12th March 2015

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Meticillin-resistant Staphylococcus aureus (MRSA) bacteraemia

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Meticillin-sensitive Staphylococcus aureus (MSSA) bacteraemia

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Quarterly analyses of *Clostridium difficile* infection from mandatory surveillance in England: up to October-December 2014.

Data sources, definitions, and links

Sources of data and definitions used for these analyses.

Note: All references to quarterly data are based on calendar year definitions, and NOT financial year definitions (e.g. Q1 2009 refers to January-March 2009 and NOT to April-June 2009).

Citation

Public Health England. Quarterly Analyses: Mandatory MRSA, MSSA and *E. coli* Bacteraemia and CDI in England (up to October-December 2014). London: Public Health England, March 2015.

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Section 1: Epidemiological analyses of *Staphylococcus aureus* bacteraemia data

MRSA Bacteraemia

- Since April 2013 all NHS organisations reporting positive cases of MRSA bacteraemia have been required to complete a Post Infection Review (PIR)¹. Subsequent to this, all MRSA bacteraemia cases are published by PIR assignment rather than by apportionment. In April 2014, NHS England introduced a new category for the PIR assignment of MRSA bacteraemia cases, acknowledging the increasingly complex nature of the MRSA bacteraemias being reported. Assignment to a "third party" through the arbitration process can now be made for cases with a specimen date post 1st April 2014.
- In the current quarter (October-December 2014), the total number of MRSA bacteraemia reports has decreased by 2.3 % compared to the same quarter in the previous year, decreasing from 218 to 213 (Table 1a), reflecting the decline in MRSA reports over the last 8 years. However, there has been a 17.0% increase in the number of all MRSA bacteraemia reports since the previous quarter of the same year (July-September 2014) from 182 to 213, which amounts to the greatest quarter-on-quarter increase observed during the last 14 quarters.
- Since October-December 2013 there has been a 27.1% decrease in the total number of Trust assigned MRSA bacteraemias (from 107 to 78 reports) (Table 1b); however, there has been an 18.9% increase in the number of CCG assigned MRSA bacteraemias (from 111 to 132). While there has been the additional PIR category of third-party assignment introduced during this time period, only 3 (1.4%) MRSA bacteraemias have been assigned to a third party in the last quarter (October-December 2014) (Table 1b).
- There is a corresponding decrease in Trust assigned rates this quarter (October-December 2014) compared to the same quarter in the previous year, from 1.25 to 0.91 per 100,000 bed days. Similar to the CCG assigned counts, the rate has increased from 0.82 to 0.97 per 100,000 population over the same time period. However, the all reports rate has decreased overall by 2.3% from 1.61 to 1.57 per 100,000 population (Table 1b).

¹ Please refer to <https://www.gov.uk/government/collections/staphylococcus-aureus-guidance-data-and-analysis> for more information.

Table 1a: MRSA bacteraemia counts and rates by quarter, July 2011 - December 2014

Year and quarter		Trust apportioned reports	Trust apportioned rates (per 100,000 bed-days)	All reports	All reports rates (per 100,000 population)
2011	Q3	103	1.21	266	1.99
	Q4	105	1.21	269	2.01
2012	Q1	117	1.32	262	1.97
	Q2	94	1.10	224	1.68
	Q3	96	1.13	229	1.70
	Q4	92	1.07	219	1.63
2013	Q1	116	1.32	252	1.90
	Q2	96	1.12	237	1.76
	Q3	82	0.97	201	1.48
	Q4	98	1.14	218	1.61
2014	Q1	88	1.01	206	1.55
	Q2	67	0.78	181	1.35
	Q3	62	0.73	182	1.34
	Q4	75	0.87	213	1.57

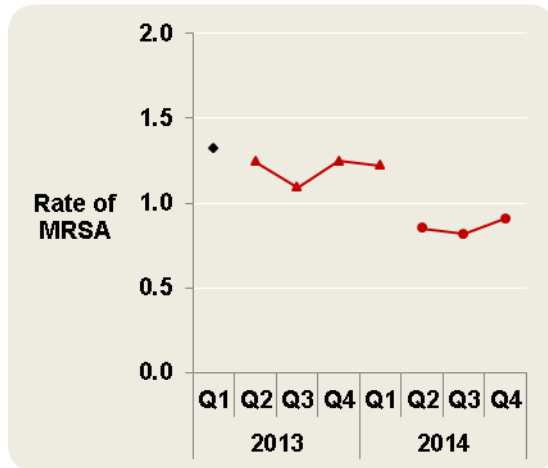
Table 1b: MRSA bacteraemia counts and rates by PIR assignment*, April 2013-December 2014

Year and quarter		Trust assigned reports	Trust assigned rates (per 100,000 bed-days)	CCG assigned reports	CCG assigned rates (per 100,000 population)	Third Party reports	Third Party assigned rates (per 100,000 population)
2013	Q2	107	1.24	130	0.97	N/A	N/A
	Q3	92	1.09	109	0.80	N/A	N/A
	Q4	107	1.25	111	0.82	N/A	N/A
2014	Q1	106	1.22	100	0.75	N/A	N/A
	Q2	73	0.85	91	0.68	17	0.13
	Q3	70	0.82	86	0.63	26	0.19
	Q4	78	0.91	132	0.97	3	0.02

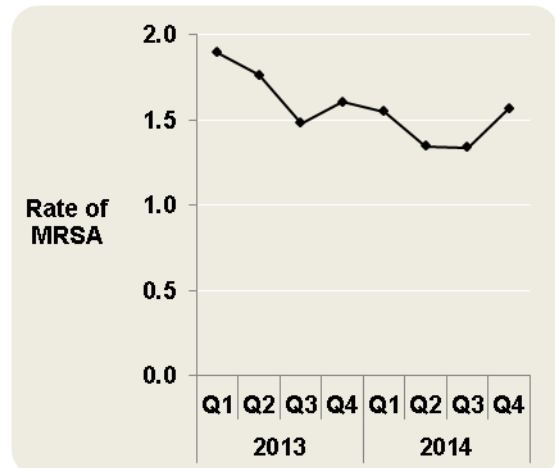
**Note: Not all PIRs were finalised (49.3%, n=105 from Q4 2014) at time of data extraction, for these cases the provisional assignments have been used.*

Figure 1: Quarterly rates of MRSA bacteraemia, January 2013 – December 2014

a) Trust apportioned/assigned* rate
(per 100,000 bed-days)



b) All reports (per 100,000 population)



***Note:** From April-June 2013, MRSA cases have been reported by assignment rather than apportionment. This is reflected in Figure 1a where Trust assigned rates (per 100,000 bed days) are presented as red triangles from April-June 2013 to July-September 2014, while Trust apportioned rates are presented as black diamonds (January-March 2013). From April-June 2014, PIR assignment of MRSA cases have had an additional option for assignment (third party cases). Trust assigned rates (per 100,000 bed days) from April 2014 are presented as red circles. Please refer to Table 1b for Trust assigned, CCG assigned and Third Party assigned cases and rates.

MSSA Bacteraemia

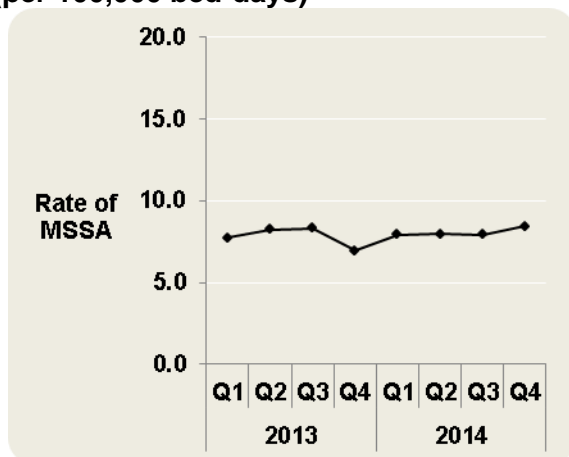
- In addition to slight quarterly fluctuations, there has been a general increasing trend in the total number of MSSA bacteraemias since the initiation of the mandatory surveillance of MSSA in January 2011; with the highest number of MSSA bacteraemias recorded in October-December 2014 (2,571), which represents a 16.2% increase from the number of MSSA bacteraemias in the same quarter last year (October-December 2013, n=2,213) (Table 2).
- Conversely, between January-March 2011 and July-September 2014 there has been a slight decrease in the number of Trust apportioned cases of MSSA bacteraemia; however, there has been a 7.1% increase in the number of Trust apportioned MSSA bacteraemias in the current quarter (October-December 2014) compared to the previous quarter (Table 2) and represents the largest number of Trust apportioned cases since January-March 2012 (723 vs. 728, respectively). When compared to the same quarter last year (October-December 2013), there has been a 21.3% increase (from 596 to 723). However, in October-December 2013, the lowest number of Trust apportioned MSSA bacteraemias since the initiation of the MSSA bacteraemia mandatory surveillance scheme were reported, which appears to have been an

unsustained dip in Trust apportioned MSSA bacteraemias and therefore, this quarter may not be an appropriate comparator.

- Of note, the percentage of the total number of MSSA bacteraemias that are Trust apportioned has decreased slightly over time from 32.4% in October-December 2011 to 28.1% in the current quarter, implying that the increase in all reported bacteraemias is not due to the increase in Trust apportioned MSSA bacteraemias reported for October-December 2014 alone.
- Like the total number of MSSA bacteraemias, the all reports rate was highest in the current quarter than previously recorded (18.94 per 100,000 population). The lowest all reports rate was observed in July-September 2012 (15.85 per 100,000 population). Overall, there has been a 17.0% increase in the all reports rate between October-December 2011 and October-December 2014; however, over the same time period there has been only a 3.8% increase in the rate of Trust apportioned reports (from 8.12 to 8.43 per 100,000 bed days).
- The current quarter has the highest Trust apportioned rate (8.43 per 100,000 bed days) since July-September 2011 and is the second highest since the mandatory surveillance scheme for MSSA bacteraemias was initiated. This is particularly striking when compared to the Trust apportioned rate for the same quarter, October-December, in the previous year: 6.95 per 100,000 bed days, which remains the time period with the lowest rate observed.

Figure 2: Quarterly rates of MSSA bacteraemia, January 2013 - December 2014

a) Trust apportioned rate (per 100,000 bed-days)



b) All reports (per 100,000 population)

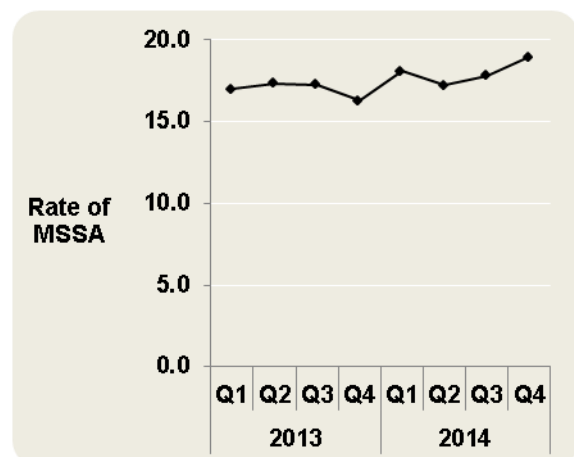


Table 2: MSSA bacteraemia counts and rates by quarter, July 2011- December 2014

Year and quarter		Trust apportioned reports	Trust apportioned rates (per 100,000 bed-days)	All reports	All reports rates (per 100,000 population)
2011	Q3	725	8.54	2,226	16.63
	Q4	703	8.12	2,167	16.19
2012	Q1	728	8.20	2,183	16.41
	Q2	711	8.29	2,238	16.83
	Q3	648	7.64	2,131	15.85
2013	Q4	663	7.70	2,186	16.26
	Q1	678	7.73	2,257	16.99
	Q2	711	8.26	2,329	17.34
2014	Q3	700	8.30	2,344	17.26
	Q4	596	6.95	2,213	16.30
	Q1	689	7.93	2,404	18.10
	Q2	681	7.95	2,315	17.24
	Q3	675	7.91	2,417	17.80
	Q4	723	8.43	2,571	18.94

Section 2: Epidemiological analyses of *Escherichia coli* bacteraemia data

- The total number of reported *E. coli* bacteraemias has increased steadily since July 2011, with seasonal peaks between July-September each year (Table 3), the same trend has been observed in the rate of *E. coli* bacteraemias (Figure 3).
- The lowest rate of *E. coli* since the mandatory surveillance scheme commenced was observed in the first quarter of 2013 (57.24 per 100,000 population) while the highest rate was in July-September 2014, with a rate of 69.79 per 100,000 population (Table 3).
- The data for the most recent quarter (October-December 2014) shows a continuation of this trend, with both the highest count (8,820) and rate (64.96 per 100,000 population) of *E. coli* bacteraemias for this time period (calendar quarter 4) since the start of the *E. coli* bacteraemia mandatory surveillance scheme in June 2011; a 2.3% increase has been observed since October-December 2013 (63.51 per 100,000 population), with an overall increase of 7.4% since October-December 2011 (60.50 per 100,000 population).

Figure 3: Quarterly rates of *E. coli* bacteraemia reports per 100,000 population, January 2013 – December 2014

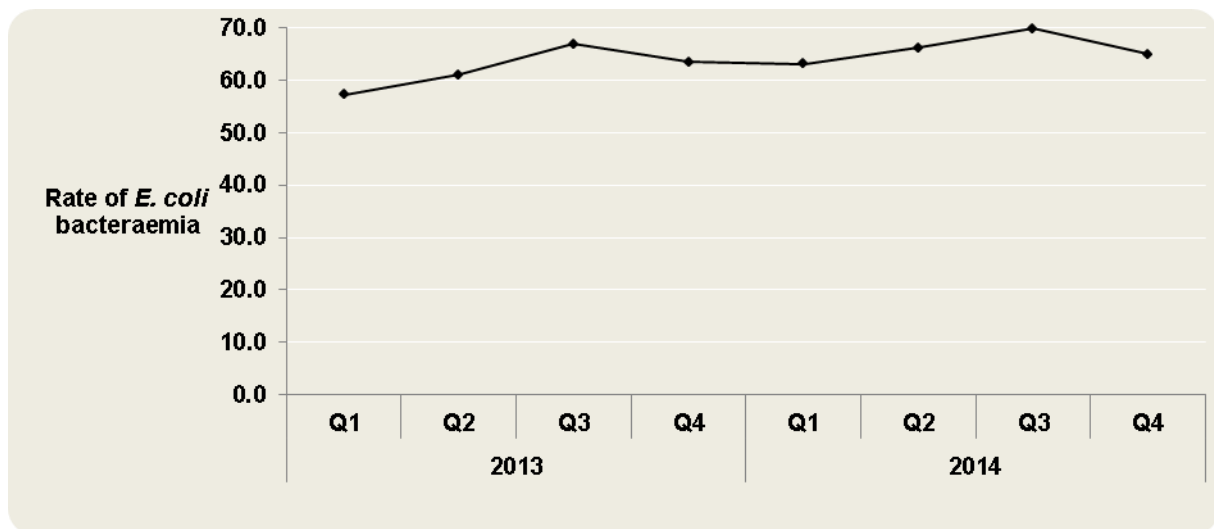


Table 3: Quarterly counts and rates of all *E. coli* bacteraemia reports by quarter, July 2011- December 2014

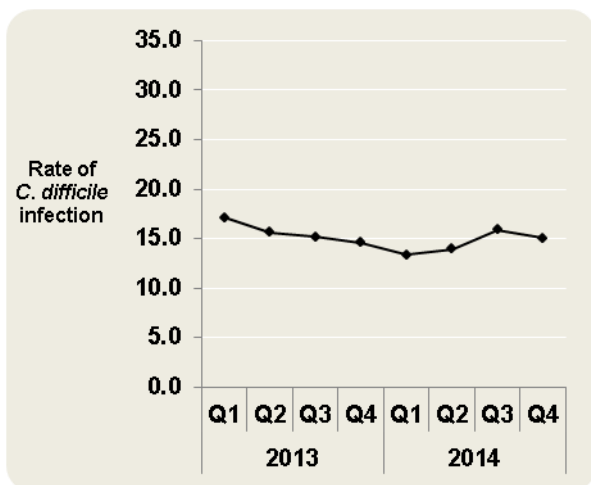
Year and quarter		Total <i>E. coli</i> bacteraemia reports	Rate (per 100,000 population)
2011	Q3	8,275	61.82
	Q4	8,098	60.50
2012	Q1	7,698	57.88
	Q2	8,074	60.71
	Q3	8,676	64.52
	Q4	7,957	59.18
2013	Q1	7,602	57.24
	Q2	8,193	61.01
	Q3	9,079	66.87
	Q4	8,623	63.51
2014	Q1	8,380	63.09
	Q2	8,886	66.17
	Q3	9,476	69.79
	Q4	8,820	64.96

Section 3: Epidemiological analyses of *Clostridium difficile* infection data

- January-March 2014 had the lowest number (n=3,006) of *Clostridium difficile* infections (CDI) since mandatory reporting began in 2007; however, 2014 also contained the quarter with the highest number of CDI since October-December 2011 (July-September 2014: n=3,970) (Table 4). This trend can also be observed in the all reports rate per 100,000 population (Figure 4).
- There has been a 15.5% decrease in all reported CDI between July-September 2014 and October-December 2014 (from 3,970 to 3,353, respectively). However, even with this recent decline, the most recent quarter still had a greater number of CDI reports than in the same quarter in the previous year (October-December 2013: n=3,298), a phenomenon also observed for April-June 2014 (n=3,970 vs. April-June 2013 n=3,671) and July-September 2014 (n=3,440 vs. July-September 2013 n=3,386). This has resulted in the first calendar year since the inception of the CDI mandatory surveillance programme where there has not been a decline from the previous year (2014 n=13,679 vs. 2013: 13,767).
- Overall, Trust apportioned CDI decreased by 757 (37.0%) between July-September 2011 and the current quarter (2,046 to 1,289, respectively). Although there were two quarter-on-quarter increases in Trust apportioned CDI in 2014, the most recent quarter (October-December 2014) saw a reduction of 64 Trust apportioned CDI cases from 1,353 in July-September 2014.
- However, even with this reduction between the two most recent quarters, the number of Trust apportioned CDI have increased by 3.2% compared to the same quarter in the previous calendar year (October-December 2013, n=1,249) (Table 4).
- Of note, while the percentage increase in non-Trust apportioned CDI cases between July-September 2013 and July-September 2014 was sharper than Trust apportioned CDI cases (9.4 % vs. 5.9%, respectively), there has been a 21.1% reduction in the number of non-Trust apportioned cases between July-September 2014 and October-December 2014 versus 4.7% observed for Trust apportioned cases. Therefore, while the number of non-Trust apportioned CDI cases in the most recent quarter is still higher than in the same quarter in 2013, (2,064 vs. 2,049, respectively), this increase is much less than among the Trust apportioned cases (0.7% vs. 3.2%), respectively.
- Trust apportioned rates have also increased in the current quarter compared to the same quarter in the previous year, from 14.56 (October-December 2013) to 15.03 (October-December 2014) per 100,000 bed days (Figure 4).

Figure 4: Quarterly rates of *C. difficile* infection in patients aged 2 years and over, January 2013 - December 2014

a) Trust apportioned reports
(per 100,000 bed-days)



b) All reports (per 100,000 population)

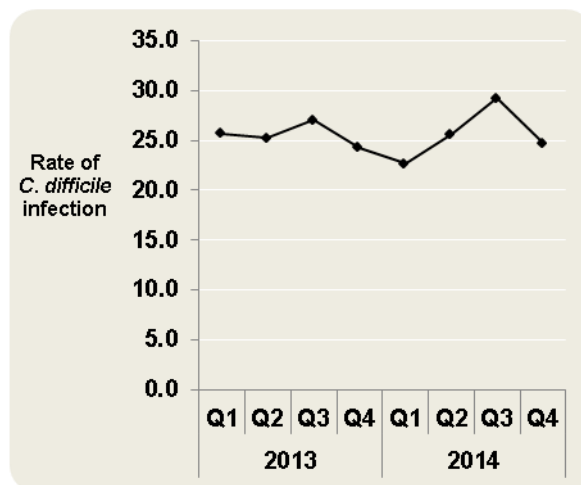


Table 4: *C. difficile* infection counts and rates in patients aged 2 years and over by quarter, July 2011- December 2014

Year and quarter		Trust apportioned reports	Trust apportioned rates (per 100,000 bed-days)	All reports	All reports rates (per 100,000 population)
2011	Q3	2,046	24.10	4,994	37.31
	Q4	1,824	21.07	4,350	32.50
2012	Q1	1,613	18.18	3,711	27.90
	Q2	1,517	17.68	3,656	27.49
	Q3	1,433	16.91	3,870	28.78
	Q4	1,527	17.74	3,756	27.93
2013	Q1	1,503	17.14	3,412	25.69
	Q2	1,347	15.65	3,386	25.21
	Q3	1,278	15.16	3,671	27.04
	Q4	1,249	14.56	3,298	24.29
2014	Q1	1,159	13.34	3,006	22.63
	Q2	1,197	13.97	3,440	25.62
	Q3	1,353	15.86	3,970	29.24
	Q4	1,289	15.03	3,353	24.70

Appendix

Bed-day data

For *S. aureus* (MRSA and MSSA) bacteraemia and CDI, the average bed-day activity reported by acute Trusts via KH03 returns is used to derive the bed-day denominator for acute Trust incidence rates. Financial year (FY) bed-day data was used as a denominator for all the quarters in that financial year i.e. FY bed-day data was converted into quarterly data for 2010/11 and used as the denominator (FY2010/11 bed-day data was used for the Q1 2011 surveillance data numerators). As of Q2 2011, bed-day data has been available on a quarterly basis and has been used as such for Q2 2011 to Q2 2014. These data are available at:

<http://www.england.nhs.uk/statistics/statistical-work-areas/bed-availability-and-occupancy/bed-data-overnight/>

Amendments to the published figures on KH03 included the following: Q3 2014 bed-day data were not available at the time of writing this report therefore bed-day data for the same quarter of the previous year (Q3 2013) were used for surveillance data for this quarter. Data for Q2 and Q3 2014 for one acute Trust (RWD) were >20% higher than the same quarters in the previous year (Q2 and Q3 2013) and the first quarter of 2014; therefore, data for the same quarters in the previous year were used for that Trust. In addition, data for Q2 2014 for one acute Trust (RQW) were missing; therefore, data for same quarter the previous year (Q2 2013) were used for that Trust.

Population data

National incidence rates are calculated using 2011, 2012 and 2013 mid-year resident population estimates which are based on the 2011 census for England (2014 estimates are based on 2013 mid-year estimates). These are available at:

<http://www.ons.gov.uk/ons/taxonomy/search/index.html?pageSize=50&sortBy=none&sortDirection=none&newquery=mid-year+population+estimates&nscl=Population>

Definitions

Apportioning and assignment of reports:

- **MRSA bacteraemia PIR assigned reports:** From the 1st of April 2013 to 31st March 2014, all MRSA bacteraemia cases reported via the HCAI Data Capture System (DCS) were assigned to either an acute Trust or a CCG through the completion of a Post Infection Review (PIR). A case is deemed to be Trust assigned where the completed PIR indicates that an acute Trust is the organisation best placed to ensure that any lessons learned are actioned. As of 1st April 2014, NHS England introduced a new category for the PIR assignment of MRSA bacteraemia cases; assignment to a "third party" through the arbitration process. Therefore, MRSA bacteraemias with a specimen date post 1st April 2014 are now assigned to an acute Trust, a CCG or a third party through the PIR process. Further information on the PIR process can be found on the following webpage: <http://www.england.nhs.uk/ourwork/patientsafety/zero-tolerance/>
- **MSSA bacteraemia Trust apportioned reports:** include patients who are (i) in-patients, day-patients, emergency assessment patients or not known; AND (ii) have had a specimen taken at an acute Trust or not known; AND (iii) specimen was taken on or after day 3 of the admission (admission date is considered day '1').
- **CDI Trust apportioned reports:** include patients who are (i) in-patients, day-patients, emergency assessment patients or not known; AND (ii) have had a specimen taken at an acute Trust or not known; AND (iii) specimen was taken on on or after day 4 of the admission (admission date is considered day '1').
- **Total reports:** These are all the cases reported by an acute Trust. They consist of both Trust apportioned reports and reports NOT apportioned to the acute Trust.

Episode duration:

- The length of an infection episode is defined as 14 days for MRSA, MSSA and *E. coli* bacteraemia and 28 days for CDI, with the date of specimen being considered day '1'.

Incidence calculations:

- **MRSA, MSSA and *E. coli* bacteraemia, and CDI population incidence (episodes per 100,000 population):**

- This incidence is calculated on an annualised basis to allow comparisons with the PHE's annually published data and is calculated as follows:

=100,000* (# episodes/mid-year England population) * (# days in year/# days in quarter).

- **MRSA and MSSA bacteraemia and CDI Trust apportioned incidence:**

- This incidence is calculated using KH03 average bed day activity (see *Bed-day data* above) and is calculated as follows:

=100,000* [# episodes/ (average KH03 occupied beds per day * # days in surveillance quarter)]

Quarters:

- Q1= January-March; Q2=April-June; Q3=July-September; Q4=October-December