Quarterly epidemiological commentary

Mandatory MRSA, MSSA, Gram-negative bacteraemia and *C. difficile* infections data (up to October to December 2019)

March 2020
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and \textit{C. difficile} infections data (up to October to December 2019)

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-leading science, research, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health and Social Care, and a distinct delivery organisation with operational autonomy. We provide government, local government, the NHS, Parliament, industry and the public with evidence-based professional, scientific and delivery expertise and support.

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Published
PHE publications
gateway number: GW-1155

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Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and C. difficile infections data (up to October to December 2019)

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Data included in this quarterly epidemiological commentary

This document contains quarterly, national-level epidemiological commentaries for Methicillin-resistant *Staphylococcus aureus* (MRSA), Methicillin-sensitive *Staphylococcus aureus* (MSSA), *Eschericia coli* (*E. coli*), *Klebsiella* species (*Klebsiella* spp.) and *Pseudomonas aeruginosa* (*P. aeruginosa*) bacteraemia and *Clostrioides difficile* infections (CDI). This includes analyses on counts and incidence rates of all cases and hospital-onset (previously referred to as trust-apportioned) cases of MRSA, MSSA, *E. coli*, *Klebsiella* spp. and *P. aeruginosa* bacteraemia and *C. difficile* infection.

The terminologies; ‘trust-apportioned’ and ‘not trust-apportioned’ have been updated to ‘hospital-onset’ and ‘community-onset’ respectively. Please note that this is only a change in the description of those terms and not a change in the methodology for apportionment.

All data tables associated with this report are included in an accompanying OpenDocument spreadsheet.

Revisions to data included are covered by a data-specific revisions and correction policy.

Further information

This publication forms part of the range of National Statistics outputs routinely published by Public Health England (PHE) which include monthly and annual reports on the mandatory surveillance of MRSA, MSSA and E. coli, Klebsiella spp. and P. aeruginosa bacteraemia and C. difficile infections (CDI).

Annual report output

Further epidemiological analyses by financial year can be found in PHE’s annual epidemiological commentary.

Monthly report outputs

The following reports are produced by PHE on a monthly basis.

MRSA bacteraemia:

- counts of all reported, hospital and community-onset cases of MRSA bacteraemia by organisation

MSSA bacteraemia:

- counts of all reported, hospital and community-onset cases of MSSA bacteraemia by organisation

E. coli bacteraemia:

- counts of all reported, hospital and community-onset cases of E. coli bacteraemia by organisation
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and C. difficile infections data (up to October to December 2019)

**Klebsiella spp. bacteraemia:**

- counts of all reported, hospital and community-onset cases of *Klebsiella* spp. bacteraemia by organisation

**P. aeruginosa bacteraemia:**

- counts of all reported, hospital and community-onset cases of *P. aeruginosa* bacteraemia by organisation

**CDI:**

- counts of all reported, hospital-onset, healthcare associated (HOHA), community-onset, healthcare associated (COHA), community-onset, indeterminate association (COIA) and community-onset, community associated (COCA) of CDI by organisation

Data for this report was extracted from PHE’s healthcare associated infections data capture system (HCAI DCS) on 23 January 2020.
Epidemiological analyses of Gram-negative bacteraemia data

*E. coli* bacteraemia

The incidence rate of all reported *E. coli* bacteraemia continues to increase each year since the initiation of the mandatory surveillance of *E. coli* bacteraemia in July 2011 (figure 1a). This is primarily driven by the increase in the rate of community-onset cases (table S1a). In contrast, the incidence rate of hospital-onset cases has remained relatively stable within the same period (figure 1b).

Between July to September 2011 and October to December 2019, the count of cases and the incidence rate of all reported cases of *E. coli* bacteraemia increased by 28.5% from 8,275 cases to 10,630 and from 61.8 to 75.3 cases per 100,000 population. Similarly, over the same period, the count of community-onset cases increased by 37.7% from 6,279 to 8,646, while the incidence rate increased by 30.6% from 46.9 to 61.3 cases per 100,000 population.

The incidence rate of hospital-onset cases in October to December 2018 (23.0 per 100,000 bed-days, n=1,984) was similar to that at the start of mandatory surveillance (23.7 per 100,000 bed-days, n=1,996 in July to September 2011).

Comparing the most recent quarter (October to December 2019) to the same period in the previous year (October to December 2018), hospital-onset *E. coli* bacteraemia cases increased 6.0% from 1,871 to 1,984 which corresponded to a 6.0% increase in incidence rates from 21.7 to 23.0 per 100,000 bed-days. Community-onset *E. coli* bacteraemia cases decreased by 1.7% from 8,795 to 8,646 per 100,000 bed-days, while the incidence rate of community-onset cases decreased by 1.7% from 62.3 per 100,000 population to 61.3 (figure 1a and 1b, table S1).

There is a seasonal pattern in the incidence of all-reported *E. coli* bacteraemia cases, with the highest rates observed between July to September of each year. There is less evidence of the same seasonality among hospital-onset cases, though a slight peak is observed during the period October to December throughout the surveillance period.
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and *C. difficile* infections data (up to October to December 2019)

Figure 1a: Quarterly rates of all reported *E. coli* bacteraemia: July to September 2011 to October to December 2019

Figure 1b: Quarterly rates of hospital-onset *E. coli* bacteraemia: July to September 2011 to October to December 2019
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and *C. difficile* infections data (up to October to December 2019)

*Klebsiella* spp. bacteraemia

Between April to June 2017 and October to December 2019, there was a 25.1% increase in the count of *Klebsiella* spp. bacteraemia cases, from 2,346 to 2,934 and a 22.9% increase in the incidence rate from 16.9 to 20.8 cases per 100,000 population respectively (figure 2a). The count and incidence rate of community-onset cases also increased by 23.8% from 1,676 to 2,075 cases and by 21.7% from 12.1 to 14.7 cases per 100,000 population respectively. Over the same period, the count and the incidence rate of hospital-onset cases increased by 28.2% from 670 to 859 cases and by 28.1% from 7.8 cases per 100,000 bed-days to 10.0 respectively (figure 2b).

Comparing the most recent quarter (October to December 2019) to the same period in the previous year (October to December 2018) showed an 8.2% increase in the count of all reported cases from 2,711 to 2,934, while the incidence rate also increased by 8.2% from 19.2 per 100,000 population to 20.8. Hospital-onset *Klebsiella* spp. cases increased by 6.0% from 810 to 859 which corresponds to a 6.0% increase in incidence rates, from 9.4 to 10.0 per 100,000 bed-days. Community-onset *Klebsiella* spp. cases increased by 9.2% from 1,901 to 2,075, while the incidence rates of community-onset *Klebsiella* spp. BSI increased by 9.2% from 13.5 to 14.7 per 100,000 population (table S2).

In October to December 2019, 74.1% (2,173/2,934) of all reported *Klebsiella* spp. bacteraemia were caused by *K. pneumoniae*, an increase from 73.8% in the same quarter of the previous year (October to December 2018). Over the same period 16.0% of cases (469/2,934) were caused by *K. oxytoca*, an increase from 14.8% in the same quarter of the previous year (October to December 2018).
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and *C. difficile* infections data (up to October to December 2019)

**Figure 2a:** Quarterly rates of all reported *Klebsiella* spp. bacteraemia by species: April to June 2017 to October to December 2019

**Figure 2b:** Quarterly rates of hospital-onset *Klebsiella* spp. bacteraemia: April to June 2017 to October to December 2019
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and *C. difficile* infections data (up to October to December 2019)

**Pseudomonas aeruginosa bacteraemia**

Between April to June 2017 and October to December 2019, there was a 9.1% increase in the count and a 7.2% increase in the incidence rate of all reported *P. aeruginosa* bacteraemia cases from 1,011 to 1,103 and from 7.3 to 7.8 cases per 100,000 population respectively (figure 3a). The count and the incidence rate of community-onset cases also increased by 8.6% from 637 to 692 cases and by 6.8% from 4.6 to 4.9 cases per 100,000 population respectively. Over the same period, the count and the incidence rate of hospital-onset cases increased by 9.9% from 374 to 411 cases and by 9.8% from 4.3 to 4.8 cases per 100,000 bed-days respectively (figure 3b).

Comparing the most recent quarter (October to December 2019) to the same period in the previous year (October to December 2018) shows a 3.7% increase in the count of all reported cases from 1,064 to 1,103, incidence rate also increased by 3.7% from 7.5 to 7.8 per 100,000 population respectively. Hospital-onset *P. aeruginosa* cases increased by 6.5% from 386 to 411 which corresponds to a 6.5% increase in the incidence rate from 4.5 to 4.8 per 100,000 bed-days. Community-onset *P. aeruginosa* cases increased by 2.1% from 678 to 692 per 100,000 population, while the community-onset incidence rate increased by 2.1% from 4.8 to 4.9 per 100,000 population (table S3).

There is seasonal pattern in the incidence of all-reported *P. aeruginosa* bacteraemia cases, with the highest rates observed in July to September of each year. Due to this seasonality, trends of *P. aeruginosa* and the limited data points available, means that the results need to be interpreted with caution.
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and \(C.\) difficile infections data (up to October to December 2019)

Figure 3a: Quarterly rates of all reported \(P.\) aeruginosa bacteraemia: April to June 2017 to October to December 2019

Figure 3b: Quarterly rates of hospital-onset \(P.\) aeruginosa bacteraemia: April to June 2017 to October to December 2019
Epidemiological analyses of *Staphylococcus aureus* bacteraemia data

**MRSA bacteraemia**

There has been a considerable decline in the incidence rate of all reported MRSA bacteraemia since the enhanced mandatory surveillance of MRSA bacteraemia began in April 2007 (figures 4a, table S4a). The incidence rate of all reported cases fell by 85% from 10.2 cases per 100,000 population in April to June 2007 and January to March 2014, respectively. The rate has subsequently increased marginally to 1.6 cases per 100,000 population between January to March 2014 and October to December 2019.

A similar trend was observed with the incidence rate of hospital-onset cases (figures 4b, table S4a). There was a steep decrease of 79% from 4.9 cases per 100,000 bed-days in April to June 2008 to 1.0 cases per 100,000 in January to March 2014. Subsequently, between January to March 2014 and October to December 2019, the rate has decreased to 0.8 cases per 100,000 bed-days.

Comparing the most recent quarter (October to December 2019) to the same period in the previous year (October to December 2018) showed a 6.0% increase in the count of all reported cases from 218 to 231, while the incidence rate increased by 6.0% from 1.5 to 1.6 cases per 100,000 population. The count of cases showed a small increase from 69 cases in Q3 2018 to 70 cases in Q3 2019. Thus, the incidence rate remained unchanged at 0.8 per 100,000 bed-days. The count of community-onset MRSA bacteraemia cases increased by 8.1% from 149 to 161, although the incident rate remained at 1.1 cases per 100,000 population (table 4a). The increase in incidence of both community-onset and hospital-onset MRSA is of potential concern. This is the first time that three quarters of sustained increase has been observed for this data collection. It will be necessary to continue to monitor these trends to determine whether it continues or is just fluctuation in a steady rate.
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and *C. difficile* infections data (up to October to December 2019)

Figure 4a: Quarterly rates of all reported MRSA bacteraemia: April to June 2007 to October to December 2019

![Graph showing quarterly rates of all reported MRSA bacteraemia](image)

Figure 4b: Quarterly rates of hospital-onset MRSA bacteraemia: April to June 2008 to October to December 2019

![Graph showing quarterly rates of hospital-onset MRSA bacteraemia](image)
MSSA bacteraemia

Since the mandatory reporting of MSSA bacteraemia began in January 2011 there has been a general trend of increasing counts and incidence rates. The count of all reported cases of MSSA bacteraemia increased by 41.7% from 2,199 to 3,117 between January to March 2011 and October to December 2019. This was accompanied by a 31.6% increase in incidence rate from 16.8 per 100,000 population to 22.1 (figure 5a, table S5).

These increases are primarily driven by the increase in community-onset cases. Between January to March 2011 and October to December 2019, the count and the incidence rate of community-onset cases increased by 55.3% and 44.2% respectively from 1,464 to 2,274 cases and from 11.2 to 16.1 cases per 100,000 population. Over the same period, the count of hospital-onset cases increased by 14.7% from 735 to 843 cases, while the incidence rate increased by 17.1% from 8.4 to 9.8 cases per 100,000 bed-days (figure 5a and 5b, table S5a).

Comparing the most recent quarter (October to December 2019) to the same period in the previous year (October to December 2018) all reported cases increase by 1.5% from 3,071 to 3,117, which corresponds to a 1.5% increase in incidence rate from 21.8 to 22.1 per 100,000 population. Hospital-onset MSSA bacteraemia cases remained similar (844 to 843) and thus the incidence rate remained unchanged at 9.8 per 100,000 bed-days. Community-onset MSSA bacteraemia cases increased 2.1% from 2,227 to 2,274, while the community-onset incidence rate increased 2.1% from 15.8 to 16.1 per 100,000 population.
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and *C. difficile* infections data (up to October to December 2019)

**Figure 5a: Quarterly rates of all reported MSSA bacteraemia: January to April 2011 to October to December 2019**

**Figure 5b: Quarterly rates of hospital-onset MSSA bacteraemia: January to April 2011 to October to December 2019**
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and *C. difficile* infections data (up to October to December 2019)

Epidemiological analyses of *Clostridioides difficile* infection data

Since the initiation of surveillance of *C. difficile* infection (CDI) in April 2007, there has been a substantial decrease in the count and associated incidence rate of both all-reported and hospital-onset cases of CDI (figure 6a, 6b and table S6).

Most of the decrease in the incidence rate occurred between April to June 2007 and January to March 2012 with a 78% decrease in all-reported cases of CDI from 16,864 to 3,711 cases and an associated 79% reduction in incidence rate from 131.6 cases per 100,000 population to 27.9. Subsequently, between January to March 2012 and October to December 2019, the count of all-reported cases decreased 8.9% from 3711 to 3380 cases and the incidence rate reduced by 14.1% from 27.9 cases per 100,000 population to 24.0.

There were similar, but greater, reductions among hospital-onset CDI cases with an 85% reduction in count of cases between April to June 2007 and January to March 2012 from 10,436 to 1,613 cases and an 84% reduction in the incidence rate from 112.5 per 100,000 bed-days to 18.2. This was followed by a further 21.1% decrease in the count of cases from 1,613 to 1,272 cases and a decrease of 18.7% in the incidence rate from 18.2 cases per 100,000 bed-days to 14.8 between January to March 2012 and October to December 2019.

Comparing the most recent quarter (October to December 2019) to the same period in the previous year (October to December 2018) showed a 19.2% increase in the count of all reported cases from 2,836 to 3,380, the incidence rate also increased 19.2% from 20.1 to 24.0 cases per 100,000 population. Hospital-onset CDI cases increased by 35.2% from 941 to 1,272 which corresponds to a 35.2% increase in incidence rates from 10.9 cases per 100,000 bed-days to 14.8. The count of community-onset CDI cases increased by 11.2% from 1,895 to 2,108, the incidence rate also increased by 11.2% from 13.4 to 14.9 per 100,000 population. The increases in incidence of hospital-onset CDI between April to March 2019 and October to December 2019 is the first time since April 2017, that three consecutive quarters of increase have been observed. It will be important to continue to monitor trends in hospital-onset cases to see if this trend persists.
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and *C. difficile* infections data (up to October to December 2019)

**Figure 6a:** Quarterly rates of all reported *C. difficile*: April to June 2007 to October to December 2019

![Graph of quarterly rates of all reported C. difficile: April to June 2007 to October to December 2019](image)

**Figure 6b:** Quarterly rates of hospital-onset *C. difficile*: April to June 2007 to October to December 2019

![Graph of quarterly rates of hospital-onset C. difficile: April to June 2007 to October to December 2019](image)
Quarterly epidemiological commentary: Mandatory MRSA, MSSA, Gram-negative bacteraemia and *C. difficile* infections data (up to October to December 2019)

From April 2017, the HCAI DCS has included questions relating to prior admissions to the same acute trust reporting the CDI case. These additional, mandatory, items will help align English CDI surveillance with definitions used by the European Centre for Disease Prevention and Control (ECDC) and Centers for Disease Control and Prevention (CDC) in the USA. Cases are now categorised as: Healthcare-Onset, Healthcare Associated (HOHA), Community-Onset, Healthcare Associated (COHA), Community-Onset, Indeterminate Association (COIA) or Community-Onset, Community Associated (COCA). Cases where prior admission details were recorded as 'Don't know', are assigned as 'Unknown' and those with missing information as 'missing information'.

The proportion of cases that are HOHA has remained stable between April to June 2017 and October to December 2019, and forms the largest group at around 40% of cases. Over the same period, COCA cases increased from 13.4% to 27.7% of all CDI, although most of this increase was observed during 2017/18. Similarly, COHA cases have increased from 9.7% to 17.3% of all CDI, with most of the increase being observed during 2017/18. COIA cases have increased from 6.3% to 12.0% of all CDI. It should be noted much of the increase observed is likely due to an increase in data quality as shown by the sharp decline of cases with missing data (figure 6b Table S6b).

**Figure 6b: Trends in proportions of CDI cases by prior trust exposure April 2017 - December 2019**
Appendix

Bed-day data

For 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 rate rates (assigned and apportioned). As of Q1 2011/12, bed-day data has been available on a quarterly basis and has been used as such for Q2 2011/12 to Q1 2019/20. This data is available at: www.england.nhs.uk/statistics/statistical-areas/bed-availability-and-occupancy/bed-data-overnight/

Amendments to the published figures on KH03 included the following.

Q2 2019/20 bed-day data was not available at the time of writing this report; therefore, bed-day data for the same quarter of the previous year (Q2 2018/19) was used as a proxy for this quarter.

In Quarterly Epidemiological Commentaries published prior to 1 December 2015, April to June 2014 to October to December 2014 quarterly KH03 figures for one acute trust (RWD) had a percentage change of more than 20% compared with the previous quarter and the same quarter in the previous year. As a result, it was replaced with the KH03 data of the same quarter in the previous year (April to June 2013 to October to December 2013).

However, PHE has reviewed its policy for processing KH03 data. Data irregularities identified have been flagged with colleagues at NHS England (data owners of the KH03 dataset). Until we receive confirmation that any identified change in the occupied overnight bed-days for an acute trust is anomalous, PHE now uses the data as published in the KH03 dataset. This affects all reports published since 1 December 2015 and incidence rate rates published prior that time will differ slightly as a result. For the KH03 data used to calculate rates included in this report to be consistent over the full-time period, previously amended KH03 data for trust United Lincolnshire Hospitals (RWD) for FY 2014/2015 has been altered to reflect that published in the KH03 dataset. Please note that this could lead to slight differences in hospital-onset/assigned rates when compared with publications prior to 1 December 2015.

Missing data for acute trusts in the KH03 returns will continue to be processed as before, where the KH03 return for the same quarter from the previous year will be used as a proxy. The following acute trusts were thus affected:
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- Moorfields Eye Hospital NHS Foundation Trust (RP6) 2007/08 and 2008/09 KH03 figures: replaced with 2006/07 KH03 figure
- Rotherham NHS Foundation Trust (RFR): 2009/10 and April-June 2010 to April-June 2011 KH03 figures: replaced with 2008/09 KH03 figure
- Sheffield Teaching Hospitals NHS Foundation Trust (RHQ) April-June 2010 to April-June 2011 KH03 figures: replaced with 2009/10 KH03 data
- The Princess Alexandra Hospital NHS Trust (RQW) April-June 2014 and October-December 2014 KH03 figures: replaced with April-June 2013 to October-December 2013 KH03 figures, respectively
- Ipswich Hospital NHS Trust (RGQ) January-March 2016 KH03 figure: replaced with January-March 2015 figures
- West Suffolk NHS Foundation Trust (RGR) April-June 2016 to October-December 2016 and April-June 2017 KH03 figures: replaced with April-June 2015 to October-December 2015 KH03 figures
- Gloucestershire Hospitals NHS Foundation Trust (RTE) October-December 2016 to January-March 2017 KH03 figures: replaced with October-December 2015 to January-March 2016 KH03 figures

The KH03 data used for this report was published on 22 August 2019. This includes revisions of previously published KH03 data and so these data may differ from those used in earlier reports.

**Population data**

National incidence rates are calculated using 2007 to 2018 mid-year resident population estimates which are based on the 2011 census for England (2019 estimates are based on 2018 mid-year estimates).

**Definitions**

**Bacteraemia hospital-onset (trust-apportioned) cases:**
Include patients who are (i) in-patients, day-patients, emergency assessment patients or not known; AND (ii) have had their 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 ‘one’). Cases that do not meet these criteria are categorised as community-onset (not-trust apportioned).

**CDI hospital-onset (trust-apportioned) cases:**
Include patients who are (i) in-patients, day-patients, emergency assessment patients or not known; AND (ii) have had their specimen taken at an acute trust or not known; AND (iii) specimen was taken on or after day 4 of the admission (admission date is...
considered day ‘one’). Cases that do not meet these criteria are categorised as community-onset (not-trust apportioned).

Historically, report published before September 2017 have used the term ‘trust-apportioned’ to describe cases meeting the above conditions for apportionment and ‘not trust-apportioned’ for those that do not. Moving forward, these terminologies have been updated to ‘hospital-onset’ and ‘community-onset’ respectively. Please note that this is simply a change in terminology and does not constitute a change in the methodology for apportionment.

**Prior Trust Exposure**
From April 2017, reporting trusts were asked to provide information on whether patients with CDI had been admitted to the reporting trust within the three months prior to the onset of the current case. This allows a greater granulation of the healthcare association of cases.

Cases are split into one of six groups:

**Hospital-Onset Healthcare Associated (HOHA):**

Any NHS patient specimens taken on the third day of admission onwards (i.e. ≥ day 3 when day of admission is day 1) at an acute trust (including cases with unspecified specimen location) for Inpatients, Day-patients, Emergency Assessment, or unknown patient category.

Records with a missing admission date (where the specimen location is acute trust or missing and the patient category is Inpatient, Day-patient, Emergency Assessment, or unspecified) are also included.

**Community-Onset Healthcare Associated (COHA):**

Any case reported by an NHS acute trust not determined to be Hospital-Onset Healthcare Associated but where the patient was discharged from the reporting organisation acute trust within 28 days prior to the current specimen date (where date of discharge is day 1).

**Community-Onset Indeterminant Association (COIA):**

Any case reported by an NHS acute trust not determined to be Hospital-Onset Healthcare Associated but where the patient was discharged from the acute trust reporting organisation between 28 and 84 days prior to the current specimen date (where date of discharge is day 1).
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Community-Onset Community Associated (COCA):

Any case reported by an NHS acute trust not determined to be Hospital-Onset Healthcare Associated but where the patient has not been discharged from the reporting organisation within the past 84 days for CDI and 28 days for bacteraemias, to the current specimen date (where date of discharge is day 1).

**Missing:**

Any case reported by an NHS acute trust not determined to be Hospital-Onset Healthcare Associated but where the information on the patient prior discharge was not reported. As of April 2019, it is no longer possible to leave these questions blank.

**Unknown:**

Any case reported by an NHS acute trust not determined to be Hospital-Onset Healthcare Associated but where the information on the patient prior discharge was reported as ‘Don’t know’.

**Total reported cases:**

This is the total count of infections for each organism as of the date of extraction. Please note that for *C. difficile*, this count excludes those from patients less than 2 years old.

**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 ‘one’.

**Incidence rate calculations:**

MRSA, MSSA and *E. coli, Klebsiella* spp., *P. aeruginosa* bacteraemia, and CDI population incidence rate (episodes per 100,000): This incidence rate is calculated using the mid-year England population and is
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\[
\text{incidence} = \left( \frac{n \text{ episodes}}{\text{mid-year population for England}} \right) \times \frac{\text{days in quarter}}{100,000}
\]

MRSA, MSSA and *E. coli, Klebsiella* spp., *P. aeruginosa* and CDI hospital-onset incidence:
This incidence rate is calculated using KH03 average bed-day activity (see bed-day data above) and is calculated as follows:

\[
\text{incidence} = \frac{n \text{ episodes}}{\text{average KH03 beds per day} \times \text{days in quarter}} \times 100,000
\]

Graphs and percentage change calculation:
Please note that percentage changes in rate have been calculated using raw rate figures while those presented in the tables and commentary have been rounded to one decimal place. Similarly, graphs included in this report were plotted using raw rates figures. The raw rate figures are included in the accompanying Quarterly Epidemiological Commentary’s accompanying data.

Quarters:
In publications prior to March 2016, all references to quarterly data are based on calendar year definitions and NOT financial year definitions, that is:

- Q1 2014: January to March 2014
- Q2 2014: April to June 2014
- Q3 2014: July to September 2014
- Q4 2014: October to December 2014

However, for all subsequent publications, including this one, all references to quarterly data are based on financial year definitions and NOT calendar year definitions, that is:

- Q1 2014/15: April to June 2014
- Q2 2014/15: July to September 2014
- Q3 2014/15: October to December 2014
- Q4 2014/15: January to March 2015