



Health & Social Care  
Information Centre

# Summary Hospital-level Mortality Indicator (SHMI) – Deaths associated with hospitalisation

England, January 2014 – December 2014:  
Quarterly report

Published 29 July 2015



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The SHMI can be used by hospital trusts to compare their mortality outcomes to the national baseline. Regulators (for example, the Care Quality Commission) and commissioning organisations can also use the SHMI to investigate outcomes for trusts. However, it should not be used to directly compare mortality outcomes between trusts and it is inappropriate to rank trusts according to their SHMI.

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## Glossary of terms

### Case-mix

Case-mix refers to the characteristics of the patients treated by a particular trust. In the calculation of the SHMI, the characteristics included are the condition the patient is in hospital for, other underlying conditions the patient suffers from, age, gender and method of admission to hospital. The severity of the condition is not included, as this information is not captured in the Hospital Episode Statistics (HES) dataset upon which the SHMI is based. This means that if a trust treats a high (or low) proportion of seriously ill patients with a particular condition compared to other trusts, the statistical models used to estimate the expected number of deaths will not take account of this.

### Deprivation quintile

Patient records are assigned to one of five deprivation groups (called quintiles) using the Index of Multiple Deprivation (IMD) Overall Rank field in the Hospital Episode Statistics (HES) dataset. Deprivation quintile 1 is the most deprived group and deprivation quintile 5 is the least deprived group. Records where there is no IMD Overall Rank (for example, because the patient's postcode is unknown) are assigned to the NULL deprivation quintile.

### Elective admission

An admission which is either booked, planned or from a waiting list and the decision to admit was made at a separate time from the actual admission to hospital.

### Episode

A single period of care under one consultant.

### Finished provider spell

See definition of 'provider spell'.

### Hospital Episode Statistics (HES)

HES is a data warehouse containing details of all admissions, outpatient appointments and A&E attendances at NHS hospitals in England. These data are collected during a patient's time at hospital and are submitted by trusts to the Secondary Uses Service (SUS) to allow hospitals to be paid for the care they deliver.

HES extracts are taken from the SUS data warehouse on a monthly basis, at pre-arranged dates during the year. HES represents a series of fixed positions aligned to extracted data, while SUS is continuously updated whenever data are submitted. This is why there can be differences between SUS and HES even when looking at the same time period.

HES is a records-based system that covers all NHS trusts in England. HES information is stored as a large collection of separate records - one for each period of care - in a secure data warehouse.

Detailed information on the HES data extracts that are used in the calculation of the SHMI can be found in the HES SHMI Data Guidance document, which is available to download from <http://www.hscic.gov.uk/shmi>.

### **Non-elective admission**

An admission which is not booked, planned or from a waiting list. This includes emergency admissions, transfers from other trusts and admissions with an unknown admission method.

### **Official statistics**

Those statistical outputs produced by the UK Statistics Authority's executive office (the Office for National Statistics), by central Government departments and agencies, by the devolved administrations in Northern Ireland, Scotland and Wales, and by other Crown bodies (over 200 bodies in total).

### **Provider spell**

A continuous period of time spent as a patient within a single trust (provider). A spell may be composed of more than one episode. A spell is finished when the spell ends i.e. the patient is discharged or dies.

### **Repeat outlier**

A trust which has either a 'higher than expected' SHMI or a 'lower than expected' SHMI for both the most recent reporting period and the same period in the previous year.

### **Summary Hospital-level Mortality Indicator (SHMI)**

The SHMI is the ratio between the actual number of patients who die following hospitalisation at the trust and the number that would be expected to die on the basis of average England figures, given the characteristics of the patients treated there.

### **Secondary Uses Service (SUS)**

See definition of 'Hospital Episode Statistics (HES)'.

### **Trust**

An NHS trust (or provider) is a legal entity which provides services on behalf of the NHS. Trusts may be located at multiple sites and may be responsible for one or more hospitals.

## Executive summary

The Summary Hospital-level Mortality Indicator (SHMI) reports on mortality at trust level<sup>1</sup> across the NHS in England. This indicator is produced and published quarterly as an official statistic by the Health and Social Care Information Centre (HSCIC) with the first publication in October 2011.

The SHMI is the ratio between the actual number of patients who die following hospitalisation at the trust and the number that would be expected to die on the basis of average England figures, given the characteristics of the patients treated there.

It covers all deaths reported of patients who were admitted to non-specialist acute trusts<sup>2</sup> in England and either die while in hospital or within 30 days of discharge. The expected number of deaths is calculated from statistical models derived to estimate the risk of mortality based on the characteristics of the patients (including the condition the patient is in hospital for<sup>3</sup>, other underlying conditions the patient suffers from, age, gender and method of admission to hospital).

The data used to produce the SHMI are generated from data the trusts submit to the Secondary Uses Service. The data are processed by the HSCIC to create Hospital Episode Statistics (HES) data, which are then linked with death registrations data from the Office for National Statistics to enable capturing of deaths which occur outside of hospital. A combination of finalised and provisional HES data is used in the calculation of the SHMI to ensure that the indicator is as timely as possible<sup>4</sup>.

## Understanding the SHMI and its banding

A SHMI is calculated for each trust and the baseline (national average) SHMI has a value of one. A trust will only have a SHMI which is equal to one if the number of patients who die following hospitalisation there is exactly the same as the number of patients expected to die based on the SHMI methodology<sup>5</sup>.

To help users of the data understand the SHMI, trusts have been categorised into one of the following three bandings:

- Where the trust's SHMI is 'higher than expected'
- Where the trust's SHMI is 'as expected'
- Where the trust's SHMI is 'lower than expected'

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<sup>1</sup> The SHMI is currently reported at trust level rather than site (hospital) level because of concerns around the accuracy of data on site of treatment in the Hospital Episode Statistics (HES) dataset. The HSCIC will continue to review the feasibility of reporting the SHMI at site level as part of the longer term development of the indicator.

<sup>2</sup> Specialist trusts, mental health trusts, community trusts and independent sector providers are excluded from the SHMI because there are important differences in the case-mix of patients treated there compared to non-specialist acute trusts and the SHMI has not been designed for these types of trusts.

<sup>3</sup> No adjustment is made for the severity of the condition, as this information is not captured in the Hospital Episode Statistics (HES) dataset upon which the SHMI is based. This means that if a trust treats a high (or low) proportion of seriously ill patients with a particular condition compared to other trusts, the statistical models used to estimate the expected number of deaths will not take account of this.

<sup>4</sup> Detailed information on the HES data used in the calculation of the SHMI is available in the HES SHMI Data Guidance document, which is available to download from <http://www.hscic.gov.uk/SHMI>.

<sup>5</sup> Full details of the methodology used to calculate the SHMI are available in the SHMI methodology specification document, which is available to download from <http://www.hscic.gov.uk/SHMI>.

For any given number of expected deaths, a range of observed deaths is considered to be 'as expected'. If the observed number of deaths falls outside of this range, the trust in question is considered to have a higher or lower SHMI than expected. Where a trust has an 'as expected' SHMI, it is inappropriate to conclude that their SHMI is lower than the national baseline, even if the number of observed deaths is smaller than the number of expected deaths. This is because the trust has been placed in the 'as expected' range because any variation from the number of expected deaths is not statistically significant.

The difference between the number of observed deaths and the number of expected deaths cannot be interpreted as the number of avoidable deaths for the trust. Whether or not a death could have been prevented can only be determined by a detailed case-note review. The SHMI is not a direct measure of quality of care.

A 'higher than expected' SHMI should not immediately be interpreted as indicating bad performance and instead should be viewed as a 'smoke alarm' which requires further investigation by the trust. Similarly, a 'lower than expected' SHMI should not immediately be interpreted as indicating good performance. The SHMI requires careful interpretation and should be used in conjunction with other indicators and information from other sources (e.g. patient feedback, staff surveys and other similar material) that together form a holistic view of trust outcomes.

The SHMI can be used by hospital trusts to compare their mortality outcomes to the national baseline. Regulators (for example, the Care Quality Commission) and commissioning organisations can also use the SHMI to investigate outcomes for trusts. However, it cannot be used to directly compare mortality outcomes between trusts and it is inappropriate to rank trusts according to their SHMI.

## Main findings

For the 137 trusts included in the SHMI for the period from 1 January 2014 to 31 December 2014:

- There were approximately 8.7 million finished provider spells, which resulted in 275,000 deaths either while in hospital or within 30 days of discharge. This includes deaths from other causes as well as deaths related to the reason for the hospital admission.
- 11 trusts had a 'higher than expected' SHMI. Of these 11 trusts, 5 also had a 'higher than expected' SHMI for the same period in the previous year.
- 109 trusts had an 'as expected' SHMI.
- 17 trusts had a 'lower than expected' SHMI. Of these 17 trusts, 9 also had a 'lower than expected' SHMI for the same period in the previous year.

## Contextual information

To support the interpretation of the SHMI, various contextual indicators are published alongside it. These contextual indicators are selected and released in order of priority from the list defined by the Steering Group for the National Review of the Hospital Standardised Mortality Ratio, with new indicators recommended by the SHMI Technical Working Group.

In the period from 1 January 2014 to 31 December 2014:

- 1.3 per cent of finished provider spells had palliative care<sup>6</sup> coded at either diagnosis or treatment specialty level, a slight increase from 1.2 per cent for the same period in the previous year.
- 25.7 per cent of deaths reported in the SHMI had palliative care<sup>6</sup> coded at either diagnosis or treatment specialty level, an increase from 22.0 per cent for the same period in the previous year.
- 0.6 per cent of elective admissions resulted in a death occurring either in hospital or within thirty days (inclusive) of discharge, showing no change from the same period in the previous year.
- 3.6 per cent of non-elective admissions resulted in a death occurring either in hospital or within thirty days (inclusive) of discharge, a slight decrease from 3.8 per cent for the same period in the previous year.
- 71.5 per cent of deaths reported in the SHMI occurred in hospital and 28.5 per cent occurred outside hospital within 30 days (inclusive) of discharge, compared to 72.7 per cent of deaths occurring in hospital and 27.3 per cent occurring outside of hospital for the same period in the previous year<sup>7</sup>.
- The percentage<sup>7</sup> of finished provider spells in each deprivation quintile<sup>8</sup> is:
  - 24.2 per cent for quintile 1 (most deprived)
  - 21.0 per cent for quintile 2
  - 19.0 per cent for quintile 3
  - 17.3 per cent for quintile 4
  - 15.7 per cent for quintile 5 (least deprived)
  - There is insufficient information to calculate the deprivation quintile for 2.9 per cent of finished provider spells.
- The percentage<sup>7</sup> of deaths reported in the SHMI in each deprivation quintile<sup>8</sup> is:
  - 21.0 per cent for quintile 1 (most deprived)
  - 20.4 per cent for quintile 2

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<sup>6</sup> The SHMI methodology does not make any adjustment for patients who are recorded as receiving palliative care. This is because there is considerable variation between trusts in the coding of palliative care. Details of further analysis on this issue can be referenced in the Palliative Care Coding Report, which is available to download from <http://www.hscic.gov.uk/shmi-development>.

<sup>7</sup> Percentages may not add to 100 due to rounding.

<sup>8</sup> The SHMI methodology does not make any adjustment for deprivation. This is because adjusting for deprivation might create the impression that a higher death rate for those who are more deprived is acceptable, and has the potential to remove from the SHMI some of the differences that it is designed to measure. More detailed analysis can be found in the Report on the Impact of Deprivation on the SHMI, which is available to download from <http://www.hscic.gov.uk/shmi-development>.

- 20.5 per cent for quintile 3
  - 19.9 per cent for quintile 4
  - 17.2 per cent for quintile 5 (least deprived)
  - There is insufficient information to calculate the deprivation quintile for 0.9 per cent of deaths.
- The percentage of finished provider spells and deaths for which there is insufficient information to calculate the deprivation quintile has decreased compared to the same period in the previous year. This is due to improvements in the way that postcodes are populated for birth records in the underlying HES data resulting in fewer records with missing postcodes.

SHMI and contextual indicator data at trust level are available to download from our Indicator Portal site at <http://indicators.ic.nhs.uk/webview/>. The data can be found towards the bottom of the navigation tree on the left-hand side of the page under *Summary Hospital-level Mortality Indicator > Recent SHMI Publications*. The 'Downloads' section is at the bottom of the resulting page.

## Introduction and main findings

### Introduction

The Summary Hospital-level Mortality Indicator (SHMI) reports on mortality at trust level<sup>9</sup> across the NHS in England. This indicator is produced and published quarterly as an official statistic by the Health and Social Care Information Centre (HSCIC) with the first publication in October 2011.

The SHMI is the ratio between the actual number of patients who die following hospitalisation at the trust and the number that would be expected to die on the basis of average England figures, given the characteristics of the patients treated there.

It covers all deaths reported of patients who were admitted to non-specialist acute trusts<sup>10</sup> in England and either die while in hospital or within 30 days of discharge. The expected number of deaths is calculated from statistical models derived to estimate the risk of mortality based on the characteristics of the patients (including the condition the patient is in hospital for<sup>11</sup>, other underlying conditions the patient suffers from, age, gender and method of admission to hospital).

The data used to produce the SHMI are generated from data the trusts submit to the Secondary Uses Service (SUS). The data are processed by the HSCIC to create Hospital Episode Statistics (HES) data, which are then linked with death registrations data from the Office for National Statistics (ONS) to enable capturing of deaths which occur outside of hospital. A combination of finalised and provisional HES data is used in the calculation of the SHMI to ensure that the indicator is as timely as possible<sup>12</sup>.

A SHMI is calculated for each trust and the baseline (national average) SHMI has a value of one. A trust will only have a SHMI which is equal to one if the number of patients who die following hospitalisation there is exactly the same as the number of patients expected to die based on the SHMI methodology<sup>13</sup>.

To help users of the data understand the SHMI, trusts have been categorised into one of the following three bandings:

- Where the trust's SHMI is 'higher than expected'
- Where the trust's SHMI is 'as expected'
- Where the trust's SHMI is 'lower than expected'

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<sup>9</sup> The SHMI is currently reported at trust level rather than site (hospital) level because of concerns around the accuracy of data on site of treatment in the Hospital Episode Statistics (HES) dataset. The HSCIC will continue to review the feasibility of reporting the SHMI at site level as part of the longer term development of the indicator.

<sup>10</sup> Specialist trusts, mental health trusts, community trusts and independent sector providers are excluded from the SHMI because there are important differences in the case-mix of patients treated there compared to non-specialist acute trusts and the SHMI has not been designed for these types of trusts.

<sup>11</sup> No adjustment is made for the severity of the condition, as this information is not captured in the Hospital Episode Statistics (HES) dataset upon which the SHMI is based. This means that if a trust treats a high (or low) proportion of seriously ill patients with a particular condition compared to other trusts, the statistical models used to estimate the expected number of deaths will not take account of this.

<sup>12</sup> Detailed information on the HES data used in the calculation of the SHMI is available in the HES SHMI Data Guidance document, which is available to download from <http://www.hscic.gov.uk/SHMI>.

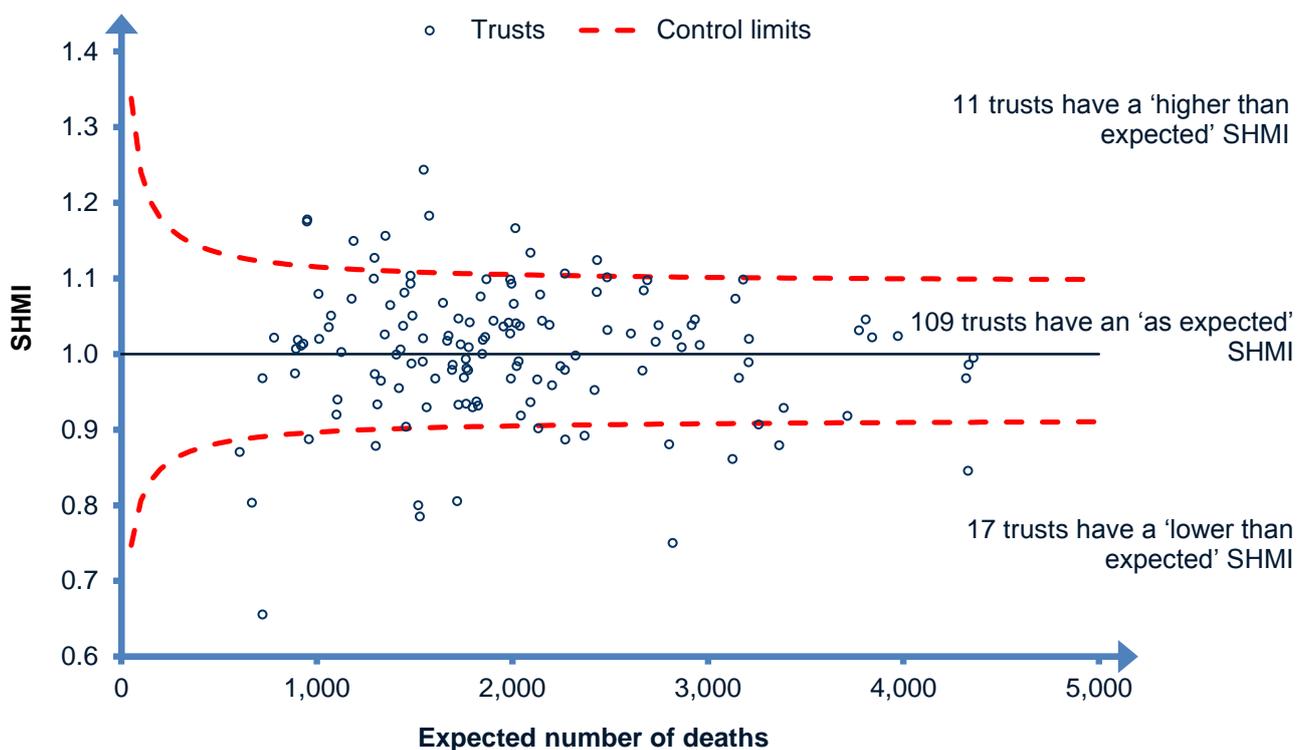
<sup>13</sup> Full details of the methodology used to calculate the SHMI are available in the SHMI methodology specification document, which is available to download from <http://www.hscic.gov.uk/SHMI>.

For any given number of expected deaths, a range of observed deaths is considered to be 'as expected'. If the observed number of deaths falls outside of this range, the trust in question is considered to have a higher or lower SHMI than expected. The range, the extremes of which are called control limits, can be calculated in a variety of ways<sup>14</sup>.

This is illustrated by the funnel plot in Figure 1, where the control limits are shown by the two dotted lines and the circles represent individual trusts.

- Trusts whose SHMI falls above the upper control limit are categorised as 'higher than expected'.
- Trusts whose SHMI falls between the upper and lower control limits are categorised as 'as expected'.
- Trusts whose SHMI falls below the lower control limit are categorised as 'lower than expected'.

Figure 1: Summary Hospital-level Mortality Indicator (SHMI) funnel plot, January 2014 – December 2014<sup>14</sup>



Source: Health and Social Care Information Centre

<sup>14</sup> Details of the calculation of the control limits can be referenced from the SHMI methodology specification document, which is available to download from <http://www.hscic.gov.uk/SHMI>.

Where a trust has an 'as expected' SHMI, it is inappropriate to conclude that their SHMI is lower than the national baseline, even if the number of observed deaths is smaller than the number of expected deaths. This is because the trust has been placed in the 'as expected' range because any variation from the number of expected deaths is not statistically significant.

The difference between the number of observed deaths and the number of expected deaths cannot be interpreted as the number of avoidable deaths for the trust. Whether or not a death could have been prevented can only be determined by a detailed case-note review. The SHMI is not a direct measure of quality of care.

A 'higher than expected' SHMI should not immediately be interpreted as indicating bad performance and instead should be viewed as a 'smoke alarm' which requires further investigation by the trust. Similarly, a 'lower than expected' SHMI should not immediately be interpreted as indicating good performance. The SHMI requires careful interpretation and should be used in conjunction with other indicators and information from other sources (e.g. patient feedback, staff surveys and other similar material) that together form a holistic view of trust outcomes.

The SHMI can be used by hospital trusts to compare their mortality outcomes to the national baseline. Regulators (for example, the Care Quality Commission) and commissioning organisations can also use the SHMI to investigate outcomes for trusts. However, it cannot be used to directly compare mortality outcomes between trusts and it is inappropriate to rank trusts according to their SHMI.

## Main findings

For the 137 trusts included in the SHMI for the period from 1 January 2014 to 31 December 2014:

- There were approximately 8.7 million finished provider spells, which resulted in 275,000 deaths either while in hospital or within 30 days of discharge. This includes deaths from other causes as well as deaths related to the reason for the hospital admission.
- 11 trusts had a 'higher than expected' SHMI. These trusts are listed in Table 1.
- 109 trusts had an 'as expected' SHMI.
- 17 trusts had a 'lower than expected' SHMI. These trusts are listed in Table 2.

SHMI data at trust level are available to download from our Indicator Portal site at <http://indicators.ic.nhs.uk/webview/>. The data can be found towards the bottom of the navigation tree on the left-hand side of the page under *Summary Hospital-level Mortality Indicator > Recent SHMI Publications*. The 'Downloads' section is at the bottom of the resulting page. The data can be found in the 'SHMI data at trust level' file in the 'SHMI data' folder of the zip file for each publication.

**Table 1: Trusts with a 'higher than expected' SHMI for discharges in the reporting period January 2014 – December 2014**

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Trust code	Trust name
RE9	South Tyneside NHS Foundation Trust
RGP	James Paget University Hospitals NHS Foundation Trust
RLQ	Wye Valley NHS Trust
RMP	Tameside Hospital NHS Foundation Trust
RP5	Doncaster and Bassetlaw Hospitals NHS Foundation Trust
RPA	Medway NHS Foundation Trust
RVW	North Tees and Hartlepool NHS Foundation Trust
RWH	East and North Hertfordshire NHS Trust
RWW	Warrington and Halton Hospitals NHS Foundation Trust
RXC	East Sussex Healthcare NHS Trust
RXL	Blackpool Teaching Hospitals NHS Foundation Trust

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Source: Health and Social Care Information Centre

**Table 2: Trusts with a ‘lower than expected’ SHMI for discharges in the reporting period January 2014 – December 2014**

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Trust code	Trust name
R1H	Barts Health NHS Trust
R1K	London North West Healthcare NHS Trust
RA2	Royal Surrey County Hospital NHS Foundation Trust
RAL	Royal Free London NHS Foundation Trust
RAX	Kingston Hospital NHS Foundation Trust
RFW	West Middlesex University Hospital NHS Trust
RGT	Cambridge University Hospitals NHS Foundation Trust
RJ1	Guy’s and St Thomas’ NHS Foundation Trust
RJ7	St George’s University Hospitals NHS Foundation Trust
RJZ	King’s College Hospital NHS Foundation Trust
RKE	The Whittington Hospital NHS Trust
RQM	Chelsea and Westminster Hospital NHS Foundation Trust
RQX	Homerton University Hospital NHS Foundation Trust
RRV	University College London Hospitals NHS Foundation Trust
RWG	West Hertfordshire Hospitals NHS Trust
RXF	Mid Yorkshire Hospitals NHS Trust
RYJ	Imperial College Healthcare NHS Trust

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*Source: Health and Social Care Information Centre*

## Feedback

We welcome user feedback on this publication. This should be sent to [enquiries@hscic.gov.uk](mailto:enquiries@hscic.gov.uk), including ‘SHMI’ in the subject line.

The next edition of this report is due to be released in October 2015.

## Repeat outliers

For the purposes of this report, repeat outliers are defined as trusts which have either a 'higher than expected' SHMI or a 'lower than expected' SHMI for both the most recent reporting period and the same period in the previous year. The rationale for this is that these reporting periods do not overlap and, therefore, the observed values of the SHMI do not contain correlated data.

For the July 2014 publication (covering discharges in the reporting period January 2013 – December 2013) and the July 2015 publication (covering discharges in the reporting period January 2014 – December 2014), the five trusts listed in Table 3 were categorised as 'higher than expected' in both publications. These trusts are referred to as 'higher than expected repeat outliers' in the remainder of this report.

**Table 3: Trusts with a SHMI categorised as 'higher than expected' in both the July 2014 and July 2015 publications, along with their SHMI bandings for the October 2014, January 2015 and April 2015 publications**

Trust code	Trust name	SHMI publication				
		Jul 14	Oct 14	Jan 15	Apr 15	Jul 15
RLQ	Wye Valley NHS Trust	H	H	A	H	H
RPA	Medway NHS Foundation Trust	H	H	H	H	H
RVW	North Tees and Hartlepool NHS Foundation Trust	H	H	H	H	H
RXC	East Sussex Healthcare NHS Trust	H	A	A	A	H
RXL	Blackpool Teaching Hospitals NHS Foundation Trust	H	H	H	H	H

Source: Health and Social Care Information Centre

**Notes:**

H – SHMI is 'higher than expected'  
A – SHMI is 'as expected'

- Three of the five trusts listed in Table 3 have been categorised as 'higher than expected' in all five publications.
- Wye Valley NHS Trust has been categorised as 'as expected' in one out of the five publications and East Sussex Healthcare NHS Trust has been categorised as 'as expected' in three out of the five publications.
- Wye Valley NHS Trust, North Tees and Hartlepool NHS Foundation Trust and Blackpool Teaching Hospitals NHS Foundation Trust were identified as higher than expected repeat outliers in the previous edition of this report (published in April 2015<sup>15</sup>).
- Medway NHS Foundation Trust and East Sussex Healthcare NHS Trust were not identified as higher than expected repeat outliers in the previous edition of this report.
- Aintree University Hospital NHS Foundation Trust and East and North Hertfordshire NHS Trust were identified as higher than expected repeat outliers in the previous edition of this report, but are not identified as higher than expected repeat outliers in this report.

<sup>15</sup> The previous edition of this report is available to download at <http://www.hscic.gov.uk/pubs/shmioc13sep14>.

For the July 2014 publication (covering discharges in the reporting period January 2013 – December 2013) and the July 2015 publication (covering discharges in the reporting period January 2014 – December 2014), the nine trusts listed in Table 4 were categorised as ‘lower than expected’ in both publications. These trusts are referred to as ‘lower than expected repeat outliers’ in the remainder of this report.

**Table 4: Trusts with a SHMI categorised as ‘lower than expected’ in both the July 2014 and July 2015 publications, along with their SHMI bandings for the October 2014, January 2015 and April 2015 publications**

Trust code	Trust name	SHMI publication				
		Jul 14	Oct 14	Jan 15	Apr 15	Jul 15
R1H	Barts Health NHS Trust	L	L	L	L	L
RAL	Royal Free London NHS Foundation Trust	L	L	L	L	L
RGT	Cambridge University Hospitals NHS Foundation Trust	L	L	L	L	L
RJ1	Guy’s and St Thomas’ NHS Foundation Trust	L	L	L	L	L
RJ7	St George’s University Hospitals NHS Foundation Trust	L	L	L	L	L
RKE	The Whittington Hospital NHS Trust	L	L	L	L	L
RQM	Chelsea and Westminster Hospital NHS Foundation Trust	L	L	L	L	L
RRV	University College London Hospitals NHS Foundation Trust	L	L	L	L	L
RYJ	Imperial College Healthcare NHS Trust	L	L	L	L	L

Source: Health and Social Care Information Centre

**Notes:**

L – SHMI is ‘lower than expected’

- All of the trusts listed in Table 4 have been categorised as ‘lower than expected’ in all five publications.
- All of the trusts listed in Table 4 (and no others) were identified as lower than expected repeat outliers in the previous edition of this report<sup>15</sup>.

## Analysis of contextual indicators

To support the interpretation of the SHMI, various contextual indicators are published alongside it. These contextual indicators are selected and released in order of priority from the list defined by the Steering Group for the National Review of the Hospital Standardised Mortality Ratio, with new indicators recommended by the SHMI Technical Working Group.

In this section, the SHMI contextual indicators are analysed for all trusts, and for trusts which are repeat outliers. When making comparisons between the two groups of repeat outliers it is important to note that there are different numbers of trusts in each group, and more variation might be expected in the group with the smaller number of trusts i.e. trusts which are higher than expected repeat outliers. Similarly, the total number of trusts may vary slightly between SHMI publications due to organisational changes such as trust mergers.

Contextual indicator data at trust level are available to download from our Indicator Portal site at <http://indicators.ic.nhs.uk/webview/>. The data can be found towards the bottom of the navigation tree on the left-hand side of the page under *Summary Hospital-level Mortality Indicator > Recent SHMI Publications*. The 'Downloads' section is at the bottom of the resulting page. The data can be found in the 'SHMI contextual indicator data' folder of the zip file for each publication.

## Palliative care coding contextual indicators

The SHMI methodology does not make any adjustment for patients who are recorded as receiving palliative care. This is because there is considerable variation between trusts in the way that palliative care codes are used<sup>16</sup>. As an interim solution for this issue and pending the adoption of new national coding guidelines, two contextual indicators relating to palliative care are published alongside the SHMI:

- Percentage of provider spells with palliative care coding
- Percentage of deaths with palliative care coding

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<sup>16</sup> Details of further analysis on this issue can be referenced in the Palliative Care Coding Report, which is available to download from <http://www.hscic.gov.uk/shmi-development>.

Table 5 presents the palliative care contextual indicators for each of the five most recent SHMI publications calculated for all trusts, and for trusts which are repeat outliers.

**Table 5: Palliative care contextual indicators for all trusts and for trusts which are repeat outliers**

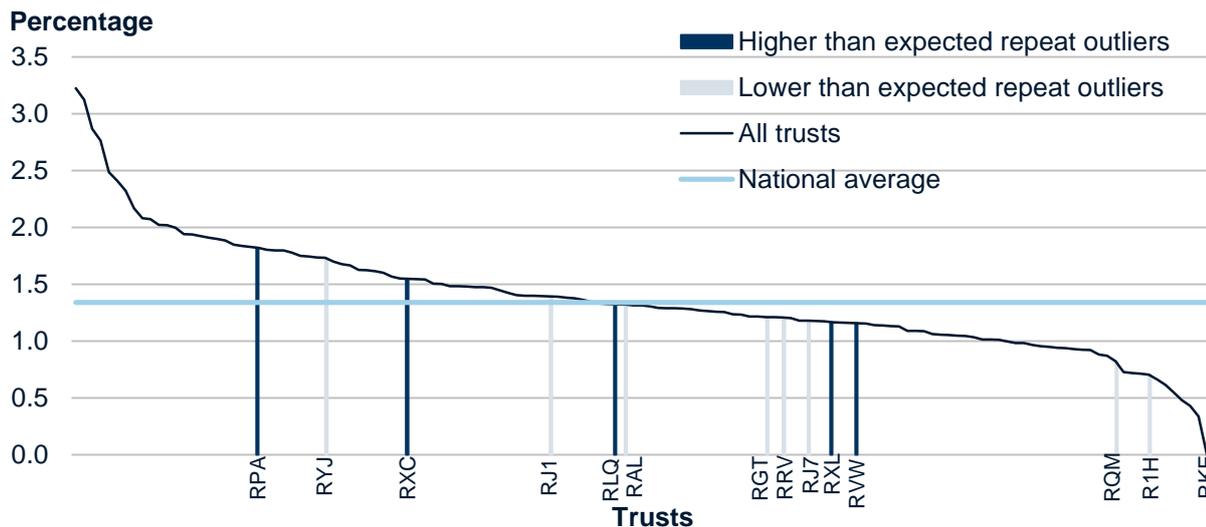
SHMI publication	All trusts	Trusts which are repeat outliers:	
		Higher than expected (5 trusts)	Lower than expected (9 trusts)
<b>Percentage of finished provider spells with palliative care coding (at either diagnosis or treatment specialty level)</b>			
Jul 14	1.2	1.3	0.9
Oct 14	1.3	1.3	1.0
Jan 15	1.3	1.3	1.0
Apr 15	1.3	1.3	1.1
Jul 15	1.3	1.4	1.1
<b>Percentage of deaths reported in the SHMI with palliative care coding (at either diagnosis or treatment specialty level)</b>			
Jul 14	22.0	19.1	23.1
Oct 14	23.6	20.4	24.6
Jan 15	24.6	20.9	26.5
Apr 15	25.3	21.9	27.4
Jul 15	25.7	22.8	28.5

Source: Health and Social Care Information Centre

- There has been little change in the overall percentage of finished provider spells with palliative care coding at either diagnosis or treatment specialty level.
- There has been a steady increase in the overall percentage of deaths reported in the SHMI with palliative care coding at either diagnosis or treatment specialty level.
- Trusts which are higher than expected repeat outliers on average show a similar percentage of finished provider spells and a lower percentage of deaths reported in the SHMI with palliative care coding at either diagnosis or treatment specialty level, compared to trusts overall.
- Trusts which are lower than expected repeat outliers on average show a slightly lower percentage of finished provider spells and a higher percentage of deaths reported in the SHMI with palliative care coding at either diagnosis or treatment specialty level, compared to trusts overall.

Figure 2 shows the distribution of the percentage of finished provider spells with palliative care coding (at either diagnosis or treatment specialty level) for all trusts, with trusts which are repeat outliers highlighted, using data from the July 2015 SHMI publication (covering discharges in the reporting period January 2014 – December 2014).

**Figure 2: Percentage of finished provider spells with palliative care coding (at either diagnosis or treatment specialty level) for all trusts and for trusts which are repeat outliers, January 2014 – December 2014<sup>17</sup>**



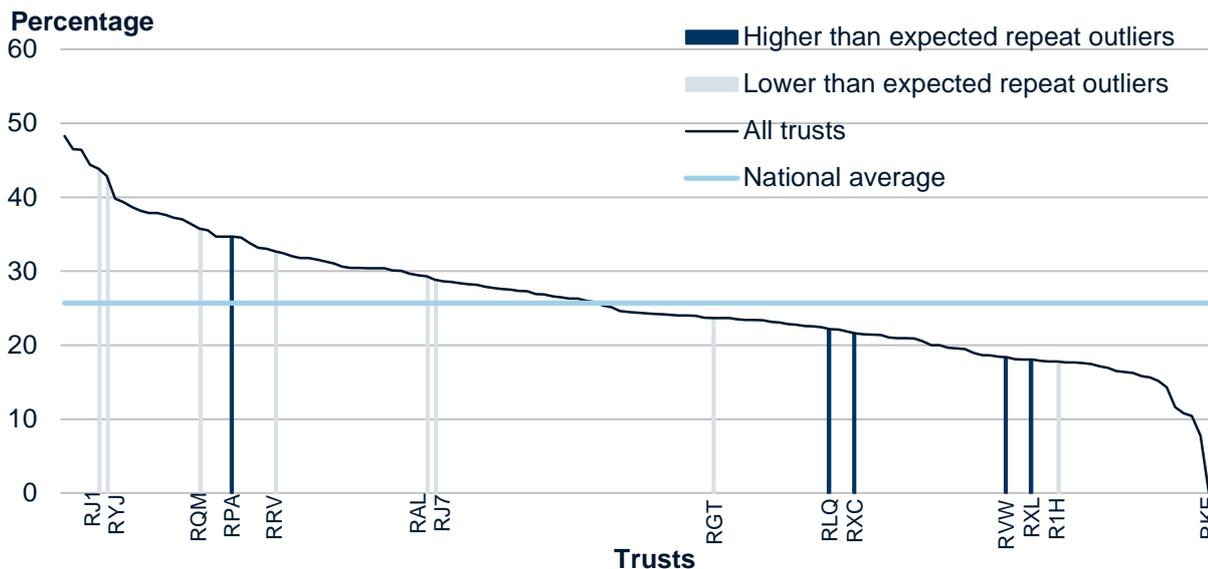
Source: Health and Social Care Information Centre

- There is some variation between trusts in the percentage of finished provider spells with palliative care coding at either diagnosis or treatment specialty level.
- Nationally, approximately 1.3 per cent of finished provider spells have palliative care coded at either diagnosis or treatment specialty level.
- This percentage ranges from 0.0 per cent to 3.2 per cent for individual trusts.
- Two out of the nine lower than expected repeat outliers and two out of the five higher than expected repeat outliers have a percentage of finished provider spells with palliative care coding which is higher than the national average.

<sup>17</sup> The trust names corresponding to the trust codes used in this figure are provided in Table 3 and Table 4. The data for the repeat outliers that have been used in the construction of this chart are available in Table 8 in Appendix A.

Figure 3 shows the distribution of the percentage of deaths reported in the SHMI with palliative care coding (at either diagnosis or treatment specialty level) for all trusts, with trusts which are repeat outliers highlighted, using data from the July 2015 SHMI publication (covering discharges in the reporting period January 2014 – December 2014).

**Figure 3: Percentage of deaths reported in the SHMI with palliative care coding (at either diagnosis or treatment specialty level) for all trusts and for trusts which are repeat outliers, January 2014 – December 2014<sup>18</sup>**



Source: Health and Social Care Information Centre

- There is wide variation between trusts in the percentage of deaths reported in the SHMI with palliative care coding at either diagnosis or treatment specialty level.
- Nationally, approximately 25.7 per cent of deaths reported in the SHMI have palliative care coded at either diagnosis or treatment specialty level.
- This percentage ranges from 0.0 per cent to 48.3 per cent between individual trusts.
- Six out of the nine lower than expected repeat outliers and one out of the five higher than expected repeat outliers have a percentage of deaths reported in the SHMI with palliative care coding which is higher than the national average.

Table 8 in Appendix A gives the values of the palliative care contextual indicators for the trusts which are repeat outliers, using data from the July 2015 SHMI publication (covering discharges in the reporting period January 2014 – December 2014).

<sup>18</sup> The trust names corresponding to the trust codes used in this figure are provided in Table 3 and Table 4. The data for the repeat outliers that have been used in the construction of this chart are available in Table 8 in Appendix A.

## Admission method contextual indicators

An adjustment is made for admission method in the SHMI methodology because crude mortality rates for elective admissions tend to be lower than crude mortality rates for non-elective admissions. Two contextual indicators on admission method are published alongside the SHMI:

- Deaths within 30 days for elective admissions
- Deaths within 30 days for non-elective admissions

Table 6 presents the admission method contextual indicators for each of the five most recent SHMI publications calculated for all trusts, and for trusts which are repeat outliers.

**Table 6: Admission method contextual indicators for all trusts and for trusts which are repeat outliers**

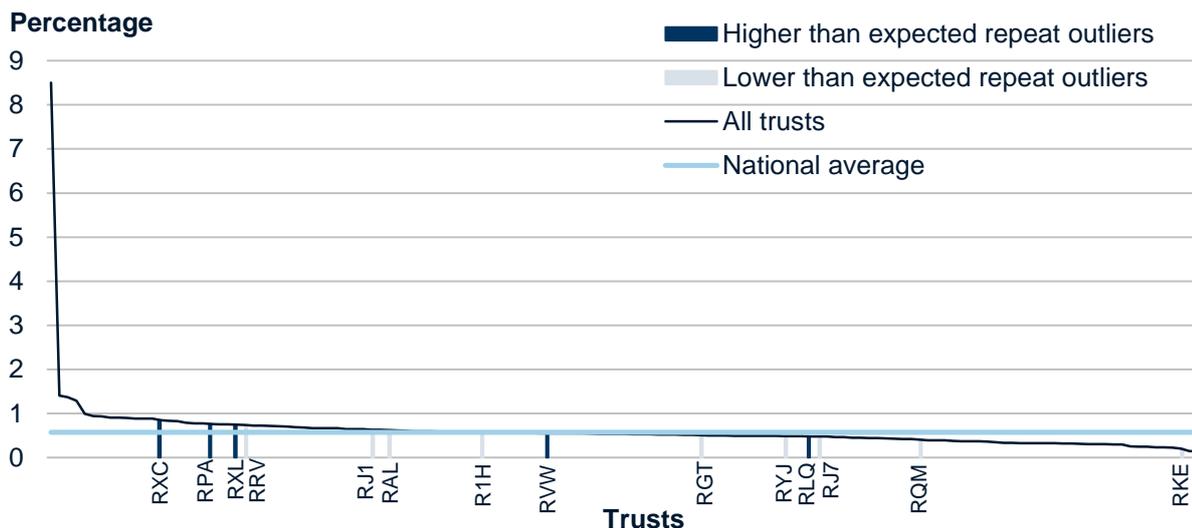
SHMI publication	All trusts	Trusts which are repeat outliers:	
		Higher than expected (5 trusts)	Lower than expected (9 trusts)
<b>Percentage of elective admissions where a death occurs either in hospital or within 30 days of discharge</b>			
Jul 14	0.6	0.7	0.6
Oct 14	0.6	0.6	0.6
Jan 15	0.6	0.7	0.6
Apr 15	0.6	0.7	0.6
Jul 15	0.6	0.7	0.6
<b>Percentage of non-elective admissions where a death occurs either in hospital or within 30 days of discharge</b>			
Jul 14	3.8	4.7	2.5
Oct 14	3.6	4.6	2.5
Jan 15	3.6	4.5	2.5
Apr 15	3.6	4.5	2.5
Jul 15	3.6	4.6	2.6

Source: Health and Social Care Information Centre

- There has been little change in the mortality rates for elective and non-elective admissions. The overall mortality rate for elective admissions is lower than that for non-elective admissions.
- Higher than expected repeat outliers on average show slightly higher mortality rates for elective admissions, compared to trusts overall. Lower than expected repeat outliers on average show similar mortality rates for elective admissions, compared to trusts overall.
- Higher than expected repeat outliers on average show higher mortality rates for non-elective admissions, compared to trusts overall. Lower than expected repeat outliers on average show lower mortality rates for non-elective admissions, compared to trusts overall.

Figure 4 shows the distribution of the percentage of elective admissions where a death occurs either in hospital or within 30 days of discharge for all trusts, with trusts which are repeat outliers highlighted, using data from the July 2015 SHMI publication (covering discharges in the reporting period January 2014 – December 2014).

**Figure 4: Percentage of elective admissions where a death occurs either in hospital or within 30 days of discharge for all trusts and for trusts which are repeat outliers, January 2014 – December 2014<sup>19</sup>**



Source: Health and Social Care Information Centre

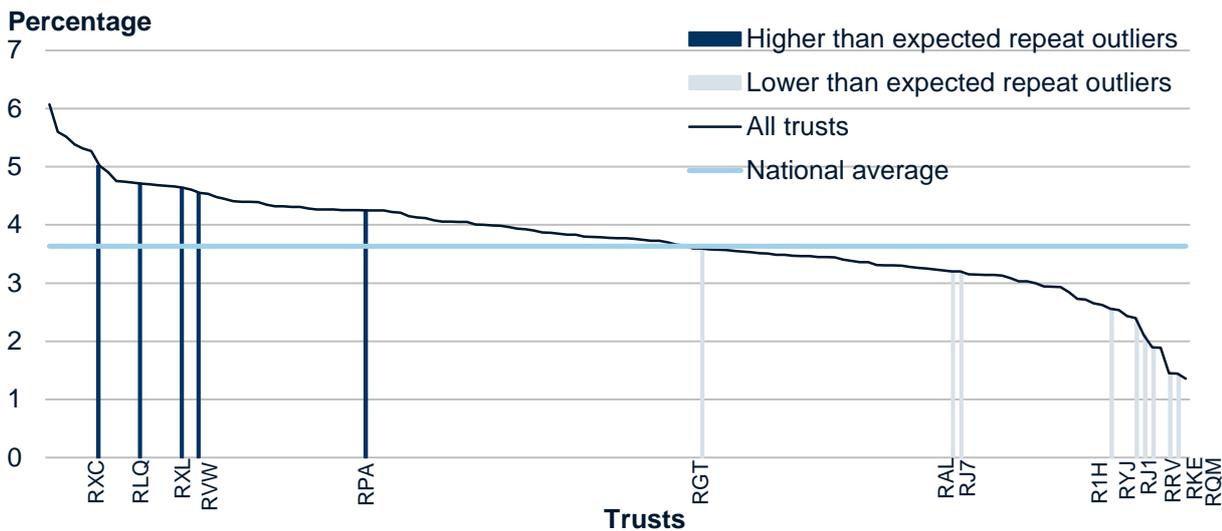
- Nationally, approximately 0.6 per cent of elective admissions result in a death occurring either in hospital or within 30 days of discharge.
- This percentage ranges from 0.1 per cent to 8.5 per cent<sup>20</sup> between individual trusts.
- Three out of the five higher than expected repeat outliers and four out of the nine lower than expected repeat outliers have a percentage of elective admissions resulting in a death that is higher than the national average.

<sup>19</sup> The trust names corresponding to the trust codes used in this figure are provided in Table 3 and Table 4. The data for the repeat outliers that have been used in the construction of this chart are available in Table 9 in Appendix A.

<sup>20</sup> One trust has a crude mortality rate for elective admissions which is much higher than that for all other trusts. Of the 166 deaths with an elective admission method for the period January 2014 – December 2014 for this trust, 150 have a site of treatment corresponding to a hospice providing palliative care. Excluding this trust, the percentage of elective admissions where a death occurs either in hospital or within 30 days of discharge ranges from 0.1 per cent to 1.4 per cent between individual trusts and is 0.6 per cent nationally.

Figure 5 shows the distribution of the percentage of non-elective admissions where a death occurs either in hospital or within 30 days of discharge for all trusts, with trusts which are repeat outliers highlighted, using data from the July 2015 SHMI publication (covering discharges in the reporting period January 2014 – December 2014).

**Figure 5: Percentage of non-elective admissions where a death occurs either in hospital or within 30 days of discharge for all trusts and for trusts which are repeat outliers, January 2014 – December 2014<sup>21</sup>**



Source: Health and Social Care Information Centre

- Nationally, approximately 3.6 per cent of non-elective admissions result in a death occurring either in hospital or within 30 days of discharge.
- This percentage ranges from 1.4 per cent to 6.1 per cent between individual trusts.
- All of the lower than expected repeat outliers have a percentage of non-elective admissions resulting in a death that is lower than the national average, while all of the higher than expected repeat outliers have a percentage of non-elective admissions resulting in a death that is higher than the national average.

Table 9 in Appendix A gives the values of the admission method contextual indicators for the trusts which are repeat outliers, using data from the July 2015 SHMI publication (covering discharges in the reporting period January 2014 – December 2014).

<sup>21</sup> The trust names corresponding to the trust codes used in this figure are provided in Table 3 and Table 4. The data for the repeat outliers that have been used in the construction of this chart are available in Table 9 in Appendix A.

## In and out of hospital deaths contextual indicator

The SHMI includes all deaths reported of patients who were admitted to non-specialist acute trusts in England and either die while in hospital or within 30 days of discharge. A contextual indicator on in and out of hospital deaths is published alongside the SHMI:

- Deaths split by those occurring in hospital and those occurring outside hospital within 30 days of discharge

Table 7 presents the percentage of deaths reported in the SHMI which occurred in hospital for each of the five most recent SHMI publications calculated for all trusts, and for trusts which are repeat outliers.

**Table 7: Percentage of deaths reported in the SHMI which occurred in hospital for all trusts and for trusts which are repeat outliers**

SHMI publication	All trusts	Trusts which are repeat outliers:	
		Higher than expected (5 trusts)	Lower than expected (9 trusts)
<b>Percentage of deaths reported in the SHMI which occurred in hospital</b>			
Jul 14	72.7	73.5	74.0
Oct 14	72.2	73.0	74.2
Jan 15	71.7	72.6	74.1
Apr 15	71.6	72.7	73.9
Jul 15	71.5	72.5	74.1

Source: Health and Social Care Information Centre

- There has been a slight decrease in the overall percentage of deaths reported in the SHMI which occurred in hospital.
- Higher than expected repeat outliers on average show a slightly higher percentage of deaths reported in the SHMI which occurred in hospital compared to trusts overall. Lower than expected repeat outliers on average also show a higher percentage of deaths reported in the SHMI which occurred in hospital compared to trusts overall.



## Deprivation contextual indicators

The SHMI methodology does not make any adjustment for deprivation. This is because adjusting for deprivation might create the impression that a higher death rate for those who are more deprived is acceptable, and has the potential to remove from the SHMI some of the differences that it is designed to measure<sup>23</sup>. Two contextual indicators on deprivation are published alongside the SHMI to support its interpretation:

- Provider spells split by deprivation quintile
- Deaths split by deprivation quintile

For both of the above indicators, the deprivation quintile is defined using the Index of Multiple Deprivation (IMD) 2010 Overall Rank field in the HES dataset. The IMD attempts to measure a broad concept of deprivation composed of several different domains, including income, employment, health deprivation and disability, education, skills and training, barriers to housing and services, crime, living environment. Each of the 32,482 Lower Super Output Areas<sup>24</sup> (LSOAs) in England has been assigned a rank. The LSOA with a rank of 1 is the most deprived and the LSOA with a rank of 32,482 is the least deprived based on this overall measure. Each provider spell in the HES dataset has an IMD Overall Rank which takes an integer value between 1 and 32,482 or is missing (for example, because the patient's postcode is unknown).

Patient records are assigned to one of five deprivation groups (called quintiles) using the IMD Overall Rank field in the HES dataset. Deprivation quintile 1 is the most deprived group and deprivation quintile 5 is the least deprived group. Records where there is no IMD Overall Rank are assigned to the NULL deprivation quintile.

Figure 7 shows the percentage of finished provider spells belonging to each deprivation quintile for all trusts and for trusts which are repeat outliers, using data from the July 2015 SHMI publication (covering discharges in the reporting period January 2014 – December 2014), while Figure 8 shows the percentage of deaths reported in the SHMI belonging to each deprivation quintile for all trusts and for trusts which are repeat outliers for the same reporting period.

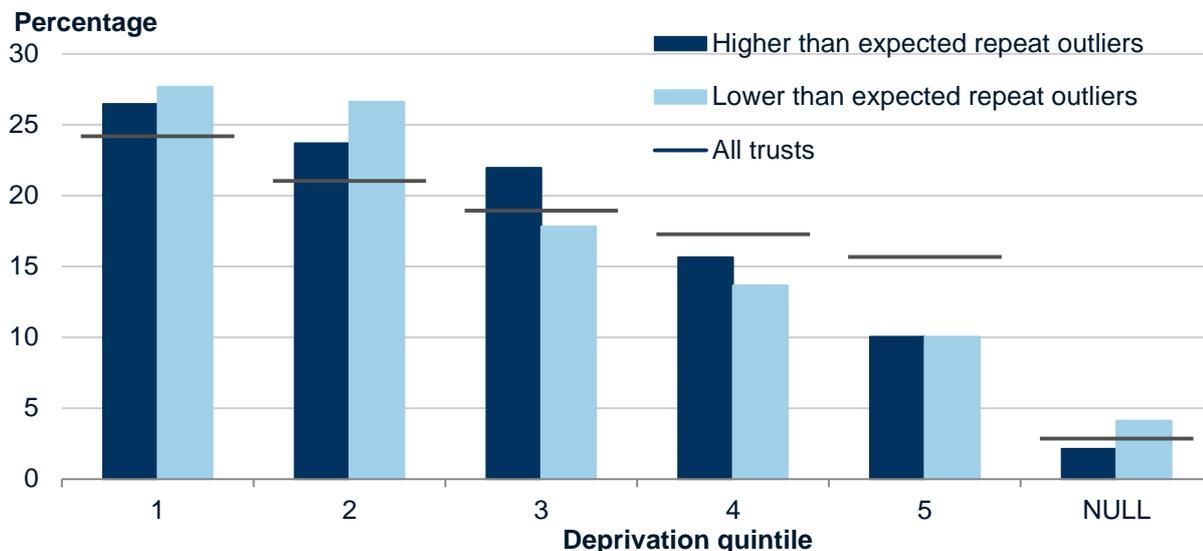
The percentage of finished provider spells and deaths for which there is insufficient information to calculate the deprivation quintile has decreased compared to the same period in the previous year. This is due to improvements in the way that postcodes are populated for birth records in the underlying HES data resulting in fewer records with missing postcodes.

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<sup>23</sup> More detailed analysis can be found in the Report on the Impact of Deprivation on the SHMI, which is available to download from <http://www.hscic.gov.uk/shmi-development>.

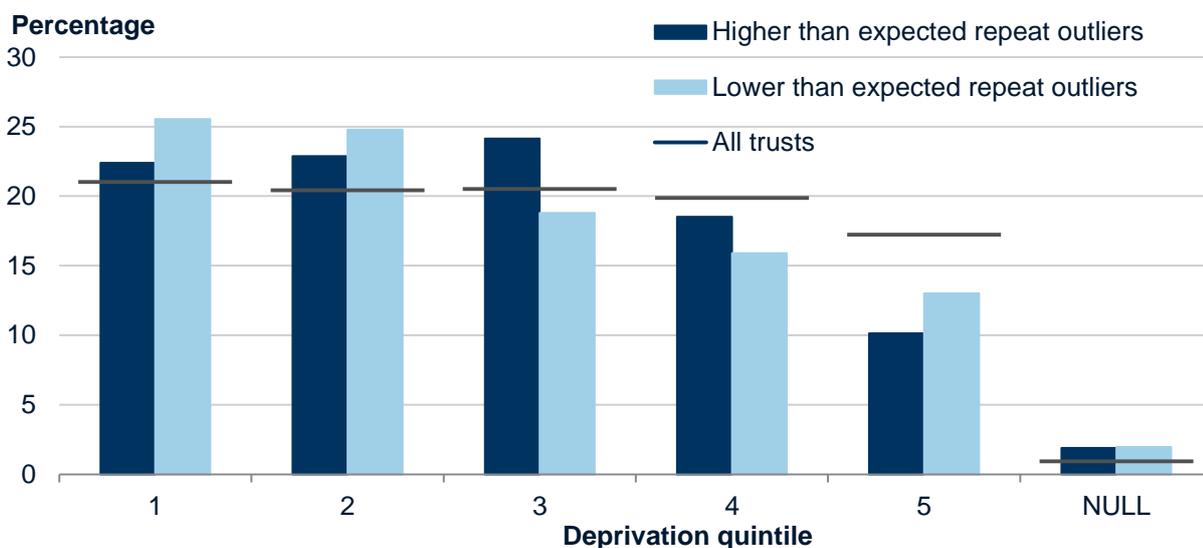
<sup>24</sup> Lower Super Output Areas are homogenous small areas of relatively even size (around 1,500 people), of which there are 32,482 in England.

**Figure 7: Percentage of finished provider spells belonging to each deprivation quintile for all trusts and for trusts which are repeat outliers, January 2014 – December 2014**



Source: Health and Social Care Information Centre

**Figure 8: Percentage of deaths reported in the SHMI belonging to each deprivation quintile for all trusts and for trusts which are repeat outliers, January 2014 – December 2014**

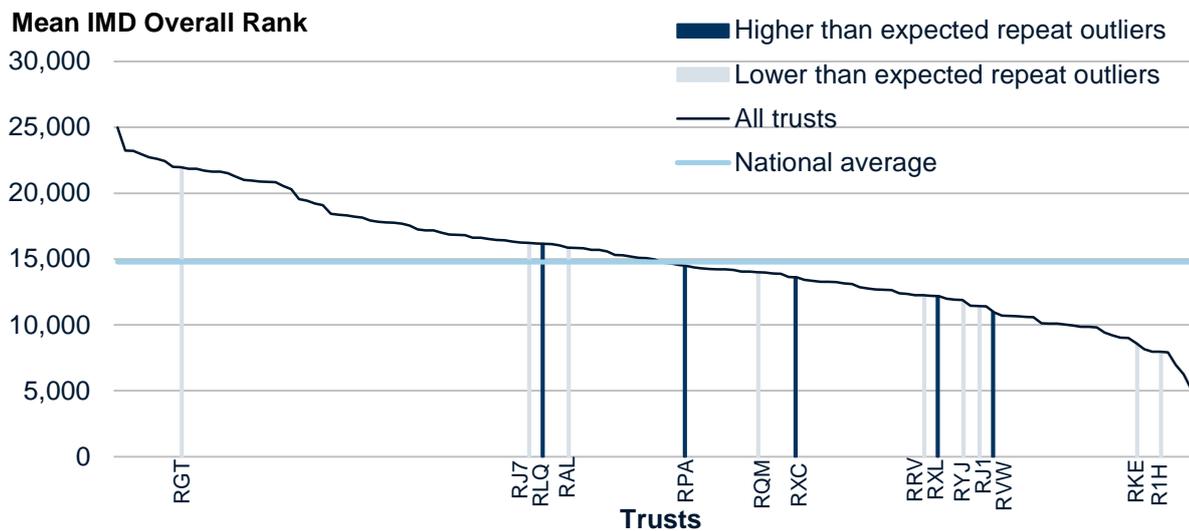


Source: Health and Social Care Information Centre

- Higher than expected repeat outliers on average show a higher percentage of finished provider spells and deaths reported in the SHMI which fall under deprivation quintiles 1, 2 and 3 (the most deprived) and a lower percentage of finished provider spells and deaths which fall under other deprivation quintiles, compared to trusts overall.
- Lower than expected repeat outliers on average show a higher percentage of finished provider spells and deaths reported in the SHMI which fall under deprivation quintiles 1 and 2 (the most deprived) and a lower percentage of finished provider spells and deaths which fall under other deprivation quintiles, compared to trusts overall.

Figure 9 shows the distribution of the mean<sup>25</sup> IMD Overall Rank over all finished provider spells<sup>26</sup> for all trusts, with trusts which are repeat outliers highlighted, using data from the July 2015 SHMI publication (covering discharges in the reporting period January 2014 – December 2014).

**Figure 9: Mean IMD Overall Rank over all finished provider spells<sup>26</sup> for all trusts and for trusts which are repeat outliers, January 2014 – December 2014<sup>27</sup>**



Source: Health and Social Care Information Centre

- There is wide variation between trusts in the mean level of deprivation across finished provider spells.
- Nationally, the mean IMD Overall Rank over all finished provider spells is approximately 14,800.
- This value ranges from 5,070 to 24,979 between individual trusts.
- Six out of the nine lower than expected repeat outliers and four out of the five higher than expected repeat outliers have a mean IMD Overall Rank over all finished provider spells which is lower than the national average i.e. a higher level of deprivation.

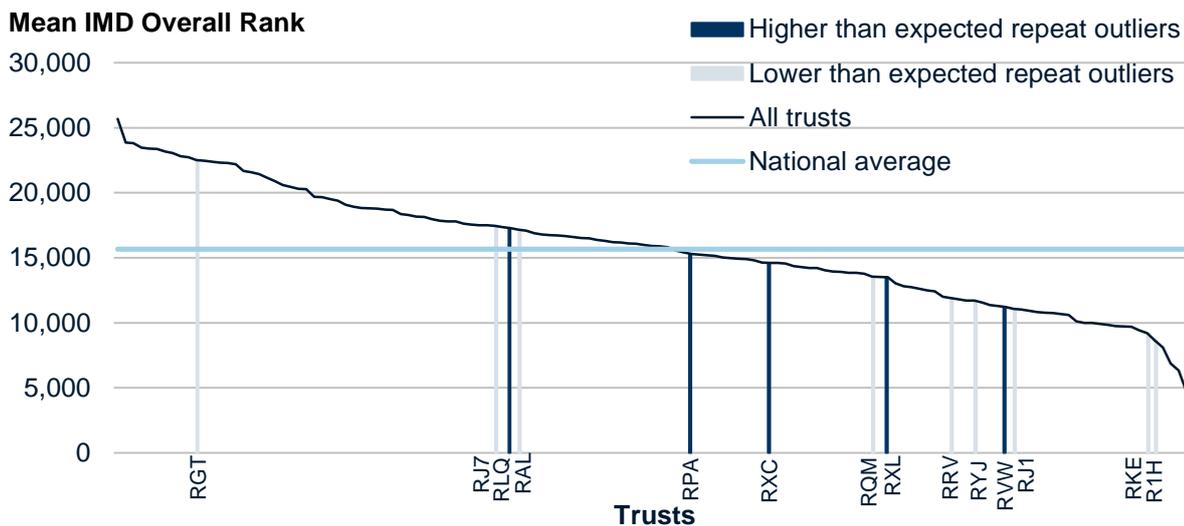
<sup>25</sup> In this report, mean refers to the arithmetic mean.

<sup>26</sup> Spells with a missing IMD Overall Rank have been excluded from the calculation.

<sup>27</sup> The trust names corresponding to the trust codes used in this figure are provided in Table 3 and Table 4. The data for the repeat outliers that have been used in the construction of this chart are available in Table 12 in Appendix A.

Figure 10 shows the distribution of the mean IMD Overall Rank over all deaths<sup>28</sup> reported in the SHMI for all trusts, with trusts which are repeat outliers highlighted, using data from the July 2015 SHMI publication (covering discharges in the reporting period January 2014 – December 2014).

**Figure 10: Mean IMD Overall Rank over all deaths<sup>28</sup> reported in the SHMI for all trusts and for trusts which are repeat outliers, January 2014 – December 2014<sup>29</sup>**



Source: Health and Social Care Information Centre

- There is wide variation between trusts in the mean level of deprivation over all deaths reported in the SHMI.
- Nationally, the mean IMD Overall Rank over all deaths reported in the SHMI is approximately 15,700.
- This value ranges from 4,702 to 25,688 between individual trusts.
- Six out of the nine lower than expected repeat outliers and four out of the five higher than expected repeat outliers have a mean IMD Overall Rank over all deaths reported in the SHMI which is lower than the national average i.e. a higher level of deprivation.

Table 11 in Appendix A gives the values of the deprivation contextual indicators for the trusts which are repeat outliers, using data from the July 2015 SHMI publication (covering discharges in the reporting period January 2014 – December 2014). Table 12 in Appendix A gives the mean IMD Overall Rank for trusts which are repeat outliers, using the same dataset.

<sup>28</sup> Deaths with a missing IMD Overall Rank have been excluded from the calculation.

<sup>29</sup> The trust names corresponding to the trust codes used in this figure are provided in Table 3 and Table 4. The data for the repeat outliers that have been used in the construction of this chart are available in Table 12 in Appendix A.

## Analysis of SHMI diagnosis groups

The SHMI is made up of 140 different diagnosis groups<sup>30</sup>. Provider spells are assigned to diagnosis groups based on the primary diagnosis of the first episode in the provider spell<sup>31</sup>. The analysis in this section will consider the following ten SHMI diagnosis groups:

- Group 2 – septicaemia (except in labour), shock
- Group 15 – cancer of bronchus, lung
- Group 30 – secondary malignancies
- Group 37 – fluid and electrolyte disorders
- Group 57 – acute myocardial infarction
- Group 73 – pneumonia (except that caused by tuberculosis or sexually transmitted disease)
- Group 74 – acute bronchitis
- Group 96 – gastrointestinal hemorrhage
- Group 101 – urinary tract infections
- Group 120 – fracture of neck of femur (hip)

These groups have been selected because they have high levels of patient activity and the underlying statistical models which are used to calculate the expected number of deaths are considered to have sufficiently explained the expected variation in outcomes<sup>32</sup>.

The risk of the patient dying in hospital or within 30 days of discharge is estimated from a statistical model based on the following variables:

- the condition the patient is in hospital for<sup>33</sup>
- other underlying conditions the patient suffers from
- the age of the patient
- the sex of the patient
- the method of admission to hospital (elective/non-elective/unknown)

The expected number of deaths is the total of the risk estimates for all finished provider spells for a particular trust and diagnosis group.

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<sup>30</sup> Details of the 140 diagnosis groups can be found in Appendix A of the SHMI methodology specification document, which is available to download at <http://www.hscic.gov.uk/SHMI>.

<sup>31</sup> If the primary diagnosis for the first episode in the spell is a symptom or sign then the primary diagnosis from the second episode in the spell is used, unless this is also a symptom or sign in which case the primary diagnosis from the first episode is used.

<sup>32</sup> The success of the case-mix adjustment in predicting the outcome is evaluated using the c statistic for each statistical model. Models are typically considered to be reasonable if the c statistic is 0.7 or higher, and this is the case for all ten SHMI diagnosis groups selected for further analysis.

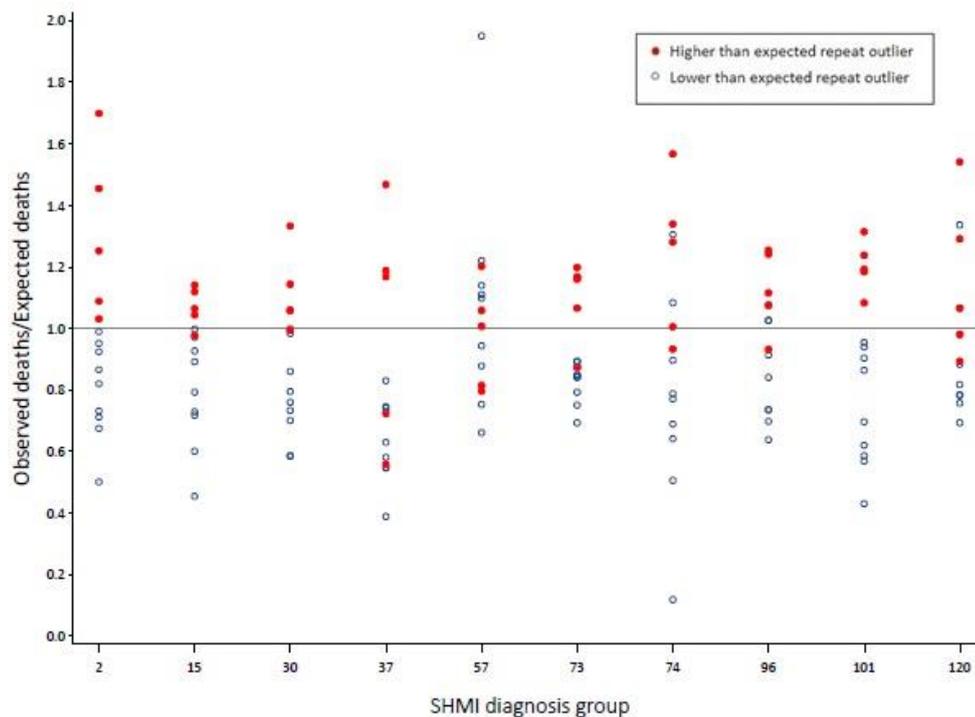
<sup>33</sup> No adjustment is made for the severity of the condition, as this information is not captured in the Hospital Episode Statistics (HES) dataset upon which the SHMI is based. This means that if a trust treats a high (or low) proportion of seriously ill patients with a particular condition compared to other trusts, the statistical models used to estimate the expected number of deaths will not take account of this.

## Ratio of observed to expected deaths

For a particular trust and SHMI diagnosis group, a ratio of observed to expected deaths which is less than one means that there were fewer deaths than expected, while a ratio of observed to expected deaths which is greater than one means that there were more deaths than expected.

Figure 11 shows the ratio of observed to expected deaths for trusts which are repeat outliers for each of the ten diagnosis groups selected for further analysis. Each circle represents the ratio of observed to expected deaths for a particular trust and diagnosis group.

**Figure 11: Ratio of observed to expected deaths for ten of the SHMI diagnosis groups<sup>34</sup> for trusts which are repeat outliers, January 2014 – December 2014<sup>35</sup>**



Source: Health and Social Care Information Centre

- For most of the ten diagnosis groups, the majority of higher than expected repeat outliers have a ratio of observed to expected deaths which is greater than one and the majority of lower than expected repeat outliers have a ratio which is less than one.
- For diagnosis group 57 (acute myocardial infarction), five of the lower than expected repeat outliers have a ratio of observed to expected deaths which is greater than one.

Table 13 in Appendix A gives the ratio of observed to expected deaths for the ten diagnosis groups for the trusts identified as repeat outliers.

<sup>34</sup> The diagnosis group descriptions corresponding to the SHMI diagnosis group numbers used in this table are provided on page 30 of this report.

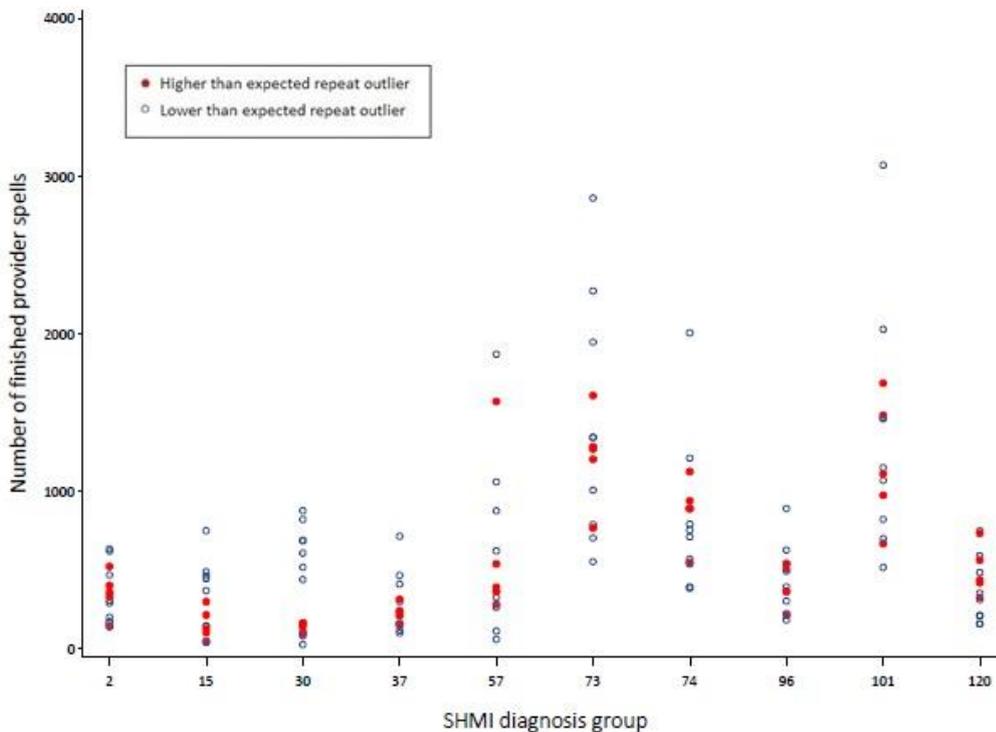
<sup>35</sup> The expected number of deaths has been calculated using the statistical models for the July 2015 SHMI publication.

## Number of finished provider spells

The number of finished provider spells gives a measure of the level of activity for each SHMI diagnosis group.

Figure 12 shows the number of finished provider spells for trusts which are repeat outliers for each of the ten diagnosis groups selected for further analysis. Each circle represents the number of finished provider spells for a particular trust and diagnosis group.

**Figure 12: Number of finished provider spells for ten of the SHMI diagnosis groups<sup>36</sup> for trusts which are repeat outliers, January 2014 – December 2014**



Source: Health and Social Care Information Centre

- The number of finished provider spells varies between diagnosis groups and trusts.
- The diagnosis groups with the highest levels of activity are diagnosis group 73 (pneumonia (except that caused by tuberculosis or sexually transmitted disease)) and diagnosis group 101 (urinary tract infections).
- There is no clear pattern of higher and lower than expected repeat outliers in the number of finished provider spells for these diagnosis groups.

Table 14 in Appendix A gives the number of finished provider spells for the ten diagnosis groups for the trusts identified as repeat outliers.

SHMI data at trust level and diagnosis group level are available to download from our Indicator Portal site at <http://indicators.ic.nhs.uk/webview/>. The data can be found towards the bottom of the navigation tree on the left-hand side of the page under *Summary Hospital-level Mortality Indicator > Recent SHMI Publications*. The 'Downloads' section is at the bottom of the resulting page. The data can be found in the 'SHMI diagnosis group breakdown' file in the 'SHMI data' folder of the zip file for each publication.

<sup>36</sup> The diagnosis group descriptions corresponding to the SHMI diagnosis group numbers used in this table are provided on page 30 of this report.

## Appendix A: Contextual indicator and diagnosis breakdown data for repeat outliers

**Table 8: Palliative care contextual indicators for trusts which are repeat outliers, January 2014 – December 2014**

Trust code	Trust name	Percentage of finished provider spells with palliative care coding (at either diagnosis or treatment specialty level)	Percentage of deaths reported in the SHMI with palliative care coding (at either diagnosis or treatment specialty level)
NAT	All non-specialist acute trusts in England	1.3	25.7
<b>Higher than expected repeat outliers</b>			
RLQ	Wye Valley NHS Trust	1.3	22.1
RPA	Medway NHS Foundation Trust	1.8	34.7
RVW	North Tees and Hartlepool NHS Foundation Trust	1.2	18.4
RXC	East Sussex Healthcare NHS Trust	1.5	21.6
RXL	Blackpool Teaching Hospitals NHS Foundation Trust	1.2	18.0
<b>Lower than expected repeat outliers</b>			
R1H	Barts Health NHS Trust	0.7	17.8
RAL	Royal Free London NHS Foundation Trust	1.3	29.3
RGT	Cambridge University Hospitals NHS Foundation Trust	1.2	23.7
RJ1	Guy's and St Thomas' NHS Foundation Trust	1.4	43.9
RJ7	St George's University Hospitals NHS Foundation Trust	1.2	28.8
RKE	The Whittington Hospital NHS Trust	0.0	0.0
RQM	Chelsea and Westminster Hospital NHS Foundation Trust	0.8	35.8
RRV	University College London Hospitals NHS Foundation Trust	1.2	32.7
RYJ	Imperial College Healthcare NHS Trust	1.7	42.9

Source: Health and Social Care Information Centre

**Table 9: Admission method contextual indicators for trusts which are repeat outliers, January 2014 – December 2014**

Trust code	Trust name	Percentage of elective admissions where a death occurs either in hospital or within 30 days of discharge	Percentage of non-elective admissions where a death occurs either in hospital or within 30 days of discharge
NAT	All non-specialist acute trusts in England	0.6	3.6
<b>Higher than expected repeat outliers</b>			
RLQ	Wye Valley NHS Trust	0.5	4.7
RPA	Medway NHS Foundation Trust	0.8	4.2
RVW	North Tees and Hartlepool NHS Foundation Trust	0.6	4.6
RXC	East Sussex Healthcare NHS Trust	0.9	5.0
RXL	Blackpool Teaching Hospitals NHS Foundation Trust	0.7	4.6
<b>Lower than expected repeat outliers</b>			
R1H	Barts Health NHS Trust	0.6	2.6
RAL	Royal Free London NHS Foundation Trust	0.6	3.2
RGT	Cambridge University Hospitals NHS Foundation Trust	0.5	3.6
RJ1	Guy's and St Thomas' NHS Foundation Trust	0.6	2.1
RJ7	St George's University Hospitals NHS Foundation Trust	0.5	3.2
RKE	The Whittington Hospital NHS Trust	0.2	1.5
RQM	Chelsea and Westminster Hospital NHS Foundation Trust	0.4	1.4
RRV	University College London Hospitals NHS Foundation Trust	0.7	1.9
RYJ	Imperial College Healthcare NHS Trust	0.5	2.4

Source: Health and Social Care Information Centre

**Table 10: Percentage of deaths reported in the SHMI which occurred in hospital for trusts which are repeat outliers, January 2014 – December 2014**

Trust code	Trust name	Percentage of deaths reported in the SHMI which occurred in hospital
NAT	All non-specialist acute trusts in England	71.5
<b>Higher than expected repeat outliers</b>		
RLQ	Wye Valley NHS Trust	69.0
RPA	Medway NHS Foundation Trust	77.8
RVW	North Tees and Hartlepool NHS Foundation Trust	74.7
RXC	East Sussex Healthcare NHS Trust	69.1
RXL	Blackpool Teaching Hospitals NHS Foundation Trust	71.7
<b>Lower than expected repeat outliers</b>		
R1H	Barts Health NHS Trust	78.4
RAL	Royal Free London NHS Foundation Trust	73.7
RGT	Cambridge University Hospitals NHS Foundation Trust	65.5
RJ1	Guy's and St Thomas' NHS Foundation Trust	73.0
RJ7	St George's University Hospitals NHS Foundation Trust	77.8
RKE	The Whittington Hospital NHS Trust	75.9
RQM	Chelsea and Westminster Hospital NHS Foundation Trust	69.5
RRV	University College London Hospitals NHS Foundation Trust	73.9
RYJ	Imperial College Healthcare NHS Trust	73.4

Source: Health and Social Care Information Centre

**Table 11: Deprivation contextual indicators for trusts which are repeat outliers, January 2014 – December 2014<sup>37</sup>**

Trust code	Trust name	Ratio of finished provider spells falling into deprivation quintile <sup>38</sup> 1, 2, 3, 4, 5 and the NULL deprivation quintile	Ratio of deaths reported in the SHMI falling into deprivation quintile <sup>38</sup> 1, 2, 3, 4, 5 and the NULL deprivation quintile
NAT	All non-specialist acute trusts in England	24:21:19:17:16:3	21:20:21:20:17:1
<b>Higher than expected repeat outliers</b>			
RLQ	Wye Valley NHS Trust	7:12:46:20:4:12	4:9:44:28:3:12
RPA	Medway NHS Foundation Trust	19:32:18:16:13:1	17:28:20:18:15:2
RVW	North Tees and Hartlepool NHS Foundation Trust	44:20:14:10:12:1	42:19:18:11:10:0
RXC	East Sussex Healthcare NHS Trust	21:29:23:18:8:1	16:29:26:21:8:0
RXL	Blackpool Teaching Hospitals NHS Foundation Trust	35:20:18:15:11:1	27:22:21:18:12:0
<b>Lower than expected repeat outliers</b>			
R1H	Barts Health NHS Trust	57:22:10:6:3:3	54:22:10:7:5:2
RAL	Royal Free London NHS Foundation Trust	13:23:28:23:10:2	10:19:28:28:13:1
RGT	Cambridge University Hospitals NHS Foundation Trust	3:13:17:29:37:1	3:11:17:29:39:1
RJ1	Guy's and St Thomas' NHS Foundation Trust	29:37:13:9:7:4	30:39:13:8:7:2
RJ7	St George's University Hospitals NHS Foundation Trust	10:31:26:15:16:2	9:25:27:17:21:2
RKE	The Whittington Hospital NHS Trust	44:34:13:6:2:2	40:37:12:9:2:1
RQM	Chelsea and Westminster Hospital NHS Foundation Trust	16:31:23:18:6:6	14:37:24:17:3:4
RRV	University College London Hospitals NHS Foundation Trust	27:27:15:11:8:12	31:30:17:10:8:5
RYJ	Imperial College Healthcare NHS Trust	27:31:19:12:5:5	28:32:21:11:5:2

Source: Health and Social Care Information Centre

<sup>37</sup> Percentages may not add to 100 due to rounding.

<sup>38</sup> Deprivation quintile 1 is the most deprived group and deprivation quintile 5 is the least deprived group. Records where there is no IMD Overall Rank are assigned to the NULL deprivation quintile.

**Table 12: Mean IMD Overall Rank for trusts which are repeat outliers, January 2014 – December 2014<sup>39</sup>**

Trust code	Trust name	Mean IMD Overall Rank over all finished provider spells	Mean IMD Overall Rank over all deaths reported in the SHMI
NAT	All non-specialist acute trusts in England	14,777	15,668
<b>Higher than expected repeat outliers</b>			
RLQ	Wye Valley NHS Trust	16,163	17,293
RPA	Medway NHS Foundation Trust	14,488	15,307
RVW	North Tees and Hartlepool NHS Foundation Trust	10,959	11,225
RXC	East Sussex Healthcare NHS Trust	13,626	14,606
RXL	Blackpool Teaching Hospitals NHS Foundation Trust	12,194	13,507
<b>Lower than expected repeat outliers</b>			
R1H	Barts Health NHS Trust	7,961	8,634
RAL	Royal Free London NHS Foundation Trust	15,880	17,154
RGT	Cambridge University Hospitals NHS Foundation Trust	21,977	22,525
RJ1	Guy's and St Thomas' NHS Foundation Trust	11,441	11,067
RJ7	St George's University Hospitals NHS Foundation Trust	16,239	17,458
RKE	The Whittington Hospital NHS Trust	8,618	9,208
RQM	Chelsea and Westminster Hospital NHS Foundation Trust	13,992	13,555
RRV	University College London Hospitals NHS Foundation Trust	12,245	11,898
RYJ	Imperial College Healthcare NHS Trust	11,889	11,702

Source: Health and Social Care Information Centre

<sup>39</sup> Spells and deaths with a missing IMD Overall Rank have been excluded from the calculation.

**Table 13: Ratio of observed to expected deaths for ten of the SHMI diagnosis groups for trusts which are repeat outliers, January 2014 – December 2014<sup>40</sup>**

Trust code	Trust name	Observed / Expected for SHMI diagnosis group <sup>41</sup> :									
		2	15	30	37	57	73	74	96	101	120
<b>Higher than expected repeat outliers</b>											
RLQ	Wye Valley NHS Trust	1.70	1.06	1.06	0.56	0.80	1.17	1.28	0.93	1.24	1.54
RPA	Medway NHS Foundation Trust	1.45	1.12	1.33	0.72	1.06	0.87	1.34	1.12	1.19	1.07
RVW	North Tees and Hartlepool NHS Foundation Trust	1.09	1.14	1.06	1.17	0.81	1.16	0.93	1.24	1.31	1.29
RXC	East Sussex Healthcare NHS Trust	1.03	0.98	1.14	1.19	1.20	1.07	1.01	1.07	1.08	0.89
RXL	Blackpool Teaching Hospitals NHS Foundation Trust	1.25	1.04	0.99	1.47	1.01	1.20	1.57	1.25	1.18	0.98
<b>Lower than expected repeat outliers</b>											
R1H	Barts Health NHS Trust	0.82	0.93	0.70	0.75	0.88	0.89	0.90	0.74	0.95	1.07
RAL	Royal Free London NHS Foundation Trust	0.99	0.97	0.76	0.58	0.94	0.84	0.69	1.03	0.94	0.78
RGT	Cambridge University Hospitals NHS Foundation Trust	0.68	1.00	0.98	0.83	1.14	0.88	0.51	0.91	0.90	0.82
RJ1	Guy's and St Thomas' NHS Foundation Trust	0.95	0.72	0.86	0.55	1.11	0.84	1.31	0.84	0.43	0.88
RJ7	St George's University Hospitals NHS Foundation Trust	0.92	0.60	0.59	0.73	1.22	0.85	0.64	1.08	0.86	0.98
RKE	The Whittington Hospital NHS Trust	0.71	0.89	0.58	0.55	0.75	0.79	0.12	0.64	0.62	0.69
RQM	Chelsea and Westminster Hospital NHS Foundation Trust	0.50	0.45	1.00	0.74	0.66	0.89	1.08	1.03	0.59	1.34
RRV	University College London Hospitals NHS Foundation Trust	0.87	0.79	0.79	0.63	1.10	0.69	0.79	0.74	0.57	0.76
RYJ	Imperial College Healthcare NHS Trust	0.73	0.73	0.73	0.39	1.95	0.75	0.77	0.70	0.70	0.78

Source: Health and Social Care Information Centre

<sup>40</sup> The expected number of deaths has been calculated using the statistical models for the July 2015 SHMI publication.

<sup>41</sup> The diagnosis group descriptions corresponding to the SHMI diagnosis group numbers used in this table are provided on page 30 of this report.

**Table 14: Number of finished provider spells for ten of the SHMI diagnosis groups for trusts which are repeat outliers, January 2014 – December 2014**

Trust code	Trust name	Total number of finished provider spells for SHMI diagnosis group <sup>42</sup> :									
		2	15	30	37	57	73	74	96	101	120
<b>Higher than expected repeat outliers</b>											
RLQ	Wye Valley NHS Trust	148	49	105	152	283	769	550	217	669	326
RPA	Medway NHS Foundation Trust	332	104	97	162	393	1,204	940	368	976	421
RVW	North Tees and Hartlepool NHS Foundation Trust	359	129	142	213	366	1,285	1,126	507	1,687	438
RXC	East Sussex Healthcare NHS Trust	404	216	167	315	541	1,609	892	541	1,483	735
RXL	Blackpool Teaching Hospitals NHS Foundation Trust	524	300	165	239	1,571	1,269	892	542	1,112	564
<b>Lower than expected repeat outliers</b>											
R1H	Barts Health NHS Trust	635	465	877	716	1,871	2,862	2,006	892	3,071	750
RAL	Royal Free London NHS Foundation Trust	621	145	519	468	876	2,273	1,212	628	2,029	592
RGT	Cambridge University Hospitals NHS Foundation Trust	306	145	689	301	363	1,344	793	360	1,151	486
RJ1	Guy's and St Thomas' NHS Foundation Trust	173	751	440	214	328	1,008	572	304	1,071	212
RJ7	St George's University Hospitals NHS Foundation Trust	292	446	609	244	1,061	1,342	755	396	1,467	354
RKE	The Whittington Hospital NHS Trust	171	46	28	119	114	790	385	212	518	161
RQM	Chelsea and Westminster Hospital NHS Foundation Trust	141	42	85	101	62	554	541	225	701	213
RRV	University College London Hospitals NHS Foundation Trust	202	371	689	160	265	704	395	184	823	159
RYJ	Imperial College Healthcare NHS Trust	470	490	822	411	623	1,947	712	494	1,461	314

Source: Health and Social Care Information Centre

<sup>42</sup> The diagnosis group descriptions corresponding to the SHMI diagnosis group numbers used in this table are provided on page 30 of this report.

## Appendix B: Background quality report

This section of the report aims to provide users with an evidence based assessment of the quality of the SHMI publication outputs. It reports against the nine European Statistical System (ESS) quality dimensions and principles<sup>43</sup>.

In doing so, this meets our obligation to comply with the UK Statistics Authority (UKSA) Code of Practice for Official Statistics<sup>44</sup>, particularly Principle 4, Practice 2 to:

*“Ensure that official statistics are produced to a level of quality that meets users’ needs and that users are informed about the quality of statistical outputs, including estimates of the main sources of bias and other errors and other aspects of the European Statistical System definition of quality”.*

### Relevance

Relevance is the degree to which the statistical product meets user needs in both coverage and content.

The SHMI is the ratio between the actual number of patients who die following hospitalisation at the trust and the number that would be expected to die on the basis of average England figures, given the characteristics of the patients treated there.

The expected number of deaths is calculated from statistical models derived to estimate the risk of mortality based on the characteristics of the patients (including the condition the patient is in hospital for, other underlying conditions the patient suffers from, age, gender and method of admission to hospital).

No adjustment is made for the severity of the condition, as this information is not captured in the HES dataset upon which the SHMI is based. This means that if a trust treats a high (or low) proportion of seriously ill patients with a particular condition compared to other trusts, the statistical models used to estimate the expected number of deaths will not take account of this.

Each trust is then assigned a banding using control limits to determine whether their SHMI is ‘higher than expected’, ‘as expected’ or ‘lower than expected’.

For the first publication of the SHMI in October 2011, two different sets of control limits and the corresponding bandings were published for this indicator:

- 95 per cent control limits from a random effects model applying a 10 per cent trim for over-dispersion
- 99.8 per cent control limits from an exact Poisson distribution

The HSCIC now only publishes one banding, corresponding to the control limits which account for over-dispersion, although the two sets of control limits will continue to be made available in the underlying data for transparency.

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<sup>43</sup> The original quality dimensions are: relevance, accuracy and reliability, timeliness and punctuality, accessibility and clarity, and coherence and comparability; these are set out in Eurostat Statistical Law. However more recent quality guidance from Eurostat includes some additional quality principles on: output quality trade-offs, user needs and perceptions, performance cost and respondent burden, and confidentiality, transparency and security.

<sup>44</sup> The UKSA’s Code of Practice for Official Statistics is available to download from <http://www.statisticsauthority.gov.uk/assessment/code-of-practice/>.

Over-dispersion is the presence of greater variability in a dataset than would be expected based on a given statistical model. This is a common feature in the analysis of applied data where populations are heterogeneous. The level of over-dispersion can be characterised by the over-dispersion factor, denoted by  $\phi$ . As described in Spiegelhalter (2005)<sup>45</sup>, if there is no over-dispersion,  $\phi N$  has an approximately  $\chi^2_N$  distribution, meaning that  $\phi$  is statistically significant if  $\phi > 1 + 2\sqrt{(2/N)}$ , where  $N$  is the number of units. For this SHMI publication  $N=137$  and  $\phi=5.10$ , i.e. it is statistically significant. Ignoring this over-dispersion could lead to a large number of trusts being inappropriately classified having a 'higher than expected' or 'lower than expected' SHMI. Therefore, the methodology described in Spiegelhalter (2005) is used to adjust the SHMI control limits for the presence of over-dispersion.

When the SHMI was established, one of the principles was that it should include activity for all admitted patients (except day cases, regular attenders and stillbirths). The Clinical Classifications Software (CCS) is a tool for grouping patients into a manageable number of clinically meaningful categories using International Classification of Diseases (ICD-10) diagnosis codes. The SHMI includes all CCS categories for ICD-10 diagnosis codes and this forms a wider coverage compared with some other mortality indicators. For example, the Hospital Standardised Mortality Ratio (HSMR) includes 56 of the CCS categories, accounting for approximately 80 per cent of deaths occurring in hospital.

*Further information regarding the CCS categories for ICD-10 diagnosis codes can be referenced at:*

[http://hcup-us.ahrq.gov/toolssoftware/icd\\_10/ccs\\_icd\\_10.jsp](http://hcup-us.ahrq.gov/toolssoftware/icd_10/ccs_icd_10.jsp)

The SHMI includes all deaths occurring either in hospital or within 30 days of discharge for all non-specialist acute NHS trusts in England. In addition, all patients who die within 30 days after transfer from a non-specialist acute NHS trust to a community, mental health or specialist trust will have their death attributed to the last non-specialist acute NHS trust they were treated in prior to transfer.

The SHMI methodology has been designed for non-specialist acute trusts. Trusts which solely provide community or specialist services are excluded from the SHMI. However, integrated acute and community trusts (which provide both acute and community services) are included and some patients will transfer between acute and community care at these trusts.

For integrated acute and community trusts, the SHMI includes the time from the patient's admission until 30 days following discharge from the trust and does not account for any transfer between acute and community settings. This is different from patients who are first treated at a trust providing only acute services who are then transferred to a community trust. In these cases, the SHMI includes the time from admission to the acute trust until 30 days following discharge from the acute trust only. This difference has led to concerns that not all trusts are being evaluated on a like-for-like basis.

There is no way of identifying community activity in the HES dataset. Therefore it is not possible to quantify the number of trusts affected, or the potential impact on these trusts. The number of affected trusts may increase over time as more trusts transition to an integrated model of service provision and the impact will vary depending on the nature of the community services being provided e.g. rehabilitation services compared to palliative care. Trusts which only provide community services in an outpatient setting will be unaffected as only inpatient activity is included in the SHMI.

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<sup>45</sup> Spiegelhalter D. (2005). Funnel plots for comparing institutional performance. *Statistics in Medicine*. 24:1185-1202.

The HSCIC is currently looking into a number of developments to help address these concerns. Reporting the SHMI at site (hospital) level rather than trust level may help to address this for trusts where inpatient community activity is provided at a separate site. However, the quality of data on site of treatment in the HES dataset is not currently sufficient to allow this; we are aware of a number of trusts with multiple sites who code all of their activity to one site. The HSCIC will continue to review site code recording and the feasibility of reporting the SHMI at site level as part of the longer term development of the indicator.

The HSCIC and the SHMI Technical Working Group are also investigating the impact of a proposal to change the definition of an event from deaths occurring in hospital or within 30 days of discharge to deaths occurring within 30 days of admission. This change could help to reduce the impact of differing discharge policies and lengths of stay between trusts. If this change is recommended following further discussions with the SHMI Technical Working Group and with agreement from the SHMI sponsor, a wider public consultation will be carried out on this significant change to the scope of the SHMI.

*Link to the SHMI Technical Working Group proceedings on the HSCIC website:*  
<http://www.hscic.gov.uk/shmi-development>

The SHMI methodology does not make any adjustment for patients who are recorded as receiving palliative care. This is because there is considerable variation between trusts in the coding of palliative care. Following feedback, as an interim solution for the above and pending the adoption and use of new coding guidelines, two contextual indicators relating to palliative care coding are published alongside the SHMI:

- The percentage of all finished provider spells coded as receiving palliative care
- The percentage of all deaths reported in the SHMI coded as receiving palliative care

It has been recognised that a small number of non-specialist acute trusts have hospices within their organisation. The transfer of patients into these hospices from other non-specialist acute trusts is likely to have an effect on the SHMI for trusts with hospices within their organisation. Also, there are a small number of non-specialist acute trusts who provide specialist palliative care inpatient services within designated wards. This arrangement will potentially have an effect on the SHMI as well.

More detailed analysis on this issue can be found in the Palliative Care Coding Report, which is available to download from the HSCIC's SHMI research and development page.

*Link to the Palliative Care Coding Report on the HSCIC website:*  
<http://www.hscic.gov.uk/shmi-development>

The SHMI methodology does not make any adjustment for deprivation. This is because adjusting for deprivation might create the impression that a higher death rate for those who are more deprived is acceptable, and has the potential to remove from the SHMI some of the differences that it is designed to measure. More detailed analysis can be found in the Report on the Impact of Deprivation on the SHMI, which is available to download from the HSCIC's SHMI research and development page.

*Link to the Report on the Impact of Deprivation on the SHMI on the HSCIC website:*  
<http://www.hscic.gov.uk/shmi-development>

Two contextual indicators on deprivation are published alongside the SHMI:

- Provider spells split by deprivation quintile
- Deaths split by deprivation quintile

Additionally, three further contextual indicators are published alongside the SHMI to support its interpretation.

- Deaths within thirty days for elective admissions
- Deaths within thirty days for non-elective admissions
- Deaths split by those occurring in hospital and those occurring outside hospital within 30 days of discharge

All of the SHMI contextual indicators are based on the same spell level data as the SHMI and report at the same level of granularity i.e. for all non-specialist acute NHS trusts.

*Link to the contextual indicator methodology specification documents on the HSCIC website:*  
<http://www.hscic.gov.uk/SHMI>

The SHMI is currently reported at trust level rather than site (hospital) level because of concerns around the accuracy of data on site of treatment in the HES dataset. The HSCIC will continue to review the feasibility of reporting the SHMI at site level as part of the longer term development of the indicator.

## Accuracy and reliability

Accuracy and reliability relates to the proximity between an estimate and the unknown true value.

The design of the methodology used was developed under the auspices of a national steering group, established by Sir Bruce Keogh, NHS Medical Director and chaired by Ian Dalton, Chief Executive of the NHS Northeast. Membership of the group included a wide range of the leading experts on mortality as well as representatives of key stakeholders comprising clinical, academic, commercial and other interests across the NHS.

The SHMI Technical Working Group support and contribute to the continuing technical work associated with the development and construction of the SHMI. Meetings are chaired by the HSCIC and are held approximately quarterly. Members of the group include representatives from the Department of Health, Care Quality Commission, HSCIC, Professional Association of Clinical Coders, Public Health England, King's Fund, University Hospitals Birmingham, Dr Foster Intelligence, Dr Foster Unit at Imperial College London, CHKS and Nuffield Trust.

*Link to the SHMI Technical Working Group proceedings on the HSCIC website:*

<http://www.hscic.gov.uk/shmi-development>

Known issues are detailed in the SHMI methodology development log and kept under review.

*Link to the SHMI Methodology Development Log on the HSCIC research and development page:*

<http://www.hscic.gov.uk/shmi-development>

## Accuracy and reliability of the underlying data

The SHMI is calculated using a combination of finalised and provisional HES data. Detailed information on the HES data extracts that are used in the calculation of the SHMI can be found in the HES SHMI Data Guidance document.

*Link to the HES SHMI Data Guidance document on the HSCIC website:*

<http://www.hscic.gov.uk/SHMI>

Information about the quality and completeness of the HES data from which the SHMI is calculated along with the relevant data quality notes for the period can be found with the corresponding HES publication on the HSCIC website.

- *Link to the HES Provisional Monthly Admitted Patient Care 2014-15 publications and data quality notes:*  
<http://www.hscic.gov.uk/searchcatalogue?q=title%3a%22provisional+monthly+hospital+episode+statistics+for+admitted+patient+care%22&sort=Most+recent&size=10&page=1#top>
- *Link to the finalised HES Admitted Patient Care 2013-14 publication and data quality notes:*  
<http://www.hscic.gov.uk/pubs/hes1314>
- *Link to the finalised HES Admitted Patient Care 2012-13 publication and data quality notes:*  
<http://www.hscic.gov.uk/pubs/hes1213>

- *Link to the finalised HES Admitted Patient Care 2011-12 publication and data quality notes:*  
<http://www.hscic.gov.uk/pubs/hes1112>
- *Link to the finalised HES Admitted Patient Care 2010-11 publication and data quality notes:*  
<http://www.hscic.gov.uk/catalogue/PUB02570>
- *Link to further information on HES data quality and data cleaning rules:*  
<http://www.hscic.gov.uk/article/1825/The-processing-cycle-and-HES-data-quality>

There is a shortfall in the number of records in the HES data for discharges in the period January 2014 – December 2014 for the following trusts: South Warwickshire NHS Foundation Trust (provider code RJC) and Sherwood Forest Hospitals NHS Foundation Trust (provider code RK5). Further details are provided in the corresponding HES Admitted Patient Care data quality notes at <http://www.hscic.gov.uk/pubs/hes1314>. This has a negligible impact on the SHMI at national level. However, the SHMI values for the affected trusts will be based on incomplete data and should therefore be interpreted with caution.

Medway NHS Foundation Trust (provider code RPA) has informed us that activity for Medway Community Healthcare has been included in error in the data submission for their trust. This affects approximately 400 records in the period January 2014 – December 2014 and means that the number of finished provider spells and observed deaths is overstated for SHMI diagnosis group 140 for this trust. This has an impact on the data for this diagnosis group and on the overall SHMI value for the trust, and so users are advised to interpret this data with caution. However, analysis suggests that the SHMI banding for the trust is unaffected. This submission error has now been corrected by the trust and the additional records will not be included in the next SHMI release, due to be published in October 2015. This has a negligible impact on the SHMI at national level.

Following the closure of Mid-Staffordshire NHS Foundation Trust (provider code RJD) on 31<sup>st</sup> October 2014, the activity previously undertaken by this trust has now transferred to University Hospitals of North Midlands NHS Trust (provider code RJE) and The Royal Wolverhampton NHS Trust (provider code RL4). As the SHMI is published to reflect current organisational structures, activity submitted by Mid-Staffordshire NHS Foundation Trust is mapped to these two providers prior to the calculation of the SHMI. For the period January 2014 – December 2014, there are 8 finished provider spells in the SHMI dataset which do not contain sufficient information for this mapping to be carried out. These records have been included in the statistical models which are used to determine the SHMI national baseline, and so there is no impact on the SHMI at national level. However, these records are not reported in the SHMI publication as they cannot be assigned to any current provider. This has a negligible impact on the SHMI values for University Hospitals of North Midlands NHS Trust and The Royal Wolverhampton NHS Trust.

It has come to our attention that there may be several trusts who are unable to record still births with a discharge method of 'Baby was still born' on their patient administration system (PAS) and are instead coding these records with a discharge method of 'Died'. This means that such records will be included in the calculation of the SHMI where they should have been excluded. We are currently reviewing this issue with initial investigations suggesting that the impact on the overall SHMI for affected trusts is small.

## Accuracy and reliability of the data linkage

HES data are linked with ONS death registrations data to enable the capturing of deaths which occur outside of hospital. This is an established data linkage which is routinely carried out by the HSCIC.

*Link to details of the methodology used to link HES and ONS death registrations data:*

<http://www.hscic.gov.uk/article/2677/Linked-HES-ONS-mortality-data>

On rare occasions patients may appear to have activity in HES after the date of death in the HES-ONS linked dataset. This is called 'subsequent activity' and is a data quality issue related to either a patient being incorrectly coded in the HES dataset (e.g. an outpatient appointment recorded as attended after the date of death) or incorrectly submitted patient identifiers resulting in incorrect linkage between HES and ONS death registrations data.

Analysis on the SHMI dataset for the period January 2011 – December 2013 shows that approximately 0.16% of records are flagged with subsequent activity. Around 0.05% of in hospital deaths in the dataset are not processed as an event of death, because there is a later record in the dataset which the death record is linked to. This problem is not specific to any particular trust or diagnosis group and so the overall impact on the SHMI at trust level is negligible. The HES Development team are continuing to review this and to refine the data linkage methodology which will further reduce the impact.

This issue was discussed at the July 2014 meeting of the SHMI Technical Working Group, where the group agreed that no further action was required due to the negligible impact of subsequent activity on the SHMI.

*Link to the SHMI Technical Working Group proceedings on the HSCIC website:*

<http://www.hscic.gov.uk/shmi-development>

## Calculation of the expected number of deaths

The expected number of deaths is calculated from 140 logistic regression models (corresponding to 140 diagnosis groups) derived to estimate the risk of mortality based on the characteristics of the patients (including the condition the patient is in hospital for, other underlying conditions the patient suffers from, age, gender and method of admission to hospital). The statistical models are constructed using thirty-six months of data from trusts throughout England. The final twelve months of this period are used to calculate the SHMI for each individual trust.

Two specific model-fitting options in the SAS Enterprise Guide software are applied to ensure that all of the 140 statistical models converge i.e. NOCHECK and RIDGING=ABSOLUTE.

- The NOCHECK option suppresses checking for infinite parameters.
- The RIDGING=ABSOLUTE option adjusts the ridging technique used by SAS to improve the log-likelihood function.

*Link to further information on the model-fitting options available in SAS:*

[http://support.sas.com/documentation/cdl/en/statug/63033/HTML/default/viewer.htm#statug\\_logistic\\_sect010.htm](http://support.sas.com/documentation/cdl/en/statug/63033/HTML/default/viewer.htm#statug_logistic_sect010.htm)

The success of the case-mix adjustment in predicting the outcome (died or survived) is evaluated using the c statistic for each logistic regression model. The c statistic is the probability of estimating a lower risk of death for a randomly selected patient who survived compared to a randomly selected patient who died and can take values in the range 0.5-1.0.

Models are typically considered to have a reasonable predictive ability if the c statistic is 0.7 or higher.

The c statistic for the 140 models ranges from 0.519 to 0.959 with an average of 0.821 and a standard deviation of 0.087. The inter-quartile range is 0.110 with the lower and upper quartiles as 0.775 and 0.885 respectively.

Table 15 provides further information on the distribution of the c statistics for the 140 SHMI diagnosis groups.

**Table 15: Distribution of the c statistic for the statistical models for the 140 SHMI diagnosis groups**

c statistic	Number of SHMI diagnosis groups
$0.5 \leq c < 0.6$	4
$0.6 \leq c < 0.7$	11
$0.7 \leq c < 0.8$	32
$0.8 \leq c < 0.9$	68
$0.9 \leq c \leq 1.0$	25

Source: Health and Social Care Information Centre

The following SHMI diagnosis groups have a c statistic which is less than 0.7 (the c statistic for each diagnosis group is given in brackets).

- Group 42 – mental retardation, senility and organic mental disorders (0.614)
- Group 44 – other psychoses (0.698)
- Group 51 – coma, stupor and brain damage (0.665)
- Group 64 – cardiac arrest and ventricular fibrillation (0.679)
- Group 65 – congestive heart failure, nonhypertensive (0.657)
- Group 66 – acute cerebrovascular disease (0.693)
- Group 75 – chronic obstructive pulmonary disease and bronchiectasis (0.677)
- Group 77 – aspiration pneumonitis, food/vomitus (0.685)
- Group 79 – respiratory failure, insufficiency, arrest (adult) (0.700)
- Group 93 – liver disease, alcohol related (0.679)
- Group 99 – acute and unspecified renal failure (0.685)
- Group 106 – maternity related diagnoses, livebirths (0.531)
- Group 117 – short gestation, low birth weight, fetal growth retardation (0.550)
- Group 118 – intrauterine hypoxia and birth asphyxia, respiratory distress syndrome, hemolytic jaundice and perinatal jaundice, birth trauma (0.519)
- Group 119 – other perinatal conditions (0.548)

All of the diagnosis groups with a c statistic which is less than 0.6 are groups where the majority of patients are babies. For these groups, there is little variation in the case-mix of patients (e.g. the age group of each patient is the same) and so there is little scope for improvement in model fit. For the other diagnosis groups, the HSCIC will investigate whether improvements can be made to the model fit as part of the longer term development of the indicator.

The c statistics for each of the 140 SHMI diagnosis groups are published along with other model fit statistics on the Indicator Portal. The data can be found towards the bottom of the navigation tree on the left-hand side of the page under *Summary Hospital-level Mortality Indicator > Recent SHMI Publications*. The 'Downloads' section is at the bottom of the resulting page. The c statistics can be found in the 'SHMI model fit statistics' file in the 'SHMI statistical model data' folder of the zip file for each publication.

*Link to the HSCIC Indicator Portal:*

<http://indicators.ic.nhs.uk/webview/>

Details of the 140 SHMI diagnosis groups can be referenced from Appendix A: CCS Diagnosis Groupings in the methodology specification document.

*Link to the SHMI methodology specification document on the HSCIC website:*

<http://www.hscic.gov.uk/SHMI>

## Timeliness and punctuality

Timeliness refers to the time gap between publication and the reference period. Punctuality refers to the gap between planned and actual publication dates.

The data used to produce the SHMI are generated from data the trusts submit to the Secondary Uses Service (SUS). The data are processed by the HSCIC to create HES data. Provisional HES data are available on a monthly basis as an on-going publication which is 3 months in arrears.

The HES-ONS linked mortality dataset is also available on a monthly basis along with the provisional monthly HES dataset where it is 1 month in arrears with 40 per cent of death registrations captured for the last month and approximately 90 per cent of death registrations captured for the second last month.

The SHMI is published on a quarterly basis with the first publication in October 2011. The statistical models used to derive the values are recalibrated on a quarterly basis in line with the publication.

The dataset used for the publication is 6 months in arrears for the provisional HES dataset and 4 months in arrears for the HES-ONS mortality dataset. Details of the data periods used for the publication can be referenced from the SHMI publication calendar. Details of the SUS data submission deadlines and corresponding HES publication dates can be referenced from the HES SHMI Data Guidance document.

*Link to the SHMI publication timetable and HES SHMI Data Guidance document on the HSCIC website:*

<http://www.hscic.gov.uk/SHMI>

The SHMI and accompanying contextual indicators are published to reflect organisational structure at the time of publication processing. Therefore, combined data are published for trusts that have merged.

## Accessibility and clarity

Accessibility is the ease with which users are able to access the data, also reflecting the format in which the data are available and the availability of supporting information. Clarity refers to the quality and sufficiency of the metadata, illustrations and accompanying advice.

### Accessibility

Pre-release access to the SHMI through the Clinical Indicator Previewer is available to trust medical directors at least 10 days prior to publication. Trusts are only provided with access to their own SHMI data. The information, which is provided at trust level for quality assurance purposes, includes:

- SHMI value
- SHMI banding and banding description
- Observed and expected number of deaths
- Total number of finished provider spells
- SHMI upper and lower control limits
- SHMI contextual indicator values
- Observed and expected number of deaths by SHMI diagnosis group
- Number of deaths occurring in and out of hospital by SHMI diagnosis group
- Total number of finished provider spells by SHMI diagnosis group

A user guide and a frequently asked questions (FAQ) document are available on the Previewer.

The user guide answers questions users may have on the functionality of the Previewer and explains how to access the Previewer, view the indicator data and raise queries on or approve the SHMI. The FAQ document provides answers to more general questions on the SHMI Previewer.

Additionally, a HES SHMI Data Guidance document is also available on the Previewer detailing which HES extracts are used for the publication of the SHMI along with a timetable for correcting data submissions in SUS, HES and SHMI.

A SHMI data extract service is available to trusts that complete an application process and have obtained the relevant approvals. This service is currently available only to individual trusts for which a SHMI is calculated (non-specialist acute NHS trusts). Trusts who have registered for this service receive an extract of the record-level data which are used to calculate their SHMI and accompanying contextual indicators following the quarterly publication of the SHMI in order to allow them to carry out quality assurance and further analysis and investigations into their SHMI. Trusts are only provided with access to their own SHMI data.

The SHMI is available in the public domain from the following sources:

- HSCIC Indicator Portal
- NHS Choices

The quarterly publication of the SHMI on the HSCIC Indicator Portal includes:

- SHMI funnel plots
- SHMI data at trust level
- SHMI data at trust and diagnosis group level
- SHMI model parameter statistics
- SHMI model fit statistics
- SHMI contextual indicators
- Machine readable format definitions
- Indicator methodology specifications

The data can be found towards the bottom of the navigation tree on the left-hand side of the page.

*Link to the SHMI publication on the HSCIC Indicator Portal:*

<http://indicators.ic.nhs.uk/webview/>

## Clarity

This report, including key facts, details of how to interpret the SHMI and its banding, analysis for trusts identified as repeat outliers and information on data quality, is available from the HSCIC's publication repository. A glossary containing definitions of the terminology used in the report is also provided.

*Link to this SHMI report on the HSCIC publication repository:*

<http://www.hscic.gov.uk/pubs/shmijan14dec14>

A frequently asked questions (FAQ) document and a document explaining how to accurately describe and interpret the SHMI (aimed at press teams and journalists) are available to download from the SHMI homepage

*Link to the SHMI FAQ and SHMI guidance for press teams and journalists document on the HSCIC website:*

<http://www.hscic.gov.uk/SHMI>

## Coherence and comparability

Coherence is the degree to which data that are derived from different sources or methods, but refer to the same topic, are similar. Comparability is the degree to which data can be compared over time and domain.

### Coherence

There are several tools available to organisations in England to monitor mortality associated with hospitalisation. Two of the main tools which are currently used by NHS trusts in addition to the SHMI are:

- Hospital Standardised Mortality Ratio (HSMR) which is developed and published by Dr Foster Intelligence (DFI)
- Risk Adjusted Mortality Indicator (RAMI) which is developed and published by CHKS

There are some differences between the SHMI and other mortality indicators. For example, the main differences between the SHMI and the HSMR are:

- The HSMR is reported as a standardised ratio with a baseline of 100, while the SHMI has a baseline of 1.
- The SHMI includes deaths occurring in hospital and deaths occurring outside of hospital within 30 days of discharge, whereas the HSMR only includes deaths occurring in hospital.
- The SHMI includes deaths from all Clinical Classifications System (CCS) groups, while the HSMR includes deaths from 56 CCS groups which account for around 80 per cent of in hospital deaths.
- The case-mix adjustment variables differ between the SHMI and HSMR, for example, the HSMR includes an adjustment for palliative care whereas the SHMI does not.
- The final model selection method varies between the SHMI and HSMR.

Further details of the methodology used to calculate the HSMR are available from DFI:

*Link to the DFI website:*

<http://drfosterintelligence.co.uk/>

The main differences between the SHMI and the RAMI are:

- The RAMI is reported as a standardised ratio with a baseline of 100, while the SHMI has a baseline of 1.
- The SHMI includes deaths occurring in hospital and deaths occurring outside of hospital within 30 days of discharge, whereas the RAMI only includes deaths occurring in hospital.
- The SHMI includes more activity compared to the RAMI. For example, zero length of stay emergencies and spells containing the palliative care diagnosis code (Z51.5) are excluded from the RAMI.
- The case-mix adjustment variables differ between the SHMI and the RAMI.

Further details of the methodology used to calculate the RAMI are available from CHKS:

*Link to the CHKS website:*

<http://www.chks.co.uk/>

Other indicators on the topic of mortality (including indicators which are wider in scope than mortality associated with hospitalisation) can be found on the HSCIC's Indicator Portal.

*Link to the HSCIC Indicator Portal:*

<http://indicators.ic.nhs.uk/webview/>

Analysis on deaths within 30, 60 and 90 days of admission or procedure calculated using HES-ONS linked data (which is the same dataset as that used in the calculation of the SHMI) was made available as a monthly topic of interest alongside the April 2014 – August 2014 provisional monthly HES APC data.

Link to monthly topic of interest on the HES-ONS linked dataset:

<http://www.hscic.gov.uk/pubs/hesapr14aug14>

## Comparability

The statistical models used in the calculation of the SHMI are recalibrated and rebased quarterly, at every publication. This means that the England average figures which drive the expected figures are updated at every quarter. Any improvements or otherwise to a SHMI for a trust compared to the previous publication will be relative to the England average at the point of publication. Therefore, if the overall England average has improved and the performance of a trust has also improved around the same scale, their SHMI would show little, if any, change.

The SHMI can be used to compare a trust's mortality outcomes to the national baseline. However, it should not be used to directly compare mortality outcomes between trusts and it is inappropriate to rank trusts according to their SHMI.

The SHMI reports on mortality for all non-specialist acute trusts in England only.

- NHS National Services Scotland publishes Hospital Standardised Mortality Ratios (HSMR) (the methodology used to calculate the Scottish HSMR is not the same as that used by DFI to calculate the English HSMR):

*Link to the Scottish HSMR data:*

<http://www.isdscotland.org/Health-Topics/Quality-Indicators/HSMR/>

- The Welsh Government publishes the Risk Adjusted Mortality Indicator (RAMI), which is calculated by CHKS:

*Link to the Welsh RAMI data:*

<http://wales.gov.uk/splash?orig=/topics/health/publications/health/reports/mortality/>

- The Department of Health, Social Services and Public Safety in Northern Ireland does not currently publish any indicators on mortality associated with hospitalisation.

## Trade-offs between output quality components

Trade-offs are the extent to which different aspects of quality are balanced against each other.

The statistical models used to estimate the expected number of deaths for the SHMI are built on fewer risk adjustment variables than the variables proposed by the Steering Group for the National Review of the Hospital Standardised Mortality Ratio (HSMR) in their report. Using more risk adjustment variables may improve the predictive power of the models.

However, the proposed risk adjustment variables were highly correlated and using only primary diagnosis, age, Charlson comorbidity index, method of admission to hospital and gender provided a simple and stable model which was recommended by the School of Health and Related Research (ScHARR) at the University of Sheffield in their final report.

*Link to the reports: 'An evaluation of the Summary Hospital Mortality Index' and 'National review of the hospital standardised mortality ratio':*

<http://www.hscic.gov.uk/SHMI>

Some proposed risk adjustment variables are not of sufficient data quality to be included in the final model. For example, the SHMI methodology does not include an adjustment for patients who are recorded as receiving palliative care. This is because there is considerable variation between trusts in the coding of palliative care. Details of further analysis on this issue can be referenced in the Palliative Care Coding Report.

*Link to the Palliative Care Coding Report on the HSCIC research and development page:*

<http://www.hscic.gov.uk/shmi-development>

## Assessment of user needs and perceptions

This section describes the processes for finding out about users and uses and their views on the SHMI publication.

Comments on the SHMI publication can be made through various media:

- By trust medical directors and other authorised users via the Indicator Previewer
- ‘Have your say’ on SHMI HSCIC website
- HSCIC general enquiries email [enquiries@hscic.gov.uk](mailto:enquiries@hscic.gov.uk) and/or telephone number 0300 303 5678

The Steering Group for the National Review of the Hospital Standardised Mortality Ratio (HSMR) considered the use of overarching mortality indicators. Conclusions drove the development of the SHMI.

The SHMI will be subject to continuous review. A methodology development log is maintained by the HSCIC in order to document issues raised on the methodology used to calculate the SHMI. These feed into the continuous review process for the SHMI.

*Link to the SHMI Methodology Development Log:*  
<http://www.hscic.gov.uk/shmi-development>

We have worked with several trusts to help them further understand their SHMI and the methodology used to calculate the SHMI. We are working to improve the range of information available to trusts and other users in light of this work. We are also investigating developing some case studies to demonstrate how we can help users understand the SHMI in more detail.

## Performance, cost and respondent burden

This section describes the effectiveness, efficiency and economy of the statistical output

The source of this data is through administrative systems in secondary care; there is no respondent burden.

## Confidentiality, transparency and security

This section describes the procedures and policy used to ensure sound confidentiality, security and transparent practices.

### Confidentiality

The SHMI publication is subject to a standard HSCIC risk assessment prior to issue. Disclosure control is implemented where this is deemed to be necessary in accordance with the protocols associated with the underlying data sources. Further details of the risk assessment are available in the HSCIC's Small Numbers Procedure. Where disclosure control is deemed necessary, the methodology used is described in the corresponding indicator methodology specification document.

*Link to the HSCIC's Small Numbers Procedure*

<http://www.hscic.gov.uk/pubs/calendar>

*Link to the HSCIC's privacy policy:*

<http://www.hscic.gov.uk/privacy>

*Link to the SHMI and contextual indicator methodology specification documents on the HSCIC website:*

<http://www.hscic.gov.uk/SHMI>

### Transparency

Detailed methodology specification documents are available on the HSCIC website. Users are invited to provide feedback and comments. All feedback and comments will be reviewed and, where agreed to be appropriate with the SHMI Technical Working Group, changes made to the methodology.

*Link to the SHMI Technical Working Group proceedings on the HSCIC website:*

<http://www.hscic.gov.uk/shmi-development>

Known issues are detailed in the SHMI methodology development log and kept under review.

*Link to the SHMI Methodology Development Log on the HSCIC website:*

<http://www.hscic.gov.uk/shmi-development>

All other supporting documentation relating to the indicator specification is also published on the SHMI support and guidance page.

*Link to the SHMI support and guidance page:*

<http://www.hscic.gov.uk/SHMI>

### Security

The Code of Practice for Official Statistics is followed regarding security and release of information prior to publication.

*Link to the Code of Practice for Official Statistics:*

<http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html>

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