**Background Quality Report:** Summary Hospital-level Mortality Indicator (SHMI)

### Introduction

**Context for the quality report.**

This background quality report accompanies the Official Statistics publication of the Summary Hospital-level Mortality Indicator (SHMI). This report, the relevant statistics and supporting documents are available on the NHS IC website.

Link to the SHMI page on the NHS IC website  
[http://www.hscic.gov.uk/SHMI](http://www.hscic.gov.uk/SHMI)

2 data sources are used in the development of the SHMI:

- Hospital Episode Statistics (HES) admitted patient dataset
- Office for National Statistics (ONS) HES-ONS linked mortality dataset

Link to the NHS IC statement on Administration Sources  

Link to HES support and guidance page on HSCIC website:  
[http://www.hscic.gov.uk/hes](http://www.hscic.gov.uk/hes)

SHMI is a new national hospital-level indicator, which provides a summary reporting of mortality at Trust level across the NHS for England.

SHMI values for each trust are made available along with bandings indicating where a trust SHMI is ‘as expected’ or otherwise.

The methodology for this indicator was established by an expert technical group following the review of the Hospital Standardised Mortality Ratio (HSMR). The SHMI methodology implements the recommendations of this review.

### Relevance

**The degree to which the statistical product meets user needs in both coverage and content.**

The SHMI value is a ratio of the observed number of deaths to the expected number of deaths given the characteristics of patients treated by that trust. The expected number of deaths is calculated from statistical models derived to estimate the risk of mortality based on the characteristics of patients admitted for England.

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

Two different control limits are used and therefore, there will be two bandings assigned to each trust. The two control limits used are:

- 95% control limits from a Random Effects Model applying a 10%
trim for over-dispersion
- 99.8% control limits from an Exact Poisson Distribution

The SHMI captures all deaths relating to all admitted patients that occur in all settings. This includes all deaths in-hospital as well as deaths occurring 30-days post discharge from the hospital.

The SHMI also reports on all Clinical Classifications Software categories for ICD-10 data in all hospital admissions. This forms a wider coverage compared to the HSMR where 56 of the Clinical Classifications Software categories were reported on, accounting for approximately 80% of in-hospital deaths.

Additional information regarding the Clinical Classifications Software for ICD-10 data can be referenced at:
http://www.ahrq.gov/data/hcup/icd10usrgd.htm

The SHMI incorporates all deaths in hospital for all non-specialist acute Trusts. In addition, all patients who die within 30 days after transfer from a non-specialist acute trust to a community or specialist hospital will have their death attributed to the last non-specialist acute provider they were treated in prior to transfer. It has been recognised that a small number of acute non-specialist Trusts have hospices within their organisation. The transfer of patients into these hospices from other acute non-specialist Trusts may have an adverse effect on the value of the SHMI for Trusts with hospices within their organisation. This will be reviewed prior to the next publication of the SHMI.

Accuracy and Reliability

The proximity between an estimate and the unknown true value.

The design of the methodology used have been 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 includes a wide range of the leading experts on mortality as well as representatives of key interest and stakeholders comprising of clinical, academic, commercial as well as different interests across the NHS.

The c statistic for the 140 models ranges from 0.52 and 0.97 with an average of 0.82 and standard deviation of 0.09. The inter-quartile range is 0.12 with the lower and upper quartile as 0.77 and 0.89 respectively.

The c statistic gives us a quick and simple indicator of accuracy of a predictive model. The c statistic, in pure form or weighted and summarized, offers a simple, intuitive, and robust indicator of the accuracy of predictions.

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

Link to the Issues Log on the NHS IC 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.*  

Provisional HES data is available on a monthly basis as an ongoing publication where it is 3 months in arrears with a possibility of an incomplete last month.  

HES-ONS Linked Mortality dataset is also available on a monthly basis along with the provisional monthly HES dataset where it is 4 months in arrears with 40% death registrations captured for the last month and approximately 90% death registrations captured for the second last month.  

The SHMI will be published on a quarterly basis with the first publication in October 2011. The models used to derive the values will also be recalibrated on a quarterly basis in line with the publication.  

The dataset used for the publication will be 6 months in arrears for Provisional HES dataset and 4 months in arrears for HES-ONS Mortality dataset. There is no time lag between publication and availability of most recent HES-ONS Mortality dataset. The time lag between publication and availability of most recent Provisional HES dataset is 3 months. Details of the data periods used for the publication can be referenced from the SHMI publication calendar.  

Link to SHMI publication calendar on the NHS IC website [http://www.hscic.gov.uk/SHMI](http://www.hscic.gov.uk/SHMI) |
|---|---|
| **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.*  

Pre-release access through Indicator Previewer is available to Trust medical directors at least 10 days prior to publication. The information which is provided for quality assurance purposes includes:  
- SHMI value  
- Upper and Lower Limits  
- Banding and banding description  

A User guide & FAQ are available on Indicator Previewer.  

The User guide explains how to access the Indicator Previewer site, view the indicator data and raise queries on, or approve, the SHMI.  

The FAQ provide answers to some of the questions users may have on the functionality of the Indicator Previewer site and the general description on the construction of the SHMI. |
## Coherence and Comparability

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

There are a few tools available to organisations to monitor mortality. Two of the main tools which are currently used are:

- HSMR which is developed and published by DFI
- Risk Adjusted Mortality Indicator (RAMI) which is developed and published by CHKS

There are some differences between the SHMI and these methods. For example, main differences when compared to HSMR:

- The HSMR is reported as a standardised ratio with a baseline of 100, the SHMI has a baseline of 1
- The SHMI covers all deaths, the HSMR approximately 80%
- The casemix adjustment variables differ between the SHMI and HSMR
- The final model selection method varies between the SHMI and HSMR

## Trade-offs between Output Quality Components

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

The models used to predict the expected number of deaths for the SHMI calculation is built on fewer risk adjustment variables than the proposed variables as provided by the Technical Review Group in their report.
Using more risk adjustment variables may improve the predictive power of the models but at the same time could introduce more data quality issues. One of the main issues was that all the proposed risk adjustment variables were highly correlated and using only Age, Charlson Comorbidity Index, Admission Method and Gender provided a simple and stable model as recommended by SchARR in their final report.

Link to reports: ‘An evaluation of the Summary Hospital Mortality Index’ and ‘National review of the hospital standardised mortality ratio’
http://www.hscic.gov.uk/SHMI

Not all the logistic regression models used to derive the expected numbers for the SHMI calculation fully converged. This requires further review by the expert technical group, as noted in the issues log. After testing is has been found that the overall results are not overtly sensitive to this issue.

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<th>Assessment of User Needs and Perceptions</th>
<th>The processes for finding out about users and uses, and their views on the statistical products.</th>
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<td>Comments can be made through various media:</td>
<td>By Trust Medical Directors via the Indicator Previewer</td>
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<td></td>
<td>‘Have your say’ on SHMI NHS IC website</td>
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<td></td>
<td>NHS IC general enquiries email and/or telephone number</td>
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<td>Clinical Indicators team email</td>
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<td>Technical review group</td>
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The HSMR review group considered the use of overarching mortality indicators. Conclusions drove the development of the SHMI.

The NHS IC Indicator Assurance Process will be used to review the SHMI.

An issues log is maintained by the NHS IC. These issues will feed into a review of the SHMI.

Link to SHMI issues log
http://www.hscic.gov.uk/SHMI

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<th>Performance, Cost and Respondent Burden</th>
<th>The effectiveness, efficiency and economy of the statistical output.</th>
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<td>Source of this data is through administrative systems in secondary care; there is no respondent burden.</td>
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<th>Confidentiality, Transparency and Security</th>
<th>The procedures and policy used to ensure sound confidentiality, security and transparent practices.</th>
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<td>The SHMI publication is subject to a standard NHS IC risk assessment prior to issue. Disclosure control is implemented where judged necessary.</td>
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Detailed methodology specification documents are available on the NHS IC website. Users were invited to provide feedback. All comments have been reviewed and where agreed to be appropriate with the expert technical group changes made to the methodology. The specification document which is now published and implemented along with the detailed list of comments received and actions taken. Going forward all issues raised with the SHMI methodology will be treated in this way – it will be periodically reviewed by an expert peer review group.

All other supporting documentation relating to the indicator specification is also published on the NHS IC website.

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