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Indicator Construction: Mortality Family

Presented as 'Survival Rates'

Developed for NHS Choices by the NHS Information
Centre

Indicator Construction: Mortality Family

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Directorate:	Information Services
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DOCUMENT MANAGEMENT

REVISION HISTORY

Version	Date	Summary of Changes
0.1	29 th March 2010	Draft completion with existing DFI clinical codes.
0.2	26 th April 2010	Added summary to the banding section at Choice's request.
0.3	29 th April 2010	Title page additions and clarification of mortality indicators being presented as survival rates

APPROVALS

Name	Signature	Title	Date of Issue	Version
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1. Overview

Indicator Family Name
Mortality

Indicator Family Code
MORT

Condition	Detailed Descriptor	Indicator Code	Indicator Category*
Hip Replacement	Standardised mortality ratio for deaths in hospital within 30 days of elective hip replacement	I00023	1
Knee Replacement	Standardised mortality ratio for deaths in hospital within 30 days of elective knee replacement	I00027	1
Repair of Abdominal Aortic Aneurysm (Elective)	Standardised mortality ratio for deaths in hospital within 30 days of elective repair of an abdominal aortic aneurysm	I00031	1
Repair of Abdominal Aortic Aneurysm (Emergency)	Standardised mortality ratio for deaths in hospital within 30 days of emergency repair of an abdominal aortic aneurysm	I00032	1
Fractured Neck of Femur	Standardised mortality ratio for deaths in hospital following an emergency admission for Fractured Neck of Femur	I00560	2

* See Section 2 for indicator category definitions

2. Introduction

Reporting Frequency
Data supplied on monthly basis.
Reporting required on a monthly basis.
Statistical model will be recalibrated on an annual basis.

Description												
<p>The mortality indicators are evaluated from a standardised mortality ratio (SMR). The formula for the ratio is observed deaths divided by expected deaths, multiplied by 100. This is calculated for each provider within the data.</p> <p>The indicators in this family are divided into two categories.</p> <p>Indicators in Category 1 measure mortality following a selected procedure in hospital e.g. mortality following a hip replacement (I00023). The number of observed deaths is the number of deaths in hospital within 30 days following the procedure. The expected number of deaths is the sum of the estimated risk of death for all patients undergoing the procedure.</p> <p>Indicators in Category 2 measure mortality in hospital following admission with a specific diagnosis e.g. mortality following emergency admission with a Fractured Neck of Femur. The number of observed deaths is the number of deaths in hospital at the end of a continuous inpatient spell following an admission for the diagnosis. The expected number of deaths is the sum of the estimated risk of death for all patients following admission for the diagnosis.</p> <p>For all indicators the estimated risk for each patient is calculated from a full logistic regression model with a case-mix of: age group, deprivation quintile, sex, co-morbidity, number of emergency admissions in the last 12 months and whether palliative care is being provided. Additional variables specific to individual indicators are specified in section 5.</p> <p>The SMR for each provider is compared against the national (England) baseline with control limits. Where it falls relative to these limits dictates whether the provider's mortality rate is reported to be within, above or below the expected range.</p> <p>Indicators in Category 1 use data for 36 months and 6 months in arrears when building and scoring the model. Indicators in Category 2 use data for 12 months and 6 months in arrears.</p> <p>The key characteristics which distinguish Category 1 indicators from Category 2 indicators are given in Table 2.1 below. The list of indicators in each category can be found in section 1. Note there may be other differences between indicators within each category (e.g. casemix variables and admission method as described in section 4 below).</p>												
<table border="1"> <thead> <tr> <th></th> <th>Category 1 (procedure based)</th> <th>Category 2 (diagnosis based)</th> </tr> </thead> <tbody> <tr> <td>Condition of mortality</td> <td>Death in hospital within 30 days following a selected procedure</td> <td>Death in hospital following admission with a specific diagnosis</td> </tr> <tr> <td>Identification of condition</td> <td>Procedure (OPCS-4) and/or diagnosis (ICD-10) codes</td> <td>Diagnosis (ICD-10) codes</td> </tr> <tr> <td>Data period</td> <td>36 months, 6 months in arrears</td> <td>12 months, 6 months in arrears</td> </tr> </tbody> </table>		Category 1 (procedure based)	Category 2 (diagnosis based)	Condition of mortality	Death in hospital within 30 days following a selected procedure	Death in hospital following admission with a specific diagnosis	Identification of condition	Procedure (OPCS-4) and/or diagnosis (ICD-10) codes	Diagnosis (ICD-10) codes	Data period	36 months, 6 months in arrears	12 months, 6 months in arrears
	Category 1 (procedure based)	Category 2 (diagnosis based)										
Condition of mortality	Death in hospital within 30 days following a selected procedure	Death in hospital following admission with a specific diagnosis										
Identification of condition	Procedure (OPCS-4) and/or diagnosis (ICD-10) codes	Diagnosis (ICD-10) codes										
Data period	36 months, 6 months in arrears	12 months, 6 months in arrears										

Table 2.1: Indicator category definitions

3. Data

Data Source
Hospital Episode Statistics (HES).

Data Fields				
For these indicators the source of data is derived from the Hospital Episodes Statistics (HES). This will be supplied on a monthly basis in two files: Main Extract and Procedures Extract.				
<p>Category 1 indicators use data from both extracts linked by CIP_SPELL_ID. The main extract will contain one row per CIP_SPELL_ID. The procedures extract could contain many rows per CIP_SPELL_ID if there is more than one procedure in the CIP spell. If there were no procedures in the CIP spell, then the CIP_SPELL_ID will not appear in the procedures extract. Category 2 indicators use data from the Main Extract only.</p> <p>The required data fields for each indicator are indicated by a cross (x) in the table below.</p>				Indicator Category
	Field	Description	1	2
Main Extract	CIP_SPELL_ID	An identifying number unique to each spell.	x	
	HESID3C	Identifier unique to each patient.	x	x
	SPELL_DISDATE_CLND	The discharge date following the original spell in hospital.	x	x
	SPELL_ADMIMETH	The admission method for the spell.	x	x
	FIRST_CLASSPAT	Identifies day cases and other spell classifications.	x	x
	LAST_DISMETH	Method of discharge from hospital.	x	x
	SPELL_ADMIDATE_CLND	The admission date to the hospital.	x	
	SPELL_SEX	The gender of the patient.	x	x
	SPELLSTARTAGE	The age of the patient at the start of the spell.	x	x
	SPELL_RANK_IMD	The ranked IMD (Index of Multiple Deprivation) for the home address of the patient.	x	x
	SPELL_CHARLSON	The Charlson score of co-morbidity for the patient.	x	x
	EMER_ADM_LAST_YEAR	The number of emergency admissions for the patient over the previous 12 months.	x	x
	PALLIATIVE_FLAG	Whether the patient has been receiving palliative care.	x	x
	FIRST_DIAG_01_CLND	The primary diagnosis of the patient for the first episode in the continuous inpatient spell.		x
FIRST_PROCODETC_IC_MAPPED	The provider code of the hospital the patient was admitted to.		x	
Procedures Extract	CIP_SPELL_ID	An identifying number unique to each spell.	x	
	CIP_SEQ	A sequential number to identify the order of the episodes that the procedure was recorded in within each spell.	x	
	OPER_SEQ	A sequential number to identify the order procedures were recorded within an episode.	x	

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	OPER_CODE	The code of the procedure.	x	
	PROCODETC_IC_MAPPED	The provider code of the hospital the procedure occurred in.	x	
	OPER_DATE_CLND	Date the procedure was carried out.	x	

Table 3.1: Data Fields

4. Data Preparation

Data Filter				
Table 4.1 shows the filters that should be applied to the data. Following filtering there will be one row (spell) per patient. For Category 1 indicators there will be one row from the procedure file matching one row from the main file for each spell. A cross (×) under an indicator indicates the filter is required for that indicator. Indicator specific information is also given where appropriate.				
Field Name	Conditions	Rationale	Indicator Category	
			1	2
OPER_SEQ	Is equal to 1	This identifies the main procedures within the spell.	×	
CIP_SPELL_ID; CIP_SEQ	The minimum value of CIP_SEQ for each unique CIP_SPELL_ID	Identifies the first episode in each spell with a main procedure. Following this filter there will be a maximum of one row in the Procedures Extract to each entry in the Main Extract.	×	
OPER_CODE	Is equal to any of the OPCS-4 codes specific to the procedure as listed in Table 1 of Appendix 2.	This gives the main procedure undergone by the patient. The codes are OPCS-4 classification codes for the procedure relevant to the indicator.	×	
HESID3C; SPELL_DISDATE_CLND	For each unique value of HESID3C select the one with the last chronological SPELL_DISDATE_CLND.	A patient may have more than one operation during the data period. We only wish to measure the performance of the last spell.	×	×
DIAG_01_CLND	Is equal to any of the following { list of codes } See Table 1 in Appendix 2 for ICD-10 codes for the diagnosis specific to the indicator.	This field gives the primary diagnosis for the admitted patient.	×	
SPELL_DISDATE_CLND	12 or 36 (see specific indicator) month period to end of month N-2. For example, data received for 2009/10 Month 1 will contain data up till the end of April 2009 (numbering of months is based on financial years). To calculate indicators up to the end of 'Month N-2' will mean using the data up to the end of February 2009.	This field is the discharge date following the spell in hospital for the procedure. The data looked at needs to be over a 12 or 36 month period (see specific indicator), the exact values for which will change monthly.	×	×
SPELL_ADMIMETH	Is equal to any of the following: { see specific indicator }	This field describes the patient's admission method. {11, 12, 13} define elective admissions. {21, 22, 23, 24, 28} define emergency admissions.	×	×
			{11, 12, 13} except I00032: {21, 22, 23, 24, 28}	{21, 22, 23, 24, 28}

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FIRST_CLASSPAT	Is not equal to 2	This condition excludes patients admitted as a day case.	×	×
PROCODETC_IC_MAPPED	a. AND b. defined as follows: a. Begins with 'R' b. Includes '5QT'	Select only relevant providers to be modelled and reported on.	×	×
SPELLSTARTAGE	>18	This field describes the age of the patient at the start of their spell in hospital. For this indicator only patients over the age of 18 are considered.	×	×
FIRST_DIAG_01_CLND	Is equal any of the following { list of codes } See Table 1 in Appendix 2 for ICD-10 codes for the diagnosis specific to the indicator.	This field gives the primary diagnosis for the admitted patient.		×

Table 4.1: Data Filters

Definition of Mortality

From this point forward the term 'patient' will refer to a distinct row in the data following filtering.

For indicators in Category 1 the *event* is a death that occurred in hospital within 30 days of the procedure. For indicators in Category 2 the *event* is a death that occurred in hospital at the end of a continuous inpatient spell following an emergency admission for a specific diagnosis. Two new variables *Died_spell* and *Survived_spell* should be created. An *event* has occurred when *Died_spell* = 1.

Category 1 indicators

For indicators in Category 1 *Died_spell* and *Survived_spell* are defined below. For each patient:

1. If OPER_DATE is not null:

$$Died_spell = \begin{cases} 1 \text{ and } Survived_spell = 0 & \text{if data conditions a. and b. are met;} \\ 0 \text{ and } Survived_spell = 1 & \text{otherwise.} \end{cases}$$

2. If OPER_DATE is null:

$$Died_spell = \begin{cases} 1 \text{ and } Survived_spell = 0 & \text{if data conditions a. and c. are met;} \\ 0 \text{ and } Survived_spell = 1 & \text{otherwise.} \end{cases}$$

where data conditions a, b and c are defined as follows:

- a. Condition: LAST_DISMETH equals 4
Rationale: Identifies those patients who are discharged as dead.
- b. Condition: SPELL_DISDATE_CLND minus OPER_DATE_CLND is less than 30
Rationale: Identifies those patients who are discharged less than 30 days after the procedure.
- c. Condition: SPELL_DISDATE_CLND minus SPELL_ADMIDATE_CLND is less than 30, where OPER_DATE is null.
Rationale: Identifies those patients who are discharged less than 30 days after their admission where the operation date is not reported.

Category 2 indicators

For indicators in Category 2 *Died_spell* and *Survived_spell* are defined as follows. For each patient:

$$Died_spell = \begin{cases} 1 \text{ and } Survived_spell = 0 & \text{if data condition 1 is met;} \\ 0 \text{ and } Survived_spell = 1 & \text{otherwise.} \end{cases}$$

where data condition 1 is defined as follows:

1. Condition: LAST_DISMETH equals 4
Rationale: Identifies those patients who are discharged as dead.

Categorisation

Data Categorisation

The following 3 variables need to be categorised into 3 new variables:

1. SPELL_RANK_IMD: This field will be a number in the range of 1 through to 32,482. The lower the number the greater the level of deprivation for the patients home address. For this indicator construction these values are split into quintiles as follows,
 - 1: SPELL_RANK_IMD value from 1 to 6,496 inclusive;
 - 2: SPELL_RANK_IMD value from 6,497 to 12,993 inclusive;
 - 3: SPELL_RANK_IMD value from 12,994 to 19,489 inclusive;
 - 4: SPELL_RANK_IMD value from 19490 to 25,986 inclusive;
 - 5: SPELL_RANK_IMD value from 25,987 to 32,482 inclusive.

These quintiles are given the field name: DEPRIVATION_QUINTILE.
2. SPELLSTARTAGE: For this indicator the ages are split into bands as follows: 19, 20-24 and similar five year bands to 85-89, then 90+, assigning a numerical value to each band from 1 (for 19) to 16 (90+); see appendix 1 for the complete list.

These age bands are given the field name: AGE_GROUP.
3. EMER_ADM_LAST_YEAR Group into four bands with values of 0, 1, 2 and 3+.

These bands are given the field name: EMER_ADM_LAST_YEAR_GROUP

If categorisation is not possible for 1, 2 or 3 due to missing data for example, exclude the patient from the indicator calculation.

Special Condition

Indicator affected: I00032

For this indicator there are subgroups based on the procedure type (OPER_CODE) and diagnosis (DIAG_01). The subgroup categories are defined in Table 2 of Appendix 2. Each patient in the data is assigned a category. These subgroup categories are given the field name SUB_GROUP.

Re-Categorisation

For all indicators the following fields require re-categorising such that each category contains no fewer than 20 *events*, where an *event* is a death as defined in 'Definition of Mortality'. This re-categorisation applies to the whole dataset.

Fields for re-categorisation:

1. AGE_GROUP
2. DEPRIVATION_QUINTILE
3. SPELL_CHARLSON
4. EMER_ADM_LAST_YEAR_GROUP

Start categorisation from the lowest numerical group of the variable. If this group has fewer than 20 *events* merge it with the next group up. If the combined group contains fewer than 20 *events* merge upwards again. Repeat moving upwards until all groups contain 20 *events* or more. If the highest group contains fewer than 20 *events* then merge it with the group below.

Name the fields following re-categorisation as below:

Field	Re-Categorised Field
1. AGE_GROUP	AGE_GROUP_REC
2. DEPRIVATION_QUINTILE	DEPRIVATION_QUINTILE_REC
3. SPELL_CHARLSON	SPELL_CHARLSON_REC
4. EMER_ADM_LAST_YEAR_GROUP	EMER_ADM_LAST_YEAR_GROUP_REC

Output

The case-mix variables in the data are as follows:

1. AGE_GROUP_REC Age group – re-categorised
2. DEPRIVATION_QUINTILE_REC Deprivation quintile – re-categorised
3. SPELL_SEX Sex – 1 or 2 (male or female).
4. SPELL_CHARLSON_REC Co-morbidity – re-categorised
5. EMER_ADM_LAST_YEAR_GROUP_REC Emergency admission within the last 12 months – re-categorised
6. PALLIATIVE_FLAG Palliative care – Y or N (whether the patient is being treated in speciality of palliative care)
7. SUB_GROUP Procedure subgroup – grouped as described above.

Each distinct combination of values of these variables in the data defines a distinct case-mix j .

Table 4.3 should be outputted following processing of the original data through the ‘Data Preparation’ section. The table shows the number of *events* (DIED_SPELL_COUNT) and *non-events* (SURVIVED_SPELL_COUNT) aggregated to case-mix (from patient) level within each provider.

Field Name	Type	Length	Source
INDICATOR_CODE	Character	6	Indicator Code given in ‘Condition’ section 1.
BATCH_ID	Numeric	4	Input file identifier.
PROVIDER	Character	3	PROCDETC_IC_MAPPED field (Category 1 indicators) or FIRST_PROCDETC_IC_MAPPED field (Category 2 indicators) in original data.
AGE_GROUP_REC	Numeric	2	As defined in ‘Re-Categorisation’ sub-section 4.
DEPRIVATION_QUINTILE_REC	Numeric	1	As defined in ‘Re-Categorisation’ sub-section 4.
SEX	Numeric	1	SPELL_SEX field from main extract
SPELL_CHARLSON_REC	Numeric	1	As defined in ‘Re-Categorisation’ sub-section 4.
EMER_ADM_LAST_YEAR_GROUP_REC	Numeric	1	As defined in ‘Re-Categorisation’ sub-section 4.
PALLIATIVE_FLAG	Character	1	PALLIATIVE_FLAG field from main extract.
SUBGROUP	Character	26	SUB_GROUP field in ‘Data Categorisation’ sub-section 4 if relevant to indicator; otherwise leave blank.
DIED_SPELL_COUNT	Numeric	10	$DIED_SPELL_COUNT_{jp} = \sum_{\substack{\text{patients of} \\ \text{casemix } j}} Died_spell$ <p>i.e. the sum of <i>Died_spell</i> for each patient in provider p of case-mix j.</p>
SURVIVED_SPELL_COUNT	Numeric	10	$SURVIVED_SPELL_COUNT_{jp} = \sum_{\substack{\text{patients of} \\ \text{casemix } j}} Survived_spell$ <p>i.e. the sum of <i>Survived_spell</i> for each patient in provider p of case-mix j.</p>

Table 4.3

5. Risk Modelling

Risk Model Specifications

A full logistic regression model with a logit link function is derived to calculate the risk of an *event* .

The independent case-mix variables are listed under 'output' in section 4. Variables 1 to 6 are included in the models for all indicators. Variable 7 (SUB_GROUP) is specific to indicator I00032.

The response variable is $\frac{ObservedEvents}{TotalPatients}$, which takes a value $\frac{ObservedEvents_j}{TotalPatients_j}$ for each case-mix j in the data where:

- $ObservedEvents_j = \sum_{p=1}^P Died_spell_count_p$ i.e. the number of observed *events* in case-mix j (for all providers $p = 1, \dots, P$).
- $TotalPatients_j = \sum_{p=1}^P (Died_spell_count_p + Survived_spell_count_p)$ i.e. the number of patients in case-mix j (for all providers $p = 1, \dots, P$).

Risk Calculation

An estimate of the risk of an *event* for each case-mix j in the data (for all providers) is calculated from the table of log odds produced by the risk modelling process as follows:

$$Risk_j = \frac{\exp(\sum \log odds)}{1 + \exp(\sum \log odds)} \quad \text{where} \quad \sum \log odds = \alpha + \sum_{i=1}^m \beta_i x_i , \text{ for intercept parameter } \alpha , \text{ model case-mix parameters } \beta_1, \dots, \beta_m \text{ and case-mix variables } x_1, \dots, x_m .$$

6. Indicator Calculation

Calculation

SMR Calculation

The SMR for each provider p is calculated as follows:

$$SMR_p = \frac{ObservedEvent_p}{ExpectedEvents_p} \times 100$$

- $ObservedEvents_p$ is the number of observed *events* for provider p and is defined as follows:

$$ObservedEvents_p = \sum_{j=1}^n Died_spell_count_j$$

- $ExpectedEvents_p$ is the expected number of *events* for provider p and is calculated as follows:

$$ExpectedEvents_p = \sum_{j=1}^n N_j \times Risk_j \quad \text{where} \quad N_j \text{ is the number of patients of case-mix } j \text{ within provider } p.$$

Note:

A provider p is exactly in line with the national baseline if $ObservedEvents_p$ equals $ExpectedEvents_p$ (i.e. the SMR score is 100).

Activity Volume

Where $ExpectedEvents_p$ is small the significance of SMR_p is reduced. For this reason providers with $ExpectedDeaths_p$ of 5 or less are not subject to comparison with other providers, as detailed in the 'Banding' section below.

Banding

The upper and lower cut-off values for evaluation of performance are derived using a 99.8% control limit from a Poisson distribution about the baseline of 100 based on the Expected Deaths value.

Following the calculation of the SMRs, the providers are grouped into one of four bandings. The banding for provider p is defined below:

1. if $ExpectedDeaths_p$ greater than 5:

$$Banding_p = \begin{cases} 1 & \text{if } SMR_p \text{ is greater than the upper control limit;} \\ 2 & \text{if } SMR_p \text{ falls between the upper and lower control limits (inclusive);} \\ 3 & \text{if } SMR_p \text{ falls beneath the lower control limit.} \end{cases}$$

2. if $ExpectedDeaths_p$ is between 1 and 5 (inclusive):

$$Banding_p = \begin{cases} 1 & \text{if } SMR_p \text{ is greater than the upper control limit;} \\ 2 & \text{if } SMR_p \text{ is beneath the upper control limit (inclusive);} \end{cases}$$

Note condition 2 ensures that providers with an SMR of zero (zero $ObservedEvents$) are assigned a banding of 2 (instead of 3 as in condition 1) which indicates their SMR is as expected (rather than lower than expected).

3. if $ExpectedDeaths_p$ is less than 1:

$$Banding_p = \begin{cases} 4 & \text{(to indicate that a comparable SMR could not be calculated due to low numbers of operations and/or deaths - see 'Activity Volume' above).} \end{cases}$$

Banding summary

The banding for a provider with an expected number of deaths greater than 5 is determined by the size of the provider’s Standardised Mortality Ratio (SMR) relative to Poisson control limits. The expected number of deaths for a provider determines the upper and lower control limit values against which its SMR is compared. If a provider’s SMR is above the upper control limit value, they are assigned a banding of 1 (i.e. their SMR is above expected); if the provider’s SMR is below the lower control limit value they are assigned a banding of 3 (i.e. their SMR is below expected). If the expected number of deaths for a provider falls between the upper and lower control limit values they are assigned a banding of 2 (i.e. their SMR is as expected).

The banding for a provider with an expected number of deaths between 1 and 5 (inclusive) is identical to those providers with an expected number of deaths above 5 except that a provider in this category cannot be assigned a band 3 (i.e. below expected). Instead, if the SMR for a provider in this category is below the upper control limit value (irrespective of where it is relative to the lower control limit), it is assigned a band 2 (i.e. as expected). This is because the provider’s low expected value is likely to be accompanied by a low observed value; in the case of an observed value of zero the SMR would be zero but the provider would be unfairly credited with a performance of band 3 (‘below expected’) when they have insufficient cases to make a judgement.

All providers with an expected number of deaths less than 1 are assigned a banding of 4 (i.e. data is considered unavailable). The SMR values for providers in this category are likely to be very large giving the misleading impression that they have a higher than expected SMR value when in actual fact they have insufficient data to make a judgement.

Output

The required scoring output from this processing is given in Table 6.1 below. There will be one output line for each provider p (unique value of PROCODETC_IC_MAPPED). Indicator_code, Batch_ID and ManufactureID will be the same across all output lines.

Table 6.1

Field Name	Type	Length	Source
Indicator_code	Character	6	Indicator Code in section 1.
Batch_ID	Numeric	4	Input file identifier.
ManufactureID	Character	40	Processing (manufacture) information identifier.
Provider	Character	3	PROCODETC_IC_MAPPED field (Category 1 indicators) or FIRST_PROCODETC_IC_MAPPED field (Category 2 indicators) in original data.
Numerator	Numeric	8.4	$ObservedEvents_p$ for the provider as defined in section 6.
Denominator	Numeric	8.4	$TotalPatients_p$ for the provider as defined in section 6.
Observed	Numeric	8.4	$ObservedEvents_p$ for the provider (same as Numerator).
Expected	Numeric	8.4	$ExpectedEvents_p$ for the provider as defined in section 6.
Lower	Numeric	8.4	As calculated in section 6.
Upper	Numeric	8.4	As calculated in section 6.
Banding	Numeric	1	$Banding_p$ (value of 1, 2, 3 or 4) for the provider as calculated in section 6.
Value	Numeric	8.4	SMR_p for the provider as calculated in section 6.

where $TotalPatients_p = \sum_{j=1}^n (Died_spell_count_j + Survived_spell_count_j)$

(i.e. all patients of case-mix $j = 1, \dots, n$ in provider p).

Appendices

Appendix 1- Age Groups

Group Number	Age Range (Years)
1	19
2	20-24
3	25-29
4	30-34
5	35-39
6	40-44
7	45-49
8	50-54
9	55-59
10	60-64
11	65-69
12	70-74
13	75-79
14	80-84
15	85-89
16	90+

Table 1. Age Group bands for categorisation.

Appendix 2- Clinical Codes

Procedure	Diagnosis	OPCS-4	ICD-10	Indicators
Repair of Abdominal Aortic Aneurysm	Abdominal Aortic Aneurysm	L161, L162, L168, L169, L181, L182, L188, L189, L191, L192, L198, L199, L201, L202, L208, L209, L211, L212, L218, L219, L231, L232, L233, L234, L235, L236, L237, L238, L239, L251, L252, L253, L254, L255, L258, L259, L283, L288, L289, L271, L272, L273, L274, L275, L276, L278, L279	I710, I711, I712, I713, I714, I715, I716, I718, I719	I00031 I00032
Hip Replacement		W370, W371, W372, W373, W378, W379, W380, W381, W382, W383, W388, W389, W390, W391, W392, W393, W394, W398, W399, W931, W932, W933, W938, W939, W930, W941, W942, W943, W948, W949, W940, W951, W952, W953, W958, W959, W950		I00023
Knee Replacement		W400, W401, W402, W403, W408, W409, W410, W411, W412, W418, W419, W420, W421, W422, W423, W424, W428, W429		I00027
	Fractured Neck of Femur		S720, S721, S722	I00560

Table 1. OPCS-4 and ICD-10 classification codes that define each procedure and diagnosis respectively.
Clinical Code Source: Doctor Foster Intelligence (DFI)

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SUB_GROUP Category	OPER_CODE	DIAG_01
Suprarenal_without_Rupture	equals either L183 or L203	equals any one of the following: I712, I714, I716, I719
Infrarenal_without_Rupture	equals either L184 or L204	equals any one of the following: I712, I714, I716, I719
Suprarenal_with_Rupture	equals either L183 or L203	equals any one of the following: I711, I713, I715 or I718
Infrarenal_with_Rupture	equals either L184 or L204	equals any one of the following: I711, I713, I715, I718
N/A	Not classified in categories above	Not classified in categories above

Table 2. SUB_GROUP category definitions
Clinical Code Source: Doctor Foster Intelligence (DFI)