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National Audit of Hospital Mortality Annual Report 2018

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NOCA National Office of Clinical Audit

NAHM National Audit of Hospital Mortality

NATIONAL AUDIT OF HOSPITAL MORTALITY

SUPPORTING APPENDIX 2018

NOCA National Office of Clinical Audit

National Audit of Hospital Mortality

SUPPORTING APPENDIX 2018

This document is supplemental to the
National Audit of Hospital Mortality Annual Report 2018.

For further information please refer to the main report available at
https://www.noca.ie/publications/publications-listing/P0/category/3

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GLOSSARY

ACRONYM	FULL TERM
AMI	acute myocardial infarction
HSE	Health Service Executive
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification
NAHM	National Audit of Hospital Mortality
NOCA	National Office of Clinical Audit
NQAIS	National Quality Assurance Improvement System. A suite of audit and performance-monitoring tools developed by the Health Intelligence Unit, Strategic Planning and Transformation, HSE.
NQAIS NAHM	National Quality Assurance Improvement System, National Audit of Hospital Mortality web-based tool
OECD	Organisation for Economic Co-operation and Development
SMR	standardised mortality ratio

METHODOLOGY FOR MEASURING IN-HOSPITAL MORTALITY

MORTALITY RATES

Introduction

In-hospital mortality (death) rates measure the number of deaths as a proportion of the number of hospital admissions. Differences in mortality findings between hospitals can be due to one or more of the following:

- **Expected variation:** Due to the nature of data, there will always be some fluctuation in the precise measure between one reporting period and the next.
- **Differences in patient factors:** Patients differ from one another in terms of age, gender and comorbidities.
- **Differences in data collection:** Hospitals and healthcare providers may for many complex reasons differ in terms of how a patient's medical chart is completed or how conditions are recorded and coded.
- **Differences in quality of care:** Mortality is one measure of the quality of care provided to patients in hospital.

There are a number of approaches to measuring mortality rates. Each varies; they are calculated in different ways and used for different purposes. The three main approaches are:

1. Crude in-hospital mortality rate
2. Directly standardised in-hospital mortality rate
3. Indirectly standardised in-hospital mortality ratio.

1. Crude in-hospital mortality rate

The crude in-hospital mortality rate is a measure of the number of deaths per 100 admissions. It is important to remember that it does not attempt to adjust for differences in patient populations (such as age and comorbidity; see above). It is usually presented with reference to a specific disease, such as stroke or acute myocardial infarction (AMI). It is typically expressed as the number of deaths per 100 of the total number of admissions for that specific condition per year.

$$\textbf{Crude in-hospital mortality rate for a given diagnosis} = \frac{\text{No. of deaths*}}{\text{Total admissions *}} \times 100 \text{ per year}$$

*For that specific diagnosis

The crude in-hospital mortality rate gives an overview of the extent to which a given condition adds to the overall burden from death in a particular hospital or group of hospitals. It is not a standardised measure because it does not take into consideration confounding factors such as age, type of admission, previous admissions or existing background illness (case mix and comorbidity) in a population of patients. This method is useful in that it allows each hospital to take a bird's-eye view of its number of deaths as well as time trends, providing there has been no significant change in case mix during the period in question.

However, that being said, it is not appropriate to compare hospitals against one another using the crude in-hospital mortality rate because it does not take into account any of the other important factors affecting mortality. Crude in-hospital mortality is used in this report to show the national trend.

2. Directly standardised mortality rate

The direct standardisation method provides more adjustment for population differences. Standardisation in this context means that a common age-structured population is used as the standard, and study populations or groups are compared against this. Age and gender are the two most common variables used for direct standardisation, and the national population may be used as the 'standard population' (see Figure 1).

(Source Naing, 2000, Figure 1)

FIGURE 1: CONCEPT OF DIRECT STANDARDISATION

Standardisation therefore means that the mortality rates produced for a population or condition in a hospital are those that they would have had if they had the same attributes as the standard population. Direct standardisation methods are more powerful when numbers are larger, and are best used for a single or otherwise homogeneous group of diagnoses. It is important to note that only a limited number of variables may be standardised for using this method.

The Organisation for Economic Co-operation and Development (OECD) uses the directly standardised death rate as the basis for its methodological approach (Organisation for Economic Co-operation and Development, 2015). The reference population is based on the age and gender profile of the OECD 2010 population admitted to hospital with selected conditions. This allows direct comparison between OECD member states and is of greatest value when it is used to compare practices across international boundaries. This is the approach used by the Department of Health for the *National Healthcare Quality Reporting System Annual Report* (Department of Health, 2018) for selected diagnoses, specifically AMI, haemorrhagic stroke and ischaemic stroke. Due to the differences in methodology, it is not possible to compare in-hospital mortality indicators in this report against those reported by the Department of Health.

3. Indirectly standardised mortality ratio

The standardised mortality ratio (SMR) is another method that adjusts for population differences. It is a measure of mortality which allows individual hospitals to compare their observed death rate against the rate that would be expected in that hospital if other variables affecting mortality could be taken into consideration. SMRs are analysed based on the principal diagnosis of the patient recorded in HIPE; that is, the diagnosis which was established after investigation and found to be responsible for the episode of admitted patient care. It does not follow that the principal reason for a person's hospitalisation is always the reason for their death.

In equation format:

$$\textbf{Standardised mortality ratio} = \frac{\text{Observed deaths}}{\text{Expected deaths}} \times 100$$

The 'expected' deaths are calculated from national data using statistical techniques to account for differences in patient factors. These factors include: age, deprivation, whether patients were in receipt of palliative care treatment in hospital, number of previous admissions in the past year, source and type of admission (for example, from home or a nursing home or an emergency transfer from another acute hospital), and the Charlson Comorbidity Index (Charlson *et al.,* 1987), which is a measure of comorbidity. The Charlson Comorbidity Index assigns a weighting to the degree to which the patient is debilitated by a number of background illnesses and conditions. Therefore, it can be seen that the indirect approach to standardisation allows a greater number of variables to be controlled for, which is very useful in dealing with complex conditions and presentations.

Overall, the SMR is an appropriate way to measure in-hospital mortality in Ireland because:

- There are a large number of hospitals, many of very different sizes.
- It takes account of a larger number of variables, which impact on in-hospital mortality.

SMRs can be presented by individual hospital or by diagnosis group, such as AMI or stroke. They do not allow hospitals to compare outcomes against one another, but they do allow comparison against a national average, which is set at 100.

Control limits

While the national average is set at 100, it is unlikely that any calculated SMR will be exactly 100. A certain amount of variation above or below this average is to be expected as normal, and the control limit approach is a method of accounting for this. Control limits are statistical calculations based on the number of admissions and deaths within each hospital which show the variation that is normally expected to occur in that hospital's data. The control limits are set at 99.8%, meaning that there is a 1-in-500 chance of a hospital being outside these limits by chance alone. This means, therefore, that an SMR which is above (or below) the 99.8% control limits is unlikely to have occurred by chance and may indicate greater (or fewer) deaths than would otherwise be expected.

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FRAMEWORK FOR THE NAHM ANNUAL REPORT

The National Audit of Hospital Mortality (NAHM) Governance Committee defined inclusion criteria in order to select a cohort of key diagnoses for the National Audit of Hospital Mortality Annual Report, as shown in Table 1.

TABLE 1: CRITERIA FOR SELECTION OF KEY DIAGNOSES

	Criterion	Comment	Rationale
Clinical	**Alignment to National Clinical Programme**	Is there an aligned Health Service Executive (HSE) National Clinical Programme?	HSE National Clinical Programmes provide national leadership for improvement.
	Burden of the clinical topic	Is the key diagnosis considered of high volume?	HSE National Clinical Programmes provide national leadership for improvement.
	Significant clinical risk	Is the key diagnosis considered of significant clinical risk, for example high mortality?	
Methodological	**Definition**	Is the volume of expected deaths ≥5?	Only key diagnoses which are explicitly defined are selected for reporting.
	Number of hospitals with defined number of admissions and expected events	Is the volume of expected deaths ≥5? Is the volume of admissions >100 over the reporting period for the individual diagnosis?	The model is more statistically reliable when these criteria are met.
	Statistical validity of the model	Is the receiver operating characteristic (ROC) statistic >0.7?	This measure calculates the performance of the model in predicting death. A result of >0.7 is considered a satisfactory predictor.

NAHM GOVERNANCE STRUCTURE

NAHM is deployed under the governance framework of the National Office of Clinical Audit (NOCA). The NOCA Governance Board guides NOCA's clinical decision-making and strategic direction, and it provides oversight for seven national clinical audits.

NOCA has established a NAHM Governance Committee with multidisciplinary membership, including clinical and executive leadership from Irish hospitals and the health service. The NAHM Governance Committee oversees two subcommittees and the NOCA Operational Team.

- In consultation with the Health Intelligence, Strategic Planning and Transformation, Health Service Executive (HIU), NOCA has developed the NQAIS NAHM Analysis and Display Scientific Team (ADST). This team provides specialist expertise in order to achieve excellence in the development and enhancement of the National Quality Assurance Improvement System National Audit of Hospital Mortality (NQAIS NAHM) web-based tool. The membership of the team comes from the HIU, NOCA, the NAHM Governance Committee and the software developer. This aligns NQAIS NAHM with developments on other NQAIS projects under the HIU umbrella.
- The NAHM Writing Group is a subcommittee of the NAHM Governance Committee that is convened specifically to write the annual report.
- The NAHM Operational Team oversees the day-to-day management of NAHM in line with NOCA policies and guidelines.

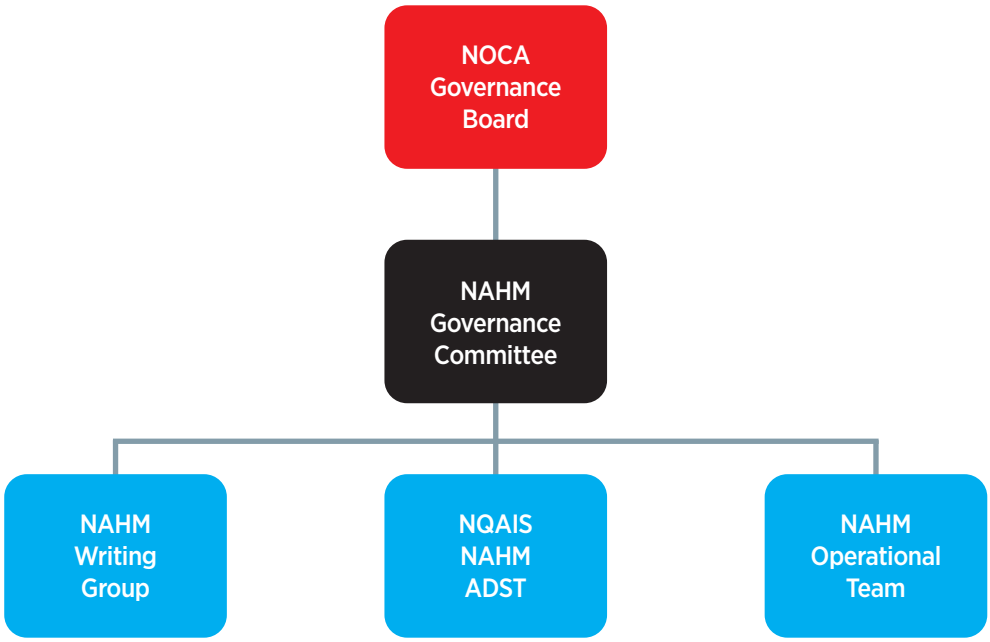

FIGURE 2: NAHM GOVERNANCE STRUCTURE

TABLE 2: ATTENDANCE AT NAHM GOVERNANCE COMMITTEE MEETINGS, 2018

Name	Role	Date Joined	Meeting 24/01/18	Meeting 10/04/18	Meeting 05/07/18	Meeting 11/09/18	Meeting 16/10/18	Comment
Margaret Brennan	HSE Acute Operations Division	2016	✓	✓	P	P	P	Gareth Clifford Proxy
Ronan Collins	Clinical Programmes Representative	2018	N/A	☒	✓	☒		Joined April 2018
Brian Creedon	Chair; Royal College of Physicians of Ireland (Pal Care)	2015	✓	✓	✓	✓	✓	Brian retired following launch of annual report 2017
Bridget Egan	Royal College of Surgeons in Ireland	2015	✓	✓	✓	✓	☒	Appointed as Clinical Lead from January 2019
Alan Egan	Patient and Public Involvement Representative	2017	✓	✓	✓	✓	☒	
Eilísh Hardiman	HSE Hospital Groups Forum	2015	✓	✓	✓	✓	✓	
Ray Healy	NAHM User Representative	2018	N/A	N/A	N/A	✓	✓	Joined July 2018, Retired December 2018
Howard Johnson	HSE Health Intelligence Unit	2015	✓	✓	✓	✓	✓	
Simon Jones	International expert	2015	✓	✓	☒	✓	✓	
Niall Mahon	Royal College of Physicians of Ireland (Cardiology)	2015	☒	N/A	N/A	N/A	N/A	Retired January 2018
Jennifer Martin	HSE Quality Improvement Team	2016	☒	P	✓	✓	P	Appointed as Chair from January 2019
Jeanne Moriarty	Joint Faculty of Intensive Care Medicine of Ireland	2018	✓	☒	☒	☒	✓	
Ed McKone	Royal College of Physicians of Ireland (Resp Med)	2017	☒		✓	☒	☒	Joined April 2017
Deirdre Murphy	HSE Healthcare Pricing Office	2015	✓	✓	☒	✓	✓	
Brian O'Mahony	Public Representative	2015			☒	N/A	N/A	Retired
Geraldine Shaw	HSE Office of Nursing and Midwifery Services	2015	☒		✓	✓		
Collette Tully	NOCA	2016	N/A	N/A	N/A	N/A	N/A	Attendance as agenda requires
Barry White	Royal College of Physicians of Ireland	2015						Retired
Deirdre Burke	NOCA	2015	✓	✓	✓	✓	✓	
Marinia Cronin	NOCA	2015	☒	✓	☒	✓	✓	

✓ Attended Meeting ☒ Apologies received P Proxy attending N/A not yet appointed or resigned from committee

INDICATORS FOR KEY DIAGNOSIS AND TABULAR INFORMATION TO SUPPORT FUNNEL PLOTS IN THE MAIN REPORT

ACUTE MYOCARDIAL INFARCTION

TABLE 3: AMI INDICATOR

Definition	Standardised mortality ratio with a principal diagnosis of AMI
Year covered	2018
ICD-10-AM codes	I21, I210, I211, I212, I213, I214, I219, I22, I220, I221, I228, I229
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Acute myocardial infarction', 'Acute transmural MI of anterior wall', 'Acute transmural MI of inferior wall', 'Acute transmural MI of other sites', 'Acute transmural MI of unspecified site', 'Acute sub-endocardial MI', 'Acute myocardial infarction unspecified', 'Subsequent myocardial infarction', 'Subsequent MI of anterior wall', 'Subsequent MI of inferior wall', 'Subsequent MI of other sites', 'Subsequent MI of unspecified site' **Denominator** Number of expected deaths for AMI. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of AMI.

TABLE 4: TABULAR PRESENTATION FOR AMI IN-HOSPITAL MORTALITY, 2018

Hospital Group	Hospital name	No. of admissions for AMI, 2018	SMR -AMI, 2018	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	125	104	(-3-232)
	St James's Hospital	664	122	(42-166)
	Tallaght University Hospital(Adult)	229	129	(5-216)
Ireland East Hospital Group	Mater Misericordiae University Hospital	557	146	(33-177)
	Regional Hospital Mullingar	101	119	(-17-255)
	Our Lady's Hospital, Navan	115	0	(-15-250)
	St Luke's Hospital, Kilkenny	180	147	(1-224)
	St Vincent's University Hospital	299	131	(27-185)
	Wexford General Hospital	235	62	(18-199)
RCSI Hospitals	Connolly Hospital	141	60	(-3-233)
	Beaumont Hospital	227	82	(1-336)
	Cavan General Hospital	189	79	(24-189)
	Our Lady of Lourdes Hospital, Drogheda	195	65	(24-189)
Saolta University Health Care Group	Galway University Hospitals	495	144	(40-167)
	Letterkenny University Hospital	210	67	(14-204)
	Mayo University Hospital	172	169	(11-209)
	Sligo University Hospital	147	42	(19-197)
South / South West Hospital Group	Cork University Hospital	661	124	(44-163)
	University Hospital Kerry	137	36	(17-201)
	South Tipperary General Hospital	106	113	(-15-250)
	University Hospital Waterford	162	126	(0-228)
UL Hospital Group	University Hospital Limerick	462	76	(39-170)

HEART FAILURE

TABLE 5: HEART FAILURE INDICATOR

Definition	**Standardised mortality ratio with a principal diagnosis of heart failure**
Year covered	2018
ICD-10-AM codes	I50, I500, I501, I509
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Heart failure', 'Congesfve heart failure', 'Leg ventricular failure', 'Heart failure unspecified' **Denominator** Number of expected deaths for heart failure. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of heart failure.

TABLE 6: TABULAR PRESENTATION FOR HEART FAILURE IN-HOSPITAL MORTALITY, 2018

Hospital Group	Hospital name	No. of admissions for Heart Failure, 2018	SMR - Heart Failure	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	127	106	(11-210)
	Midland Regional Hospital, Portlaoise	119	114	(18-199)
	St James's Hospital	255	141	(38-171)
	Tallaght University Hospital (Adult)	168	85	(18-197)
	Midland Regional Hospital, Tullamore	143	124	(18-200)
Ireland East Hospital Group	Mater Misericordiae University Hospital	279	108	(39-170)
	Regional Hospital Mullingar	169	72	(17-201)
	Our Lady's Hospital, Navan	162	118	(21-194)
	St Luke's Hospital, Kilkenny	215	137	(31-181)
	St Vincent's University Hospital	332	106	(50-156)
	Wexford General Hospital	263	114	(28-183)
RCSI Hospitals	Connolly Hospital	156	97	(30-181)
	Beaumont Hospital	276	123	(42-165)
	Cavan General Hospital	201	100	(24-189)
	Our Lady of Lourdes Hospital, Drogheda	229	89	(28-183)
Saolta University Health Care Group	Portiuncula University Hospital	110	52	(11-209)
	Galway University Hospitals	440	102	(49-156)
	Letterkenny University Hospital	218	101	(29-183)
	Mayo University Hospital	345	103	(43-163)
	Sligo University Hospital	189	58	(31-180)
South / South West Hospital Group	Bantry General Hospital	115	169	(2-222)
	Cork University Hospital	382	112	(36-173)
	University Hospital Kerry	154	105	(11-209)
	Mallow University Hospital	130	140	(0-228)
	Mercy University Hospital	164	106	(13-204)
	South Tipperary General Hospital	136	30	(12-208)
	University Hospital Waterford	198	53	(27-186)
UL Hospital Group	University Hospital Limerick	294	88	(43-164)
	Ennis Hospital	157	59	(31-180)
	St John's Hospital, Limerick	119	81	(24-190)
	Nenagh Hospital	125	81	(1-226)

ISCHAEMIC STROKE

TABLE 7: ISCHAEMIC STROKE INDICATOR

Definition	**Standardised mortality ratio with a principal diagnosis of ischaemic stroke**
Year covered	2018
ICD-10-AM codes	I63, I630, I631, I632, I633, I634, I635, I636, I638, I639
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Cerebral infarction', 'Cerebral infarction due to thrombosis of the pre-cerebral artery', 'Cerebral infarction due to embolism of pre-cerebral artery', 'Cerebral infarction due to unspecified occlusion of pre-cerebral artery', 'Cerebral infarction due to thrombosis of the cerebral artery', 'Cerebral infarction due to embolism of the cerebral artery', 'Cerebral infarction due to unspecified occlusion of the cerebral artery', 'Cerebral infarction due to central venous thrombosis non-pyogenic', 'Other cerebral infarction', 'Cerebral infarction unspecified' **Denominator** Number of expected deaths for ischaemic stroke. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of ischaemic stroke.

TABLE 8: TABULAR PRESENTATION FOR ISCHAEMIC STROKE IN-HOSPITAL MORTALITY, 2018

Hospital Group	Hospital name	No. of admissions for Ischaemic Stroke, 2018	SMR – Ischaemic Stroke, 2018	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	177	87	(29-182)
	St James's Hospital	229	134	(19-197)
	Tallaght University Hospital (Adult)	227	154	(20-195)
Ireland East Hospital Group	Mater Misericordiae University Hospital	297	86	(42-166)
	St Vincent's University Hospital	321	107	(48-158)
	Wexford General Hospital	110	169	(8-213)
RCSI Hospitals	Connolly Hospital	136	105	(6-216)
	Beaumont Hospital	501	75	(45-162)
	Cavan General Hospital	130	98	(20-195)
	Our Lady of Lourdes Hospital, Drogheda	181	76	(31-180)
Saolta University Health Care Group	Galway University Hospitals	256	53	(39-169)
	Letterkenny University Hospital	147	139	(18-199)
	Mayo University Hospital	144	91	(25-188)
	Sligo University Hospital	124	102	(12-208)
South / South West Hospital Group	Cork University Hospital	433	163	(42-165)
	University Hospital Kerry	161	55	(26-187)
UL Hospital Group	University Hospital Limerick	317	78	(44-163)

HAEMORRHAGIC STROKE

TABLE 9: HAEMORRHAGIC STROKE INDICATOR

Definition	**Standardised mortality ratio with a principal diagnosis of haemorrhagic stroke**
Years covered	2016–2018
ICD-10-AM codes	I60, I600, I601, I602, I603, I604, I605, I606, I607, I608, I609, I61, I610, I611, I612, I613, I614, I615, I616, I618, I619
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Subarachnoid haemorrhage', 'Subarachnoid haemorrhage, carotid siphon and bifurcation', 'Subarachnoid haemorrhage from middle cerebral artery', 'Subarachnoid haemorrhage from anterior communicating artery', 'Subarachnoid haemorrhage from posterior communicating artery', 'Subarachnoid haemorrhage from basilar artery', 'Subarachnoid haemorrhage from vertebral artery', 'Subarachnoid haemorrhage from other intracranial artery', 'Subarachnoid haemorrhage from intracranial artery unspecified', 'Other subarachnoid haemorrhage', 'Subarachnoid haemorrhage unspecified', 'Intracerebral haemorrhage', 'Intracerebral haemorrhage in hemisphere subcortical', 'Intracerebral haemorrhage in hemisphere cortical', 'Intracerebral haemorrhage in hemisphere unspecified', 'Intracerebral haemorrhage in brain stem', 'Intracerebral haemorrhage in cerebellum', 'Intracerebral haem intraventricular', 'Intracerebral haem multiple localised', 'Other intracerebral haemorrhage', 'Intracerebral haemorrhage unspecified'. **Denominator** Number of expected deaths for haemorrhagic stroke. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of haemorrhagic stroke.

TABLE 10: TABULAR PRESENTATION FOR HAEMORRHAGIC STROKE IN-HOSPITAL MORTALITY, 2016-2018

Hospital Group	Hospital name	No. of admissions for Haemorrhagic Stroke, 2016-2018	SMR – Haemorrhagic Stroke, 2016-2018	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	102	98	(49-157)
	St James's Hospital	155	120	(53-151)
	Tallaght University Hospital (Adult)	137	89	(50-155)
Ireland East Hospital Group	Mater Misericordiae University Hospital	248	75	(64-139)
	St Vincent's University Hospital	283	101	(71-131)
RCSI Hospitals	Connolly Hospital	107	102	(49-156)
	Beaumont Hospital	923	100	(73-129)
	Our Lady of Lourdes Hospital, Drogheda	112	98	(52-153)
Saolta University Health Care Group	Galway University Hospitals	157	99	(60-143)
South / South West Hospital Group	Cork University Hospital	486	126	(71-130)
	University Hospital Waterford	104	79	(53-152)
UL Hospital Group	University Hospital Limerick	211	110	(63-140)

COPD

TABLE 11: COPD INDICATOR

Definition	**Standardised mortality ratio with a principal diagnosis of COPD**
Year covered	2018
ICD-10-AM codes	J40, J41, J410, J411, J418, J42, J43, J430, J431, J432, J438, J439, J44, J440, J441, J448, J449, J47
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Bronchitis not specified as acute or chronic', 'Simple and mucopurulent chronic bronchitis', 'Simple chronic bronchitis', 'Mucopurulent chronic bronchitis', 'Mixed simple and mucopurulent chronic bronchitis', 'Unspecified chronic bronchitis', 'Emphysema', 'MacLeod's syndrome', 'Pan-lobular emphysema', 'Centrilobular emphysema', 'Other emphysema', 'Emphysema unspecified', 'Other COPD', 'COPD with acute lower respiratory infection', 'COPD with acute exacerbation unspecified', 'Other specified COPD', 'COPD unspecified', 'Bronchiectasis' **Denominator** Number of expected deaths for COPD. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of COPD.

TABLE 12: TABULAR PRESENTATION FOR COPD IN-HOSPITAL MORTALITY, 2018

Hospital Group	Hospital name	No. of admissions for COPD, 2018	SMR -COPD, 2018	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	411	106	(33-178)
	Midland Regional Hospital, Portlaoise	337	91	(16-201)
	St James's Hospital	789	96	(48-157)
	Tallaght University Hospital (Adult)	769	131	(45-162)
	Midland Regional Hospital, Tullamore	448	140	(25-188)
Ireland East Hospital Group	St Columcille's Hospital	260	53	(-13-245)
	Mater Misericordiae University Hospital	834	104	(38-171)
	Regional Hospital Mullingar	441	87	(21-194)
	Our Lady's Hospital, Navan	390	96	(23-191)
	St Luke's Hospital, Kilkenny	548	85	(38-171)
	St Michael's Hospital	193	17	(-11-241)
	St Vincent's University Hospital	415	84	(32-178)
	Wexford General Hospital	763	111	(40-168)
RCSI Hospitals	Connolly Hospital	537	111	(36-174)
	Beaumont Hospital	731	131	(43-164)
	Cavan General Hospital	506	67	(33-177)
	Our Lady of Lourdes Hospital, Drogheda	592	101	(36-174)
Saolta University Health Care Group	Portiuncula University Hospital	307	124	(22-193)
	Galway University Hospitals	624	67	(41-167)
	Letterkenny University Hospital	621	87	(31-179)
	Mayo University Hospital	628	106	(45-161)
	Sligo University Hospital	455	96	(36-174)
South / South West Hospital Group	Cork University Hospital	644	161	(36-173)
	University Hospital Kerry	325	110	(24-190)
	Mallow University Hospital	274	40	(-17-254)
	Mercy University Hospital	582	124	(37-172)
	South Tipperary General Hospital	406	71	(31-180)
	University Hospital Waterford	314	106	(18-200)
UL Hospital Group	University Hospital Limerick	739	108	(54-151)
	Ennis Hospital	368	55	(38-170)
	St John's Hospital, Limerick	444	64	(31-179)
	Nenagh Hospital	171	97	(-16-251)

PNEUMONIA

TABLE 13: PNEUMONIA INDICATOR

Definition	**Standardised mortality ratio with a principal diagnosis of pneumonia**
Year covered	2018
ICD-10-AM codes	A202, A212, A221, A310, A420, A430, A481, A78, B012, B052, B250, B583, B59, B671, J12, J120, J121, J122, J123, J128, J129, J13, J14, J15, J150, J151, J152, J153, J154, J155, J156, J157, J158, J159, J16, J160, J168, J17, J170, J171, J172, J173, J178, J18, J180, J181, J182, J188, J189, J85, J850, J851
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Pneumonic plague', 'Pulmonary tularaemia', 'Pulmonary anthrax', 'Pulmonary mycobacterial infection', 'Pulmonary actinomycosis', 'Pulmonary nocardiosis', 'Legionnaires' disease', 'Q fever', 'Varicella pneumonia', 'Measles complicated by pneumonia', 'Cytomegaloviral pneumonitis', 'Pulmonary toxoplasmosis', 'Pneumocystosis', 'Echinococcus granulosus infection lung', 'Viral pneumonia not elsewhere classified', 'Adenoviral pneumonia', 'Respiratory syncytial virus pneumonia', 'Parainfluenza virus pneumonia', 'Human metapneumovirus pneumonia', 'Other viral pneumonia', 'Viral pneumonia unspecified', 'Pneumonia due to Streptococcus pneumoniae', 'Pneumonia due to Haemophilus influenzae', 'Bacterial pneumonia NEC', 'Pneumonia due to Klebsiella pneumoniae', 'Pneumonia due to Pseudomonas', 'Pneumonia due to staphylococcus', 'Pneumonia due to streptococcus group B', 'Pneumonia due to other streptococci', 'Pneumonia due to Escherichia coli', 'Pneumonia due to other (aerobic) gram negative bacteria', 'Pneumonia due to Mycoplasma pneumoniae', 'Other bacterial pneumonia', 'Bacterial pneumonia unspecified', 'Pneumonia due to other infect organisms NEC', 'Chlamydial pneumonia', 'Pneumonia due to other spec infect organisms', 'Pneumonia in diseases class elsewhere', 'Pneumonia in bacteria disease classified elsewhere', 'Pneumonia in viral disease classified elsewhere', 'Pneumonia in mycoses', 'Pneumonia in parasitic diseases', 'Pneumonia in other disease classified elsewhere', 'Pneumonia organism unspecified', 'Bronchopneumonia unspecified', 'Lobar pneumonia unspecified', 'Hypostatic pneumonia unspecified', 'Other pneumonia organism unspecified', 'Pneumonia unspecified', 'Abscess of lung and mediastinum', 'Gangrene and necrosis of lung', 'Abscess of lung with pneumonia' **Denominator** Number of expected deaths for pneumonia. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of pneumonia.

TABLE 14: TABULAR PRESENTATION FOR PNEUMONIA IN-HOSPITAL MORTALITY, 2018

Hospital Group	Hospital name	No. of admissions for pneumonia, 2018	SMR – pneumonia, 2018	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	404	81	(56-148)
	Midland Regional Hospital, Portlaoise	238	79	(43-165)
	St James's Hospital	854	137	(68-134)
	Tallaght University Hospital (Adult)	561	104	(61-142)
	Midland Regional Hospital, Tullamore	236	168	(37-172)
Ireland East Hospital Group	St Columcille's Hospital	172	43	(18-197)
	Mater Misericordiae University Hospital	803	97	(64-139)
	Regional Hospital Mullingar	240	108	(42-165)
	Our Lady's Hospital, Navan	352	61	(53-152)
	St Luke's Hospital, Kilkenny	502	91	(60-143)
	St Michael's Hospital	214	87	(41-166)
	St Vincent's University Hospital	848	96	(71-131)
	Wexford General Hospital	341	87	(44-163)
RCSI Hospitals	Connolly Hospital	484	113	(61-142)
	Beaumont Hospital	514	136	(58-145)
	Cavan General Hospital	507	93	(60-144)
	Our Lady of Lourdes Hospital, Drogheda	862	95	(69-133)
Saolta University Health Care Group	Portiuncula University Hospital	520	72	(63-140)
	Galway University Hospitals	616	99	(62-141)
	Letterkenny University Hospital	430	119	(56-148)
	Mayo University Hospital	407	127	(54-150)
	Sligo University Hospital	646	68	(66-136)
South / South West Hospital Group	Bantry General Hospital	103	139	(18-198)
	Cork University Hospital	518	165	(55-149)
	University Hospital Kerry	396	82	(57-147)
	Mallow University Hospital	176	124	(26-187)
	Mercy University Hospital	304	137	(46-161)
	South Tipperary General Hospital	380	95	(57-147)
	University Hospital Waterford	274	87	(48-158)
UL Hospital Group	University Hospital Limerick	408	90	(54-150)
	Ennis Hospital	140	53	(34-176)
	St John's Hospital, Limerick	162	50	(38-170)

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