NOCA National Office of Clinical Audit | NAHM National Audit of Hospital Mortality

NATIONAL AUDIT OF HOSPITAL MORTALITY

ANNUAL REPORT 2021

HSE Healthcare Pricing Office

CONTENTS

GLOSSARY OF TERMS & ABBREVIATIONS

ACRONYM	MEANING
AMI	acute myocardial infarction
CCS	Clinical Classifications Software
CI	Confidence interval
COPD	chronic obstructive pulmonary disease
COVID-19	coronavirus disease 2019
CuSum	cumulative summary control chart
DPH	Director of Public Health
HIPE	Hospital In-Patient Enquiry scheme
HIQA	Health Information and Quality Authority
HPO	Healthcare Pricing Office
HPSC	Health Protection Surveillance Centre
HSE	Health Service Executive
ICD-10-AM / ACHI/ACS	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification/Australian Classification of Health Interventions/Australian Coding Standards
MOH	Medical Officer of Health
NAHM	National Audit of Hospital Mortality. A structured review and evaluation of care as part of the clinical audit cycle.

ACRONYM	MEANING
NCEC	National Clinical Effectiveness Committee
NCHD	Non-consultant hospital doctor
NHIU	National Health Intelligence Unit, Strategic Planning and Transformation, HSE
NOCA	National Office of Clinical Audit
NQAIS	National Quality Assurance Improvement System. A suite of audit and performance-monitoring tools developed by the National 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
PCI	percutaneous coronary Intervention
principal diagnosis	The diagnosis which was established after investigation and found to be responsible for the episode of admitted patient care, as represented by an ICD-10-AM/ ACHI/ACS code.
SMR	standardised mortality ratio

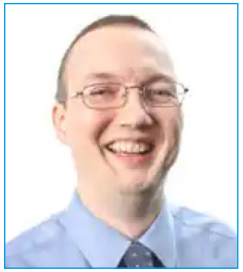
FOREWORD

We have already had three years of COVID-19, with well over 200 countries and territories reporting cases and millions dying worldwide. Happily, in Ireland as in many countries, its waves of infections are now much lower than in 2020 and 2021. However, non-communicable diseases such as heart attacks, strokes and the other conditions in this report never went away and remain among the most important reasons for hospital admission and death. We know that most in-hospital deaths are not unexpected, and we can learn from the best-performing units. Such quality improvement requires the collection, analysis, and presentation of relevant data to the right people, which includes us all as patients. Transparent publication of public sector performance is a hallmark of a healthy democracy and is widespread in many parts of the Western world .

The purpose of this report on the National Audit of Hospital Mortality (NAHM) is to continue Ireland's transparency, to allow us all to reflect on the current situation regarding deaths that occur in hospital, and to begin new initiatives to improve the quality of care. It will not happen overnight. It may involve asking difficult questions on the reasons why death rates vary across the country. These reasons are legion and can include data quality and staff shortages. But if the public and the healthcare teams understand the purpose of the statistics in this report and react in a spirit of improvement rather than judgment, then progress will be easier and greater.

Like the process of improving healthcare, the process of measuring performance using indicators such as hospital mortality does not and must not stand still. No country has perfect data or can fully adjust its death rates for patient risk. However, I was delighted to lead the recent review of NAHM and to contribute to its evolution in moving the science forward. I look forward to seeing more examples of how data have been used to drive up standards and save lives.

Prof Alex Bottle, Professor of Medical Statistics at Imperial College London



Prof. Alex Bottle

"quality improvement reqiures the collection, analysis and presentation of relevant data to the relevant people, who include us all as patients"

EXECUTIVE SUMMARY

The seventh National Audit of Hospital Mortality (NAHM) Annual Report sees a change in appearance, moving to a more streamlined and condensed online version. Data on all diagnoses is updated quarterly and all participating hospitals have access to their information at all times throughout the year via the web-based online tool called the National Quality Assurance Improvement System, National Audit of Hospital Mortality (NQAIS NAHM).

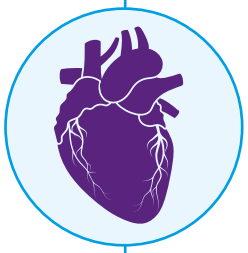
The inclusion of case studies from two hospitals shows the ongoing commitment to quality improvement using NAHM data and sincere thanks go to those hospitals for sharing their work. These case studies have identified data issues which were highlighted in previous NAHM reports and point to the importance of accurate documentation in the medical record and the need for agreed terminology to ensure all palliative care treatment is captured and included as continual learning in all NAHM training sessions.

Analysis of the data for 2021 shows that crude mortality for AMI (acute myocardial infarction) and both stroke conditions has declined over the last 10 years. However, heart failure mortality has risen in 2021 and the reasons why are not yet evident.

As in NAHM Annual Report 2020 (NOCA 2021), the crude mortality rate for chronic obstructive pulmonary disease (COPD) and pneumonia, continue to rise and this can be directly linked to COVID-19 – see Figures 11 and 14 for more information.

All hospitals had a standardised mortality ratio (SMR) within the control limits in 2021 for the six key diagnoses described in this report and for all diagnoses included in the web-based tool, which means there were no statistical outliers, and all hospitals were within expected ranges, despite the high numbers of COVID-19 cases in the reporting period.

KEY FINDINGS



ACUTE MYOCARDIAL INFARCTION

In-hospital mortality for AMI has declined steadily, from 69 deaths per 1,000 admissions in 2012 to 48 deaths per 1,000 admissions in 2021.

HEART FAILURE

Crude mortality for heart failure increased significantly (15%) between 2020 and 2021, from 63 deaths per 1,000 admissions in 2020 to 73 deaths per 1,000 admissions in 2021. There is insufficient data at present to establish the reason for this increase, but it will be monitored and if it continues to increase it will be reported on in the future.

ISCHAEMIC STROKE

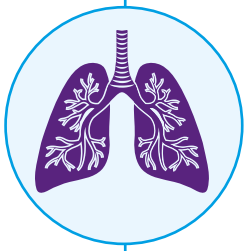
There was a significant reduction (42%) in in-hospital mortality for ischaemic stroke, from 116 deaths per 1,000 admissions in 2012 to 68 deaths per 1,000 admissions in 2021, despite the rise in numbers of presentations to hospital.

HAEMORRHAGIC STROKE

For haemorrhagic stroke there was a 21% reduction in in-hospital mortality, from 309 deaths per 1,000 admissions in 2012 to 253 deaths per 1,000 admissions in 2021.

CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

In-hospital crude mortality for COPD shows a slight increase from 38 deaths per 1,000 admissions in 2020 to 41 deaths per 1,000 admissions in 2021. This may reflect more severe exacerbations in those with COVID-19, as 13% of the COPD deaths had a recorded COVID-19 flag associated with them.



PNEUMONIA

Pneumonia crude mortality has seen a significant increase, from 103 deaths per 1,000 admissions reported in 2019 to 140 deaths per 1,000 admissions reported in 2021.The number of in-hospital viral pneumonia cases recorded has increased exponentially in the last two years due to COVID-19, rising from 26 cases in 2019, to 9,118 cases in 2021. Deaths in hospitals, as a result of pneumonia, can be seen to revert to normal rates post vaccination roll-out, reflecting the beneficial effect of the vaccination programme in reducing mortality.

Case studies identify the continued need for clearer documentation in the medical record to ensure accuracy of principal diagnosis.

There is still a need for agreed terminology/synonyms which can be used in the medical record in the absence of the wording 'palliative care', to ensure that all palliative care and end of life care cases are correctly assigned the ICD-10-AM Palliative Care Z51.5 code. This is required to ensure that there is consistency in the application of the code for inclusion in the NQAIS NAHM risk modelling.

POINTS FOR CONSIDERATION /LEARNING

- Heart failure crude mortality rate shows a significant increase of 15% from 2020 to 2021. However, there is insufficient data yet to pinpoint the cause of this increase. The data will be monitored and if the upward trend continues, appropriate analysis will be carried out.
- All NAHM users/hospitals should identify an area for review, using NAHM data and conduct quality improvement case studies similar to those included in this report.
- Clinicians should work with local Hospital In-Patient Enquiry Scheme (HIPE) coders and carry out a review on a sample of cases to examine if the principal diagnoses assigned to those cases are correct.
- Consideration should be given by all hospitals to include education on medical chart documentation and HIPE coding as part of the non-consultant hospital doctor's (NCHD) induction programme.

The commitment and support shown for NQAIS NAHM from the participating hospitals, and users within those hospitals, continued throughout the COVID-19 pandemic and is ongoing today. The NAHM Governance Committee thank them for ensuring that mortality rates in Ireland are being monitored, which is evidenced by the lack of statistical outliers in any of the 6 key diagnoses featured in this report, or indeed in any other diagnosis group for in-patent admissions during 2021.

INTRODUCTION

The National Audit of Hospital Mortality (NAHM) provides mortality data to 44 publicly funded acute hospitals, via a web-based tool called NQAIS NAHM. A national report using NAHM data has been published by the National Office of Clinical Audit (NOCA) annually since 2016, showing identifiable hospital data for six key clinical conditions – AMI, heart failure, ischaemic stroke, haemorrhagic stroke, COPD and pneumonia.

The NAHM Annual Report is the public face of the audit, and this 2021 report is presented as a concise online report. The six conditions are defined with more expansive clinical information obtained via hyperlinks to both NOCA and external websites. The hyperlinked documents are highlighted in blue throughout the text. There are 44 participating hospitals, and they continue to be able to access data for all possible diagnosis and conditions for their patients throughout the year – not just the six included in this report. This report is aimed at patients, their families, the health service, and those providing care to patients who are admitted as in-patients to Irish hospitals. It is important to note that the categorisation of data within NAHM is based on the Principal Diagnosis (the primary reason a patient required hospital admission). The six key diagnoses presented in the report do not therefore necessarily reflect the cause of death.

The NAHM Governance Committee defines a statistical outlier as occurring where standardised mortality ratios (SMRs) for an individual diagnosis are higher than expected, appearing outside the 99.8% confidence intervals, combined with a high breach of 99.8% control limits in the cumulative summary control chart (CuSum). If this outlier occurs in two consecutive quarterly releases of data in NQAIS NAHM, it is significant. While there was a pause in release of data to NQAIS NAHM during 2020/2021 because of concerns around the reliability of data when there were such high numbers of COVID-19 cases, as can be seen from the graphs, there were no outliers in the 2021 data. At the year-end all hospitals had results within expected ranges for the six diagnoses included in this report, and for all other diagnoses available to view at local hospital level.

This report also graphs the data on crude mortality patterns in COPD and pneumonia, which are more likely to have been affected by COVID-19, mapped against the number of COVID-19 cases from January 2020 to March 2022. The data shows the continued high levels of COVID-19 cases and mortality, particularly in pneumonia, during late 2021 and into 2022. As testing became less frequent, and the shift towards antigen testing and self-reporting evolved, the reported incidence of COVID-19 became less reliable, so therefore the COVID-19 graphs do not map beyond March 2022.

"It is important to note that the categorisation of data within NAHM is based on the Principal Diagnoses (the primary reason a patient required hospital admission). The six key diagnoses presented in the report do not therefore necessarily reflect the cause of death."

In 2022, an independent review of NAHM was published (see audit update on page 20 for more information). Twelve recommendations were developed from the review, and NAMH is currently assessing and working on implementing as many as are feasible in the shortest possible time frame. The outcome of the review and changes should result in an improved NQAIS NAHM tool, giving added confidence to hospitals and service users alike, that the highest international monitoring standards are being applied.

METHODS

A short-life annual report writing group was formed to prepare this report. Members with subject matter expertise in audit and data were invited to join. The writing group met throughout a period of 6 months to prepare and approve the content of the report on behalf of the NAHM Governance Committee. Further information on the NAHM governance structure is available on the NOCA website.

This report includes data for 44 hospitals for six key diagnoses recorded within the period 1 January 2021 to 31 December 2021. While 44 hospitals are included in the crude mortality trend graphs, the SMR funnel plots exclude hospitals where less than 100 cases have been recorded in each of the six key diagnoses. Furthermore, specialist hospitals for which the diagnoses are not appropriate (for example The Royal Victoria Eye and Ear Hospital and orthopaedic hospitals) have also been excluded from the SMR funnel plots. The number of hospitals included is detailed in each clinical section.

The NQAIS NAHM tool calculates SMRs for all diagnoses for all in-hospital admissions. The SMR is calculated from the observed number of deaths divided by the expected number of deaths in a hospital for a particular diagnosis and time period, adjusted for the following factors:

- **AGE**
- **SEX**
- **PRE-EXISTING CONDITIONS** (Charlson Comorbidity Index (Charlson *et al.,* 1987))
- **IN-HOSPITAL PALLIATIVE CARE TREATMENT**
- **SOURCE OF ADMISSION** (e.g., other acute hospital, home, nursing home)
- **TYPE OF ADMISSION** (e.g., elective, emergency)
- **PREVIOUS EMERGENCY ADMISSIONS** in the last 12 months to the same hospital
- **MEDICAL CARD** (proxy depravation measure)

Hospitals data cannot be compared to each other, they are compared to the national average for a condition or diagnosis. In Ireland COVID-19 virus is identified in hospital data as a secondary diagnosis and as NQAIS NAHM is based on the principal diagnosis, the presence of COVID-19 is not directly included in the risk calculations for the SMR or expected deaths. A 'COVID-19 flag' was added to the NQAIS NAHM web-based tool to show users in hospitals which cases had tested positive for COVID-19, or were being treated for COVID-19, during that admission to hospital. This extra information helps hospitals to analyse the data.

A full explanation of NAHM methodology is available on the NOCA website.

In this report, SMR funnel plots are presented for the year 2021 for AMI, heart failure, ischaemic stroke, COPD and pneumonia. Due to the small numbers of cases per year, haemorrhagic stroke is presented for a three-year period 2019–2021. The funnel plots are presented with control limits showing expected variation.

A line chart is presented for all six diagnoses to show a trend of crude mortality rate over the 10 years 2012–2021. These charts are presented with control limits to show the number of people that died in hospital as a proportion of the total number of admitted cases for that diagnosis. Unlike the SMRs, crude mortality rates have not been adjusted for differences in age profile or comorbidities over time.

Graphs showing crude mortality against the number of COVID-19 cases per month and significant vaccination milestones, are presented in the COPD and pneumonia sections. Data on COVID-19 cases per month was requested from the Health Protection Surveillance Centre (HPSC). The data are based on cases notified on the Computerised Infectious Disease Reporting (CIDR). Data were extracted from the CIDR system on 24 January 2023. Data are provisional and subject to ongoing review, validation, and update.

DATA QUALITY STATEMENT

The data quality statement provides an assessment of the data released for this report, focusing on the data quality dimension of accuracy and reliability, as laid out in the Health Information and Quality Authority's (HIQA) *Guidance on a data quality framework for health and social care* (HIQA, 2018) .

Data analysis in this report focuses on six key diagnoses identified by the NAHM Governance Committee as being of high burden on the Irish health service. Inclusion criteria have been set and data for 2021 has been analysed. Data for 2020 and 2022 has also been included in the context of COVID-19 in the respiratory diagnoses included in this report, as those diagnoses are the most impacted by COVID-19.

TABLE 1: **DATA QUALITY STATEMENT**

DATA SOURCE **Where did the data come from?** 	The main source of data for analysis in this report was HIPE which is a health information system designed to collect demographic, clinical and administrative information on all discharges, including deaths, from acute hospitals nationally. Clinical information is coded using the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification/Australian Classification of Health Interventions/ Australian Coding Standards (ICD-10-AM/ACHI/ACS) (Australian Consortium for Classification Development, 2017). NQAIS NAHM uses data directly sourced from HIPE via the Healthcare Pricing Office (HPO). Hospitals routinely collect information on patients discharged from hospital and enter it into HIPE and this data is exported to NQAIS NAHM via the HPO by the National Health Intelligence Unit in the HSE. Data provided by the Health Protection Surveillance Centre (HPSC) was also used in this report to present COVID-19 in-hospital cases and their impact on mortality data.
DATA COVERAGE **Have all participating hospitals contributed data?** 	HIPE Data coverage was 100% for the 44 participating acute hospitals during the reporting period 2021. Data coverage for 2020 and preliminary data for 2022 was also 100%. HPSC COVID data coverage: As COVID-19 is a notifiable disease under Infectious Diseases Regulations in Ireland, all medical practitioners, including clinical directors of diagnostic laboratories, are required to notify the Medical Officer of Health (MOH)/Director of Public Health (DPH) of COVID-19 cases meeting the case definition.
DATA COMPLETENESS **Are all the medical records coded?** 	HIPE Data completeness averaged 99.8% during the period 2021 for the 44 hospitals participating in the audit. Completeness for 2020 data was 98.9%. Preliminary data available in January 2023 for 2022, are on average 96.3% complete. Figures were provided by the HPO. Data completeness for HPSC COVID data is unknown, as assessment of completeness has not been undertaken but is likely to be high as it is a notifiable infection.
DATA ACCURACY **How accurate is the data?** 	The data in this report are extracted from NQAIS NAHM using closed, validated HIPE data files, except 2022, which is preliminary data. Data validation was carried out by both the hospitals and the HPO. HPSC data accuracy is correct as of the time of extraction. However, CIDR is a dynamic database and subject to ongoing review, validation and update.

QUALITY IMPROVEMENT CASE STUDIES

In this section, two hospitals have shared their work on quality improvement using NAHM data. These case studies have identified data issues highlighted in previous NAHM reports and these points are included as continual learning in all NAHM training sessions.

CASE STUDY NUMBER 1
Connolly Hospital

Case No. 1 highlights the need for clearer documentation in medical records. It was recommended in the NAHM 2017 Annual Report (NOCA 2018) that a discharge summary (letter) should be included in the medical chart for all patients, including those who die. The HIPE coders can be faced with multiple pages of manual notes to decipher, and the inclusion of a discharge summary will help to ensure an accurate principal diagnosis. The Health Information and Quality Authority (HIQA) developed a standard and template for discharge letters in 2013 to help improve accuracy (HIQA 2013).

CASE STUDY NUMBER 2
Beaumont Hospital

Case No.2 also shows the need for clearer documentation and highlights the requirement for agreed terminology/synonyms in the absence of the wording 'palliative care' to ensure that all palliative care and end of life care cases are correctly assigned the ICD-10-AM Palliative Care Z51.5 code. It is clear that the identification of patients who receive palliation treatment still needs to be addressed. Work to improve the capture of this indicator is continuing with the HPO and National Clinical Care Programme for Palliative Care, and when agreed will help to achieve consistency in applying the code for inclusion in the NQAIS NAHM risk modelling.

CASE STUDY NUMBER 1

Connolly Hospital

BACKGROUND

High SMR for unspecified acute lower respiratory infection in 2021.

With the assistance of NOCA, analysis showed that Connolly Hospital had a higher percentage of cases with a principal diagnosis of unspecified lower respiratory infection within the respiratory group and a lower percentage of cases with lower respiratory disease than similar sized hospitals, indicating that the principal diagnosis needed to be examined in these cases.

STATISTICS

309
cases in 2021

25
25 deaths. 9 were recorded as at high risk of death and 16 as at medium risk.

16
The 16 cases with a medium risk, which resulted in death, were examined further.

FINDINGS

In 9 of the 16 cases, clinical review of records indicated further information in the medical chart would have resulted in a different principal diagnosis.

In 7 of the 16 cases, clinical review established that they were at higher risk of death.

More detailed diagnosis and clearer documentation at initial presentation and the provision of further clinical information in medical records may have resulted in a different HIPE coding.

QUALITY IMPROVEMENT STEPS

- Circulation of a learning notice to in-patient care medical teams to advise that more granular and precise information is required about patients' principal diagnosis throughout medical records.
- The term 'LRTI' (lower respiratory tract infection) should be avoided in cases where treatment for the exacerbation of COPD or pneumonia is being provided.
- Consideration should be given to including education around the HIPE coding system to NCHDs as part of the induction programme.

CASE STUDY NUMBER 2

Beaumont Hospital

BACKGROUND

High SMR for COPD in 2021. A clinical review of relevant healthcare records was carried out to determine what factors may have contributed to the high SMR, with a view to ensuring a return to normal levels in 2022. Twenty-two medical records, where the outcome was death, were reviewed.

STATISTICS

498 cases

22 deaths

6/22 tested positive for COVID-19 *either on admission or during the episode of care*

FINDINGS

PALLIATIVE CARE AND END OF LIFE CARE

The 22 patients who died were extremely unwell, but only **12** patients had palliative care code applied.

20 patients had a ceiling of care on their medical chart (agreed plan for level of treatment to be given).

17 patients received end of life care

6 patients were seen by a palliative care consultant

6 patients deteriorated out of hours and received end of life care from an on-call team.

From the information above, at least 17 of the 22 deceased patients should have had palliative care code applied, which would have impacted on the statistical outlier status.

CODING & PRINCIPAL DIAGNOSIS

7 CASES were identified by clinicians as being a different principal diagnosis than COPD.

2 CASES incorrectly included a background history of COPD

QUALITY IMPROVEMENT STEPS

- Actively reviewing NAHM data as it becomes available; noting and correcting discrepancies as they arise.
- Engagement with HIPE department in relation to wording which indicates palliative care, e.g., end of life, ceiling of care, has commenced
- The respiratory team received education around documentation of palliative care in the medical chart if they were required to provide treatment in the absence of the Palliative Care Team.
- Education of NCHDs on the importance of clearly documenting principal diagnosis and past medical history to assist with accurate coding of cases.

ACUTE MYOCARDIAL INFARCTION

The medical term for a heart attack is acute myocardial infarction (AMI). A heart attack is life-threatening and occurs when the supply of blood to the heart is suddenly blocked, which can cause heart muscle cells to die. Further information is available on **AMI from the HSE website** and on **heart attack from the Irish Heart Foundation**.

A **list of ICD-10-AM codes included in the AMI diagnoses** in NQAIS NAHM is available on the NOCA website. For the purposes of this report both ST-elevation and non-ST-elevation myocardial infarction cases are combined in the AMI Clinical Classification Software (CCS) group. Further information on ST elevation in-hospital mortality in percutaneous coronary intervention (PCI) centres, can be found in the Irish Heart Attack Audit Report 2017–2020 (NOCA 2022a).

FINDINGS

Figure 1 presents the crude in-hospital mortality rate for AMI from 2012 to 2021, with a 95% confidence interval (CI). In-hospital mortality rate for AMI had declined steadily from 68.6 deaths per 1,000 admissions in 2012 to 47.7 deaths per 1,000 admissions in 2021. The significant reduction in mortality over the past decade can be attributed to improved therapies, and particularly to prompt access to the cardiac catheter laboratory under the HSE National Clinical Programme for Acute Coronary Syndrome.

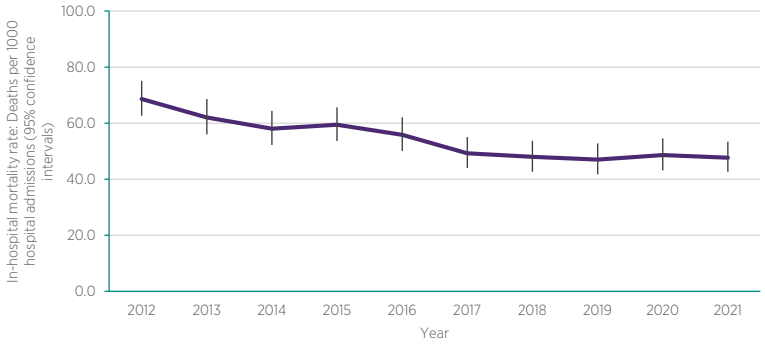


FIGURE 1: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF ACUTE MYOCARDIAL INFARCTION, 2012–2021

Figure 2 presents a funnel plot of SMRs for hospitals that met the inclusion criteria, with 99.8% control limits. Interpretation of SMR funnel plots is explained on the NOCA website. Supplementary data presenting more detailed statistics for the SMR funnel plot is available from the NOCA website. All hospitals had an SMR within the control limits of 99.8% for AMI, indicating that the SMRs of all hospitals (including those hospitals with small numbers of admissions and excluded from this graph) were within the expected range for 2021. Of the 44 participating hospitals, only 21 met the selection criteria for public reporting in 2021. The number of cases with a principal diagnosis of AMI admitted to these hospitals in 2021 ranged from 111 to 672, accounting for 92% of AMI in-hospital cases nationally.

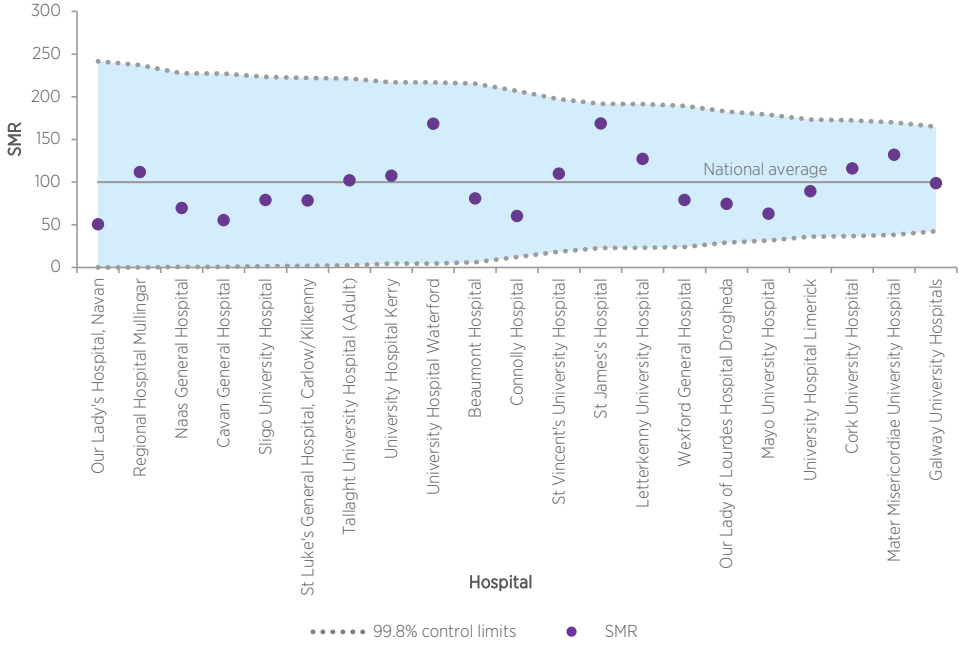


FIGURE 2: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF ACUTE MYOCARDIAL INFARCTION, 2021

HEART FAILURE

Heart failure is a medical condition when due to reduced blood flow, the heart is unable to deliver enough oxygen and nourishment to the body to allow it to work normally. Heart failure usually affects people over 65 years of age and the incidences of it in Ireland are rising, along with our ageing population. Further information is available on **heart failure from the HSE** and on **heart failure from the Irish Heart Foundation**.

A list of **ICD-10-AM codes for heart failure in NQAIS NAHM** is fully defined on the NOCA website.

FINDINGS

A crude in-hospital mortality rate from 2012 to 2021 for heart failure is presented in Figure 3, with a 95% CI. There was a statistically significant reduction (18%) recorded for in-hospital mortality over this time period, from 89.1 deaths per 1,000 admissions in 2012 to 72.8 deaths per 1,000 admissions in 2021. However, the crude mortality rate increased significantly (p=0.027) by 15% from 63.2 in 2020 to 72.8 in 2021. If this increase continues over time, it will be investigated to see what is driving the change. Is it the result of our ageing population or is there a higher comorbid impact on this cohort of patients following COVID-19? There is no direct correlation between the increase in the crude mortality rate and the number of COVID-19 cases during the reporting period. However, the increase may be an indirect consequence of COVID-19. Dr Inam Khan, consultant cardiologist, commented "the majority of heart failure patients are frail and elderly and were reluctant to attend hospital during the height of the pandemic and this may have led to sicker and more unstable patients with known heart failure presenting to hospitals, resulting in the higher mortality rate. Future trends may clarify this finding."

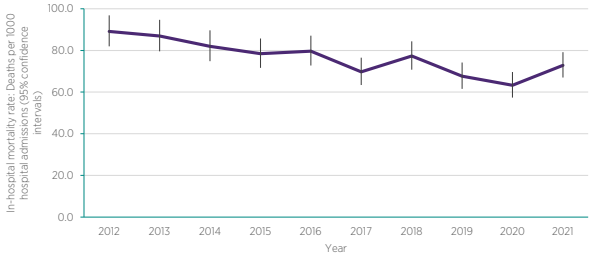


FIGURE 3: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF HEART FAILURE, 2012–2021

Figure 4 presents the SMRs for these hospitals in a funnel plot, with 99.8% control limits. Interpretation of SMR funnel plots is explained on the NOCA website. Supplementary data presenting more detailed statistics for the SMR funnel plot is available from the NOCA website. All hospitals had an SMR within the control limits of 99.8% for heart failure, indicating that all hospital SMRs (including those hospitals with small numbers of admissions excluded from this graph) were within the expected range for 2021.

Of the 44 participating hospitals, only 29 met the public reporting inclusion criteria for heart failure in 2021.The number of cases with a principal diagnosis of heart failure admitted to these hospitals in 2021 ranged from 116 to 475. The 29 hospitals included have a high number of admissions and account for 94% of cases in Ireland admitted with a principal diagnosis of heart failure in 2021, increasing from 6,621 cases nationally in 2020 to 7,031 cases in 2021.

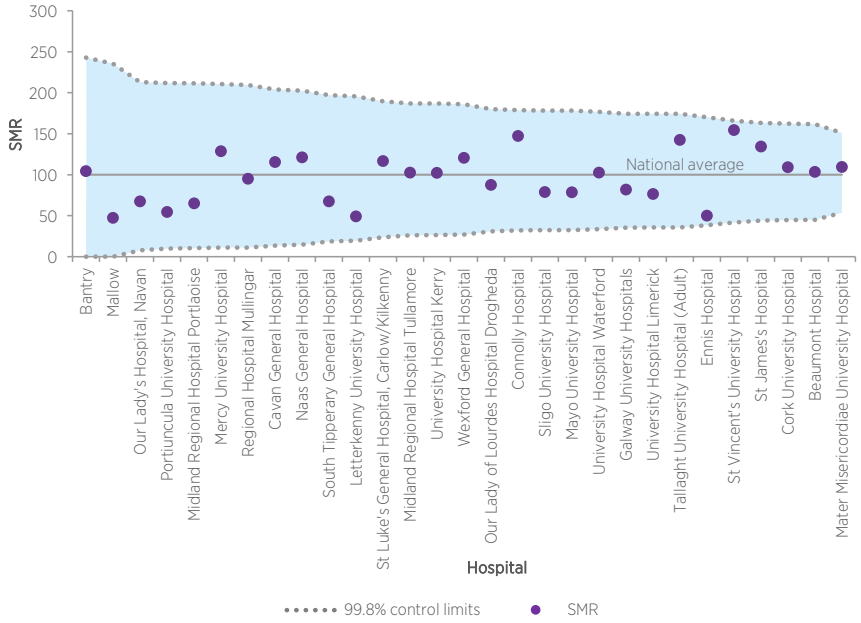


FIGURE 4: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF HEART FAILURE, 2021

ISCHAEMIC STROKE

Ischaemic stroke, the most common type of stroke, occurs when the brain's blood vessels become narrowed or are blocked by blood clots, causing reduced blood flow to the brain (ischaemia). For further information on **heart and stroke conditions from the HSE** and to **learn about stroke from the Irish Heart Foundation** visit their websites.

Ischaemic stroke in NQAIS NAHM is based on ICD-10-AM codes and is fully defined on the NOCA website.

FINDINGS

A crude in-hospital mortality rate from 2012 to 2021 for ischaemic stroke is presented in Figure 5, with a 95% CI. There was a significant reduction (42%) recorded for in-hospital mortality between 2012 and 2021, from 116.5 deaths per 1,000 admissions in 2012 to 68.1 deaths per 1,000 admissions in 2021.The reduction in mortality may be attributed to earlier presentation of stroke cases via the Act F.A.S.T. campaign, better stroke unit care, wider availability of thrombolysis (drug mediated clot-dissolving treatment) and the commencement of a thrombectomy (mechanical retrieval of clot) service.

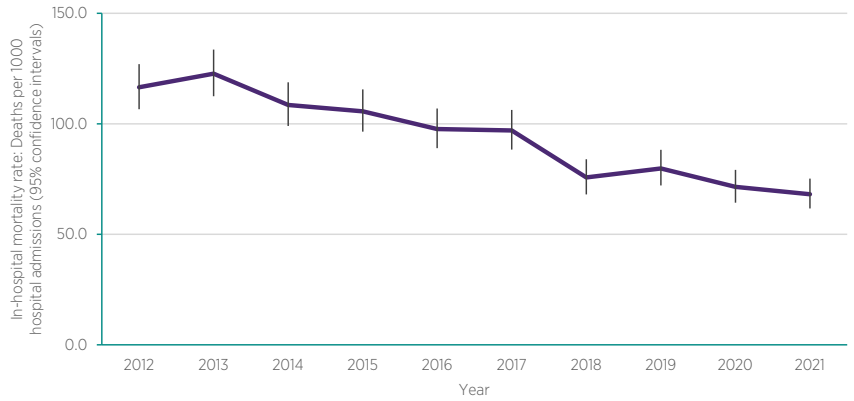


FIGURE 5: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF ISCHAEMIC STROKE, 2012–2021

Twenty-four of the NQAIS NAHM participating hospitals admit acute stroke patients, and 21 of those met the public reporting inclusion criteria for 2021. The number of cases with a principal diagnosis of ischaemic stroke admitted to those hospitals in 2021 ranged from 102 to 619 and accounted for 89% of cases admitted with ischaemic stroke in 2021. There was an increase in the number of cases admitted to hospital with a principal diagnosis of ischaemic stroke, rising from 5,135 in 2020 to 5,387 in 2021. Figure 6 presents the SMRs for these hospitals in a funnel plot, with 99.8% control limits. Interpretation of SMR funnel plots is explained on the NOCA website. Supplementary data presenting more detailed statistics for the SMR funnel plot is available from the NOCA website. All 21 included hospitals had an SMR within the control limits of 99.8% for ischaemic stroke (including those hospitals with small numbers of admissions excluded from this graph). Three of the 24 hospitals accepting acute stroke patients are not included in this analysis, as they did not meet the inclusion criteria for public reporting.

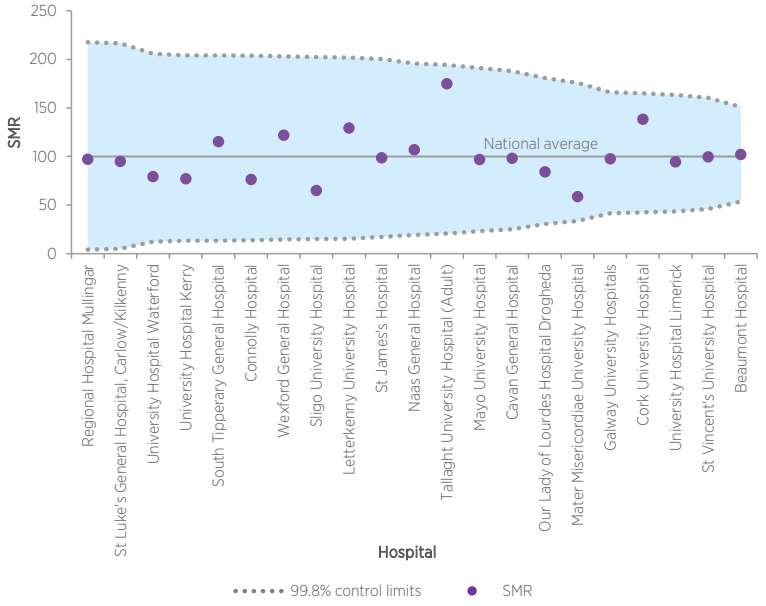


FIGURE 6: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF ISCHAEMIC STROKE, 2021

HAEMORRHAGIC STROKE

Haemorrhagic strokes (also known as cerebral haemorrhages or intracranial haemorrhages) usually occur when a blood vessel in the brain bursts and bleeds into the substance of the brain. In about 5% of cases, the bleeding occurs on the surface of the brain (subarachnoid haemorrhage). Since January 2020, these subarachnoid haemorrhage cases are no longer included in the CCS group 'stroke haemorrhagic' in NQAIS NAHM and are not included in the analysis in this chapter. The ICD-10-AM codes contained in haemorrhagic stroke CCS group for analysis in this report are fully defined on the NOCA website. More information is available about stroke from the Irish Heart Foundation and on heart and stroke conditions from the HSE.

FINDINGS

Crude in-hospital mortality rates from 2012 to 2021 for haemorrhagic stroke are presented in Figure 7, with a 95% CI. There was a 21% reduction recorded for in-hospital mortality over this period, from 309.4 deaths per 1,000 admissions in 2012 to 252.6 deaths per 1,000 admissions in 2021. In 2021, there were 958 cases (compared with 960 cases in 2020) discharged from hospital in Ireland with a principal diagnosis of haemorrhagic stroke.

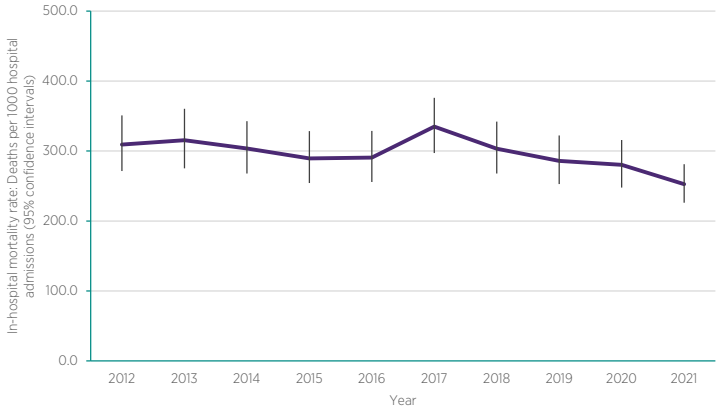


FIGURE 7: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF HAEMORRHAGIC STROKE, 2012–2021

Due to the small numbers of cases with a principal diagnosis of haemorrhagic stroke, data for the three-year period from 2019 to 2021 were combined. Twenty-four of the 44 NQAIS NAHM participating hospitals admit acute stroke patients, and only nine of these met the public reporting inclusion criteria for 2019–2021. The number of cases with a principal diagnosis of haemorrhagic stroke admitted to these nine hospitals between 2019 and 2021 ranged from 101 to 334, accounting for 60% of cases nationally between 2019 and 2021.

The SMRs for these hospitals are presented in a funnel plot, with 99.8% control limits representing the upper and lower limits of expected variation (Figure 8). Interpretation of SMR funnel plots is explained on NOCA website. Each hospital's control limits are calculated based on that hospital's patient details. All hospitals had an SMR within the expected range for haemorrhagic stroke (including those hospitals with small numbers of admissions excluded from this graph), in 2019–2021. Supplementary data presenting more detailed statistics for the SMR funnel plot is available from the NOCA website.

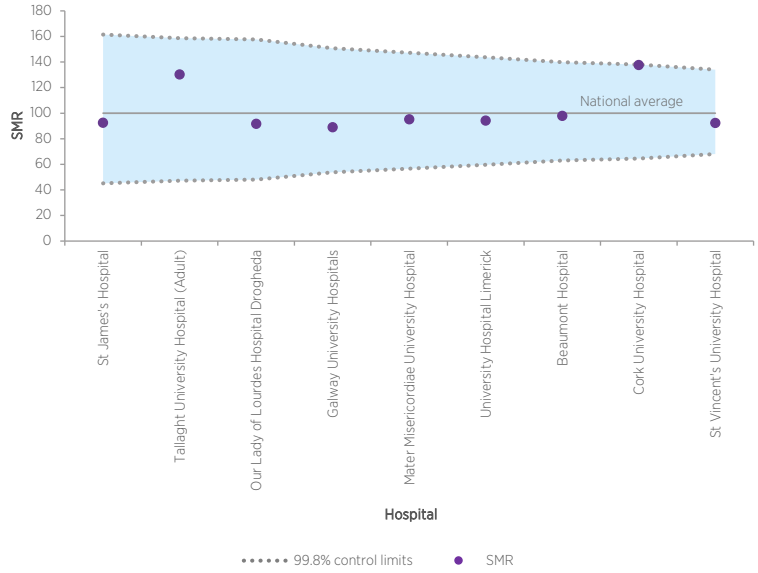
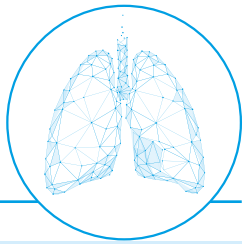


FIGURE 8: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF HAEMORRHAGIC STROKE, 2019–2021

CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)



COPD is a life-threatening condition and is one of the most common respiratory diseases in Irish adults. The disease affects the lungs and is most commonly caused by tobacco smoke resulting in tissue destruction and airway damage. It usually affects people aged over 35 years. More information is available on **COPD from the HSE** and about **COPD from the Irish Thoracic Society**. The **ICD-10-AM codes on COPD** in NQAIS NAHM are fully defined on the NOCA website.

FINDINGS

A crude in-hospital mortality rate from 2012 to 2021 for COPD is presented in Figure 9, with a 95% CI. The COPD crude mortality rate increased from 37.5 per 1,000 COPD hospital admissions in 2020 to 40.6 per 1,000 COPD hospital admissions recorded in 2021. The in-hospital COPD admission rate in 2021 was 18.5 per 1,000 hospital admissions for COPD, which represents a significant decrease (38%) from the 22.5 recorded in 2020 and the 27.4 recorded in 2019. Dr Brian McCullagh, consultant respiratory and general physician, commented "The decreases in the rate of COPD in-hospital admissions are most likely a result of patients with COPD self-isolating during this period when there were high numbers of COVID-19 cases, thereby not suffering from infective exacerbations which would require hospital admission". However, the increased in-hospital mortality rate may reflect more severe exacerbations in those with COVID-19, which may be explained by the fact that 13% of the COPD deaths had a recorded COVID-19 flag associated with them.

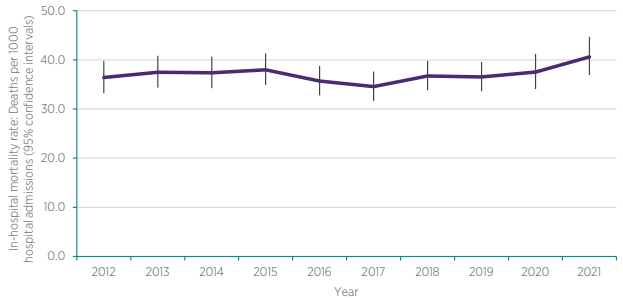


FIGURE 9: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE, 2012–2021

Of the 44 participating hospitals, 29 met the criterion for inclusion in this report. The number of cases with a principal diagnosis of COPD admitted to these hospitals in 2021 ranged from 126 to 538 and account for 95% of cases admitted nationally.

Figure 10 presents the SMRs for these 29 hospitals in a funnel plot, with 99.8% control limits, indicating that all hospital SMRs (including those hospitals with small numbers of admissions excluded from this graph) were within the expected range for 2021. Interpretation of SMR funnel plots is explained on the NOCA website. Supplementary data presenting more detailed statistics for the SMR funnel plot is available from the NOCA website.

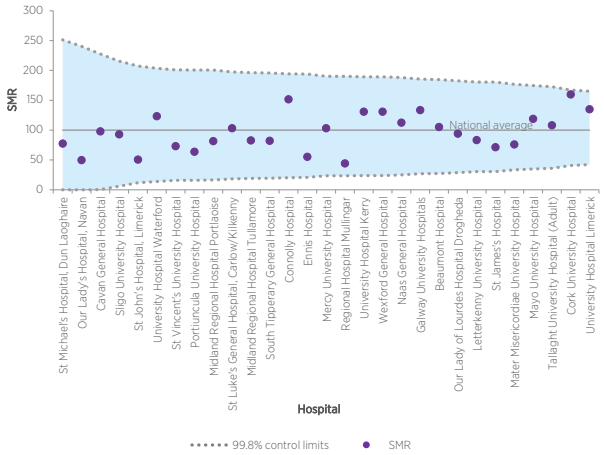


FIGURE 10: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE, 2021

Figure 11 shows the crude mortality rate for in-hospital COPD against the number of confirmed COVID-19 cases and significant vaccine roll-out dates. The graph shows that during 2020, pre vaccine roll-out, there were spikes in the crude mortality rate, in line with each corresponding spike in COVID-19 cases, while post-vaccination this corresponding sharp spike is not evident.

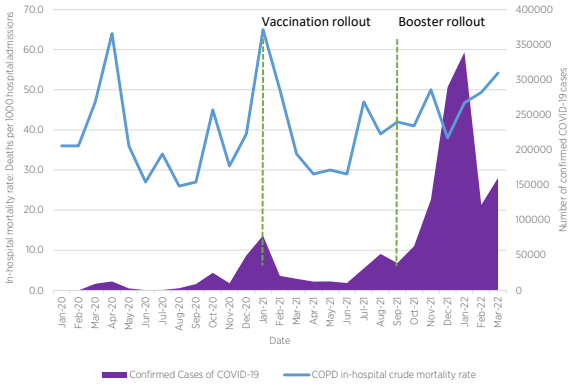


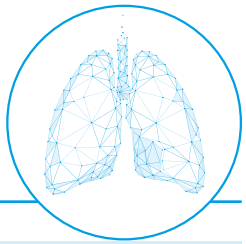
FIGURE 11: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE, SHOWING CONFIRMED COVID 19 CASES 2020–2022 [1]

[1] COVID-19 confirmed cases are based on cases notified on the Computerised Infectious Disease Reporting (CIDR) system. Data were extracted from the CIDR system on 24 January 2023. Data are provisional and subject to ongoing review, validation, and update. As a result, data may differ from previously published numbers.

Data should be interpreted in the context of the COVID-19 testing policy prevailing at the time. Testing policies can affect the number of confirmed cases notified on CIDR e.g. limited testing capacity in the early stages of the pandemic, launch of online self-referral portal for PCR tests in 2021. Information on the current testing policy in Ireland can be found here.

Epidemiological date has been used to determine the number of confirmed COVID-19 cases. This date is based on the earliest of dates available on the case and taken from date of onset of symptoms, date of diagnosis, laboratory specimen collection date, laboratory received date, laboratory reported date or event creation date/notification date on CIDR. Using epidemiological date rather than event creation/ notification date, adjusts for any delays in testing/notification to CIDR.

PNEUMONIA



Pneumonia is defined as an acute infection of lung tissue resulting in inflammation with fluid and pus accumulation within the small airways and tiny air sacs of one or both lungs, which can lead to serious complications, and can be fatal. Pneumonia is usually the result of bacterial infection, although other viruses can also cause pneumonia, for example COVID-19. More information on **pneumonia from the HSE** and on **pneumonia from the Irish Thoracic Society** can be found on the respective websites. For at-risk groups, pneumonia can be severe and may require hospital treatment. For the period 2013 to 2015, Ireland had the fifth-highest age-standardised mortality rate for pneumonia in the EU at 42.1 deaths per 100,000 population, compared with the EU average of 28.1 deaths per 100,000 population (OECD/EU, 2018). Pneumonia in NQAIS NAHM is based on several ICD-10-AM codes which are fully defined on the NOCA website.

FINDINGS

A crude in-hospital mortality rate for pneumonia from 2012 to 2021 is presented in Figure 12, with a 95% CI. Figure 12 shows a 16% increase recorded for in-hospital mortality for pneumonia over this 10-year period, from 121 deaths per 1,000 hospital admissions in 2012 to 140 deaths per 1,000 hospital admissions in 2021. Furthermore, there has been a significant increase between 2019 and 2021, from 103 deaths per 1,000 admissions reported in 2019 to 140 deaths per 1,000 admissions reported in 2021. A flag within the NQAIS NAHM web-based tool, designed to show the number of cases testing positive for COVID-19, showed that COVID-19 was present for 19.4% (n=2448) of pneumonia cases in 2020 and in 52.1% (n=9224) of cases in 2021. This is the largest percentage of COVID-19 cases among the six diagnoses presented in this report and is reflective of the high rise in mortality in pneumonia during 2020 and 2021. As a result of the COVID-19 pandemic, there was an overall reduction in hospital admissions during 2020, but the number of cases admitted with pneumonia in 2021 increased significantly to 17,720 cases compared to 12,603 cases in 2020. This increase in numbers is reflective of the higher COVID-19 incidence throughout late 2021 and is likely contributed to by a loosening of restrictions in late 2020. The result was an influx of COVID-related pneumonia in early 2021 as evidenced by an exponential increase in HIPE coding of 'viral pneumonia'. Other viral pneumonia (ICD-10-AM/ACHI/ACS code J12.8) was recorded as the principal diagnosis in 26 cases in 2019, in 2,309 cases in 2020 and in 9,118 cases in 2021.

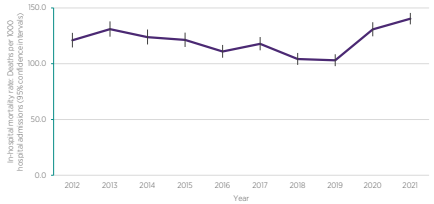


FIGURE 12: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF PNEUMONIA, 2012–2021

Of the 44 participating hospitals, 28 met the criteria for public reporting in 2021. The number of cases with a principal diagnosis of pneumonia admitted to these 28 hospitals in 2021 ranged from 111 to 1380, accounting for 97% of pneumonia cases admitted to hospital nationally. Figure 13 presents the SMRs for 28 hospitals in a funnel plot, with 99.8% control limits. Interpretation of SMR funnel plots is explained on the NOCA website. Supplementary data presenting more detailed statistics for the SMR funnel plot is available from the NOCA website. All hospitals (including those hospitals with small numbers of admissions excluded from this graph) had an SMR within the control limits of 99.8%, indicating that their SMRs were within the expected range for 2021. Sixteen hospitals are not included in this analysis, as they did not meet the selection criteria relating to a defined number of admissions and expected events.

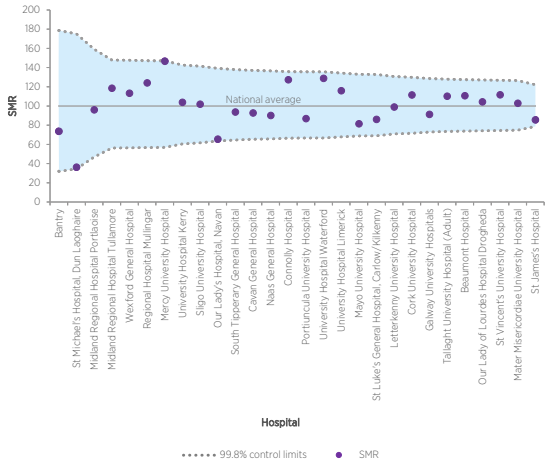


FIGURE 13: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF PNEUMONIA, 2021

The crude mortality rate for in-hospital pneumonia against the number of confirmed cases and significant vaccine roll-out dates is shown in Figure 14. The graph displays a direct correlation with crude mortality rates for pneumonia and the number of cases of COVID-19. By September 2021, 90% of the Irish population were fully vaccinated and the graph shows that despite the sharp increase in COVID-19 cases in late 2021 the rate of mortality did not rise. Pneumonia deaths in hospitals, which increased with each wave of COVID-19 pre-vaccination, can be seen to revert to normal rates post-vaccination roll-out, again reflecting the beneficial effect of the vaccination programme in reducing mortality.

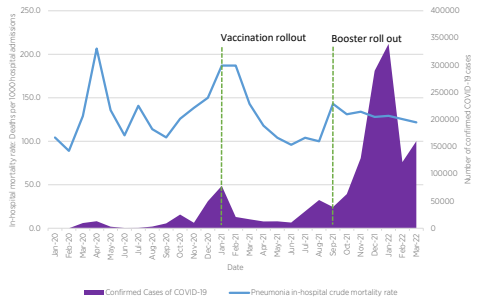


FIGURE 14: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF PNEUMONIA, SHOWING CONFIRMED COVID 19 CASES, 2020–2022 [2]

[2] COVID-19 confirmed cases are based on cases notified on the Computerised Infectious Disease Reporting (CIDR) system. Data were extracted from the CIDR system on 24 January 2023. Data are provisional and subject to ongoing review, validation, and update. As a result, data may differ from previously published numbers.

Data should be interpreted in the context of the COVID-19 testing policy prevailing at the time. Testing policies can affect the number of confirmed cases notified on CIDR e.g. limited testing capacity in the early stages of the pandemic, launch of online self-referral portal for PCR tests in 2021. Information on the current testing policy in Ireland can be found here.

Epidemiological date has been used to determine the number of confirmed COVID-19 cases. This date is based on the earliest of dates available on the case and taken from date of onset of symptoms, date of diagnosis, laboratory specimen collection date, laboratory received date, laboratory reported date or event creation date/notification date on CIDR. Using epidemiological date rather than event creation/ notification date, adjusts for any delays in testing/notification to CIDR.

AUDIT UPDATE

UPDATE ON RECOMMENDATIONS FROM PREVIOUS REPORTS

The National Audit of Hospital Mortality Annual Report 2018 (NOCA 2019) recommended the development of accepted documented terminology to be used in the absence of the wording 'Palliative Care' in the medical record which will provide the evidence needed for coders to apply the Palliative Care code Z51.5, which is one of the factors included in the risk methodology in NAHM. Work had commenced but had to be paused due to the onset of COVID-19, followed by the cyber-attack on the HSE system in May 2021. The HPO are engaging with the National Clinical Lead for Palliative Care to progress this important recommendation.

AUDIT DEVELOPMENT

An independent review of NAHM, was commissioned by the NOCA Governance Board to explore whether currently NAHM is effective in terms of healthcare quality assurance and improvement and any recommendations would inform the strategic direction of NOCA's in-hospital mortality reporting in the future. The review was led by international expert Prof Alex Bottle, Professor of Medical Statistics at Imperial College London and assisted by Dr Maria Kehoe, Post-Doctoral Researcher at NOCA.

The review (NOCA 2022b) includes an in-depth summary of international approaches to mortality reporting and a detailed comparative technical analysis. Consultation was held with international experts in mortality reporting in Canada, the Netherlands, England (SHMI, Telstra Health), Northern Ireland, Scotland, USA, and Australia (NSW). Those international chapters hold a wealth of information, invaluable to anyone involved in mortality reporting, and has been widely welcomed internationally. The review included a thorough examination of international seminal and grey literature. There were extensive consultations held with relevant stakeholders, including members of the public, using surveys and a series of follow-up focus groups and workshops. NOCA will enlist an independent statistical researcher to analyse the impact of the recommended changes to the NQAIS NAHM modelling and online tool arising from the NAHM independent review and aims to implement as many as are feasible in the shortest possible timeframe.

"NOCA will enlist an independent statistical researcher to analyse the impact of the recommended changes to the NQAIS NAHM modelling and online tool arising from the NAHM independent review and aims to implement as many as are feasible in the shortest possible timeframe."

TABLE 2: **SUMMARY OF KEY FINDINGS**		
	FINDINGS FROM **THE INTERNATIONAL CONSULTATION**	• Every country is characterised by a unique approach to hospital mortality reporting. • HSMR (Hospital Standardised Mortality Rate) is the most commonly used indicator. Thirty-day mortality is a gold standard mortality indicator, as a significant proportion of hospital-related deaths occur soon after discharge from hospital. • Ireland has the highest alerting threshold of all contemporary health systems included in this review, potentially resulting in a risk of delays in identifying serious problems in patient care.
	FINDINGS FROM **REVIEW OF THE LITERATURE**	• Research suggests that the CuSum remains the best approach to outlier detection using administrative data. • Systematic reviews suggest that the Elixhauser Index may perform better than the Charlson Comorbidity Index for comorbidity risk adjustment. • A large and growing body of literature suggests machine learning may be considered in the future for risk adjustment, especially with richer data. • The inclusion of 30-day mortality and better approaches to condition specific risk adjustment are contingent on data linkage capability and the implementation of an individual health identifier. • Evidence suggests that there is a modest, positive effect of public reporting on patient care.
	FINDINGS - **CONSULTATION WITH STAKEHOLDERS**	• Some lack of engagement with NAHM at all levels. • Considerable variability in understanding, monitoring, and reviewing of the data. • Enthusiasm for benchmarking in driving improvement. • The value and applicability of NAHM in response to COVID-19 to other quality and patient safety issues such as sepsis.
	FINDINGS - **THE PUBLIC PERSPECTIVE**	• This review highlighted the importance of public reporting of hospital mortality to the public. • There is an expectation of transparency amongst the public: the main reason they wish to see it being used is to drive improvements in patient care.

POINTS FOR CONSIDERATION / LEARNING

- Heart failure crude mortality rate shows a significant increase of 15% from 2020 to 2021. There is insufficient data yet to pinpoint the cause of this increase or do any meaningful analysis. It could be the result of our ageing population or there could be a higher comorbid impact on this cohort of patients following COVID-19. There is no direct correlation between the increase in the crude mortality rate and the number of COVID-19 cases during the reporting period. However, the increase may be as an indirect consequence of COVID-19 because we know that the frail elderly were reluctant to attend hospital during the height of the pandemic and this may have led to sicker and more unstable patients with known heart failure presenting to hospital, resulting in the higher mortality rate. The data will continue to be monitored for the next number of years to establish whether this trend is continuing and to establish the causes of the increase in mortality. International literature will also be reviewed to establish if there are similar findings in other countries.

- The case studies included in the quality improvement section are a very valuable source of learning for all hospitals participating in NAHM. All NAHM users/ hospitals should identify an area for review using NAHM data and conduct quality improvement case studies similar to those included in this report to see if there are areas which can be improved.

- The included case studies, and indeed every other review conducted for NAHM to date, mentioned amendments to the principal diagnosis coded for some cases following review of the documentation/medical records. Clinicians should work with local HIPE coders and carry out a review on a sample of cases to examine if the principal diagnosis assigned to those cases are correct and use the findings to inform practices for the documentation of medical records across all specialities in hospitals. This will also encourage ongoing links between clinical coders and clinicians to achieve accuracy in the coding of medical cases.

- Case Study No.1 recommends including education on medical chart documentation and HIPE coding as part of each NCHD's induction programme. This should be conserved as a quality improvement action in all hospitals participating in NAHM, as it will help improve the quality of data used for the audit.

CONCLUSION

The NAHM report for 2021 shows a significant increase in in-hospital mortality for pneumonia over the period 2019–2021. However on a positive note, evidence can be seen of the beginning of a reduction in the pneumonia mortality rate between 2021 and Q1 2022 which can be attributed to the roll-out of the COVID-19 vaccination programme. The rate of crude mortality in pneumonia would have been significantly greater if high levels of the population were not vaccinated when the number of COVID-19 cases soared in late 2021 and into January 2022. As COVID-19 vaccinations are offered they should be availed of in order to continue to save lives. The COPD crude mortality rate also increased during the reporting period, which may reflect more severe exacerbations in those with COVID-19, as 13% of the COPD deaths had a recorded COVID-19 flag associated with them. Furthermore, there was a significant increase in the crude mortality rate for heart failure between 2020 and 2021 despite a steady fall in mortality in the preceding years. This will be monitored over the next few years to establish the reasons for this increase. Encouragingly the mortality rates for both stroke diagnoses and AMI have declined over the last 10 years, despite the numbers of COVID-19 cases.

There are some items for consideration/learning points included in this report, highlighting areas where there is potential to improve practice which will have an impact on the quality of hospital data. For example, there is still more focus needed on clarity and detail in some areas of documentation in the medical record to ensure that accurate information is available to determine the principal diagnosis and to help HIPE coders identify all aspects of the episode of care, including when palliative care treatment is provided. This is dependent on complete and up-to-date data.

The commitment and support shown for NQAIS NAHM from the participating hospitals, and users within those hospitals, continued throughout the COVID-19 pandemic and is ongoing today. The NAHM Governance Committee thank them for ensuring that mortality rates in Ireland are being monitored, which is evidenced by the lack of statistical outliers in any of the 6 key diagnoses featured in this report, or indeed in any other diagnosis group for in-patent admissions during 2021.

“There are some items for consideration/learning points included in this report, highlighting areas where there is potential to improve practice which will have an impact on the quality of hospital data.”

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NOCA National Office of Clinical Audit

Dr Anne Dee
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22nd June 2023

Dear Dr Dee,

I wish to acknowledge receipt of the National Audit of Hospital Mortality Annual Report 2021.

On behalf of the NOCA Governance Board, I wish to congratulate you, Audit Manager Deirdre Burke and your governance committee on an excellent report which gives assurance to patients that mortality is being carefully monitored in Irish hospitals. The revised format of the report enhances the clarity of the findings.

Please accept this as formal endorsement from the NOCA Governance Board of the National Audit of Hospital Mortality Report 2021.

Yours sincerely,

Dr Brian Creedon
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NATIONAL OFFICE OF CLINICAL AUDIT (NOCA)

The National Office of Clinical Audit (NOCA) was established in 2012 to create sustainable clinical audit programmes at national level. NOCA is funded by the Health Service Executive Office of the Chief Clinical Officer and operationally supported by the Royal College of Surgeons in Ireland.

The National Clinical Effectiveness Committee (NCEC) defines national clinical audit as "a cyclical process that aims to improve patient care and outcomes by systematic, structured review and evaluation of clinical care against explicit clinical standards on a national basis" (NCEC, 2015, p. 2).

NOCA supports hospitals to learn from their audit cycles.

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