

National audit of hospital mortality annual report 2020

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NATIONAL AUDIT OF HOSPITAL MORTALITY

ANNUAL REPORT 2020



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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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We would like to acknowledge the Health Service Executive (HSE) National Clinical Care Programmes for their guidance and support in the preparation of this sixth National Audit of Hospital Mortality Annual Report. In particular, we wish to thank the following:

Prof. Joseph Harbison and Joan McCormack, Irish National Audit of Stroke
Dr Desmond Murphy, National Clinical Lead in Respiratory Medicine
Prof. Ken McDonald and Regina Black, National Heart Programme



The National Health Intelligence Unit (NHIU), Strategic Planning and Transformation, HSE, has developed the National Quality Assurance Improvement System (NQAIS) suite of tools in partnership with OpenApp, the National Clinical Programmes and other stakeholders. The NQAIS NAHM web-based tool is one of those tools and helps participating hospitals to focus on in-hospital mortality patterns.

We would like to thank the NHIU for its support in the review of the NQAIS NAHM web-based tool and its outputs, even when faced with the challenges brought about by the COVID-19 pandemic. The NHIU provides valuable advice to NOCA and the NAHM Governance Committee.



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National Audit of Hospital Mortality

ANNUAL REPORT 2020

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18th January 2022

Dear Ms Egan,

I wish to acknowledge receipt of the National Audit of Hospital Mortality Annual Report 2020.

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.

I look forward to the findings and recommendations arising from the independent review of NAHM that is currently underway, that will guide the future for analysis and reporting of in-hospital mortality in Ireland.

Please accept this as formal endorsement from the NOCA Governance Board of the National Audit of Hospital Mortality Annual Report 2020.

Yours sincerely,



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GLOSSARY

ACRONYM	FULL TERM
ADST	Analysis and Display Scientific Team
AMI	acute myocardial infarction
CCI	Charlson Comorbidity Index
CI	confidence interval
CCS	Clinical Classifications Software
COPD	chronic obstructive pulmonary disease
COVID-19	coronavirus disease 2019
CT	computed tomography
CuSum	cumulative summary control chart
EU	European Union
HIPE	Hospital In-Patient Enquiry scheme
HIQA	Health Information and Quality Authority
HPO	Healthcare Pricing Office
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
IHAA	Irish Heart Attack Audit
IHFD	Irish Hip Fracture Database
INAS	Irish National Audit of Stroke
IHPA	Independent Hospital Pricing Authority
NAHM	National Audit of Hospital Mortality. A structured review and evaluation of care as part of the clinical audit cycle.
NCEC	National Clinical Effectiveness Committee
NHIU	National Health Intelligence Unit, Strategic Planning and Transformation, HSE
NHQRS	National Healthcare Quality Reporting System
NOCA	National Office of Clinical Audit
NPHET	National Public Health Emergency Team
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, Health Service Executive.

ACRONYM	FULL TERM
NQAIS NAHM	National Quality Assurance Improvement System, National Audit of Hospital Mortality web-based tool
NSTEMI	non-ST-elevation myocardial infarction
OECD	Organisation for Economic Co-operation and Development
PPCI	primary 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.
ROC	receiver operating characteristic
SARS-CoV-2	severe acute respiratory syndrome coronavirus 2
SMR	standardised mortality ratio
STEMI	ST-elevation myocardial infarction
WHO	World Health Organization

EXECUTIVE SUMMARY

This is the National Office of Clinical Audit's (NOCA's) sixth *National Audit of Hospital Mortality Annual Report*. The data in the National Quality Assurance Improvement System, National Audit of Hospital Mortality (NQAIS NAHM) web-based tool are extracted from the Hospital In-Patient Enquiry (HIPE) scheme records in 44 participating publicly funded acute hospitals nationally. Thirty hospitals have met the inclusion criteria to have their data included in this publication.

The purpose of the NQAIS NAHM web-based tool is to provide hospitals with mortality data for diagnostic groups based on International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM/ACHI/ACS) coding carried out in each hospital's HIPE office in order to allow analysis of expected versus actual outcomes. This allows for continuous monitoring of mortality data and provides opportunities to identify any areas of concern. This report is the public face of the audit, with data presented in line with inclusion criteria set by the National Audit of Hospital Mortality (NAHM) Governance Committee. The six key diagnoses are acute myocardial infarction (AMI), heart failure, ischaemic stroke, haemorrhagic stroke, chronic obstructive pulmonary disease (COPD) and pneumonia. More information on inclusion criteria can be found in Table 1. The main report is supported by the *National Audit of Hospital Mortality Supporting Appendix 2020* and by a summary report that is written in clear and understandable language with infographics. Both of the supporting documents are available to download from the NOCA website at www.noca.ie.

Analysis of the NAHM data shows that there was a reduction in the number of cases admitted for in-hospital treatment in acute hospitals in 2020 compared with 2019. These reductions were anecdotally found to be due to people's reluctance to go to a hospital for fear that they would contract coronavirus disease 2019 (COVID-19) while there. There has been a rise in the crude mortality rate in the respiratory diagnoses included in this report, particularly for pneumonia, despite the decreased number of overall cases. The Healthcare Pricing Office (HPO) issued guidance to HIPE coders to confirm that if the term 'pneumonia' is documented on the medical records of a confirmed case of COVID-19, without any further specificity, then the principal diagnosis to be used is 'other viral pneumonia'. This change in coding practice led to a rise in the number of viral pneumonia cases recorded, from 26 cases in 2019 to 2,306 cases in 2020. The rise in crude mortality figures for pneumonia is directly attributed to the COVID 19 pandemic. This is reflective of the higher risk of mortality for cases with COVID-19 that developed a respiratory condition and required hospitalisation. Analysis of NAHM records shows that in 19.4% of pneumonia cases, the COVID-19 flag was present, indicating that COVID-19 had been laboratory confirmed or clinically diagnosed.

ANALYSIS OF THE NAHM DATA SHOWS THAT THERE WAS A REDUCTION IN THE NUMBER OF CASES ADMITTED FOR IN-HOSPITAL TREATMENT IN ACUTE HOSPITALS IN 2020 COMPARED WITH 2019. THESE REDUCTIONS WERE ANECDOTALLY FOUND TO BE DUE TO PEOPLE'S RELUCTANCE TO GO TO A HOSPITAL FOR FEAR THAT THEY WOULD CONTRACT CORONAVIRUS DISEASE 2019 (COVID-19) WHILE THERE.

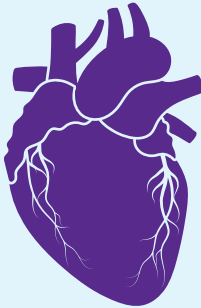

An infographic is presented in each diagnosis chapter showing the percentage of cases in each Charlson Comorbidity Index (CCI) group. The CCI score indicates the significance of pre-existing medical conditions and the risk of mortality in the 12 months following discharge. The percentage of cases with a CCI score of less than 1, indicating that those cases are in the lowest risk category, was high in all diagnoses. However, more than one-quarter of ischaemic and haemorrhagic stroke cases and more than one-third of pneumonia cases had a CCI score of greater than 5, indicating that these cases have the highest risk of mortality in the 12 months following discharge.

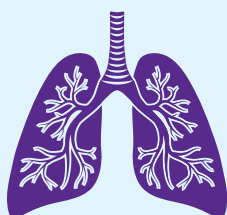
Data showing the percentage of deaths in each age group are also presented per diagnosis. In all six diagnoses, the highest percentage of deaths occurred in those aged over 65 years, ranging from 80% for haemorrhagic stroke to 96% for heart failure.

As part of an independent review of NAHM that is currently underway, the adjustment of the NQAIS NAHM model for COVID-19 and other secondary diagnoses is being considered.

There are no recommendations included in this report. Recommendations arising from the independent review of NAHM will be developed based on the findings from the review and will be published as part of the 2021 NAHM annual report.

KEY FINDINGS

	ACUTE MYOCARDIAL INFARCTION
	<p>In-hospital mortality for AMI declined steadily from 2011 to 2019, from 69 deaths per 1,000 admissions in 2011 to 47 deaths per 1,000 admissions in 2019; this increased slightly to 49 deaths per 1,000 in 2020. These publicly reported cases account for 93% of cases admitted with a principal diagnosis of AMI nationally in 2020.</p>
	HEART FAILURE
	<p>Heart failure in-hospital mortality decreased significantly (22%) between 2011 and 2020, from 81 deaths per 1,000 admissions in 2011 to 63 deaths per 1,000 admissions in 2020. The downward trend continued from 2019 to 2020. These publicly reported cases account for 91% of cases admitted with a principal diagnosis of heart failure nationally in 2020.</p>
	ISCHAEMIC STROKE
	<p>There was a significant reduction (42%) in ischaemic stroke in-hospital crude mortality between 2011 and 2020, from 123 deaths per 1,000 admissions in 2011 to 71 deaths per 1,000 admissions in 2020. The trend continued downward from 2019 to 2020.</p> <p>These publicly available data account for 86% of cases admitted with a principal diagnosis of ischaemic stroke nationally in 2020.</p>
	HAEMORRHAGIC STROKE
	<p>In-hospital crude mortality due to haemorrhagic stroke reduced by 21% between 2011 and 2020, from 355 deaths per 1,000 admissions in 2011 to 280 deaths per 1,000 admissions in 2020. The trend continued downward from 2019 to 2020.</p> <p>The cases included in this report account for 57% of cases nationally that were admitted with a principal diagnosis of haemorrhagic stroke between 2018 and 2020.</p>



CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

The COPD crude mortality rate has increased slightly in 2020 (38 in-hospital mortalities per 1,000 admissions recorded) compared with the relatively static rate recorded in 2018 and 2019 (37 in-hospital mortalities per 1,000 admissions recorded in both years), with a downward trend having been recorded between 2011 and 2018.

These publicly reported cases account for 95% of cases admitted with a principal diagnosis of COPD nationally in 2020.

PNEUMONIA

There was a slight increase in in-hospital mortality for pneumonia between 2011 and 2020, from 127 deaths per 1,000 admissions in 2011 to 131 deaths per 1,000 admissions in 2020; however, there was a significant increase between 2019 and 2020, from 103 deaths per 1,000 admissions reported in 2019 to the 131 deaths per 1,000 admissions reported in 2020. The cases included in this report account for 97% of cases admitted with a principal diagnosis of pneumonia nationally in 2020.



OUTLIERS

In March 2020, release of data to the National Quality Assurance Improvement System, National Audit of Hospital Mortality (NQAIS NAHM) web-based tool and monitoring of outliers in the NQAIS NAHM web-based tool were paused due to the possible underestimation of risk of death in cases with confirmed coronavirus disease 2019 (COVID-19) infection. Therefore, there are no outlier reviews in this report.

INTRODUCTION

Welcome to the sixth *National Audit of Hospital Mortality Annual Report* from the National Office of Clinical Audit (NOCA). The last year has seen many changes across the Irish health service, our country, and the world as a result of the coronavirus disease 2019 (COVID-19) pandemic. Health service workers have shown their devotion to their patients' well-being time and time again under previously unimagined pressures – it is a testament to all those involved that Irish hospitals remained open throughout this period. This report outlines how the National Audit of Hospital Mortality (NAHM) has dealt with the impact of COVID-19, the changes that are required to the National Quality Assurance Improvement System, National Audit of Hospital Mortality (NQAIS NAHM) web-based tool, and the mortality rates for the six key diagnoses as follows:

- acute myocardial infarction (AMI)
- heart failure
- ischaemic stroke
- haemorrhagic stroke
- chronic obstructive pulmonary disease (COPD)
- pneumonia.

NAHM includes data extracted from 44 publicly funded acute hospitals in Ireland. Inclusion criteria have been applied in order to produce a report which examines six key diagnoses that constitute the highest burden on the healthcare system in Ireland and have high levels of mortality. (More information on the inclusion criteria can be found under 'How to read this report' later in the Introduction.) While not all data for 2020 are published in this report, hospitals can view all of their data throughout the year using the NQAIS NAHM web-based tool. This report is aimed at the public; users of, and workers within, the health service; and those who develop health policies. Alan Egan, NAHM Public and Patient Interest Representative, commented: "The COVID-19 pandemic and associated restrictions had a major impact on the way we all do business. Due to factors outside of NAHM's control, some delays were experienced in issuing data to hospitals. It is a tribute to the efforts of all concerned that NAHM managed to meet most targets under these difficult conditions."

This report includes data on 30 of the 44 hospitals included in the audit. Each year, a number of hospitals are not included in any of the chapters discussing the six diagnoses due to the inclusion criteria for publication, whereby hospitals with fewer than 100 cases are not included in the report. Those hospitals will continue to be part of NAHM and will be monitored in the same way as all other hospitals, as the diagnoses/conditions that are publicly reported on constitute only a small fraction of the overall diagnoses available for review at local hospital level.

NAHM AIMS

Our aims are to:

- understand and improve the quality of hospital-based mortality data
- promote reflection on the quality of overall patient care
- identify areas for improvement.

WHAT IS NQAIS NAHM?

The NQAIS NAHM web-based tool extracts Hospital In-Patient Enquiry (HIPE) scheme data from 44 participating publicly funded acute hospitals. These data are routinely collected from inpatients' medical records and coded in the HIPE department of each hospital. Data are then encrypted and securely exported to the National Health Intelligence Unit (NHIU), where they are uploaded to the NQAIS NAHM web-based tool. This tool is one of a suite of tools developed by the NHIU, Strategic Planning and Transformation in the Health Service Executive (HSE) and the software developer OpenApp, with support from Professor Simon Jones (Professor in Population Health, New York University). This annual report focuses exclusively on six key diagnoses; however, the web-based tool allows hospitals to access their mortality data at three different levels: hospital, diagnostic group and individual diagnosis. This information is available to all hospitals throughout the year, allowing them to review their mortality patterns in detail.

NQAIS NAHM calculates a standardised mortality ratio (SMR) for each of the three levels mentioned above. The risk calculation is based on the principal diagnosis (the principal reason that a patient required hospital admission) as coded in the HIPE system. An SMR is an indirect standardisation of the observed number of deaths divided by the expected number of deaths in a hospital for a particular diagnosis and time period. The analysis is calculated using the characteristics of each individual patient that are known to impact on inpatient mortality, as follows:

- age
- sex
- pre-existing conditions (Charlson Comorbidity Index (CCI))
- in-hospital palliative care treatment
- source of admission (e.g. home, nursing home)
- type of admission (e.g. elective, emergency)
- previous emergency admissions in last 12 months to the same hospital
- medical card (proxy for deprivation).

If a hospital's observed mortality rate is within the expected range, it means that, the number of cases that died was within the expected range based on the characteristics listed above.

SMRs in the NQAIS NAHM web-based tool are calculated for all 44 participating hospitals and for all diagnosis groups within which a patient could be admitted to a hospital. The SMR is one of a number of quality indicators in hospitals and is an appropriate way of examining mortality data in Ireland. Variation between the expected value and a result that is unlikely to have arisen from random variation provides a signal to hospitals that the number of deaths in their hospital is above what was expected for that diagnosis – such hospitals are outliers and further review should be conducted.

The NAHM Governance Committee defines a statistical outlier as occurring where an SMR for an individual diagnosis is higher than expected, appearing outside the 99.8% confidence intervals, combined with 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 considered to be significant. In line with NOCA's *Monitoring of statistical outliers in national clinical audit and registries* (NOCA, 2021a), all statistical outliers should be reviewed in order to first establish whether the outlier is a confirmed statistical outlier or whether it is the result of data issues. If it is due to a data issue, the hospital corrects the data and the outlier is closed. If the outlier is not the result of a data issue, NOCA engages with the hospital and requests an accountable user to liaise with NOCA to conduct a review to investigate the possible reasons for the difference from what was expected. The review should examine, for example, patient profile, case mix and healthcare provision, and, where appropriate, identify areas for improvement.

NQAIS NAHM is based on the principal diagnosis recorded for each case. The NQAIS NAHM risk model has not been adjusted to account for diagnosis 2–30 if reported in HIPE. However, a diagnosis of COVID-19 is only recorded as a secondary diagnosis in HIPE due to classification standards, meaning that the NQAIS NAHM model may not have been as robust in estimating the risk of death during the COVID-19 pandemic as it would have been in normal circumstances. Due to the possible underestimation of the risks of mortality associated with COVID-19 within NAHM risk modelling (see the 'Impact of COVID-19 on the NQAIS NAHM tool' section in the 'Data quality' chapter), there was a pause in data being released to the NQAIS NAHM web-based tool and outliers relating to 2020 data have not been monitored. The situation regarding the monitoring of outliers will be examined once the rate of COVID-19 infections has declined.

At year end for 2020 data, the NQAIS NAHM risk model has been performing well despite the presence of COVID-19-positive cases, and no statistical outliers were present in the 44 participating hospitals.

HOW TO READ THIS REPORT

This year's report contains clinical information and data chapters for the six key diagnoses and their findings, as well as a COVID-19 chapter. The report is supplemented by the *National Audit of Hospital Mortality Supporting Appendix 2020*, which is only published online and is available to download. The *Supporting Appendix* contains information on risk methodology, the NAHM Governance Committee, and supporting tables for the main report's funnel plots. As in previous years, there is also a summary report, *National Audit of Hospital Mortality Summary Report 2020*, which is aimed at the public and the wider health service and is presented using plain language and graphics. All reports are available to download from the NOCA website at www.noca.ie.

This report publishes mortality data for participating Irish acute hospitals for six key diagnoses. NAHM has always advocated for transparency and continues to publish hospital-identifiable information from the NQAIS NAHM web-based tool. Because of the methodology used in the calculation of SMRs, this report cannot be used to compare one hospital against another.

HIPE data are based on cases that may include multiple admissions for the same

patient. For this reason, this report refers to ‘cases’ rather than ‘patients’.

Within the clinical chapters for AMI, heart failure, ischaemic stroke, COPD and pneumonia, the following information is presented: -

- A line/trend chart presenting crude mortality rates over 10 years from 2011 to 2020 is provided, with control limits set at 95%, for each of the six key diagnoses in order to illustrate the number of cases that died in hospital as a proportion of the total number of cases admitted. These data have not been adjusted for differences in age profile or comorbidities over time, but they provide background information on hospital presentations for this time period. Only hospitals that meet the inclusion criteria are included in the crude mortality analysis. The number of included hospitals is specified and the percentage of the national cases they account for is given for each diagnosis.
- A funnel plot displaying the national in-hospital SMR for 2020 is presented for each diagnosis. Due to the smaller number of cases, haemorrhagic stroke is presented over a 3-year period from 2018 to 2020. A funnel plot for each of the six key diagnoses is presented with 99.8% control limits. These limits represent the upper and lower limits of expected variation. Each individual hospital's control limits are calculated based on that hospital's patient details. If an SMR appears outside the 99.8% control limits, it is very unlikely that this is due to chance (1 in 500 likelihood of being due to chance alone), and further investigation is warranted. The funnel plot for each diagnosis is supported by a tabular presentation in the *Supporting Appendix*. Further information on how to interpret funnel plots is given in Appendix 1.
- CCI is a measure of other chronic or long-term diagnoses present in the same person at the time of admission (Charlson *et al.*, 1987). Data for the CCI score are extracted from the additional diagnoses applied to a coded HIPE record. The collection of HIPE data nationally is managed by the Healthcare Pricing Office (HPO) on behalf of the HSE. Additional diagnoses 2–30 are conditions that either coexist with the principal diagnosis or that arise during the same episode of care. Note that HIPE data collection “is not intended to describe the current disease status of the inpatient population, but rather the conditions that are significant in terms of treatment required, investigations needed and resources used in each episode of care (ACS 0002 Additional Diagnoses).” (Murphy, 12 November 2021, personal communication). Therefore, not all conditions listed in a patient's chart will meet criteria for coding. All HIPE data undergo rigorous data quality assurance checks at all stages of the process before being released to the NHIU for inclusion in the NQAIS NAHM model. NQAIS NAHM calculates a CCI score for each case which is a measure of comorbidity. The CCI calculates the impact of those comorbidities on the patient's outcome and assigns a score depending on the risk to the patient from 17 background illnesses and conditions and their associated 1-year mortality risk. The scores are grouped as less than 1, between 1 and 5, and greater than 5. A CCI score greater than 5 indicates a higher risk of death within the 12 months following discharge.

Infographics are included in each clinical chapter in order to show the breakdown of percentages of deaths per age group for that diagnosis.

This report examines the mortality rates of cases where the main reason for admission was one of the six key diagnoses, but it is important to emphasise that this may not be the actual cause of death for each case; for example, a patient may be admitted with a stroke but the ultimate cause of death may be some other event or condition.

The Department of Health publishes mortality data in the National Healthcare Quality Reporting System (NHQRS) for diagnoses of AMI, haemorrhagic stroke and ischaemic stroke (Department of Health, 2020). The basis of this methodology is the Organisation for Economic Co-operation and Development's (OECD's) direct standardised death rate. This method allows for comparison between Ireland and other countries. The methodology used for NQAIS NAHM differs from that used for the NHQRS, as NQAIS NAHM uses an indirect SMR that adjusts for patient characteristics that are known to impact on inpatient mortality. This allows hospitals to compare their observed death rate against the death rate that would be expected in that hospital if other variables affecting mortality could be taken into consideration. For more information refer to methodology section in *National Audit of Hospital Mortality Supporting Appendix 2020*, available to download from NOCA website. Due to the differences in methodology, it is not possible to compare in-hospital mortality indicators in this report against those presented by the Department of Health in the NHQRS report.

SELECTION OF KEY DIAGNOSES

The NAHM Governance Committee defined inclusion criteria in order to select a cohort of key diagnoses for the *National Audit of Hospital Mortality Annual Report 2020*, as shown in Table 1.

TABLE 1: CRITERIA FOR SELECTION OF KEY DIAGNOSES

	Criterion	Comment	Rationale
Clinical	Alignment to a National Clinical Programme	Is there an aligned HSE National Clinical Programme?	HSE National Clinical Programmes provide national leadership for improvement.
	Burden of the clinical topic	Is the key diagnosis considered to be of high volume?	Priority in this report is given to diseases associated with the greatest burden to public health and the health system.
	Significant clinical risk	Is the key diagnosis considered to be of significant clinical risk; for example, high mortality?	
Methodological	Definition	Is the key diagnosis clearly clinically defined?	Only key diagnoses that 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 for the individual diagnosis >100 over the reporting period?	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.

While not all hospitals' data for all diagnoses are published in the *National Audit of Hospital Mortality Annual Report 2020*, hospitals can view their in-hospital mortality data for all diagnoses (high and low volume) throughout the year via the NQAIS NAHM web-based tool.

NAHM IN ACUTE HOSPITALS

NOTE: Dublin hospitals have been displayed collectively by hospital group

 **SAOLTA UNIVERSITY HEALTH CARE GROUP**

 **RCSI HOSPITALS**

 **IRELAND EAST HOSPITAL GROUP**

 **DUBLIN MIDLANDS HOSPITAL GROUP**

 **UL HOSPITALS GROUP**

 **CHILDREN'S HEALTH IRELAND**

 **SOUTH/SOUTH WEST HOSPITAL GROUP**



Hospitals with low case numbers are indicated by a black marker and their data are not included in this report.

LETTERKENNY UNIVERSITY HOSPITAL

SLIGO UNIVERSITY HOSPITAL

ROSCOMMON UNIVERSITY HOSPITAL 

PORTIUNCULA UNIVERSITY HOSPITAL

MAYO UNIVERSITY HOSPITAL

GALWAY UNIVERSITY HOSPITALS

NENAGH HOSPITAL

UNIVERSITY HOSPITAL LIMERICK

ENNIS HOSPITAL

ST JOHN'S HOSPITAL, LIMERICK

CROOM ORTHOPAEDIC HOSPITAL 

UNIVERSITY HOSPITAL KERRY

BANTRY GENERAL HOSPITAL

MALLOW GENERAL HOSPITAL

CORK UNIVERSITY HOSPITAL

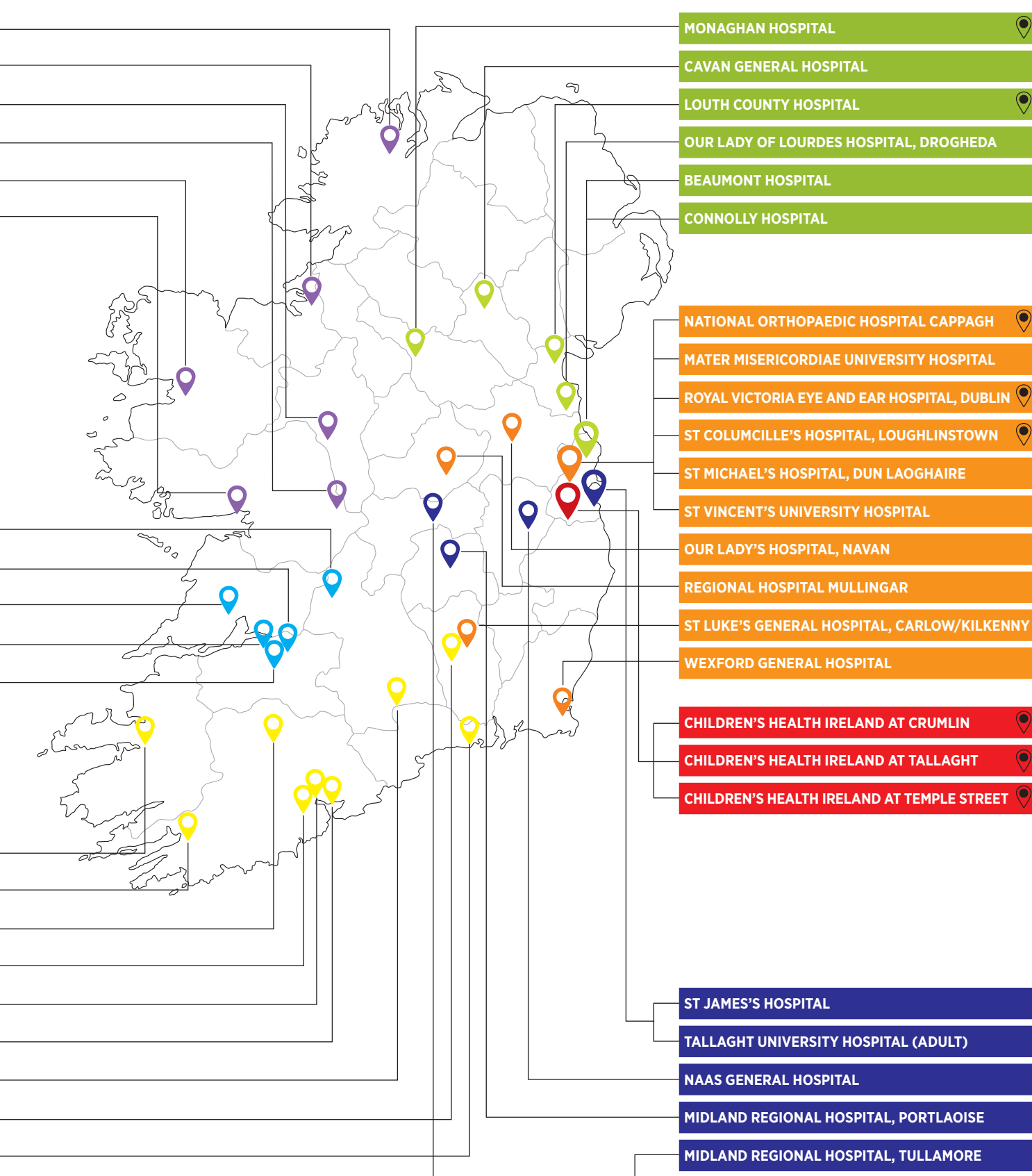
MERCY UNIVERSITY HOSPITAL, CORK

SOUTH INFIRMARY VICTORIA UNIVERSITY HOSPITAL 

SOUTH TIPPERARY GENERAL HOSPITAL

KILCREENE REGIONAL ORTHOPAEDIC HOSPITAL 

UNIVERSITY HOSPITAL WATERFORD





DATA QUALITY



Data for NQAIS NAHM are sourced from 44 acute hospitals in Ireland. Data from discharged inpatients' medical records are routinely coded by HIPE clinical coders in each hospital and collection of these data is overseen by the HPO. HIPE clinical coders and clinicians should collaborate in order to ensure that the information contained in the patient medical record, and thus also the HIPE coding, is as accurate as possible.


Healthcare workers have experienced many challenges and demands during the COVID-19 pandemic, and the importance of accurate and timely HIPE coding being continued was highlighted by the HPO and identified as essential in the management of the pandemic. In an update to HIPE coders and HSE Acute Operations, the HPO stated that "Under the current circumstances the HIPE function at hospital level is essential and the HPO recommends that HIPE staff are retained in their roles and are not redeployed" (Curley, 19 March 2020, personal communication). The retention of the HIPE coders resulted in minimal impact on the data for the NAHM report, with a 1-month delay in closure of the 2020 national HIPE file. Consequently, there was a delay in the release of data for the annual report, and this was further delayed due to the HSE cyberattack in May 2021.

The data quality statement (Table 2) highlights the assessment of the quality of NQAIS NAHM data during 2020 and Q1 2021 against internationally agreed dimensions of data quality as laid out in the Health Information and Quality Authority's (HIQA's) *Guidance on a data quality framework for health and social care* (HIQA, 2018). This statement describes high-level changes and improvements to NQAIS NAHM data under five dimensions of data quality for 2020. The accuracy and reliability of data are continually assessed by NQAIS NAHM users and improvements are made where deficiencies are identified.

TABLE 2: OVERVIEW OF DATA QUALITY FOR THE NATIONAL AUDIT OF HOSPITAL MORTALITY 2020 AND QUARTER 1 2021

DATA QUALITY STATEMENT		
Dimensions of data quality in 2020 and Q1 2021	Definition (HIQA, 2018)	Assessment of dimension (NQAIS NAHM)
Relevance 	Data meet the current and potential future needs of users.	<p>Data used in NQAIS NAHM are sourced from HIPE. In January 2020, 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) was adopted by the HPO for use in Irish hospitals. Mapping of ICD-10-AM/ACHI/ACS codes was carried out in order to ensure that no codes were omitted in the changeover. Release of data to the NQAIS NAHM live tool was paused from March 2020 to March 2021 due to the COVID-19 pandemic and the inability to assess risk associated with COVID-19-positive cases, and to allow time to develop a 'COVID-19 flag'. A COVID-19 flag was added to NQAIS NAHM in August 2020 in order to enable NQAIS NAHM users to identify which cases had COVID-19 (either laboratory confirmed or clinically diagnosed). Amendments were made to age groupings in records and crosstabs in order to allow hospitals to extract information for paediatric cases separately.</p> <p>There were no change or research requests received in 2020 or Q1 2021.</p>
Accuracy and reliability 	How closely the data describe what they were designed to measure and how consistently they measure it over time	<p>As data are extracted directly from HIPE, data validation is carried out by the hospitals and the HPO. NOCA carries out further validation before releasing data to the live web-based tool.</p> <p>Coding of patients' charts has been minimally impacted by the COVID-19 pandemic. Coding of COVID-19 cases within 48 hours of discharge was prioritised during the pandemic. All hospitals had serious issues around coder availability during the pandemic due to redeployment and illness, and three hospitals had lower than expected coverage as a result. The hospitals are working to address these issues. Overall, 98.9% of acute cases nationally were coded and exported to the HPO for the national HIPE file for 2020. This slight reduction from 99.5% national coverage in 2019 does not impact on the analysis and presentation of NAHM data in this report. The 'COVID-19' chapter of this report contains preliminary data for Q1 2021 – the coverage for this period was 89%.</p> <p>This report is based on data from the closed 2020 HIPE data file (HIPE_2020_ASOF_0421_V17) and preliminary data for Q1 2021 from the HIPE release period up to July 2021 (V2021.10.11 (revision 62330)).</p>

Dimensions of data quality in 2020 and Q1 2021	Definition (HIQA, 2018)	Assessment of dimension (NQAIS NAHM)
Timeliness and punctuality 	Data are collected and delivered by the time and date agreed	<p>The scheduled update of data in January 2020 was postponed in order to facilitate the validation of the transfer and data matching of Clinical Classifications Software (CCS) codes within NQAIS NAHM. This was necessary as a result of the update to the 10th edition of the classification used in HIPE, the International Statistical Classification of Diseases (Australian Consortium for Classification Development, 2017). Data were released in February, March and April 2020, updating the tool to display data up to the end of February 2020, prior to the beginning of the COVID-19 pandemic in Ireland. The closed 2019 HIPE file was released in June 2020. The release of new 2020 data to NQAIS NAHM was paused in March 2020 in order to allow work on the web-based tool to assess the impact of COVID-19 on the data. A decision was made to resume data releases for the completed calendar year 2020 data and to include a COVID-19 flag so that cases with COVID-19 could be identified. The pause in the release of data and the reason for this pause was communicated to all NQAIS NAHM users by email. Release of new data resumed in March 2021.</p> <p>The 2020 national HIPE file was closed on 30 April 2021, 4 weeks later than normal due to disruption caused by the COVID-19 pandemic.</p>
Coherence and comparability 	Data should be consistent over time and be easily linked to other sources	<p>Changes were made to the CCS group “haemorrhagic stroke” in order to split it into two CCS groups:</p> <ul style="list-style-type: none"> • (I60): “subarachnoid haemorrhage” (see Appendix 2 for 2020 data) • (I61): “stroke haemorrhagic” <p>This report will only examine the CCS group “stroke haemorrhagic” (I61), which now correlates to the Irish National Audit of Stroke (INAS), making it easier for both audits to compare findings.</p> <p>Codes under the CCS group “fracture neck of femur” were changed in mid-2020 and now align with those used for the Irish Hip Fracture Database (IHFD) – previously, some cases were under the CCS group “fracture lower limb”.</p> <p>International or regional comparison to other mortality models is not possible due to differences in the risk models (i.e. ages, day cases, 30-day mortality figures, etc.).</p>

Dimensions of data quality in 2019	Definition (HIQA, 2018)	Assessment of dimension (NQAIS NAHM)
Accessibility and clarity 	Data are easily obtainable and understandable.	<p>NQAIS NAHM users within each hospital/Hospital Group are trained on interpreting the outputs from the web-based tool. Training continues to be offered monthly to all new and existing users. Hospital-level data for all diagnoses and cases are always available to NQAIS NAHM users throughout the year. Annual reports are presented at hospital level with graphs and infographics to make them understandable, while a summary report aimed at the general public is published annually using clear language and graphics. These reports are available from the NOCA website (www.noca.ie).</p>

DATA RELEASES TO THE NQAIS NAHM WEB-BASED TOOL

Details of delay to release of data to the NQAIS NAHM web-based tool in 2020 is included in Table 2 under the heading “Timeliness and Punctuality”. Table 3 shows the scheduled release dates for data in 2022.

TABLE 3: SCHEDULED DATES FOR THE RELEASE OF DATA TO THE NATIONAL QUALITY ASSURANCE IMPROVEMENT SYSTEM, NATIONAL AUDIT OF HOSPITAL MORTALITY WEB-BASED TOOL IN 2022

Release of data to NQAIS NAHM	Data periods included in the NQAIS NAHM data release	Comments/ type of release
January 2022	November 2020 to October 2021	Monthly update
February 2022	December 2020 to November 2021	Monthly update
March 2022	January 2021 to December 2021	Quarterly
June 2022	April 2021 to March 2022	Closed HIPE file/ quarterly
September 2022	July 2021 to June 2022	Quarterly
December 2022	October 2021 to September 2022	Quarterly

IMPACT OF COVID-19 ON THE NQAIS NAHM TOOL

As the first cases with COVID-19 were admitted to Irish hospitals in March 2020, there was an expectation that the NQAIS NAHM web-based tool would be able to predict mortality outcomes for in-hospital cases with COVID-19. The NQAIS NAHM risk model is driven by the principal diagnosis recorded in the patient’s medical record and entered into the HIPE system by HIPE coders in each hospital.

The World Health Organization (WHO) and the Independent Hospital Pricing Authority (IHPA) (which provides guidance on the ICD-10-AM/ACHI/ACS classification) have provided guidelines on how new emergency ICD-10-AM/ACHI/ACS codes introduced to facilitate COVID-19 coding should be identified within HIPE (HPO, 2020b):

- U07.1 Emergency use of U07.1 (COVID-19, virus identified)
- U07.2 Emergency use of U07.2 (COVID-19, virus not identified)
- U06.0 Ruled-out cases, tested negative. (IHPA only code – not in use by WHO).

Further COVID-19 codes and guidance were issued throughout 2021.

IHPA, which publishes and supports the ICD-10-AM/ACHI/ACS used in Ireland, advised that these new codes should be recorded in HIPE as secondary or additional diagnoses, either where there was a laboratory-confirmed positive test or where COVID-19 was clinically diagnosed. The coding guidelines stipulate that the manifestation is sequenced before the underlying cause, e.g. viral pneumonia followed by the emergency use of U07.1 or U07.2 COVID-19 codes. The NQAIS NAHM risk model does not account for secondary diagnoses and therefore is possibly underestimating the risk of death for COVID-19-positive cases.

NOCA commissioned a study to assess the impact of COVID-19 on the NQAIS NAHM model, specifically on respiratory CCS groups. The study compared NAHM data from March and April 2020 with NAHM data from March and April in 2017, 2018 and 2019 (NOCA, 2020b). The study showed an impact on in-hospital mortality across the period March to April 2020, with higher SMRs, decreased admissions, and more complex case mix in non-COVID-19 cases. The most impacted CCS group was “pneumonia”. The study found that the risk model continued to discriminate reasonably well between lower-risk and higher-risk cases, including those with confirmed COVID-19. However, because of the possible underestimation of expected deaths in cases where COVID-19 was confirmed, the NAHM Analysis and Display Scientific Team (ADST) advised the NAHM Governance Committee that updates of data to the NQAIS NAHM web-based tool should cease until investigation into the calculation of SMRs during the pandemic could be completed and international agreement on SMR methodology reached. This limitation to mortality methodology is being experienced internationally: other SMRs and mortality tools either paused the release of new data or excluded COVID-19 data from the risk calculations (NHS Digital, 2021). There were limitations on the study due to the fact that only 2 months of data from the first wave of the pandemic in Ireland were available for analysis at the time.

The NAHM ADST advised that the release of data should resume when the baseline year (known as “hai_year” in the NQAIS NAHM tool) switched over to 2020, meaning that once the current year’s data file contained sufficient cases, it would be more reliable for benchmarking as the data include COVID-19 cases for comparison. The NAHM ADST conducted analyses and developed a parallel tool to show both years (2019 and 2020) as a baseline for determining if both views should be released to users on the NQAIS NAHM live tool. It was decided to release only the data using the 2020 hai_year, as these data provided more meaningful information. Data release resumed in March 2021, updating the live web-based tool with data for the full 2020 calendar year. Communication was circulated to all users explaining the delays and the work that was carried out, and advising caution in the interpretation of SMRs and CuSums while high numbers of cases with COVID-19 infection exist within the data.

One action arising from the impact study was that of adding a COVID-19 flag to the records tab in the NQAIS NAHM web-based tool. The COVID-19 flag uses secondary diagnoses identifying the disease, either laboratory confirmed or clinically diagnosed, allowing hospitals to analyse which of the cases within an unusual pattern of mortality were being treated for COVID-19-related illnesses. The HPO also introduced a COVID-19 flag that has been added to the HIPE administration fields. The difference with this flag is that it identifies where a patient has laboratory-confirmed COVID-19 (i.e. tested positive) at any time in the past or during the present admission. This flag has been effective since 1 October 2020 and applies to all discharges coded from that date onward. It may also be applied retrospectively to discharges before 1 October 2020, but this is not a requirement. The HIPE COVID-19 flag was combined with the NAHM COVID-19 flag on the NQAIS NAHM web-based tool records tab in October 2021.

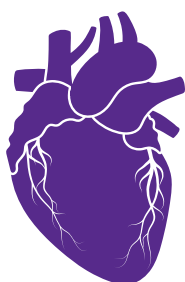
As the data continued to be unstable throughout 2020, and due to the possible underestimation of expected deaths, the monitoring of signals in NQAIS NAHM was also paused. No hospital was required to investigate any outliers until the data became more stable. Monitoring of statistical outliers remains on hold in 2021.

CLINICAL CHAPTERS

This report examines six key diagnoses that place a high burden on the Irish health service. The six diagnoses are a group of cardiovascular and respiratory conditions.

CARDIOVASCULAR CONDITIONS

ACUTE
MYOCARDIAL
INFARCTION



HEART
FAILURE

ISCHAEMIC
STROKE



HAEMORRHAGIC
STROKE

RESPIRATORY CONDITIONS

CHRONIC
OBSTRUCTIVE
PULMONARY
DISEASE (COPD)



PNEUMONIA

CARDIOVASCULAR DIAGNOSES

Cardiovascular disease is the leading cause of death globally, causing approximately 17.9 million deaths in 2019. Of these deaths, 85% were due to heart attack or stroke (WHO, 2021). Cardiovascular diseases are a group of disorders affecting the heart and blood vessels and include coronary heart disease (myocardial infarction or heart attack), cerebrovascular disease (ischaemic and haemorrhagic stroke), heart failure, and rheumatic heart disease.

The NQAIS NAHM web-based tool includes data for all cases with a cardiovascular principal diagnosis, not solely those diagnoses presented in this report. Each hospital can access its data locally and conduct reviews as required.

For the purposes of public reporting, the NAHM Governance Committee applied inclusion criteria to the framework for the NAHM report. The following cardiovascular diagnoses meet the inclusion criteria:

- AMI
- heart failure
- ischaemic stroke
- haemorrhagic stroke.



ACUTE MYOCARDIAL INFARCTION

BACKGROUND

The medical term for a heart attack is acute myocardial infarction (AMI). A heart attack is a life-threatening medical emergency in which the supply of blood to the heart is suddenly blocked, usually by a blood clot. The lack of blood or blockage to the heart can seriously damage the heart muscles (Irish Heart Foundation, 2020).

There are two types of heart attack that are diagnosed by a trace of the heart rhythm known as an electrocardiogram (ECG):

- ST-elevation myocardial infarction (STEMI)
- non-ST-elevation myocardial infarction (NSTEMI).

For the purposes of this report, both subtypes are grouped together under the diagnosis of AMI.

A STEMI is a major heart attack caused by a blockage in the arteries supplying blood to the heart muscle. Urgent treatment is required. The HSE's HeartBeat Portal records data on STEMI cases brought directly, or referred from surrounding general hospitals, to designated primary percutaneous coronary intervention (PPCI) centres for treatment. These are centres equipped with an emergency catheter laboratory. Treatment consists of either the use of a clot-busting drug (thrombolysis) or the insertion of a wire into the artery to open it using a balloon to allow blood to flow to the heart muscle again. The latter is the preferred and most effective method of treatment in the initial hours of a STEMI. The aim is to transfer the patient to a designated PPCI centre with a catheter laboratory within 90 minutes of first medical contact (HSE, 2016). Collection and management of data from the HeartBeat Portal has been under the governance of NOCA since 2019, and the data will be published in a report from the Irish Heart Attack Audit (IHAA) in 2022.

NSTEMI heart attacks usually cause less damage to the heart muscle. The majority of cases are sent for an early investigation of the arteries in the heart (called an angiogram), which is carried out in a hospital equipped with a catheter laboratory. Low-risk NSTEMI heart attacks can be treated medically using prescription drugs.

AMI in NQAIS NAHM is based on ICD-10-AM/ACHI/ACS codes I21, I210, I211, I212, I213, I214, I219, I22, I220, I221, I228, and I229, and is fully defined in the online supporting appendices, which can be found at <https://www.noca.ie/publications/publications-listing/P0/category/3/0>.

FINDINGS

NQAIS NAHM calculates a CCI score for each case, which indicates the significance of the pre-existing conditions on admission and their associated 1-year mortality risk (Figure 1). The majority (66%) of AMI cases had a CCI score of less than 1, meaning that these cases presenting with AMI as their principal diagnosis had a low risk of mortality. Figure 2 shows that 84% of deceased AMI cases were aged over 65 years.

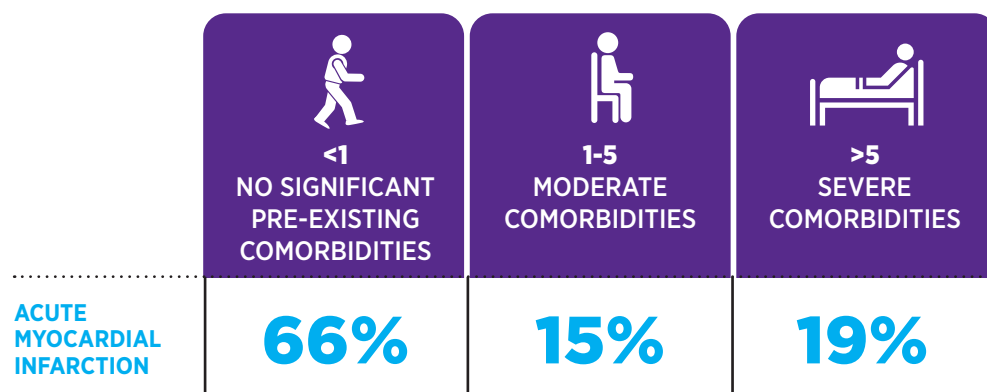


FIGURE 1: CHARLSON COMORBIDITY INDEX SCORES FOR CASES WITH A PRINCIPAL DIAGNOSIS OF ACUTE MYOCARDIAL INFARCTION, 2020

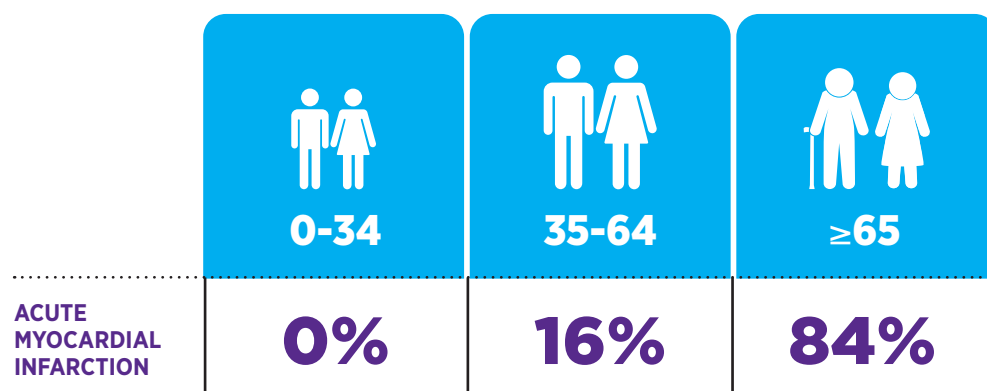


FIGURE 2: DECEASED CASES WITH A PRINCIPAL DIAGNOSIS OF ACUTE MYOCARDIAL INFARCTION, BY AGE GROUP, 2020

Figure 3 presents the crude in-hospital mortality rate for AMI from 2011 to 2020, with a 95% confidence interval (CI). In-hospital mortality for AMI had declined steadily from 69 deaths per 1,000 admissions in 2011 to 47 deaths per 1,000 admissions in 2019; this increased slightly to 49 deaths per 1,000 admissions in 2020. During 2020, there were 5,883 cases discharged from Irish hospitals with a principal diagnosis of AMI; 0.6% (n=33) of those cases had a confirmed COVID-19 flag in the NQAIS NAHM web-based tool.

The significant reduction in mortality over the past decade can be attributed to increased awareness about risk factors for cardiovascular disease among the population, to improved therapies, and particularly to early access to the cardiac catheter laboratory under the HSE National Clinical Programme for Acute Coronary Syndrome, while the increase in 2020 may be attributed to the COVID-19 pandemic.

There was a 14.7% reduction in cases presenting to the emergency department with AMI from Q2 to Q4 2020 compared with Q1 2020. This demonstrated reduced utilisation of emergency acute hospital care during the first wave of the COVID-19 pandemic. The consequences of this delay may become more apparent over time (Crowley and Hughes, 2021).

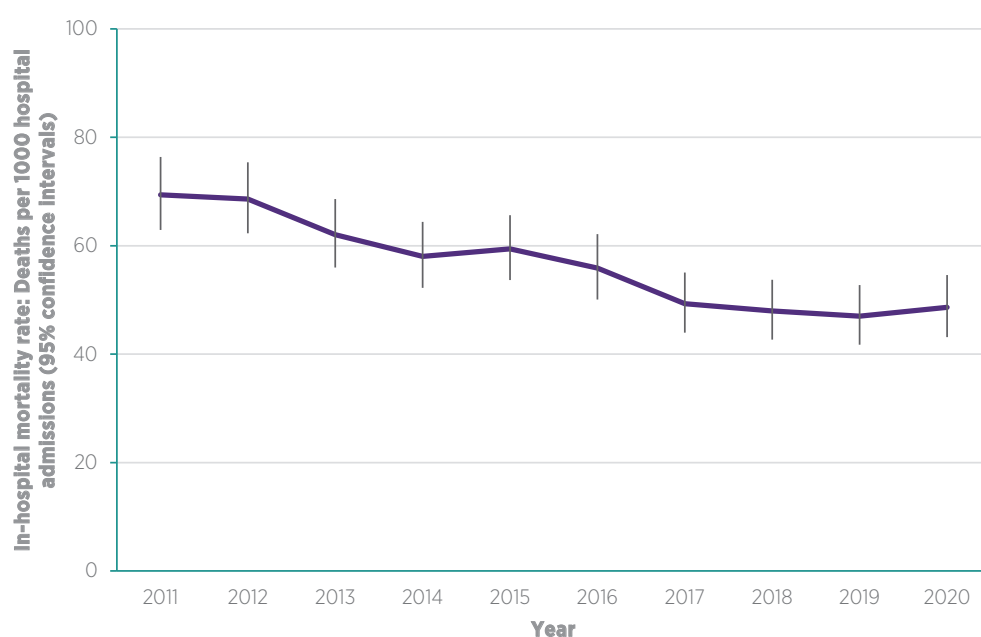


FIGURE 3: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF ACUTE MYOCARDIAL INFARCTION, 2011-2020

Of the 44 participating hospitals, only 22 met the selection criteria for public reporting in 2020. The number of cases with a principal diagnosis of AMI admitted to these hospitals in 2020 ranged from 104 to 673.

The 22 included hospitals have a high number of admissions and account for 93% of cases in Ireland admitted with a principal diagnosis of AMI in 2020. There were 5,883 discharged cases in 2020, compared with 6,149 in 2019, which represents a 4.5% reduction in cases. This may be due to non-attendance or delayed attendance as a result of the perception among the general public of contracting COVID-19 in hospital.

Figure 4 presents a funnel plot of the SMRs for hospitals that met the inclusion criteria, with 99.8% control limits. All hospitals had an SMR within the control limits of 99.8% for AMI, indicating that all hospitals' SMRs were within the expected range for 2020.

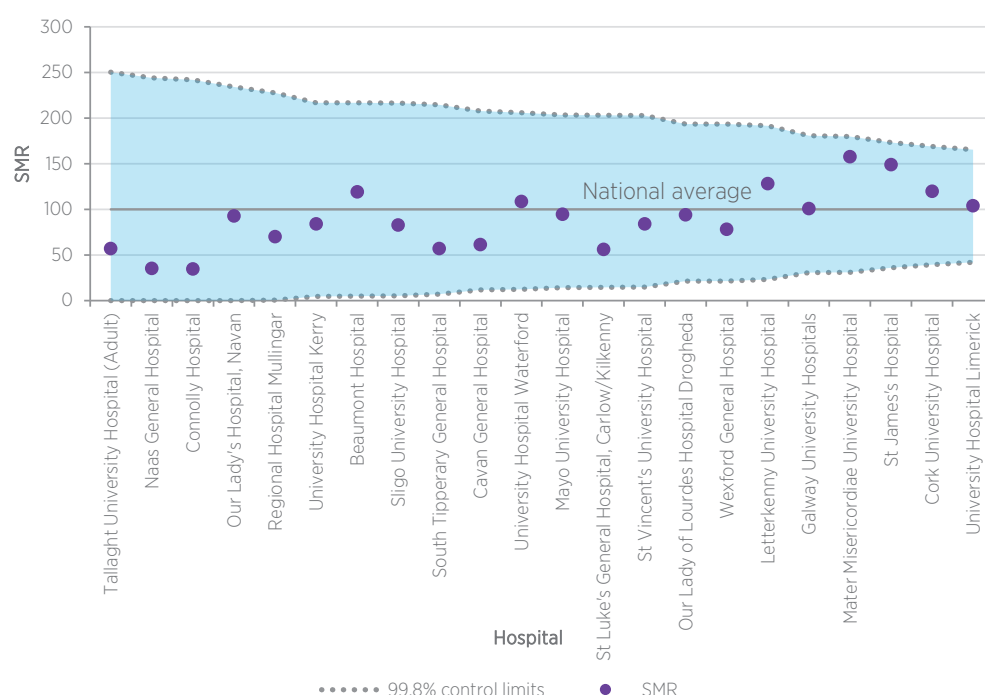


FIGURE 4: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF ACUTE MYOCARDIAL INFARCTION, 2020

HEART FAILURE

BACKGROUND

Heart failure is a medical condition where the heart does not work as efficiently as it should. This means that due to reduced blood flow, the blood is unable to deliver enough oxygen and nourishment to the body in order to allow it to work normally. This can cause various symptoms such as shortness of breath, muscle and leg swelling. Some 80% of heart failure patients suffer from physical symptoms, such as severe breathlessness and fatigue (Irish Heart Foundation, 2021).

Heart failure is a major chronic disease not only in Ireland but worldwide. It is estimated that up to 2% of the adult population in developed countries has heart failure, with the prevalence rising above 10% among those aged over 70 years. Because it is primarily a condition of older adults, mortality and morbidity remain high with heart failure, despite advances in diagnosis and therapy. Heart failure is reported to account for 5% of all emergency medical admissions, of which 80% are aged over 65 years. Research in Ireland shows similar findings, and heart failure represents a major public health burden (HSE, 2021a). People with heart failure are less able to work or participate in social activities. They are also more likely to suffer from depression and social isolation. With incidence of the condition on the rise, heart failure will continue to produce significant mortality and place an ever increasing burden on healthcare resources (Irish Heart Foundation, 2021).

The most up-to-date economic evidence available, from the National Heart Failure Clinical Care Programme's *Heart Failure Model of Care* (HSE, 2012), highlights that heart failure is a major drain on healthcare spending, accounting for an estimated 2–4% of the total healthcare budget (based on data from the United Kingdom and the United States of America). In Ireland, the estimated cost was €660 million in 2012 and is projected to rise as the incidence of heart failure increases (Irish Heart Foundation, 2021).

The number of heart failure cases continues to rise due to three major factors:

- the ageing population
- improved survival post-myocardial infarction
- the continuing difficulty of preventing and managing cardiometabolic diseases (obesity, hypertension, type 2 diabetes) in the general population.

A growing body of data from national and international sources shows that integrated management programmes for heart failure, encompassing primary care and hospital services, can produce significant reductions in the need for hospitalisation and achieve better quality of life and outcomes for patients. Shared care with multidisciplinary-based approaches is indicated as achieving the most effective heart failure care outcomes (HSE, 2021a). The further roll-out of heart failure community projects under Sláintecare will lead to significant improvement in heart failure care, reducing the associated morbidity and improving the quality of life of those living with heart failure.

Heart failure in NQAIS NAHM is based on ICD-10-AM/ACHI/ACS codes I50, I500, I501, I509 and U822, and is fully defined in the online supporting appendix, which can be found at <https://www.noca.ie/publications/publications-listing/P0/category/3/0>.

FINDINGS

NQAIS NAHM calculates a CCI score for each case, which indicates the significance of the pre-existing conditions on admission and their associated 1-year mortality risk (Figure 5). Just over one-half of heart failure cases in 2020 had a CCI score of less than 1, meaning that these cases presenting with heart failure as their principal diagnosis were in the group with the lowest risk of mortality in the following 12 months. Figure 6 shows that 96% of deceased heart failure cases were aged over 65 years.

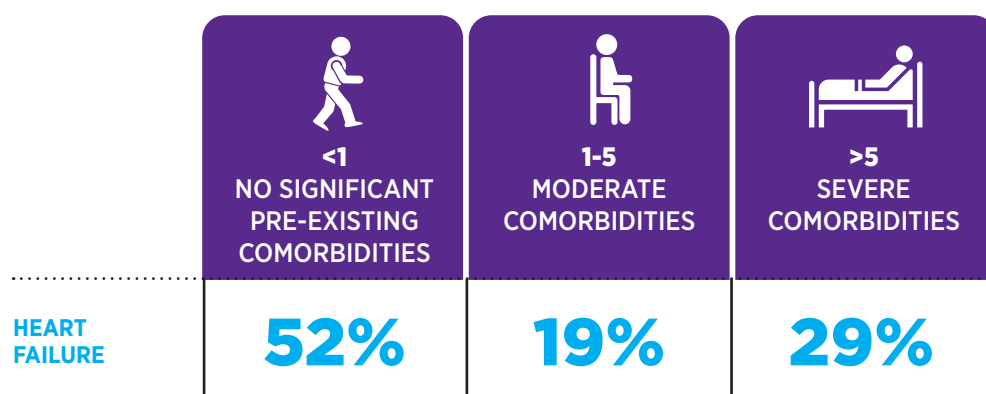


FIGURE 5: CHARLSON COMORBIDITY INDEX SCORES FOR CASES WITH A PRINCIPAL DIAGNOSIS OF HEART FAILURE, 2020

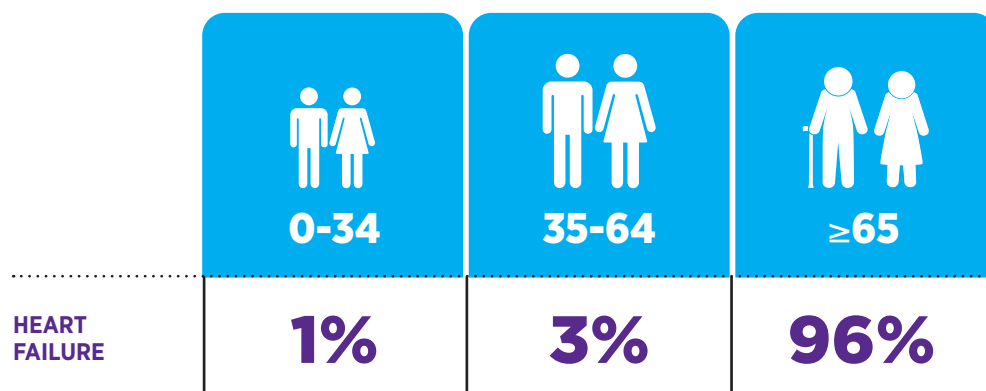


FIGURE 6: DECEASED CASES WITH A PRINCIPAL DIAGNOSIS OF HEART FAILURE, BY AGE GROUP, 2020

A crude in-hospital mortality rate from 2011 to 2020 for heart failure is presented in Figure 7, with a 95% CI. There was a significant reduction (22%) in in-hospital mortality over this time period, from 81 deaths per 1,000 admissions in 2011 to 63 deaths per 1,000 admissions in 2020. Improvements in diagnostic facilities and techniques, improved survival following myocardial infarctions, and the introduction of newer therapies leading to increased survival have resulted in this overall reduction in mortality over the past decade.

In 2020, there were 6,621 cases discharged from hospital in Ireland with a principal diagnosis of heart failure, 96% of which were emergency admissions. There was a very small proportion of heart failure cases (0.9%; n=57) with a COVID-19 flag indicating the presence of the disease in that episode of care.

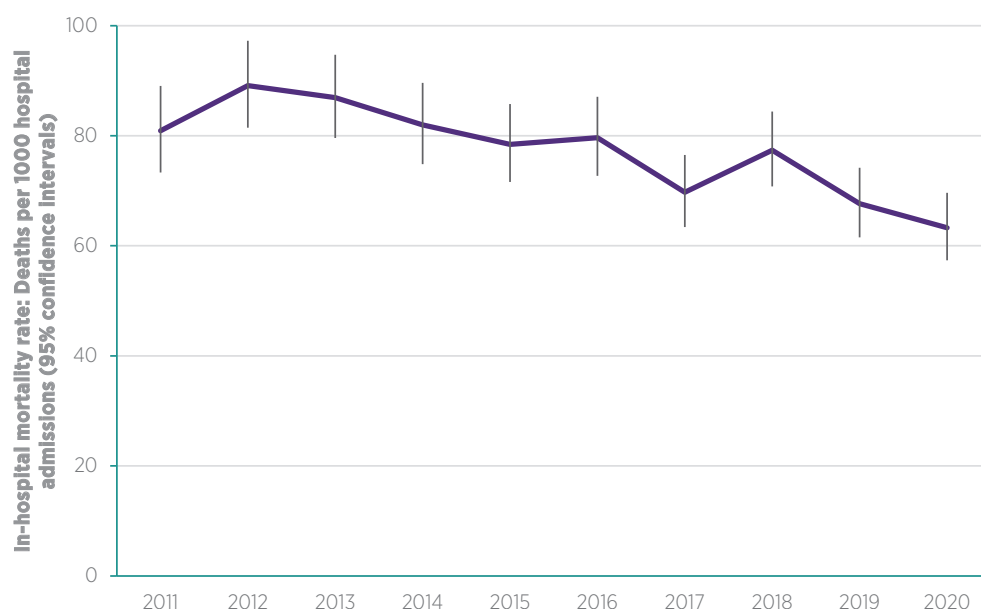


FIGURE 7: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF HEART FAILURE, 2011–2020

Of the 44 participating hospitals, only 27 met the public reporting inclusion criteria for heart failure in 2020. The number of cases with a principal diagnosis of heart failure admitted to these hospitals in 2020 ranged from 126 to 417.

The 27 included hospitals have a high number of admissions and account for 91% of cases in Ireland admitted with a principal diagnosis of heart failure in 2020. The number of cases admitted to hospital in 2020 with a principal diagnosis of heart failure remained relatively static, at 6,621 cases nationally in 2020 compared with 6,697 in 2019; however, the number of hospital admissions should increase with the increased incidence of heart failure on a yearly basis. The slight reduction of admissions in 2020 may be attributed to the impact of the COVID-19 pandemic, wherein patients were not seeking timely advice and avoided attending hospital due to the fear of contracting COVID-19. The consequences of these delays may only become apparent over time and through examination of wider health information datasets (Crowley and Hughes, 2021). The distribution of cases with heart failure was across fewer individual hospitals in 2020 as inclusion criterion required them to record at least 100 cases.

Figure 8 presents the SMRs for these hospitals in a funnel plot, with 99.8% control limits. All hospitals had an SMR within the control limits of 99.8% for heart failure, indicating that all hospitals' SMRs were within the expected range for 2020. Seventeen hospitals are not included in this analysis, as they did not meet the inclusion criteria relating to a defined number of admissions and expected events.

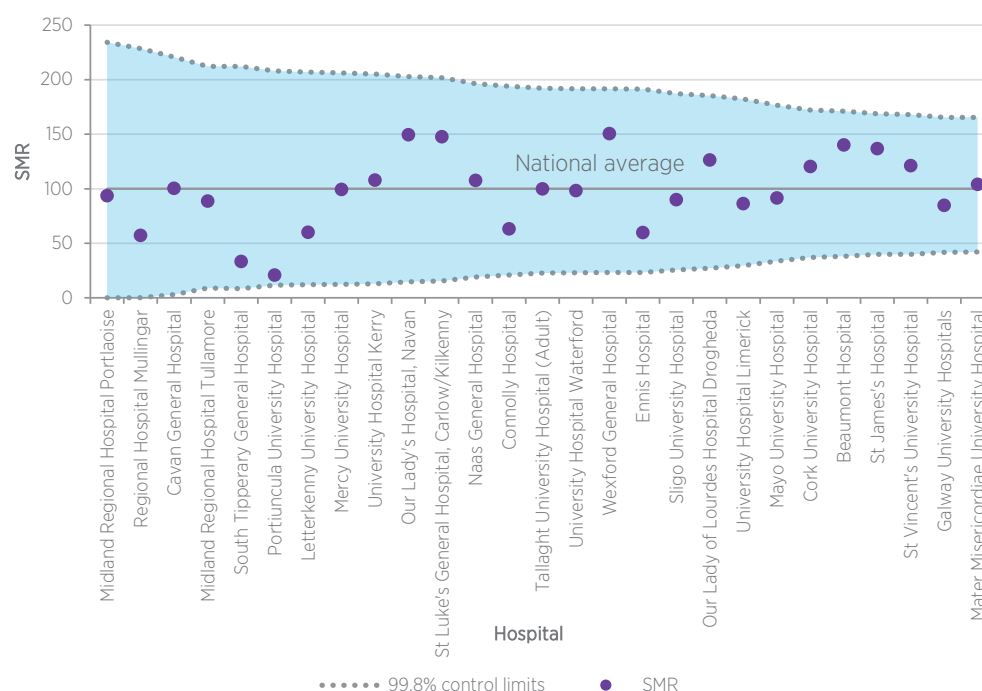


FIGURE 8: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF HEART FAILURE, 2020

STROKE

BACKGROUND

A stroke is a serious, life-threatening medical condition. There are two main types:

- 1) **Ischaemic**, where the blood supply to the brain is stopped due to a blood clot, accounts for approximately 85% of all strokes.
- 2) **Haemorrhagic**, where a weakened blood vessel supplying blood to the brain ruptures, causing bleeding into or around the brain, accounts for the remaining 15% of strokes (King's College London for the Stroke Alliance for Europe (SAFE), 2017) and is reflected in the figures available for Ireland in 2020 (NOCA, 2022).

Like all organs, the brain needs oxygen and nutrients provided by the blood in order to function properly. If the supply of blood becomes interrupted or cut off, brain cells begin to die within minutes. When the affected brain cells die, the motor, visual or cognitive function (e.g. speech) controlled by these cells stops working. Depending on the location and size of the affected area, a stroke can lead to very significant brain injury and disability, and possibly even death. Stroke affects 17 million people worldwide each year; it is the second leading cause of death and the leading cause of long-term adult disability (SAFE, 2020). The *Irish National Audit of Stroke Annual Report 2020* reports that 71% of ischaemic stroke cases and 60% of haemorrhagic stroke cases had disabilities on discharge in 2020 (NOCA, 2022). The INAS reported on 5,153 stroke cases in 2020 from 24 public hospitals that provided acute stroke care to patients aged 17 years and over and that admitted more than 25 stroke cases annually.

Primary care interventions, including detection and management of hypertension and atrial fibrillation, are key drivers of the trend in a reduction of mortality and an increase in admissions for stroke. National policies such as Healthy Ireland have increased public awareness of cardiovascular risk factors, and general healthier living practices (e.g. exercise; smoking cessation) may also be having an impact. In addition, time-dependent acute treatments for ischaemic stroke, such as thrombolysis and thrombectomy, have improved greatly in recent years. This has been achieved as the result of the Acute Stroke Collaborative Programme run by the Royal College of Physicians of Ireland, which has reduced the door to decision time across the acute hospital sector, and by further expansion and development of the National Thrombectomy Service.

The figures in this section are reflective of the 24 hospitals accepting acute stroke patients rather than of all 44 NAHM participating hospitals.



ISCHAEMIC STROKE

BACKGROUND

Ischaemic strokes, which are the most common type of stroke, occur when the brain's blood vessels become narrow or are blocked by blood clots, causing reduced blood flow to the brain (ischaemia). Blood clots typically form in areas where the arteries have been narrowed or blocked by fatty, cholesterol-containing deposits known as plaque which lodge in the blood vessels in the brain (hardening of the arteries or atherosclerosis).

As people get older their arteries become narrower, but certain risk factors can dangerously accelerate this process. Risk factors include:

- smoking
- high blood pressure
- obesity
- high cholesterol levels (often caused by a high-fat diet, but can result from inherited factors)
- a family history of diabetes or heart disease
- excessive alcohol intake (which can also make obesity and high blood pressure worse, as well as causing heart damage and an irregular heartbeat).

Diabetes is also a risk factor, particularly if it is poorly controlled, as the excess glucose in the blood can damage the arteries. Another possible cause of ischaemic stroke is an irregular heartbeat (atrial fibrillation), which can cause blood clots that become lodged in the brain.

Since the establishment of the National Clinical Programme for Stroke (NCPS) in 2010 and the introduction of standardised care pathways and new forms of treatment in the form of thrombolysis (clot-busting drugs) and, more recently, acute thrombectomy, there has been an improvement in survival rates for patients presenting with stroke. In 2020, there were 458 cases with ischaemic stroke referred for mechanical thrombectomy, and of those cases, 392 underwent the procedure (National Thrombectomy Service, 2021). The INAS reports that in 2020, 10.6% of ischaemic stroke cases were treated with thrombolysis (NOCA, 2022).

Ischaemic stroke in NQAIS NAHM is based on ICD-10-AM/ACHI/ACS codes I63, I630, I631, I632, I633, I634, I635, I636, I638, and I639, and is fully defined in the online supporting appendix, which can be found at <https://www.noca.ie/publications/publications-listing/P0/category/3/0>.

FINDINGS

NQAIS NAHM calculates a CCI score for each case, which indicates the significance of the pre-existing conditions on admission and their associated 1-year mortality risk (Figure 9). More than one-quarter of ischaemic stroke cases in 2020 had a CCI score greater than 5, meaning that these cases presenting with ischaemic stroke as their principal diagnosis were at high risk of mortality in the following 12 months. Figure 10 shows that 89% of deceased ischaemic stroke cases were aged over 65 years.

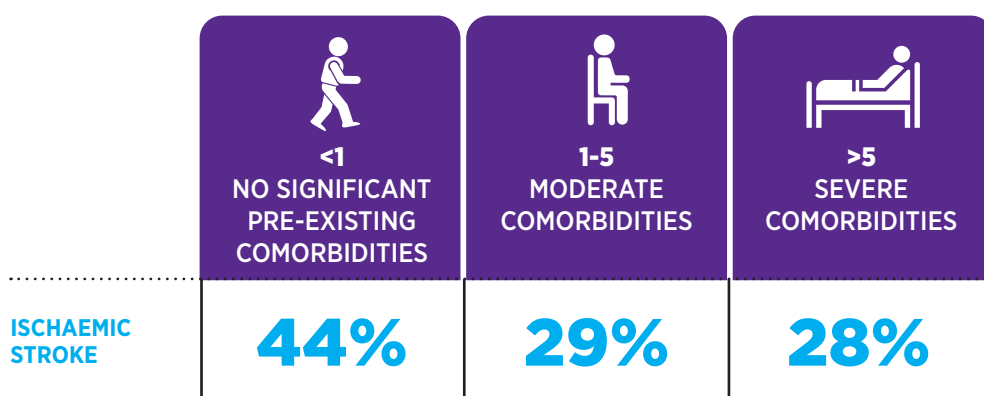


FIGURE 9: CHARLSON COMORBIDITY INDEX SCORES FOR CASES WITH A PRINCIPAL DIAGNOSIS OF ISCHAEMIC STROKE, 2020

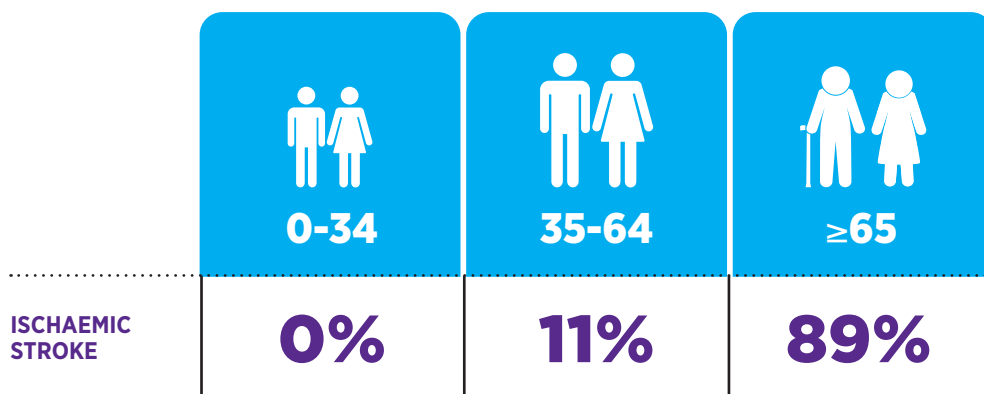


FIGURE 10: DECEASED CASES WITH A PRINCIPAL DIAGNOSIS OF ISCHAEMIC STROKE, BY AGE GROUP, 2020

A crude in-hospital mortality rate from 2011 to 2020 for ischaemic stroke is presented in Figure 11, with a 95% CI. There was a significant reduction (42%) in in-hospital mortality between 2011 and 2020, from 123 deaths per 1,000 admissions in 2011 to 71 deaths per 1,000 admissions in 2020. In 2020, there were 5,135 cases (compared with 4,809 cases in 2019) discharged from hospital in Ireland with a principal diagnosis of ischaemic stroke. A paper on the impact of the COVID-19 pandemic on society quotes Professor Joe Harbison as follows: “There was a behavioural impact of the first wave of COVID-19 in the form of non or late attendance related to population anxiety at the start of the pandemic which weakened during subsequent waves and the overall admission rate remained stable” (Crowley and Hughes, 2021, p. 14). Among the 5,135 cases discharged in 2020, 1.3% had a COVID-19 flag present, showing that there was a very low percentage of ischaemic stroke cases either admitted with COVID-19 or that contracted it in hospital.

The reduction in mortality may be attributed to early presentation of stroke cases via the Act F.A.S.T. campaign and timely availability of novel thrombolytic therapy and thrombectomy. In 2020, there was a 3% increase in the rate of thrombolysis compared with 2019. The number of cases with stroke seen by a doctor within 1 hour of hospital presentation increased from 60% in 2019 to 70% in 2020. Cases with stroke that had computed tomography (CT) within 1 hour of hospital arrival increased from 40% in 2019 to 49% in 2020 (Crowley and Hughes, 2021). It is envisaged that with continued improvement in care pathways for stroke patients under the NCPS, the in-hospital mortality rate will continue to fall.

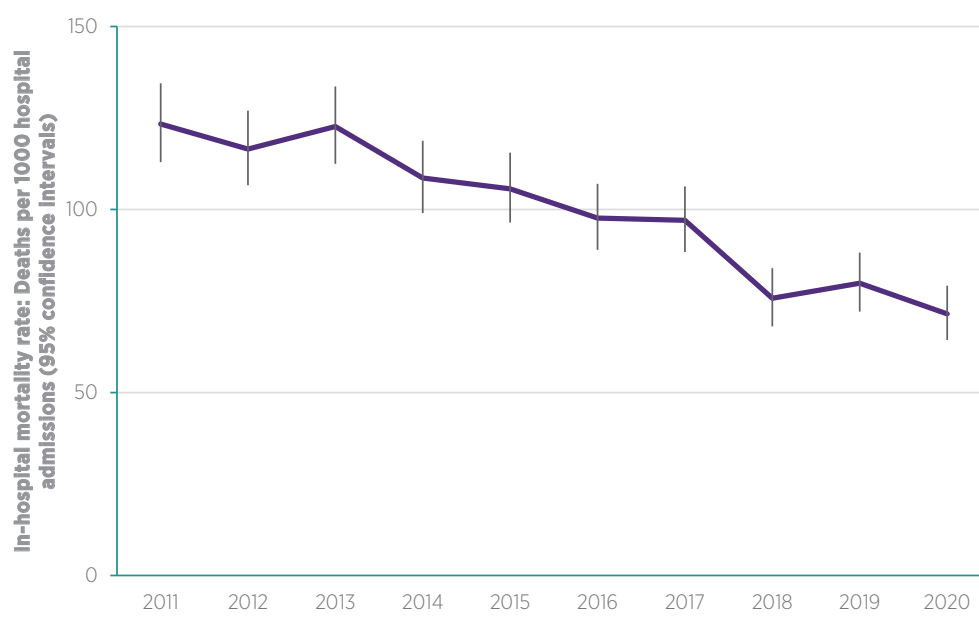


FIGURE 11: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF ISCHAEMIC STROKE, 2011-2020

Twenty-four of the NQAIS NAHM participating hospitals admit acute stroke patients, and 19 of these met the public reporting inclusion criteria for 2020. The number of cases with a principal diagnosis of ischaemic stroke admitted to these hospitals in 2020 ranged from 118 to 650. The 19 included hospitals have a high number of admissions and account for 86% of cases admitted with a principal diagnosis of ischaemic stroke in 2020. There was an increase in the number of cases admitted to hospital with a principal diagnosis of ischaemic stroke in 2020, rising from 4,809 in 2019 to 5,135 in 2020.

Figure 12 presents the SMRs for these hospitals in a funnel plot, with 99.8% control limits. All 19 included hospitals had an SMR within the control limits of 99.8% for ischaemic stroke. Five of the 24 hospitals accepting acute stroke patients are not included in this analysis, as they did not meet the selection criteria relating to a defined number of admissions and expected events.

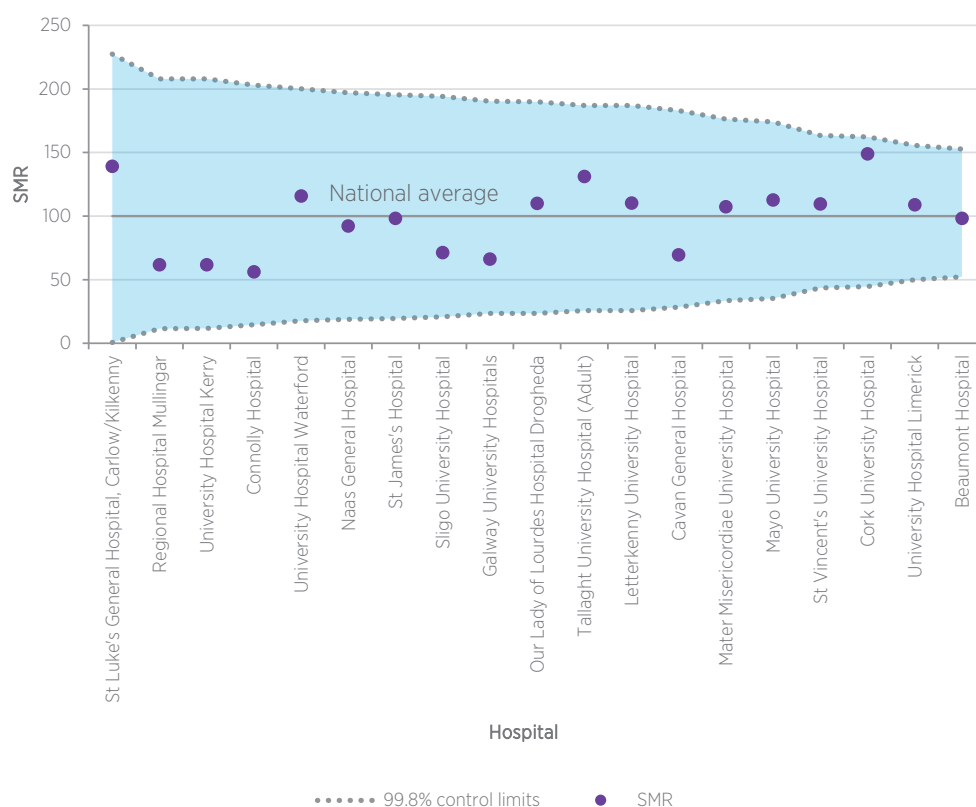


FIGURE 12: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF ISCHAEMIC STROKE, 2020

HAEMORRHAGIC STROKE

BACKGROUND

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 (intracerebral haemorrhage). 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 main cause of haemorrhagic stroke is high blood pressure (hypertension), which can weaken the arteries in the brain and make them prone to splitting or rupturing. The risk factors for high blood pressure include:

- being overweight
- drinking excessive amounts of alcohol
- smoking
- a lack of exercise.

Haemorrhagic stroke occurs less frequently than ischaemic stroke but has a much higher mortality rate, with 280 deaths per 1,000 admissions for haemorrhagic stroke compared with 71 deaths per 1,000 admissions for ischaemic stroke in 2020. Mortality for haemorrhagic stroke cases was statistically higher during the COVID-19 period (Crowley and Hughes, 2021), which again may be related to non-attendance or late attendance to hospital (particularly during the first wave of COVID-19) and its overall impact on the Irish healthcare system.

Haemorrhagic stroke in NQAIS NAHM is based on ICD-10-AM/ACHI/ACS codes I61, I610, I611, I612, I613, I614, I615, I616, I618, and I619. This is a change from previous years. Up to the end of 2019, haemorrhagic stroke in NQAIS NAHM included both I60 and I61 codes under one CCS group. From 2020 onwards, the I60 codes representing subarachnoid haemorrhage cases are in their own CCS group. Details of the data for this group for 2020 can be found in Appendix 2. The codes contained in the “stroke haemorrhagic” CCS group for analysis in this report are fully defined in the online supporting appendix, which can be found at <https://www.noca.ie/publications/publications-listing/PO/category/3/0>.

FINDINGS

NQAIS NAHM calculates a CCI score for each case, which indicates the significance of the pre-existing conditions on admission and their associated 1-year mortality risk (Figure 13). Although more than 40% of haemorrhagic stroke cases had a CCI score of less than 1, almost one-third had a CCI score of greater than 5, indicating that these cases had a high risk of mortality in the following 12 months. Figure 14 shows that 80% of deceased haemorrhagic stroke cases were aged over 65 years.

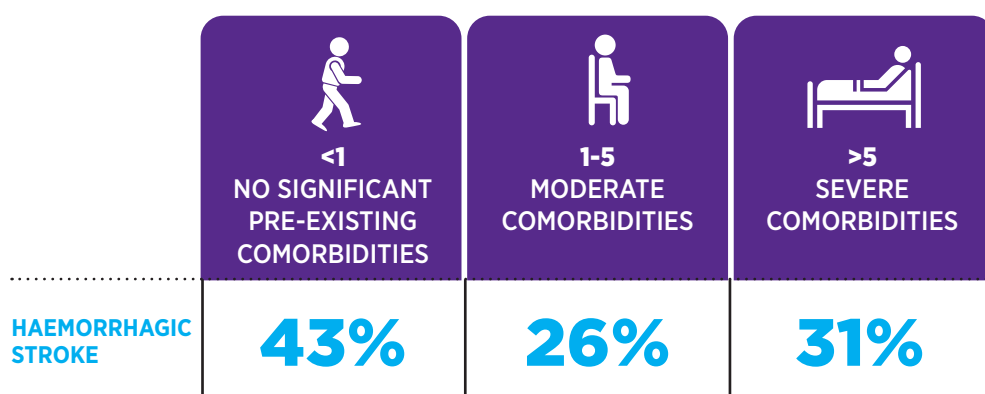


FIGURE 13: CHARLSON COMORBIDITY INDEX SCORES FOR CASES WITH A PRINCIPAL DIAGNOSIS OF HAEMORRHAGIC STROKE, 2020

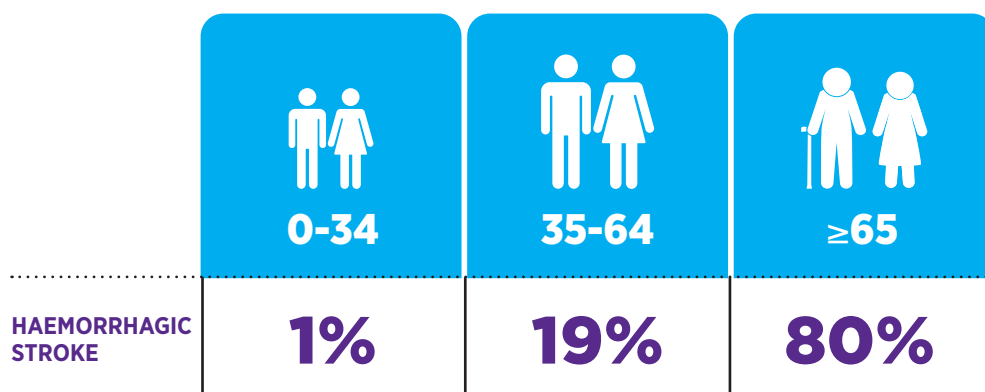


FIGURE 14: DECEASED CASES WITH A PRINCIPAL DIAGNOSIS OF HAEMORRHAGIC STROKE, BY AGE GROUP, 2020

A crude in-hospital mortality rate from 2011 to 2020 for haemorrhagic stroke is presented in Figure 15, with a 95% CI. There was a 21% reduction in in-hospital mortality over this period, from 355 deaths per 1,000 admissions in 2011 to 280 deaths per 1,000 admissions in 2020¹.

In 2020, there were 960 cases (compared with 941 cases in 2019) discharged from hospital in Ireland with a principal diagnosis of haemorrhagic stroke. The COVID-19 flag was present in 0.8% (n=8) of those cases.

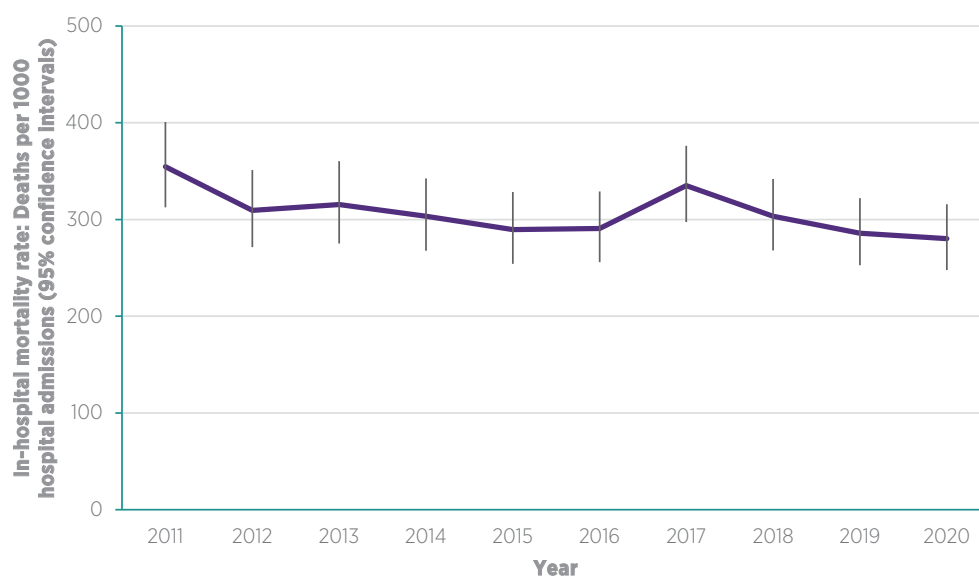


FIGURE 15: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF HAEMORRHAGIC STROKE, 2011–2020

¹ This CCS group has been changed since the NAHM Annual Report 2019

Due to the low numbers of cases with a principal diagnosis of haemorrhagic stroke, data for the 3-year period from 2018 to 2020 were combined. Twenty-four of the 44 NQAIS NAHM participating hospitals admit acute stroke patients, and only 8 of these met the public reporting inclusion criteria for 2018–2020. The number of cases with a principal diagnosis of haemorrhagic stroke admitted to these hospitals between 2018 and 2020 ranged from 105 to 333. The number of hospitals that met the inclusion criteria was small, as there was a change in the ICD-10-AM/ACHI/ACS codes included in the associated CCS group, which resulted in a reduced number of cases with a principal diagnosis of haemorrhagic stroke. The data from the eight included hospitals account for 57% of cases with a principal diagnosis of haemorrhagic stroke between 2018 and 2020.

The SMRs for these hospitals are presented in a funnel plot, with 99.8% control limits (Figure 16). These limits represent the upper and lower limits of expected variation. Each individual hospital's control limits are calculated based on that hospital's patient details. All hospitals had an SMR within the control limits of 99.8% for haemorrhagic stroke, indicating that all hospitals' SMRs were within the expected range for 2018–2020.

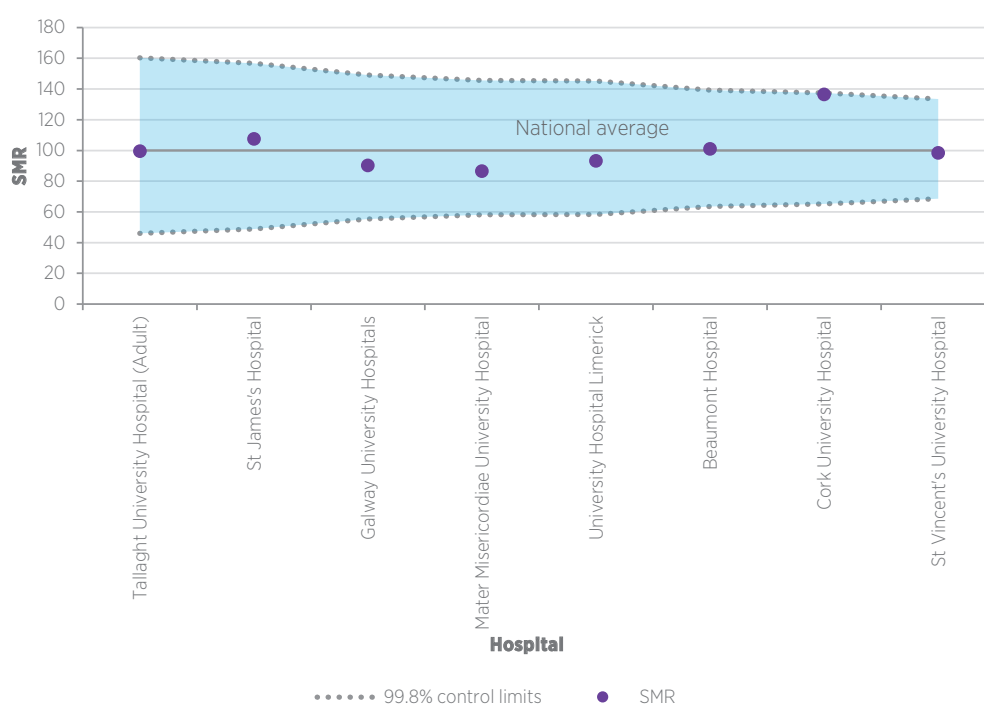


FIGURE 16: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF HAEMORRHAGIC STROKE, 2018–2020

RESPIRATORY DIAGNOSES

Respiratory diseases are diseases of the airways and other structures of the lung. Respiratory diseases are the third leading cause of death in European Union (EU) countries, causing 366,000 deaths in 2017 (accounting for 8% of all deaths). The vast majority of these deaths occurred among people aged over 65 years. Respiratory diseases accounted for 7% of all deaths among women and 9% among men. Chronic obstructive pulmonary disease (COPD) is the most common cause of mortality among respiratory diseases, followed by pneumonia (OECD/EU, 2020).

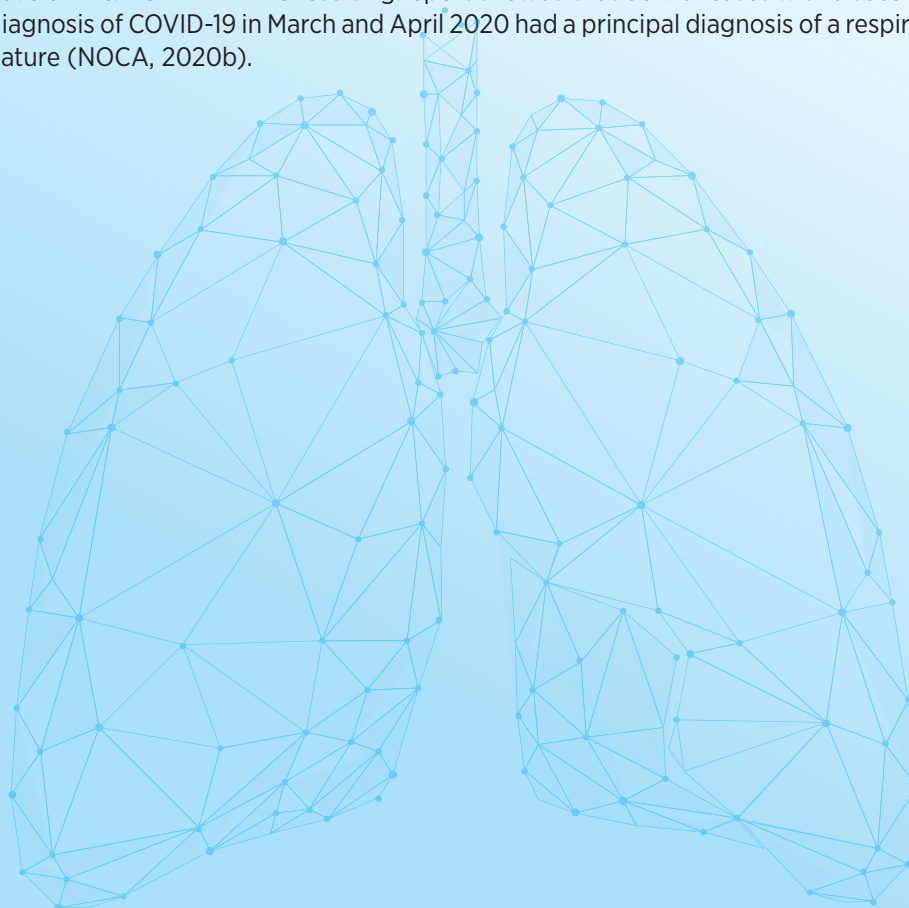
In 2015, Ireland had the second-highest age-standardised death rate from respiratory diseases among EU countries (OECD/EU, 2018).

In Ireland in 2016, there were 3,856 deaths registered as being due to respiratory disease (excluding lung cancer). Deaths due to chronic lower respiratory disease (n=1711) and deaths due to pneumonia (n=1049) account for 72% of these deaths (HSE, 2019b).

The main causes of death from respiratory diseases are COPD, pneumonia, asthma and influenza. Data on these diseases, among others, are available to hospitals to view locally on the NQAIS NAHM web-based tool.

For the purposes of public reporting, the NAHM Governance Committee applied inclusion criteria to the framework for the NAHM report. The respiratory diagnoses that meet the reporting criterion are COPD and pneumonia, which are two of the most common causes of respiratory hospitalisation in Ireland.

The NAHM Governance Committee commissioned an impact assessment using HIPE data from March and April 2020 in order to establish the impact that COVID-19 could have on NQAIS NAHM. The resulting report showed that 66% of cases with a secondary diagnosis of COVID-19 in March and April 2020 had a principal diagnosis of a respiratory nature (NOCA, 2020b).



CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

BACKGROUND

COPD is a life-threatening condition and is one of the most common respiratory diseases in Irish adults. It usually affects people aged over 35 years.

COPD is a disease of the lungs most commonly caused by tobacco smoke inhalation, resulting in lung tissue destruction (emphysema) and airway damage with inflammation, airway constriction and mucous production (chronic bronchitis). It manifests clinically as progressive breathlessness; a cough that usually produces mucous; occasional wheezing; and recurrent acute episodic worsening of symptoms, termed 'exacerbations'. Severe cases can result in frequent intervention at primary care level, hospital admissions and often premature death. It is a significant cause of mortality in Ireland, which has the fourth-highest age-standardised mortality rate for COPD in the EU at 49.7 deaths per 100,000 population, compared with the EU average of 36.3 deaths per 100,000 population (OECD/EU, 2018).

Ireland continues to have one of the highest rates of hospitalisation per 100,000 cases of COPD (n=357) when compared with the OECD average (n=183). Not all hospitalisations due to COPD are avoidable and may be clinically appropriate, but there is room for improvement. The HSE National Clinical Programme for Respiratory, in conjunction with the NCEC has developed National Guidelines for the treatment of COPD *National Clinical Guideline No.27 - Management of Chronic Obstructive Pulmonary Disease (COPD)* (Department of Health, 2021). These national clinical guidelines will enable clinicians in Ireland to manage COPD in an evidence-based and cost-effective way (Department of Health, 2020).

It is estimated that more than 500,000 people in Ireland are living with COPD, with about 200,000 of those with moderate or severe disease and only half are diagnosed (Department of Health, 2021). It is particularly prevalent in the more vulnerable in society, including people from areas with high social deprivation. Tobacco smoking is the most significant risk factor for the development of COPD. The disease is not curable, but it is treatable. The most effective treatment in patients who smoke is to stop smoking. Tobacco smokers have a higher risk of respiratory symptoms, lung function abnormalities and mortality from COPD than non-smokers. However, 10% of patients with COPD are non-smokers or have ceased smoking for a number of years.

For more than 60% of people with COPD, a comorbidity other than COPD may be listed as the primary cause of their death. Under-recognition and under-diagnosis of COPD affect the accuracy of mortality data. Although COPD is frequently the primary cause of death, it may be listed as a contributory cause of death or omitted from the death certificate entirely (HSE, 2019b). An Irish audit examining cases admitted to 11 Irish hospitals between 1st January and 28th February 2011, showed that the in-hospital mortality rate for those with COPD was 3.3%, and the 90-day mortality rate was 8.3% (Crinion *et al.*, 2013).

COPD in NQAIS NAHM is based on ICD-10-AM/ACHI/ACS codes J40, J41, J410, J411, J418, J42, J43, J430, J431, J432, J438, J439, J44, J440, J441, J448, J449, J47, U83, U831, U832 and U834 and is fully defined in the online supporting appendix, which can be found at <https://www.noca.ie/publications/publications-listing/P0/category/3/0>.

FINDINGS

NQAIS NAHM calculates a CCI score for each case, which indicates the significance of the pre-existing conditions on admission and their associated 1-year mortality risk (Figure 17). The majority (63%) of COPD cases in 2020 had a CCI score of less than 1, meaning that these cases presenting with COPD as their principal diagnosis were in the low-risk group for mortality in the next 12 months. Figure 18 shows that 88% of deceased COPD cases were aged over 65 years.

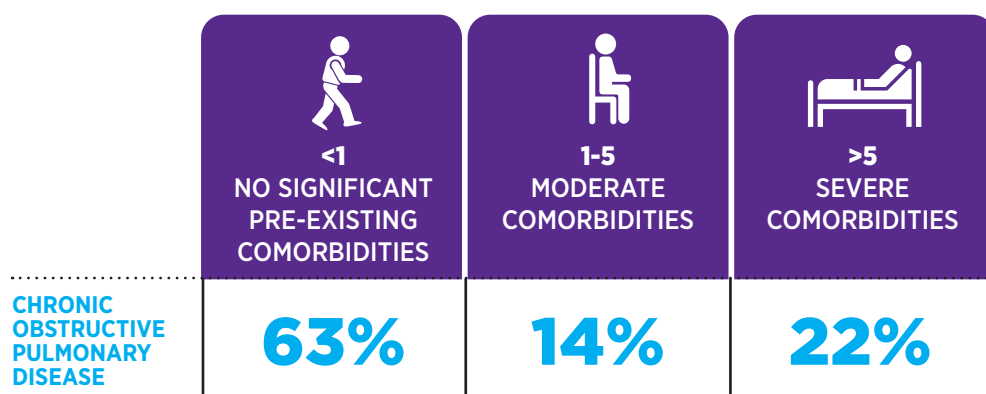


FIGURE 17: CHARLSON COMORBIDITY INDEX SCORES FOR CASES WITH A PRINCIPAL DIAGNOSIS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE, 2020

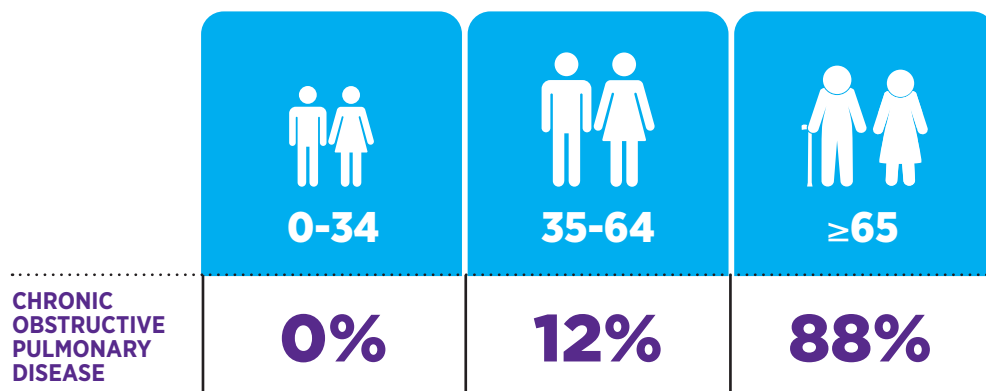


FIGURE 18: DECEASED CASES WITH A PRINCIPAL DIAGNOSIS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE, BY AGE GROUP, 2020

A crude in-hospital mortality rate from 2011 to 2020 for COPD is presented in Figure 19, with a 95% CI. The COPD crude mortality rate increased slightly in 2020 (38 in-hospital mortalities per 1,000 admissions recorded) compared with the relatively static rate recorded in 2018 and 2019 (37 in-hospital mortalities per 1,000 admissions recorded in both years), with a downward trend recorded in the years prior to 2018. The number of in-hospital cases with COPD as a principal diagnosis in 2020 was 11,570, which represents a 29% decrease from the 16,184 cases recorded in 2019. The COVID-19 flag was present in 1.5% (n=178) of the 2020 cases.

The decrease in COPD cases is most likely due to the COVID-19 pandemic. Anecdotally, the number of cases in hospital with COPD exacerbations fell dramatically, as people with COPD were reluctant to go to hospital. The result was that, due to increased hand hygiene and social distancing, it appears that COPD patients had fewer viral respiratory tract infections that would cause exacerbations. Notably, there was a 54% decrease in influenza cases nationally on the NQAIS NAHM web-based tool from 2019 to 2020.

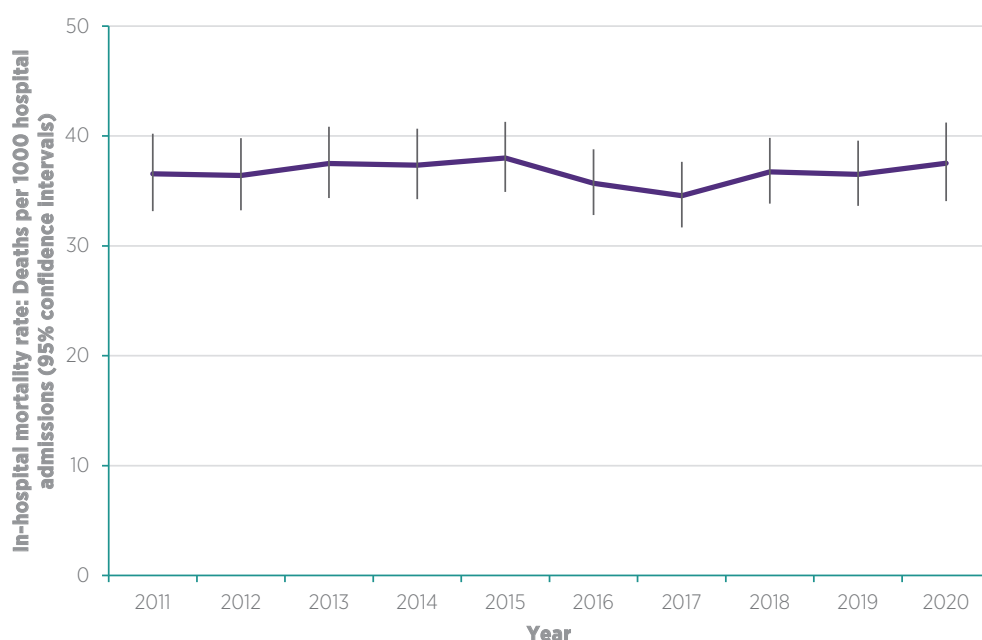


FIGURE 19: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE, 2011-2020

Of the 44 participating hospitals, 29 met the criterion for public reporting in 2020. The number of cases with a principal diagnosis of COPD admitted to these hospitals in 2020 ranged from 105 to 746. The included hospitals have a high number of cases and account for 95% of cases with a principal diagnosis of COPD in 2020.

Figure 20 presents the SMRs for these hospitals in a funnel plot, with 99.8% control limits. All hospitals had an SMR within the control limits of 99.8% for COPD, indicating that all hospitals' SMRs were within the expected range for 2020. Fifteen 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.

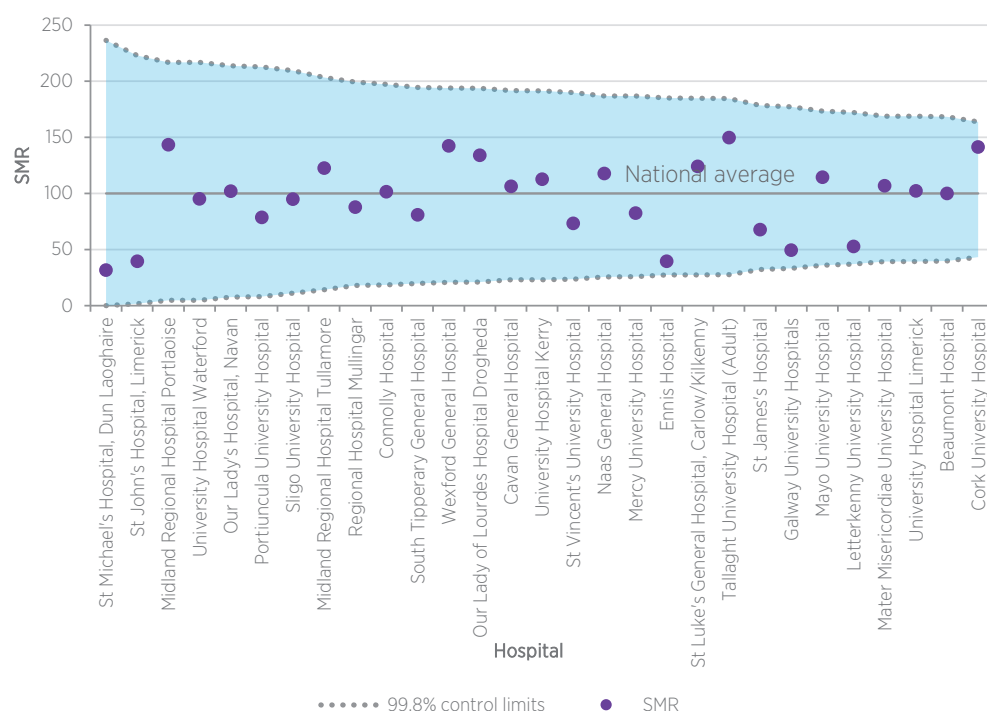


FIGURE 20: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE, 2020

PNEUMONIA

BACKGROUND

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.

Common symptoms of pneumonia include:

- cough, which may be dry or may produce thick yellow, green, brown or bloody mucous (phlegm)
- breathlessness on exertion or at rest
- fever
- low energy
- general malaise.

Pneumonia normally affects around 8 in 1,000 adults each year (HSE, 2021b). It is more widespread in autumn and winter. Pneumonia can affect people of any age; however, it is more common – and can be more serious – in certain groups of people, such as the very young, very elderly, those with other chronic health conditions or those with a weakened immune system. Pneumonia is usually the result of a bacterial infection, although different types of bacteria and viruses can also cause pneumonia. For example, COVID-19 can cause viral pneumonia as a complication of the infection in humans. The HPO issued an advisory note to HIPE coders in April 2020 to clarify the appropriate coding of unspecified pneumonia in COVID-19-positive cases. The advisory note stated that where the term “pneumonia” is documented on medical records of a confirmed case of COVID-19, without any further specificity, the code to be used is ICD-10-AM/ACHI/ACS J12.8 other viral pneumonia (HPO, 2020a).

For at-risk groups, pneumonia can be severe and may require hospital treatment. This is because it can lead to serious complications, which in some cases can be fatal. 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).

Possible complications of pneumonia include:

- pleurisy, where the thin linings between the lungs and ribcage (pleura) become inflamed, which can lead to painful breathing
- lung abscess, a rare complication resulting in lung tissue destruction and cavitation that is mostly seen in people with a serious pre-existing illness or a history of severe alcohol misuse
- blood poisoning (septicaemia), which is also a rare but life-threatening complication.

Pneumonia in NQAIS NAHM is based on ICD-10-AM/ACHI/ACS codes A202, A212, A221, A310, A420, A430, A481, B012, B052, B250, B371, B380, B381, B382, B390, B391, B392, 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, and J851, and is fully defined in the online supporting appendix, which can be found at <https://www.noca.ie/publications/publications-listing/PO/category/3/0>.

FINDINGS

NQAIS NAHM calculates a CCI score for each case, which indicates the significance of the pre-existing conditions on admission and their associated 1-year mortality risk (Figure 21). Forty-five percent of pneumonia cases in 2020 had a CCI score of less than 1; however, more than one-third (35%) had a CCI score of greater than 5, indicating that these cases were at high risk of mortality in the following 12 months. Figure 22 demonstrates that 89% of deceased pneumonia cases were aged over 65 years.

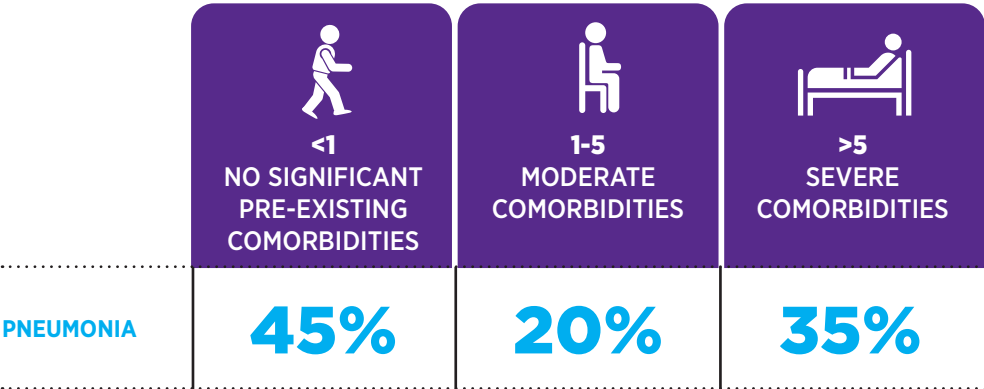


FIGURE 21: CHARLSON COMORBIDITY INDEX SCORES FOR CASES WITH A PRINCIPAL DIAGNOSIS OF PNEUMONIA, 2020

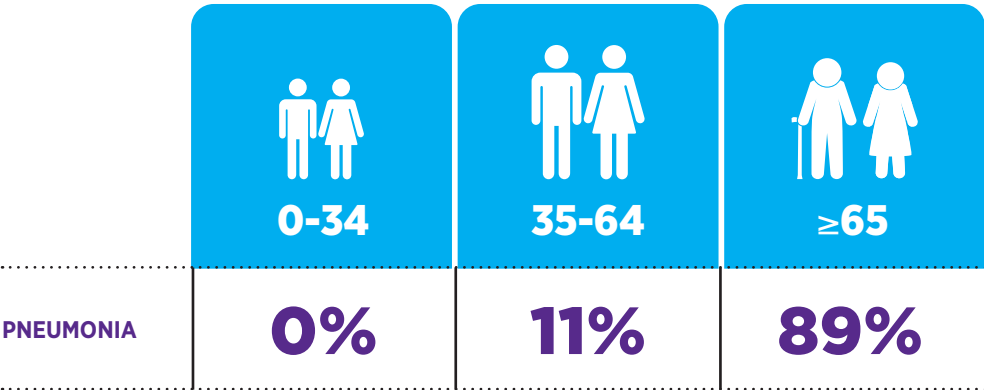


FIGURE 22: DECEASED CASES WITH A PRINCIPAL DIAGNOSIS OF PNEUMONIA, BY AGE GROUP, 2020

A crude in-hospital mortality rate for pneumonia from 2011 to 2020 is presented in Figure 23, with a 95% CI. Figure 23 shows a slight increase in in-hospital mortality for pneumonia over this 10-year period, from 127 deaths per 1,000 admissions in 2011 to 131 deaths per 1,000 admissions in 2020; however, there was a significant increase between 2019 and 2020, from 103 deaths per 1,000 admissions reported in 2019 to 131 deaths per 1,000 admissions reported in 2020. The COVID-19 flag was present in 19.4% (n=2448) of pneumonia cases in 2020. 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. As a result of the COVID-19 pandemic, there was an overall reduction in hospital admissions during 2020. The number of cases admitted with pneumonia as a principal diagnosis in 2020 was 12,603, compared with 14,066 in 2019. Furthermore, the pandemic also accounts for the relative increase in mortality from pneumonia between 2019 and 2020, as evidenced by an increase in HIPE coding of 'viral pneumonia'. In 2019, ICD-10-AM/ACHI/ACS code J12.8 other viral pneumonia was recorded as the principal diagnosis in 26 cases, and in 2020, this was recorded as the principal diagnosis in 2,309 cases.

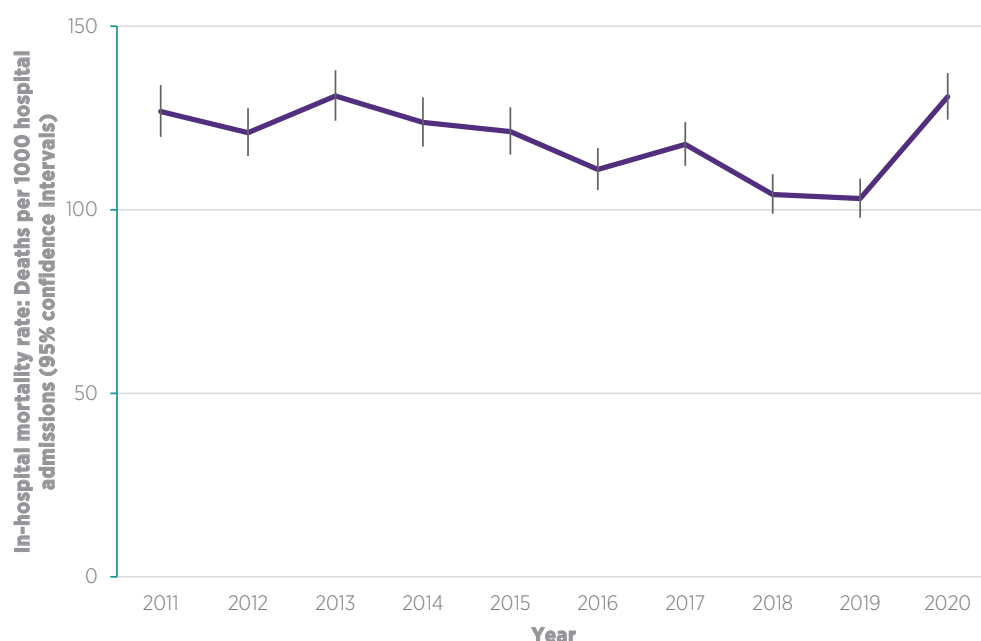


FIGURE 23: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF PNEUMONIA, 2011–2020

Of the 44 participating hospitals, only 29 met the criterion for public reporting in 2020. The number of cases with a principal diagnosis of pneumonia admitted to these hospitals in 2020 ranged from 105 to 1,165. The included hospitals have a high number of admissions and account for 97% of cases admitted with a principal diagnosis of pneumonia in 2020.

Figure 24 presents the SMRs for these hospitals in a funnel plot, with 99.8% control limits. Twenty-eight hospitals had an SMR within the control limits of 99.8% for pneumonia. One hospital (St John's Hospital, Limerick) was outside the lower control limit of 99.8% for pneumonia as of December 2020. Fifteen 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.

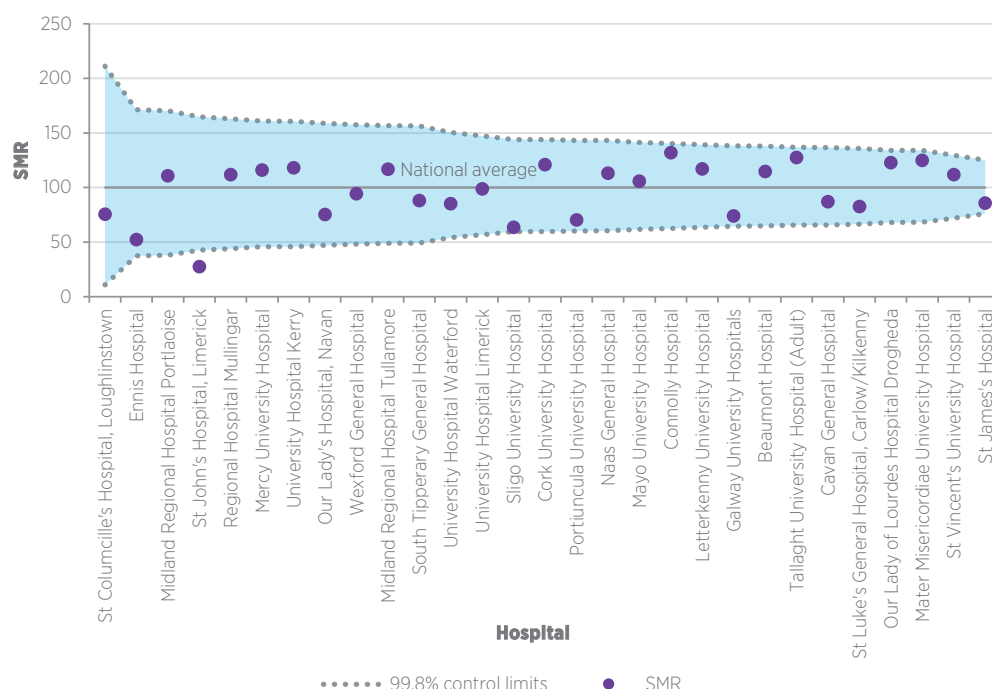


FIGURE 24: NATIONAL IN-HOSPITAL STANDARDISED MORTALITY RATIO FOLLOWING ADMISSION WITH A PRINCIPAL DIAGNOSIS OF PNEUMONIA, 2020

COVID-19

NAHM'S JOURNEY THROUGH COVID-19

In December 2019, a novel strain of coronavirus, commonly known as COVID-19, was identified in the city of Wuhan in the Hubei province of China. This virus has spread globally and continues to cause huge disruption to, and strain on, healthcare services, society, and economies all over the world. The timeline of COVID-19 in Ireland can be seen in Figure 25.

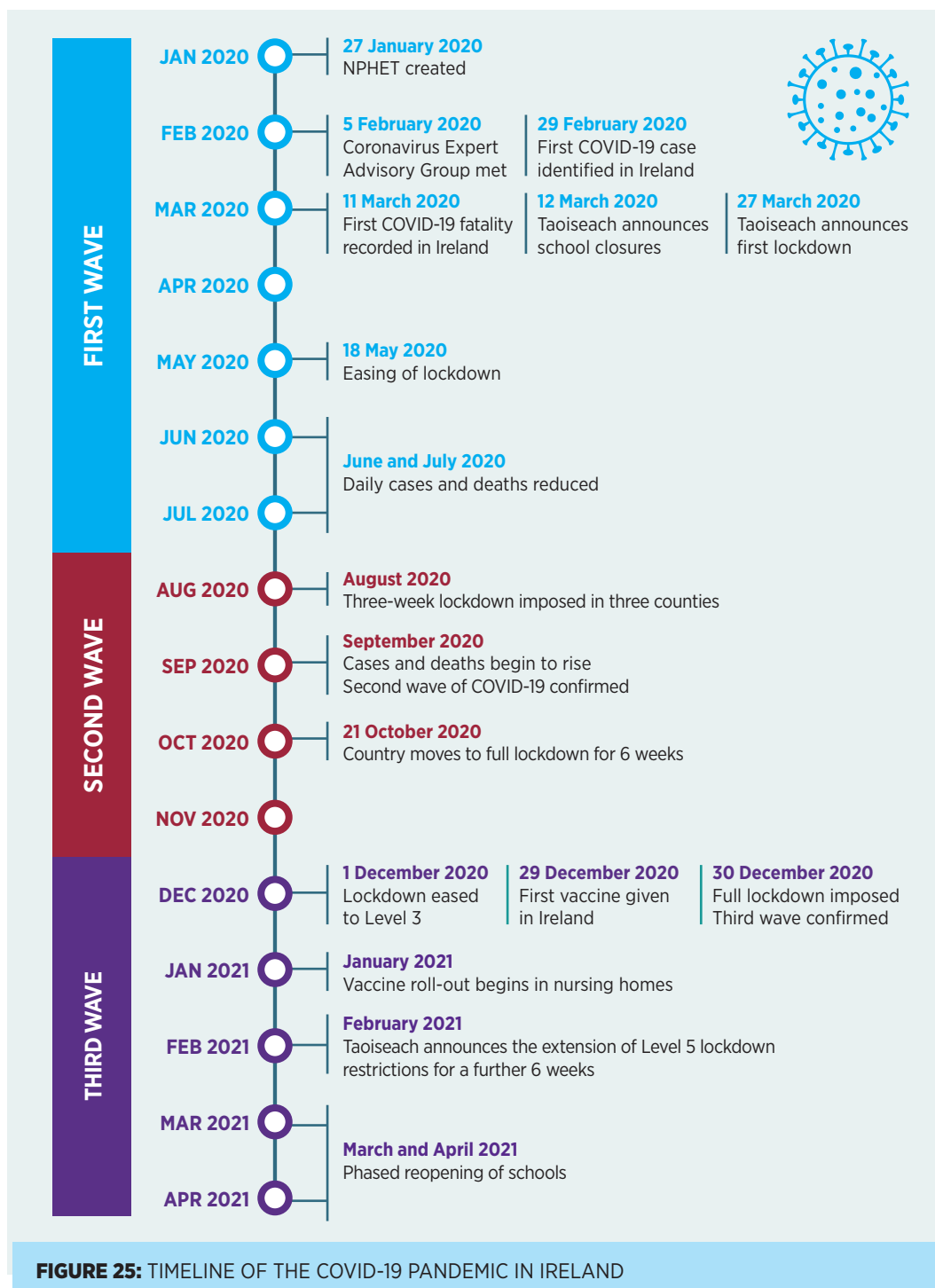


FIGURE 25: TIMELINE OF THE COVID-19 PANDEMIC IN IRELAND

The first cases of COVID-19 were admitted to Irish hospitals in March 2020. NOCA established a short-life working group to examine the impact of COVID-19 on the NQAIS NAHM model. A summary of its report, *National Audit of Hospital Mortality: COVID-19 Impact Assessments*, can be found in the 'Impact of COVID-19 on the NQAIS NAHM tool' section in the 'Data quality' chapter of this report, and the document is available to download from the NOCA website (www.noca.ie).

COVID-19 has had a significant impact on mortality patterns across acute hospitals since March 2020. The normal process for the comparison of data within NQAIS NAHM is to use the baseline of the previous year until there are sufficient numbers to 'lock in' the current year to be able to compare the year against itself. Many variables introduced by COVID-19 impacted on the comparison of 2020 data against the baseline year of 2019. NOCA continued to be able to view NQAIS NAHM data on a development server throughout the period while the data release to the NQAIS NAHM live tool was paused. The first wave of COVID-19 in March and April 2020 showed a high number of observed deaths, particularly in those with respiratory conditions, and this resulted in high SMRs in Q2 and Q3 2020 when compared with 2019.

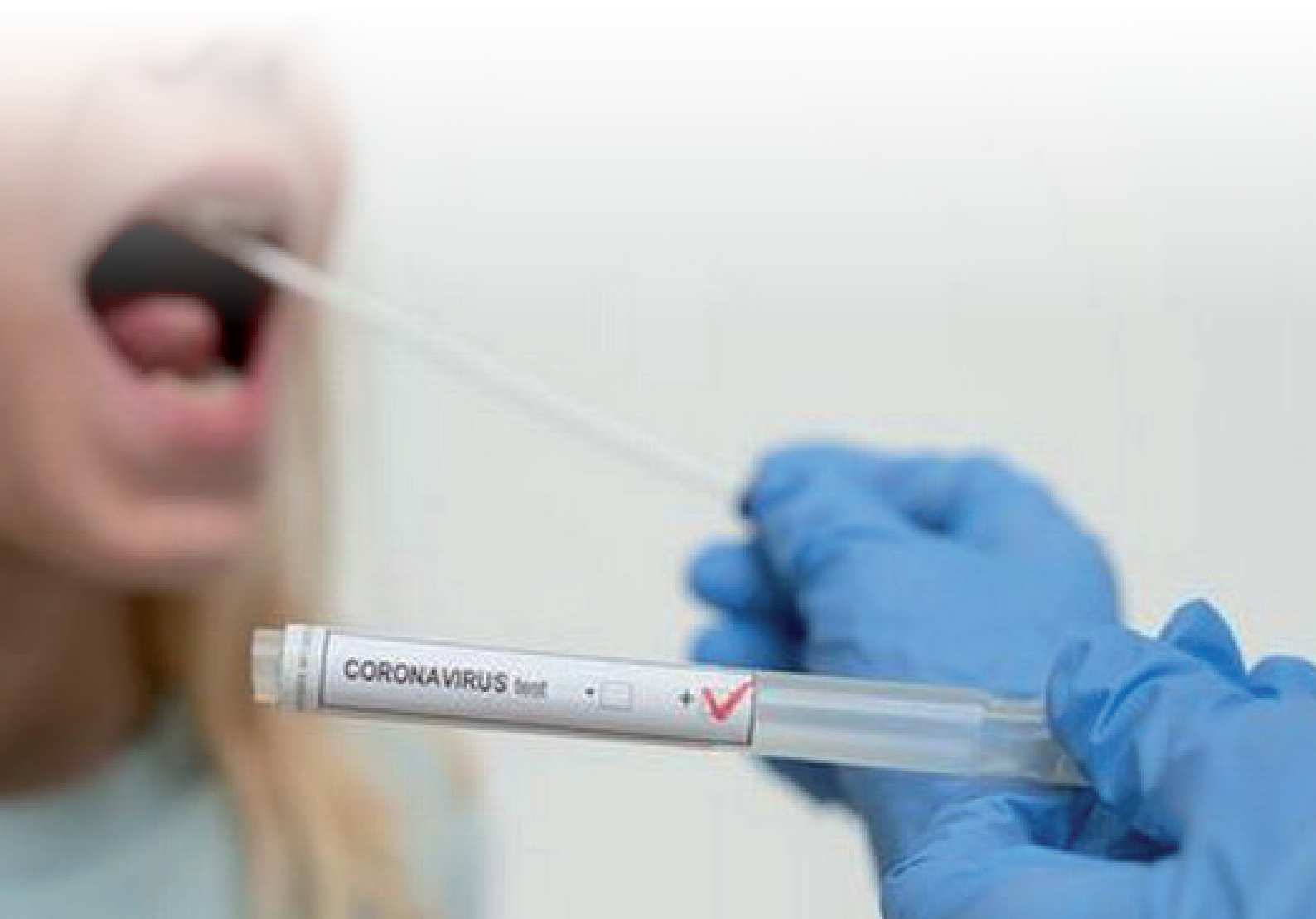
The changeover to lock in the current year of 2020 for baseline comparison resulted in a reduction in the number of high SMRs and CuSum alerts as the unstable data from 2020, which included COVID-19 cases, was compared with itself. Once the baseline (hai_year) changed over to 2020 (see the 'Impact of COVID-19 on the NQAIS NAHM tool' section in the 'Data quality' chapter of this report for more information), SMRs in the calendar year 2020 fell into normal ranges. Users of the NQAIS NAHM web-based tool were sent communications throughout 2020 advising them of the pause in the release of data and monitoring of outliers.



COVID-19 is likely to continue to impact significantly on acute hospitals in 2021. The initial months of 2021 used 2020 as the baseline year for comparison. The NAHM ADST will continue to monitor patterns in order to ensure that the baseline year remains appropriate, so as not to overstate the post-COVID-19 expected mortality risk and thereby understate SMRs.

As the NQAIS NAHM model does not take secondary diagnoses into account, there was a need to identify which cases were COVID-19 related and a COVID-19 flag was added to the records tab in order to identify laboratory-confirmed or clinically diagnosed cases of COVID-19 (see the 'Impact of COVID-19 on the NQAIS NAHM tool' section in the 'Data quality' chapter of this report for more information).

NOCA's *National Audit of Hospital Mortality COVID-19 Report Issue 1: Outcomes of COVID-19 patients (March 2020 – September 2020)* (NOCA, 2021b) examined factors contributing to death and/or the severity of illness among cases in hospital with COVID-19 between March and September 2020. The report highlighted the higher risk of dying and severe illness among in-hospital cases aged over 65 years, with the risk of mortality increasing with age. The findings in the report support the prioritisation of those aged over 65 years in the national vaccination programme.



FINDINGS

The data in this chapter are based on cases diagnosed with COVID-19 that were admitted to hospital between March 2020 and March 2021, inclusive. This 13-month period represents the first three waves of the COVID-19 pandemic in Ireland, using both 2020 and 2021 data.

A COVID-19 flag was present on 2.7% (n=16831) of in-hospital cases nationally during the 13-month period. Of the 16,831 in-hospital cases diagnosed with COVID-19, 2,588 (15%) subsequently died, 59% of whom were male (Figure 26).

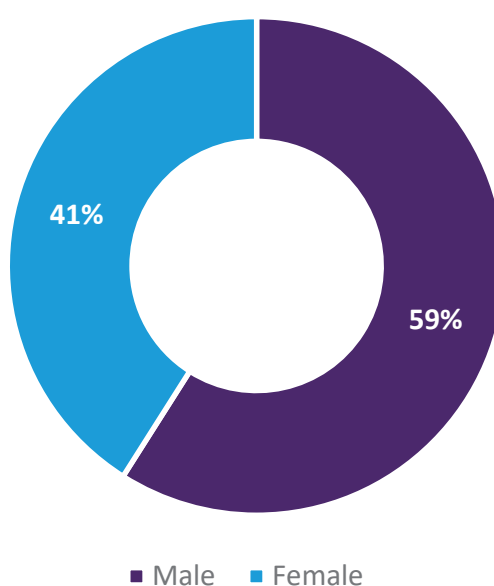


FIGURE 26: DEATHS AMONG IN-HOSPITAL COVID-19 CASES, BY SEX (n=2588)

Figure 27 presents the age distribution of COVID-19 cases that died in hospital. The median age of COVID-19 in-hospital cases that died was 80 years. The vast majority of COVID-19 in-hospital deaths occurred in cases aged 65 years or over (89%; n=2295).

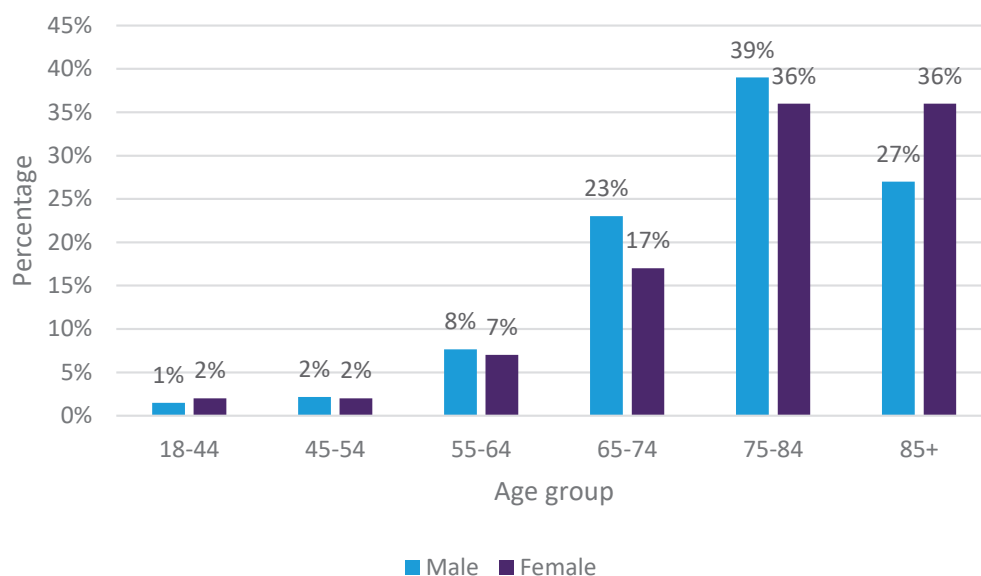


FIGURE 27: HOSPITALISED COVID-19 CASES THAT DIED, BY SEX AND AGE (n=2588)

The median length of hospital stay of COVID-19 cases that died in hospital was 14 days, compared with 8 days for those that survived (Figure 28).




		MEAN	MEDIAN
	DEAD	22	14
	ALIVE	16	8
	NATIONAL	17	8

FIGURE 28: LENGTH OF STAY FOR COVID-19 IN-HOSPITAL CASES

The number of COVID-19 discharges and deaths peaked in January 2021 (Figures 29 and 30).

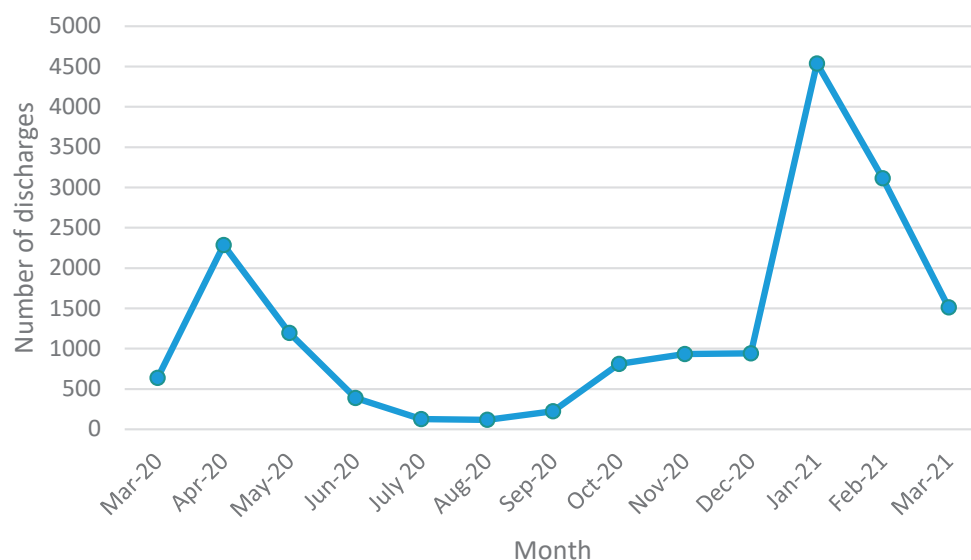


FIGURE 29: COVID-19 CASES DISCHARGED FROM HOSPITAL, BY MONTH, MARCH 2020 TO MARCH 2021 (n=16381)

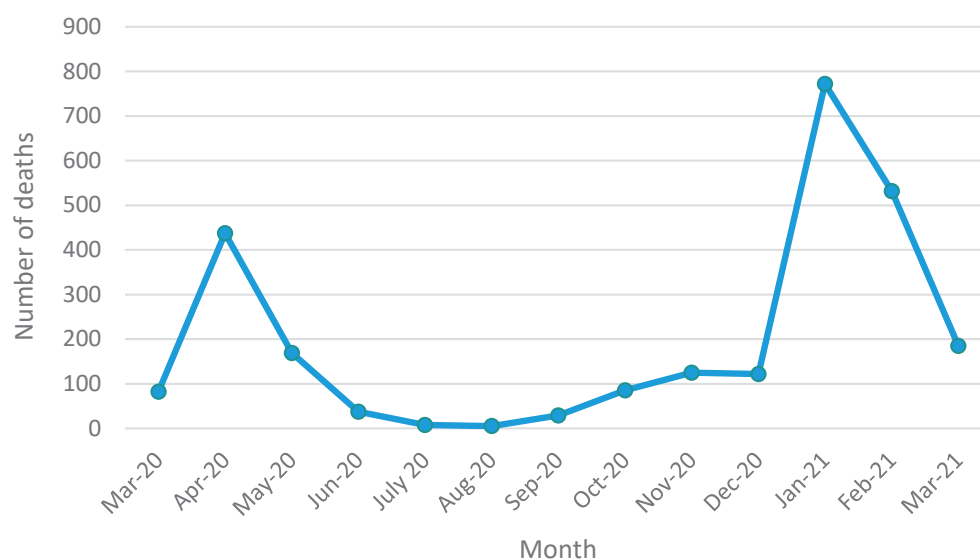


FIGURE 30: NUMBER OF COVID-19 IN-HOSPITAL DEATHS, BY MONTH, MARCH 2020 TO MARCH 2021 (n=2588) (NUMBERS BASED ON DATE OF DISCHARGE)

AUDIT UPDATE

INDEPENDENT REVIEW OF NAHM

In 2020, the NOCA Governance Board commissioned an independent review of NAHM in response to:

- the focus of the NAHM methodology on the principal diagnosis and not on additional diagnoses, such as sepsis and COVID-19, which can impact on in-hospital mortality
- the publication of the *National Review of Clinical Audit* (HSE, 2019a), which identified NAHM as a register rather than as a national clinical audit.

The purpose of this review of NAHM is to inform the strategic direction of in-hospital mortality reporting in NOCA. The scope of the review is to assess:

1. current approaches to monitoring in-hospital mortality and recommendations regarding what brings value to patient outcomes and health service improvement
2. model and risk adjustment methodology
3. the approach to national reporting of in-hospital mortality.

The review will examine international models and literature and consult with relevant stakeholders. An external reviewer and researcher have been appointed, and it is hoped that work will be completed in Q1 2022. Information on the results of this review will be published in the 2021 NAHM annual report.

GUIDANCE FOR HEALTH SERVICE PROVIDERS REVIEWING STATISTICAL OUTLIERS FROM NATIONAL CLINICAL AUDITS

The *National Audit of Hospital Mortality Annual Report 2019* included the following recommendation:

“The National Audit of Hospital Mortality recommends that NOCA should develop more structured guidance on statistical outlier reviews, and it also recommends that this should be completed during the second quarter of 2021” (NOCA, 2020a).

NOCA established a short-life working group to develop guidance for all health service providers required to review statistical outliers from all national clinical audits under the governance of NOCA. Terms of reference for the group were drafted, with a view to holding three meetings over a 3-month period. Once developed, the guideline document will be peer reviewed, and approval sought from the NOCA Governance Board before disseminating the approved guideline document to health service providers.

The guideline working group consists of Hospital Group representatives, audit coordinators in hospitals, a hospital quality manager, and NOCA team members. Unfortunately, the further spread of COVID-19, followed by the HSE cyberattack on 14 May 2021, have impacted on the guideline working group’s timelines and availability, and just two meetings have been held to date. The group agreed on terms of reference, discussed items for inclusion in the review, and made changes to the monitoring of statistical outliers in national clinical audits and registries, which will be underpinned by the guidance on the review of statistical outliers being developed. The NOCA Governance Board approved these actions.

Work on this guidance will continue during the remainder of 2021.

PALLIATIVE CARE – UPDATE ON RECOMMENDATION

The *National Audit of Hospital Mortality Annual Report 2018* (NOCA, 2019) recommended guidance on palliative care reporting in HIPE. The HPO and the National Clinical Programme for Palliative Care have worked together to improve the reporting of palliative care through HIPE. For patients discharged on or after 1 January 2022, a flag will be available as a new administrative variable to indicate if a member of a specialist palliative care team attended a patient (regardless of whether or not treatment was given). This flag will enable tracking of all palliative care activity being undertaken across hospitals. Further development of the coding guidelines for coders using ICD-10-AM/ACHI/ACS code Z51.5 palliative care will be explored. Irish Coding Standard 2116 Palliative Care will be updated accordingly.

LOW VOLUME OF CASES IN SOME DIAGNOSES IN NQAIS NAHM

Work was undertaken on data pertaining to hospitals with low volumes of cases in one of the six included diagnosis in order to assess whether these hospitals were performing within expected parameters (the NQAIS NAHM model is more reliable when dealing with a larger number of cases). If a hospital had fewer than 100 cases for one of the six included diagnoses, the numbers in that year were combined with those of previous years so that their mortality could be assessed using larger numbers, thus allowing for more precision in the interpretation of the confidence intervals. The NQAIS NAHM model was also used to examine how the lower-volume hospitals had performed over the 3-year period from 2017 to 2019 and to ascertain if any high SMRs or CuSum signals were occurring. The 2017–2019 data were used to examine these hospitals, as these data represented a more typical view without the 2020 data (which included COVID-19 cases).

None of the hospitals excluded from the 2019 report due to a low volume of cases had a higher than expected mortality rate over the 3-year period from 2017 to 2019 in any of the analyses carried out, and are thus considered to be performing within expected parameters.

All hospitals, both those with a high and low volume of cases per diagnosis, are able to view their data throughout the year via the NQAIS NAHM web-based tool, and NOCA's procedure for monitoring statistical outliers applies to all outliers, irrespective of the volume of cases involved.

CONCLUSION

Levels of in-hospital mortality throughout 2020 were lower than anyone had dared to expect when first faced with the COVID-19 pandemic that spread throughout communities, taking hold of our loved ones. The number of people presenting to hospitals for treatment dropped, particularly during the first wave in March and April 2020. This was most likely due to the fear of contracting COVID-19 while in hospital. Consequently, the severity of illness for some patients by the time they did go to hospital was higher, and therefore the expected mortality was also higher.

An impact assessment carried out using NAHM data from the first wave of COVID-19 showed that the observed increase in mortality rates for the period March–April 2020 can be attributed to COVID-19 and the increased complexity of treating non-COVID-19 cases due to pandemic restrictions. “Pneumonia” was the most impacted CCS group during the dates examined. The pattern of decreased case numbers and increased mortality for pneumonia cases continued throughout 2020.

The clinical chapters in this report present the 2020 data on the six key diagnoses for public reporting. There has been a reduction in the number of cases admitted in four of the six diagnoses, with the largest reduction in the two respiratory diagnoses, COPD and pneumonia. The crude mortality rates have continued to decrease in stroke and heart failure, with a small increase from 2019 in AMI and COPD. However, there has been a larger increase in the mortality rate for cases with a principal diagnosis of pneumonia. Data show that this increase was related to COVID-19-positive cases with viral pneumonia.

The COVID-19 pandemic impacted on NAHM’s engagement with the participating hospitals and with the many doctors, hospital managers, HIPE coders and staff who use the NQAIS NAHM web-based tool. Data are once again available to the users of the tool, and an independent review of NAHM is underway in order to assess the current methodology.

The NAHM Governance Committee would like to acknowledge all the frontline workers, particularly in healthcare, who have contributed so much to sustaining the Irish health service during 2020 and 2021 as the COVID-19 pandemic continues to have a hold on society. Personal sacrifices were made every day in order to ensure that Irish hospitals remain open to those most in need of care and treatment.

Thanks also go to members of the NAHM Report Writing Group and subject matter experts who gave up their time and knowledge to help bring this report to publication.

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APPENDIX 1: SMR FUNNEL PLOT

Standardised mortality ratio funnel plot



For this report, standardised mortality ratio (SMR) funnel plots are scatterplots of individual hospitals' SMRs. The upper and lower borders of the funnel are represented by the 99.8% control limits. These borders represent the upper and lower limits of what is referred to as 'expected variation'. The control limits are affected by the number of cases with a particular principal diagnosis in hospitals. Hospitals with smaller numbers of cases have wider control limits and appear to the left of the SMR funnel plot, while hospitals with larger numbers of cases have narrower control limits and appear to the right of the funnel plot.

An SMR is expected to appear within the 99.8% control limits 998 times out of 1000. Statistically, 1 in 500 observations can be expected to appear outside these control limits by chance alone. In other words, if an SMR appears outside these limits, it is very unlikely that this is due to chance. These observations represent variation worthy of further review.

Funnel plots make it very easy to identify these observations worthy of further review. A hospital's SMR should only be compared with its own control limits. There is no basis for ranking institutions into 'league tables' (Spiegelhalter, 2005), therefore it is not valid to directly compare SMRs between hospitals.

SAMPLE NATIONAL FUNNEL PLOT

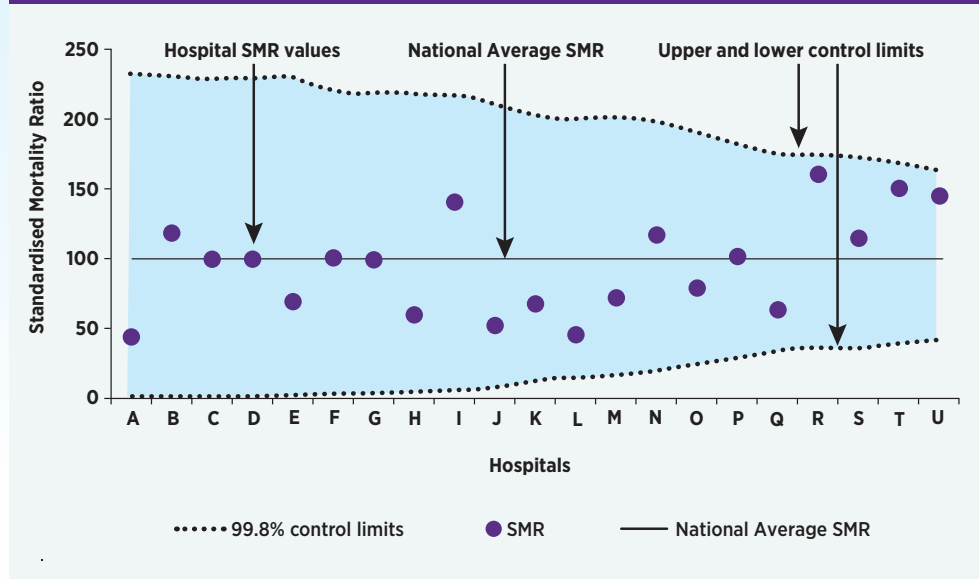


FIGURE A1.1: INFORMATION ON INTERPRETATION OF FUNNEL PLOTS

APPENDIX 2: SUBARACHNOID HAEMORRHAGE

The “stroke haemorrhagic” Clinical Classifications Software (CCS) group within the National Quality Assurance Improvement System, National Audit of Hospital Mortality (NQAIS NAHM) web-based tool has been further split to now show only the I61 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) codes. The subarachnoid haemorrhage I60 codes that were included in the “stroke haemorrhagic” CCS group up to 2020 now form their own group. Details of the 2020 data are shown in Table A2.1 in order to be completely transparent. The change to these CCS groups means that NQAIS NAHM data for haemorrhagic stroke are comparable with the Irish National Audit of Stroke (INAS) data collection, as the INAS does not capture data for subarachnoid haemorrhage.

TABLE A2.1: ICD-10-AM/ACHI/ACS CODES FOR THE “SUBARACHNOID HAEMORRHAGE” CSS GROUP, 2020

ICD-10-AM/ ACHI/ACS CODE	Description	n
I601	Subarachnoid haemorrhage from middle cerebral artery	55
I602	Subarachnoid haemorrhage from anterior communicating artery	54
I603	Subarachnoid haemorrhage from posterior communicating artery	40
I604	Subarachnoid haemorrhage from basilar artery	12
I605	Subarachnoid haemorrhage from vertebral artery	6
I606	Subarachnoid haemorrhage from other intracranial artery	6
I607	Subarachnoid haemorrhage from intracranial artery unspecified	24
I608	Other subarachnoid haemorrhage	65
I609	Subarachnoid haemorrhage unspecified	295
Total		557

NOTES

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