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Supplementary codes for chronic conditions: evaluation report for population health monitoring

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Supplementary codes for chronic conditions: evaluation report for population health monitoring

Australian Institute of Health and Welfare
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Summary

The International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification (ICD-10-AM)¹ is used to classify diseases, injury and related health problems in admitted patient care data in Australia.

In July 2015, 29 supplementary codes for chronic conditions (U78–U88), and a new Australian Coding Standard (ACS 0003 *Supplementary codes for chronic conditions*) were implemented in the Ninth Edition of ICD-10-AM.

The introduction of these codes has implications for the monitoring of chronic conditions using hospitalisation data in Australia. This report uses data from the National Hospital Morbidity Database and the National Dementia Linked Dataset² to evaluate the use of the supplementary codes for the purpose of population health monitoring and provide evidence for including these codes in future analysis and linked data assets.

Key findings include:

- 1 in 3 hospitalisations in 2019–20 had at least one supplementary code.
- One-third of the conditions for which supplementary codes were introduced in 2015–16, had a marked drop in additional diagnoses in that year.
- Including supplementary codes in analyses increases the capture of some chronic conditions up to 15-fold in unlinked hospitalisations data and 9-fold in available linked hospitalisations data.
- Supplementary codes are only being assigned in a minority of hospitalisations of people who have a prior record of a diagnosis or supplementary code for the chronic condition.

The supplementary codes provide unique information about chronic conditions in the hospitalised population beyond principal and additional diagnoses and should be used in routine analyses and health research. The value of this unique information to the monitoring of chronic conditions and associated work would be greatest if included in analysis of linked data.

Box 1: Key definitions

Supplementary code: A supplementary code is assigned for chronic conditions that are part of the current health status on admission that do not meet criteria for inclusion as a principal or additional diagnosis on the patient's hospital record.

Principal diagnosis: The diagnosis established after study to be chiefly responsible for occasioning an episode of admitted patient care.

Additional diagnosis: A condition or complaint either coexisting with the principal diagnosis or arising during the episode of admitted patient care which is significant in terms of treatment required, investigations needed and resources used in each episode of care. Multiple diagnoses may be recorded.

¹ For details see 'Glossary' on page 28.

² For details see 'Data sources' on page 3.

Introduction

Background

In July 2015, 29 supplementary codes for chronic conditions (U78–U88), and a new Australian Coding Standard (0003 *Supplementary codes for chronic conditions*) were implemented in the International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification (ICD-10-AM) Ninth Edition (ACCD 2015a) and the associated Australian Coding Standards (ACS) (ACCD 2015b).

These codes represent a discrete list of clinically significant chronic conditions, which are part of the patient's current health status on admission but do not meet the criteria for inclusion as a principal or additional diagnosis in that episode of care. It should be noted that not all chronic conditions are assigned a supplementary code.

Initially the codes were intended to be a temporary inclusion to review the coding of additional diagnoses, but they have been retained in each ICD-10-AM edition change since. These codes are supplied to the Australian Institute of Health and Welfare (AIHW) by states and territories on an annual basis as part of the National Hospital Morbidity Database (NHMD). Until mid-2022, they were partitioned into a separate table and not utilised in routine analyses when reporting on hospitalisations for chronic conditions.

Project phases

This project has been undertaken across 2 phases.

The first phase produced a baseline report on the use of the supplementary codes for chronic conditions in Australian unlinked hospital data. The baseline report was distributed to key stakeholders in 2019 and included analysis of the first 2 available years of data, 2015–16 and 2016–17. The baseline report identified variation in the use of supplementary codes for chronic conditions by population and hospital factors. For example, supplementary codes were more commonly identified among older age groups and separations with greater case complexity, reflecting the higher burden of chronic conditions in these populations. The proportion of separations with at least one supplementary code was lower amongst private hospital separations and in hospitals located in *Remote or Very remote* areas. The report was reviewed by the AIHW Chronic Conditions Advisory Committee, AIHW Metadata, Information Management and Classifications Unit and the National Hospital Information Advisory Committee, including representatives from all states and territories.

This report forms the second phase of the project.

Aims

The second phase aims to evaluate the use of supplementary codes for the purpose of population health monitoring and provide evidence for the inclusion of these codes in future analysis and linked data assets. This includes further understanding of the impact of supplementary codes on chronic disease identification within linked and unlinked hospitalisations data, and the reliability of supplementary codes to consistently capture chronic conditions across hospitalisations.

This report aims to:

- examine the patterns of use of the supplementary codes for chronic conditions in the first 5 years since their introduction (2015–16 to 2019–20) using unlinked hospitalisation data
- examine whether the introduction of the supplementary codes for chronic conditions affected the coding of additional diagnoses for the same chronic conditions

- examine the impact that the inclusion of the supplementary codes for chronic conditions in linked and unlinked data analysis makes on estimates of chronic conditions among the hospitalised population
- assess the consistency of chronic condition coding for an individual over time using linked data.

Rationale

Based on self-reported survey data, it is estimated that almost half of all Australians (47%, more than 11 million people) had one or more chronic condition/s in 2020–21 (ABS 2022).

In 2019–20, approximately one-third of hospital separations had at least one supplementary chronic condition code recorded (AIHW 2021a). Given the magnitude of their capture and the impact on the allocation of additional diagnoses codes, they constitute a break in time series for statistical interpretation of admitted patient care data that needs further exploration.

It is considered that these codes may provide a valuable source of data for the monitoring of chronic conditions, particularly for conditions that rely on self-reported data or do not have robust national incidence or prevalence data sources available for this purpose. The supplementary codes for chronic conditions may also be valuable in the measurement of multimorbidity, which is a substantial issue for the Australian health-care system.

In 2017, Queensland Health published state-specific analysis that showed that in their first 12 months of implementation the uptake of supplementary codes was considerable. This technical report championed that inclusion of the codes uncovered conditions ‘that would have otherwise remained unavailable and invisible for reporting’ (Queensland Health 2017).

Early analysis undertaken by the National Centre for Classification in Health in 2018 demonstrated that hospital separations with supplementary codes used relatively less resources (measured by mean costs and average length of stay) than hospital separations with corresponding additional diagnosis codes from the relevant chapter (Zhou & Guo 2018).

This project aims to provide a better understanding of the use of the supplementary codes for chronic conditions in AIHW population health monitoring work. Specifically, this work will inform recommendations for including the codes in wider AIHW routine analyses and their inclusion in data linkage. The results may also inform future decisions on the capture of chronic conditions in broader health system reporting and research.

Methods

Ethics and approvals

This project was approved by the AIHW Ethics Committee at its meeting on 23 February 2021 (EO2021/1/1243). The use of the National Dementia Linked Dataset (NDLD) for this project was approved by all the data custodians of the states and territories who contributed data to the NDLD (Request ID 2021-0058).

Data sources

This report uses 2 sources of Australian hospitals data:

- **National Hospital Morbidity Database (NHMD)** data for the period 1 July 2013 to 30 June 2020. The NHMD data are episode-level and are referred to as 'unlinked hospital data' in this report. This means that records of multiple episodes of care for one person are not linked together and are recorded the same as episodes of care for multiple different people.
- **National Dementia Linked Dataset (NDLD)** data for the period 1 July 2012 to 30 June 2017. The NDLD data link together the episodes of care for an individual and are referred to as 'linked hospital data' in this report. This data set includes individuals who were aged 40 or older between 2010 and 2017. The NDLD was the only available multi-state linked data source that included the supplementary chronic condition codes at the time of writing this report. Admitted patient care data for Western Australia and Northern Territory data are not available in the NDLD. In addition, private hospital data for New South Wales, South Australia and Tasmania are not available.

See the 'Data sources' section on page 31 for further information.

Study population

The population for **NDLD** analysis included all individuals with one or more hospital separations with a discharge date between 1 July 2015 and 30 June 2017. As mentioned above, only individuals aged 40 and older are included in the NDLD and admitted patient care data for Western Australia and Northern Territory data were not available.

The population for **NHMD** included all ages and hospitalisations from all states and territories.

As the populations of the 2 data sets are different, drawing comparisons between the results from the 2 is out of scope for this report.

Key definitions

Hospitalisation

For this report, a hospitalisation is defined as a hospital separation. A hospital separation is an episode of care for an admitted patient, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation). A patient's complete hospital stay (the continuous period of time a person receives hospital care) may be made up of one or more continuous hospital separations, which would be treated as separate hospitalisations in this report.

Principal diagnosis

The diagnosis established after study to be chiefly responsible for occasioning an episode of admitted patient care, an episode of residential care or an attendance at a health-care establishment (AIHW 2016a). The application of principal diagnosis in admitted patient care is guided by ACS 0001 (ACCD 2015b).

Additional diagnosis

A condition or complaint either coexisting with the principal diagnosis or arising during the episode of admitted patient care which is significant in terms of treatment required, investigations needed and resources used in each episode of care. Multiple diagnoses may be recorded. (AIHW 2016b). The application of additional diagnosis in admitted patient care is guided by ACS 0002 (ACCD 2015b).

Supplementary code

A supplementary code is assigned for chronic conditions that are part of the current health status on admission that do not meet criteria for inclusion as a principal or additional diagnosis in the episode of care. These codes represent conditions that would normally not be included in the coded data. The application of supplementary codes in admitted patient care is guided by ACS 0003 (ACCD 2015b).

ACS 0003 outlines the criteria for assignment of certain chronic conditions to codes in the range U78 to U88.

The supplementary codes are not assigned:

- in addition to another ICD-10-AM chapter code for the same condition
- for a past history of a condition
- for an acute condition.

There is an additional note in the Alphabetic Index of ICD-10-AM that informs code assignment: *Except where otherwise indicated, only assign codes from this section for unspecified/not elsewhere classified (NEC)/not otherwise specified (NOS) conditions (for example, hypertension NOS).*

Note that a separate supplementary code data element and associated definition has not yet been included in the Admitted Patient Care National Minimum Data Set 2021-22 (APC NMDS) (AIHW 2021b). Supplementary codes are currently collected under the additional diagnosis data element.

Classifications and mapping

Each supplementary code was mapped to the corresponding ICD-10-AM diagnosis codes using the 'Supplementary codes for chronic conditions to ICD-10-AM Eleventh Edition mapping file' produced by the Independent Health and Aged Care Pricing Authority (IHACPA 2020). Mapping based on this file is referred to in this report as 'direct mapping'.

Given the instructional notes in ACS 0003 and the Alphabetic Index of ICD-10-AM for some supplementary codes, the direct mapping was limited to diagnosis codes where the condition is described as 'unspecified' or 'not elsewhere classified'. For some chronic conditions, the direct mapping was assessed as too narrow, or more limited than the classifications the AIHW would routinely use to identify the condition using admitted patient care data. To allow for meaningful comparative analysis of the hospitalised population with chronic conditions, an expanded mapping was undertaken by AIHW Health Classifications Team to broaden the capture of diagnosis codes. These are referred to in the report as 'broad mapping'. This 'broad mapping' does not reflect the actual assignment of supplementary codes. The purpose of including the 'broad mapping' in this report is to allow comparisons of how these conditions may be defined in chronic condition monitoring if a wider case definition was utilised. This report does not apply a broad mapping for all supplementary codes.

The ICD-10-AM diagnosis codes in the 'broad' and 'direct' maps accounted for changes between the Eighth and Eleventh Editions. The supplementary codes for chronic conditions have not changed between their introduction in the Ninth Edition through to the Eleventh Edition, which are the editions in use for the data in this report.

Measures

Patterns and trend analysis

Patterns of supplementary code use and trends in the allocation of supplementary codes, and principal and additional diagnosis codes are presented in this report as a:

- percentage of all hospitalisations
- rate (number of hospitalisations per 100,000 population).

Where comparisons between population groups are presented (for example, sex or remoteness area), age-standardised rates are used.

Chronic condition capture analysis

The impact that the inclusion of the supplementary chronic condition codes makes on estimates of chronic conditions among the hospitalised population is presented as population rates and ratios. For details on the selection of diagnosis codes see section 'Classifications and mapping' above. Broad mapping was used for these measures where available.

In the analysis of unlinked hospital data:

- Population rates were calculated for the:
 - a) number of hospitalisations with diagnosis code (principal or additional) or supplementary code per 100,000 population
 - b) number of hospitalisations with diagnosis code (principal or additional only) per 100,000 population.
- Additional capture due to inclusion of the supplementary code was presented as an absolute increase ($a - b$) and as a ratio (a / b). Where comparisons between population groups are presented (for example, sex or remoteness area), age-standardised rates are used.

In the analysis of linked hospitalisations data, individuals with the supplementary chronic condition codes, rather than hospitalisations, were counted. Persons were selected based on 2 years of hospitalisation data (2014–15 and 2015–16).

- Population rates were calculated for:
 - a) persons with diagnosis code (principal or additional) or supplementary code per 100,000 population
 - b) persons with diagnosis code (principal or additional only) per 100,000 population.
- Additional capture due to inclusion of the supplementary code was presented as an absolute increase ($a - b$) and as a ratio (a / b). Where comparisons between population groups are presented (for example, sex or remoteness area), age-standardised rates are used.

Consistency of chronic condition coding analysis

The consistency of chronic condition coding for an individual over time was analysed in the linked data.

Consistency with a prior chronic condition diagnosis was measured for each supplementary code at the hospitalisation level by the following:

Hospitalisation (as per denominator) with the supplementary code assigned
Hospitalisation of a person with a prior mapped diagnosis

- Subsequent hospitalisations with the mapped diagnosis coded as additional or principal diagnosis were excluded from measures of consistency as these hospitalisations would not be eligible for the supplementary code to be assigned. (See section ‘Classifications and mapping’ above for details of mapping.)
- The results of this measure were combined to categorise the hospitalisation as capturing all, some, or none of the prior chronic condition diagnoses for a person.
- A look-back period was applied as a retrospective review to assess if a person had a prior hospitalisation with a mapped diagnosis (principal or additional). This look-back period differed by year: 2012–13 to 2014–15 for the hospitalisations selected in 2015–16, and 2012–13 to 2015–16 for the hospitalisations selected in 2016–17.

Consistency with prior supplementary codes was measured for each supplementary code at the hospitalisation level by the following:

Hospitalisation (as per denominator) with the supplementary code assigned
Hospitalisation of a person allocated a supplementary code at a prior hospitalisation

- Hospitalisations with the mapped diagnosis coded as additional or principal diagnosis were excluded from measures of consistency as these hospitalisations would not be eligible for the supplementary code to be assigned.
- Hospitalisations from 2016–17 were used in this analysis. The look-back period for prior supplementary codes was 2015–16.

Report structure

The results are presented in 3 sections:

- Section 1 provides information about the allocation of all supplementary codes in the first 5 years since their introduction (2015–16 to 2019–20).
- Section 2 provides information on the use of each of the 29 supplementary codes during this 5-year period and comparisons with the trends in the coding of mapped diagnoses. Additional findings are provided in appendices A1 to A29.
- Section 3 provides information on the impact the inclusion of supplementary codes would make on estimates of the chronic conditions / condition groups in linked and unlinked hospitalisation data. Information about the consistency of chronic condition coding for individuals over time in linked data is also presented. Additional findings are provided in appendices A1 to A29.

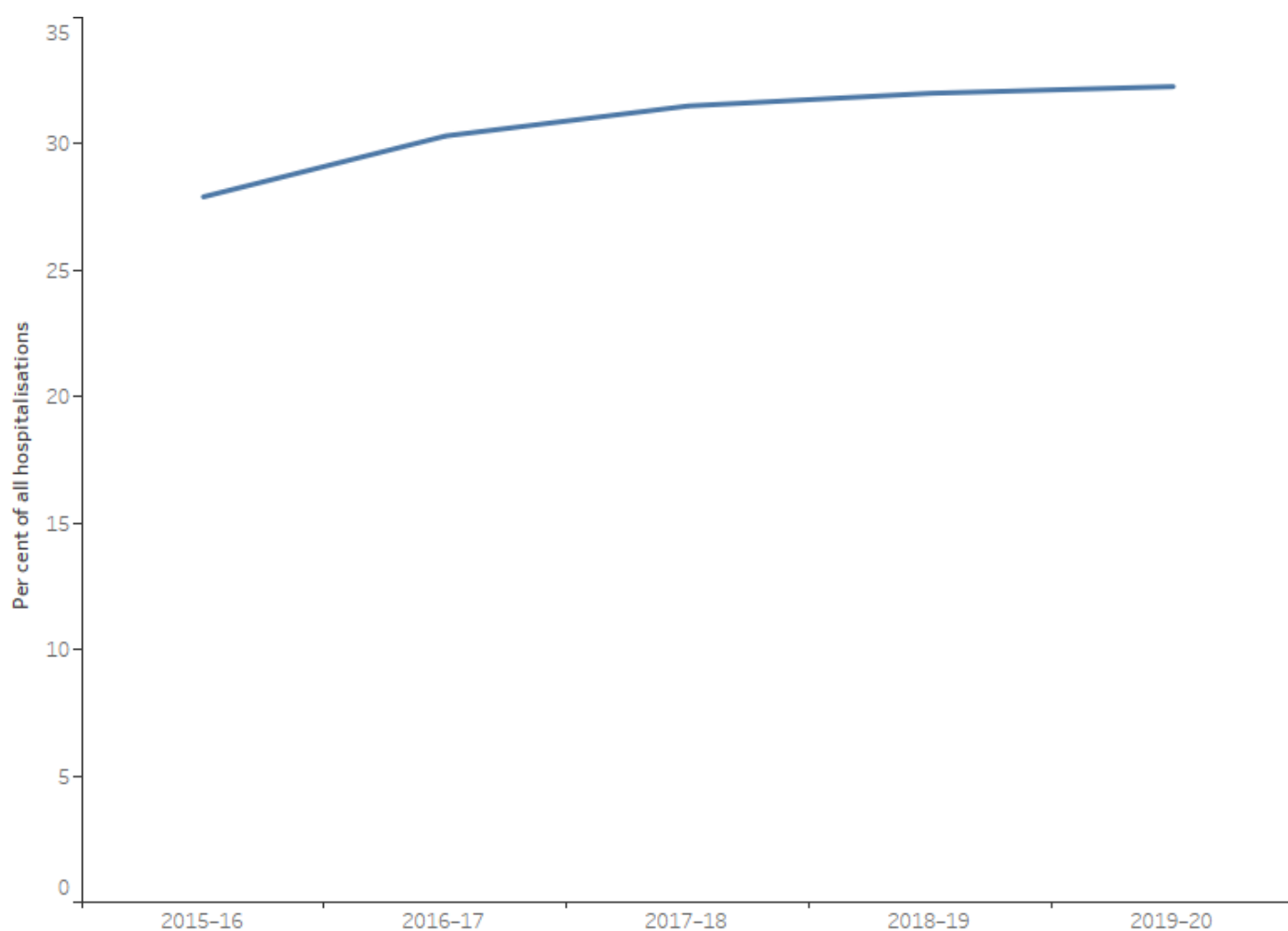
Section 1: Trends in supplementary code utilisation from 2015–16 to 2019–20

This section uses data from the National Hospital Morbidity Database (NHMD) to address the following aim:

- examine the patterns of use of supplementary codes for chronic conditions in the first 5 years since their introduction (2015–16 to 2019–20) in unlinked hospitalisation data.

In the year supplementary codes were introduced, 2015–16, 27.9% of hospitalisations had at least one supplementary code. Their use has increased over time. In 2019–20, 32.3% of hospitalisations had at least one supplementary code (Figure 1). Hospitalisations that had at least one supplementary code (2019–20), had on average 1.7 supplementary codes assigned.

Figure 1: Percentage of hospitalisations with at least one supplementary code by year, 2015–16 to 2019–20



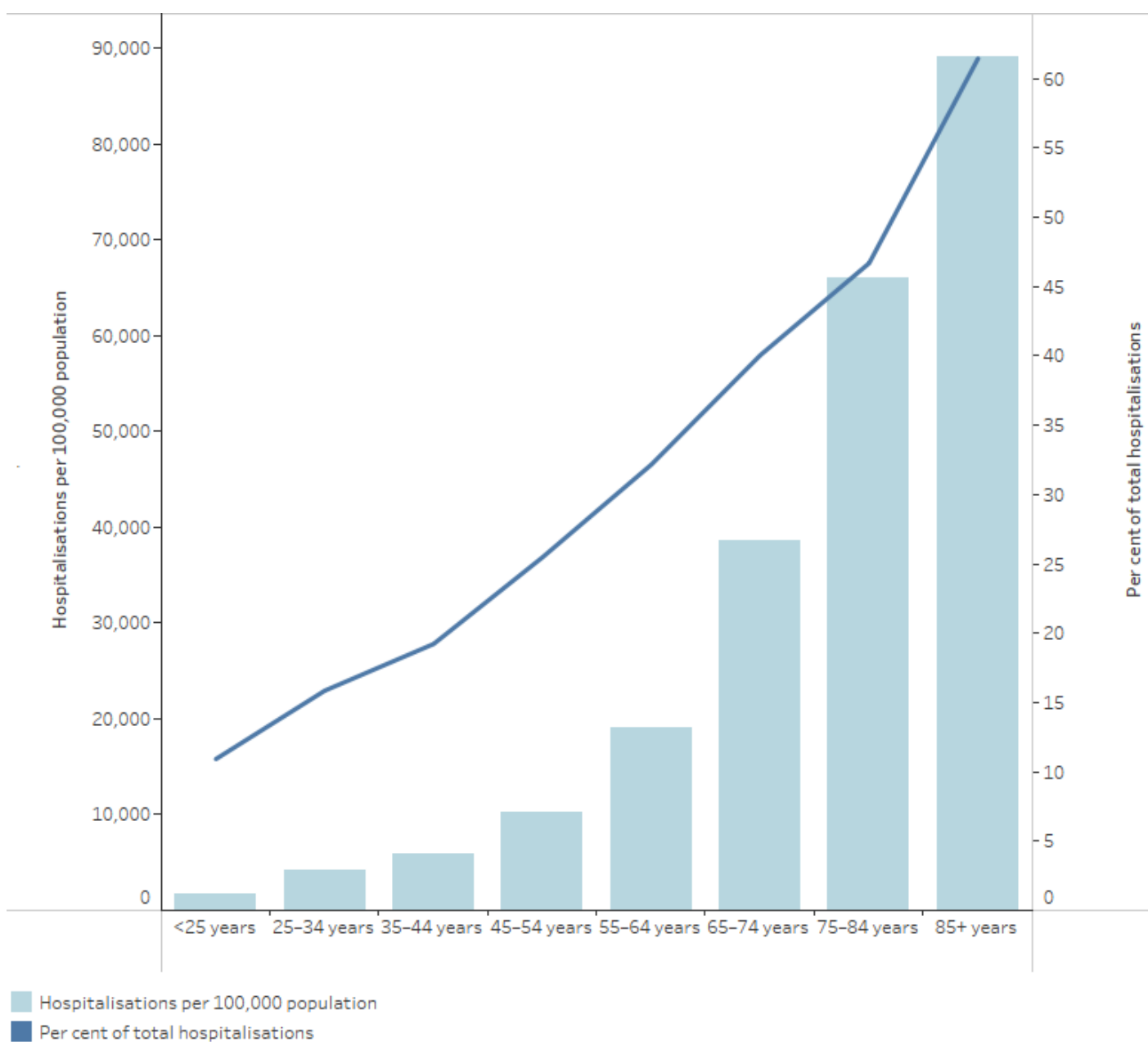
Source: AIHW National Hospital Morbidity Database.

Demographic characteristics

In 2019–20, males and females had a similar proportion of hospitalisations with at least one supplementary code (32.3% and 32.2%, respectively). The allocation of supplementary codes increased with age. In 2019–20, 10.9% of hospitalisations of people aged under 25 had at least one supplementary code, while 61.4% hospitalisations for people aged 85 and older had at least one supplementary code (Figure 2).

Among hospitalisations with at least one supplementary code, the average number of supplementary codes per hospitalisation increased with increasing age; from an average of 1.2 supplementary codes for people younger than 25 to an average of 2.1 supplementary codes for people 85 and older.

Figure 2: Rate of hospitalisations with at least one supplementary code by age, 2019–20



Source: AIHW National Hospital Morbidity Database.

In 2019–20, a lower proportion of hospitalisations of Aboriginal and Torres Strait Islander people had at least one supplementary code compared to hospitalisations of non-Indigenous Australians (20.9% and 32.9%, respectively). Among hospitalisations with at least one supplementary code, the average number of supplementary codes per hospitalisation was similar for hospitalisations of Indigenous and non-Indigenous Australians (an average of 1.7 supplementary codes).

Note that results have not been adjusted for differences in the age structures of the Indigenous and non-Indigenous populations.

Hospitalisation characteristics

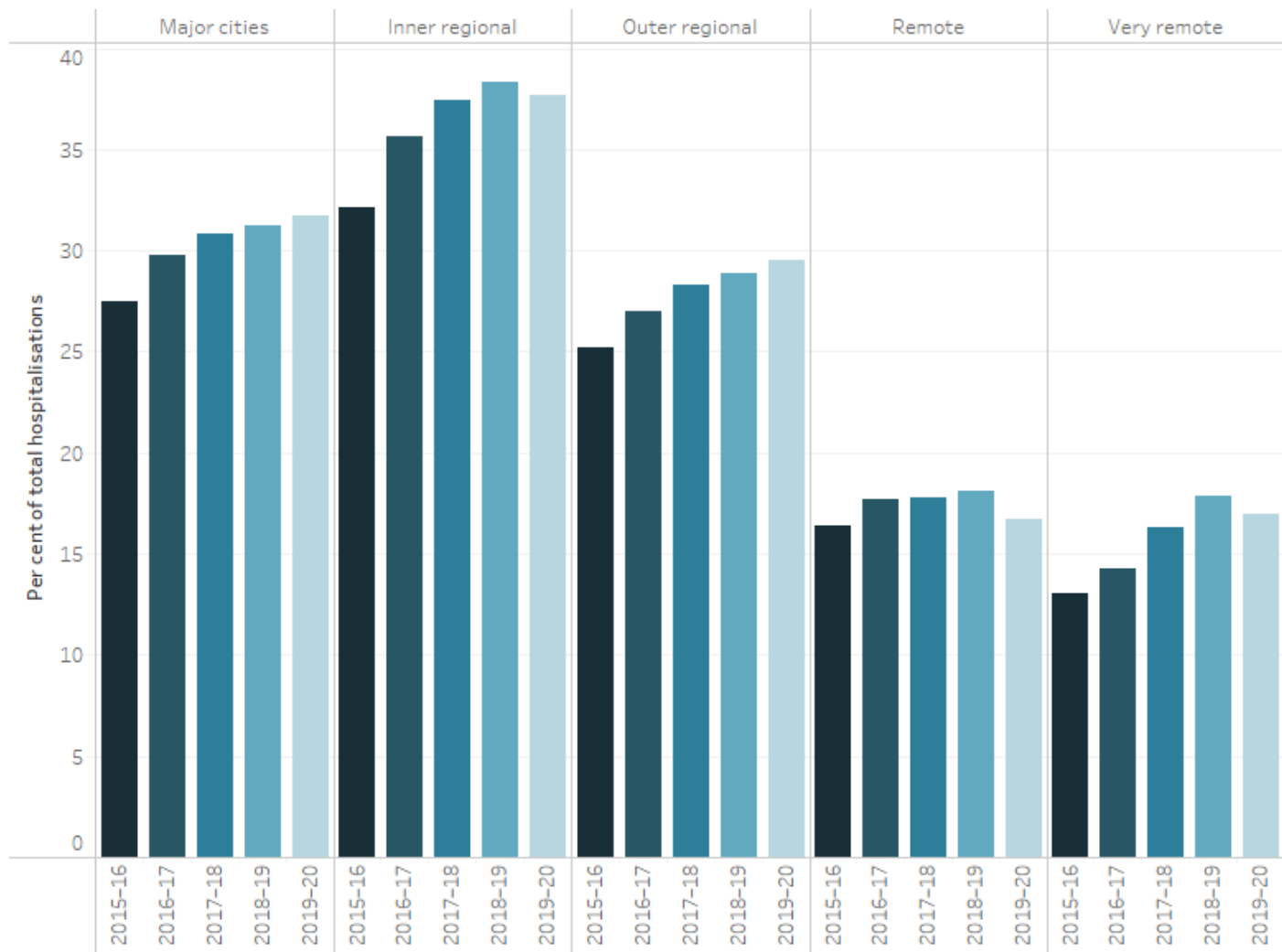
Hospital location

In 2019–20, hospitals in *Inner regional* areas had the highest proportion of hospitalisations with at least one supplementary code (37.7%). Hospitals in *Remote* and *Very remote* areas had the lowest proportion of hospitalisations with at least one supplementary code (16.7% and 16.9%, respectively). This pattern has been similar over the 5 years since the introduction of supplementary codes (Figure 3). The average number of supplementary codes per hospitalisation with at least one supplementary code was similar across remoteness areas.

By jurisdiction, hospitals in the Australian Capital Territory had the highest proportion of their hospitalisations with at least one supplementary code (37.5%) in 2019–20 (Figure 4). South Australia, Tasmania and New South Wales all had a higher proportion when compared to the Australian average. The Northern Territory had the lowest proportion of hospitalisations with at least one supplementary code (15.7%).

Note that results by hospital location have not been adjusted for differences in the age structure of the populations serviced by hospitals in different regions.

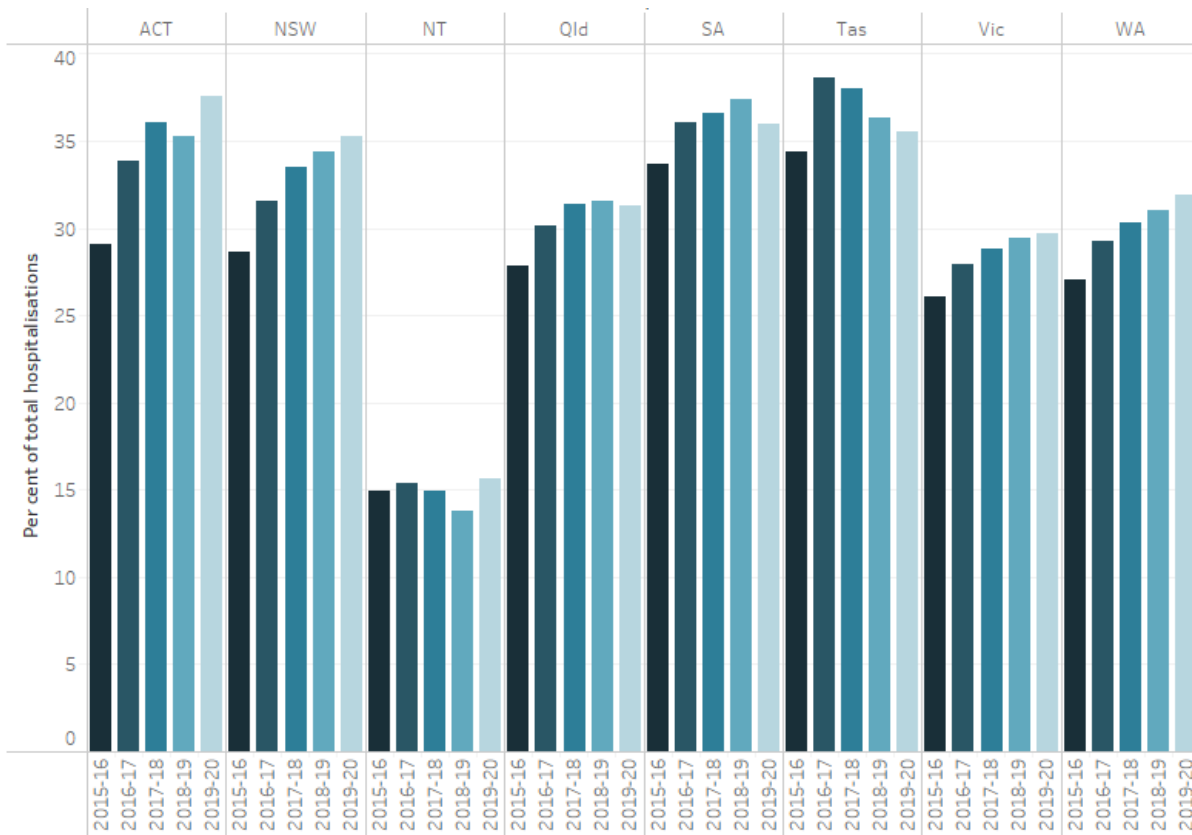
Figure 3 : Percentage of hospitalisations with at least one supplementary code by remoteness area of hospital and year, 2015–16 to 2019–20



Note: Remoteness is classified according to the Australian Statistical Geography Standard 2016 Remoteness Areas structured based on Statistical Area Level 2 (SA2) of usual residence.

Source: AIHW National Hospital Morbidity Database.

Figure 4: Percentage of hospitalisations with at least one supplementary code by state or territory location of hospital and year, 2015–16 to 2019–20



Source: AIHW National Hospital Morbidity Database.

Sector

Public hospitals had a greater proportion of hospitalisations with at least one supplementary code than private hospitals in each of the 5 years since their introduction. In 2019–20, the proportion of hospitalisations with at least one supplementary code in public hospitals was 33.6% and in private hospitals was 30.3%. The average number of supplementary codes per hospitalisation with at least one supplementary code was higher for public hospitals (1.8) than private hospitals (1.5).

Length of stay

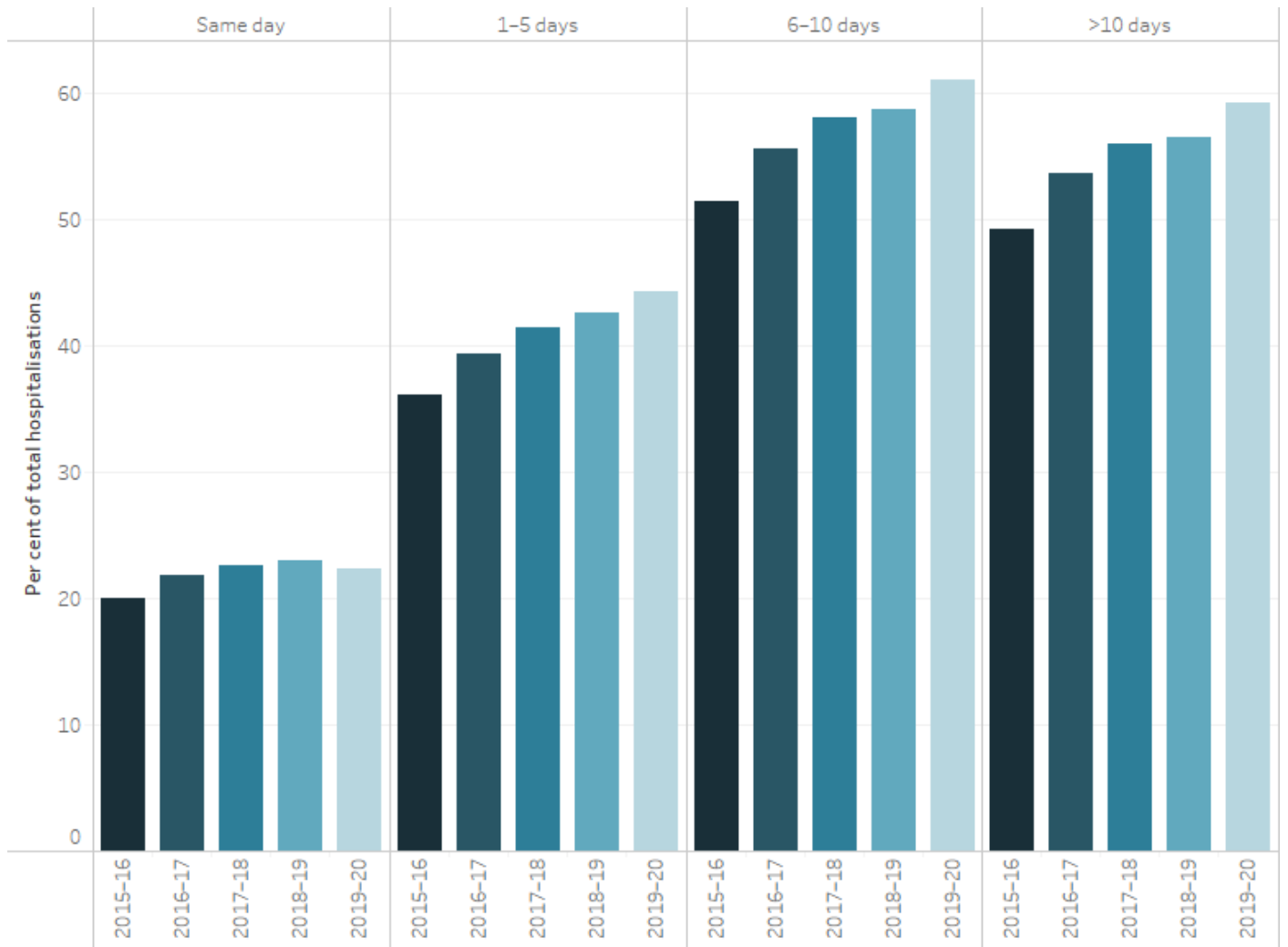
The proportion of hospitalisations with at least one supplementary code varied by length of stay (Figure 5).³ In 2019–20:

- 22.3% of same-day and 48.3% of multi-day hospitalisations had at least one supplementary code.
- 61.0% of hospitalisations with a length of stay of 6–10 days had at least one supplementary code, which was slightly higher than the proportion of hospitalisations with a length of stay longer than 10 days (59.2%).

³ Please note: Analysis, including by length of stay, occurred at the hospital separation level. A patient's complete hospital stay (the continuous period of time a person receives hospital care) may be made up of one or more continuous hospital separations. If a person has a long hospital stay for one treatment, but also several 1-day treatments at another hospital or ward during the same period of time, these separations would be counted as separate hospitalisations in this analysis.

- 44.3% of multi-day hospitalisations with a length of stay of less than 6 days had at least one supplementary code.
- Same-day hospitalisations with at least one supplementary code had an average of 1.5 supplementary codes allocated, while multi-day hospitalisations had an average of 1.8.

Figure 5: Percentage of hospitalisations with at least one supplementary code by length of stay and year, 2015–16 to 2019–20



Source: AIHW National Hospital Morbidity Database.

By supplementary code

Hypertension (U82.3) was the most common supplementary chronic condition code, allocated in 18.4% of hospitalisations in 2019–20 (Table 1). Depression (U79.3) was allocated in 5.2% of hospitalisations, Ischaemic heart disease (U82.1) in 5.0%, Arthritis and osteoarthritis (U86.2) in 4.8% and Asthma, without mention of chronic obstructive pulmonary disease (U83.3) in 4.6%. These conditions were the 5 most frequently allocated supplementary codes in each year between 2015–16 and 2019–20.

Less frequently allocated supplementary codes in 2019–20 included Chronic respiratory failure (0.002% of hospitalisations), Chronic liver failure (0.01%), Cystic fibrosis (0.01%) and Spina bifida (0.03%).

Table 1: Hospitalisations with supplementary codes, 2019–20

Supplementary code for chronic conditions		Count	% of hospitalisations	Rank
Arthritis and osteoarthritis	U86.2	530,810	4.8	4
Asthma, without mention of chronic obstructive pulmonary disease	U83.3	517,380	4.6	5
Bronchiectasis	U83.4	24,380	0.2	17
Cerebral palsy	U80.4	11,252	0.1	22
Chronic heart failure	U82.2	143,763	1.3	10
Chronic kidney diseases, stage 3–5	U87.1	205,497	1.8	9
Chronic liver failure	U84.3	609	0.01	28
Chronic obstructive pulmonary disease	U83.2	278,007	2.5	7
Chronic respiratory failure	U83.5	199	0.002	29
Crohn's disease	U84.1	20,009	0.2	18
Cystic fibrosis	U78.2	1,114	0.01	27
Dementia (including Alzheimer's disease)	U79.1	99,912	0.9	11
Depression	U79.3	579,645	5.2	2
Disorder of intellectual development	U79.4	39,127	0.4	16
Down's syndrome	U88.2	4,237	0.04	25
Emphysema	U83.1	18,124	0.2	19
Epilepsy	U80.3	77,525	0.7	13
Hypertension	U82.3	2,050,766	18.4	1
Ischaemic heart disease	U82.1	555,863	5.0	3
Multiple sclerosis	U80.2	11,010	0.1	23
Obesity	U78.1	483,356	4.3	6
Osteoporosis	U86.4	228,370	2.1	8
Parkinson's disease	U80.1	48,265	0.4	14
Rheumatoid arthritis	U86.1	86,998	0.8	12
Schizophrenia	U79.2	41,838	0.4	15
Spina bifida	U88.1	3,101	0.03	26
Systemic lupus erythematosus	U86.3	10,452	0.1	24
Tetraplegia, paraplegia, diplegia, monoplegia and hemiplegia, due to any cause;	U80.5	14,508	0.1	21
Ulcerative colitis	U84.2	14,952	0.1	20

Source: AIHW National Hospital Morbidity Database.

Section 2: Chronic conditions recorded as supplementary codes

This section uses data from the National Hospital Morbidity Database (NHMD) to address the following aims:

- examine the patterns of use of supplementary codes for chronic conditions in the first 5 years since their introduction (2015–16 to 2019–20) in unlinked hospitalisation data
- examine whether the introduction of supplementary codes affected the coding of additional diagnoses.





























Summary of findings

The allocation of most supplementary codes, as a percentage of all hospitalisations, increased from their introduction in 2015–16 to 2019–20. Most supplementary codes had the steepest increase over the first 2 years post introduction. This was frequently followed by a plateau or slight decrease in 2019–20. In 2019–20 in Australia the COVID-19 pandemic began, and a new ICD-10-AM edition with a revised ACS 0002 additional diagnosis standard was introduced. The following supplementary codes had different trends:




- The use of Chronic liver failure (U84.3) and Chronic respiratory failure (U83.5) decreased from 2015–16 to 2019–20.
- The use of Cystic fibrosis (U78.2) decreased in 2016–17 before increasing to a peak in 2018–19.

One-third of the conditions for which supplementary codes were introduced in 2015–16 had an observable drop in additional diagnosis in that year, measured as a percentage of all hospitalisations (see Table 2).

Table 2: Summary of key results by supplementary code

Chronic condition with supplementary code	Rate per 100,000 population 2015–16 (first year of usage)	Rate per 100,000 population 2019–20 (fifth year of usage)	Trend in additional diagnosis corresponding to supplementary code introduction
Arthritis and osteoarthritis (U86.2)	2,086.7	2,079.8	
Asthma, without mention of chronic obstructive pulmonary disease (U83.3)	1,796.0	2,027.2	
Bronchiectasis, without mention of cystic fibrosis (U83.4)	54.4	95.5	
Cerebral palsy (U80.4)	35.8	44.1	
Chronic heart failure (U82.2)	419.9	563.3	
Chronic kidney disease, stage 3–5 (U87.1)	510.0	805.2	
Chronic liver failure (U84.3)	5.3	2.4	
Chronic obstructive pulmonary disease (U83.2)	907.1	1,089.3	
Chronic respiratory failure (U83.5)	1.8	0.8	
Crohn's disease (U84.1)	50.8	78.4	
Cystic fibrosis (U78.2)	3.8	4.4	
Dementia (including Alzheimer's disease) (U79.1)	296.3	391.5	
Depression (U79.3)	1,851.9	2,271.1	
Disorder of intellectual development (U79.4)	114.7	153.3	
Down's syndrome (U88.2)	15.5	16.6	
Emphysema, without mention of chronic obstructive pulmonary disease (U83.1)	65.9	71.0	
Epilepsy (U80.3)	252.6	303.8	
Hypertension (U82.3)	7,216.5	8,035.2	
Ischaemic heart disease (U82.1)	1,888.8	2,178.0	
Multiple sclerosis (U80.2)	31.1	43.1	
Obesity (U78.1)	926.4	1,893.9	
Osteoporosis (U86.4)	742.4	894.8	
Parkinson's disease (U80.1)	147.0	189.1	
Rheumatoid arthritis (U86.1)	266.4	340.9	
Schizophrenia (U79.2)	115.4	163.9	
Spina bifida (U88.1)	10.1	12.2	
Systemic lupus erythematosus (U86.3)	26.7	41.0	
Tetraplegia, paraplegia, diplegia, monoplegia and hemiplegia, due to any cause; (U80.5)	58.0	56.8	

Ulcerative colitis (U84.2)	36.3	58.6	
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Key			
	An observable decrease in additional diagnosis (as percentage of total hospitalisations) corresponded to the introduction of supplementary codes in 2015–16.		
	Visual interrogation was insufficient to determine whether or not a decrease in additional diagnosis (as percentage of total hospitalisations) corresponded to the introduction of supplementary codes in 2015–16. This may have been due to the size of the potential decrease or other characteristics of the trend of additional diagnosis allocation over time.		
	No decrease in additional diagnosis (as percentage of total hospitalisations) was observed to correspond to the introduction of supplementary codes in 2015–16.		

Source: AIHW National Hospitals Morbidity Database.

Some of the most common principal diagnoses for hospitalisations with the supplementary codes varied by chronic condition.

- Cataracts and Pharmacotherapy session for neoplasm were common principal diagnoses across the hospitalisations with supplementary codes.
- Chest pain, unspecified was the most common principal diagnosis for hospitalisations with the supplementary codes for Depression and Schizophrenia.
- Urinary tract infection (site not specified) was the most common principal diagnosis for hospitalisations with the supplementary codes for Spina bifida, Dementia (including Alzheimer’s disease), Multiple sclerosis and Tetraplegia, paraplegia, diplegia, monoplegia and hemiplegia, due to any cause.
- Congestive heart failure was the most common principal diagnosis for hospitalisations with the supplementary code for Chronic kidney disease, stage 3–5.

Detailed results by supplementary code

Additional results for each of the supplementary codes are presented in appendices A1 to A29. Available in [related material](#).

A1: Additional results by supplementary code Arthritis and osteoarthritis (U86.2)

A2: Additional results by supplementary code Asthma, without mention of chronic obstructive pulmonary disease (U83.3)

A3: Additional results by supplementary code Bronchiectasis, without mention of cystic fibrosis (U83.4)

A4: Additional results by supplementary code Cerebral palsy (U80.4)

A5: Additional results by supplementary code Chronic heart failure (U82.2)

A6: Additional results by supplementary code Chronic kidney disease, stage 3–5 (U87.1)

A7: Additional results by supplementary code Chronic liver failure (U84.3)

A8: Additional results by supplementary code Chronic obstructive pulmonary disease (U83.2)

A9: Additional results by supplementary code Chronic respiratory failure (U83.5)

A10: Additional results by supplementary code Crohn’s disease (U84.1)

A11: Additional results by supplementary code Cystic fibrosis (U78.2)

A12: Additional results by supplementary code Dementia (including Alzheimer’s disease) (U79.1)

A13: Additional results by supplementary code Depression (U79.3)

A14: Additional results by supplementary code Disorder of intellectual development (U79.4)

A15: Additional results by supplementary code Down’s syndrome (U88.2)

A16: Additional results by supplementary code Emphysema, without mention of chronic obstructive pulmonary disease (U83.1)

A17: Additional results by supplementary code Epilepsy (U80.3)

A18: Additional results by supplementary code Hypertension (U82.3)

A19: Additional results by supplementary code Ischaemic heart disease (U82.1)

A20: Additional results by supplementary code Multiple sclerosis (U80.2)

A21: Additional results by supplementary code Obesity (U78.1)

A22: Additional results by supplementary code Osteoporosis (U86.4)

A23: Additional results by supplementary code Parkinson's disease (U80.1)

A24: Additional results by supplementary code Rheumatoid arthritis (U86.1)

A25: Additional results by supplementary code Schizophrenia (U79.2)

A26: Additional results by supplementary code Spina bifida (U88.1)

A27: Additional results by supplementary code Systemic lupus erythematosus (U86.3)

A28: Additional results by supplementary code Tetraplegia, paraplegia, diplegia, monoplegia and hemiplegia, due to any cause (U80.5)

A29: Additional results by supplementary code Ulcerative colitis (U84.2)

Section 3: Supplementary codes for use in monitoring chronic conditions

This section uses data from the National Hospital Morbidity Database (NHMD) and the National Dementia Linked Dataset (NDLD) to address the following aims:

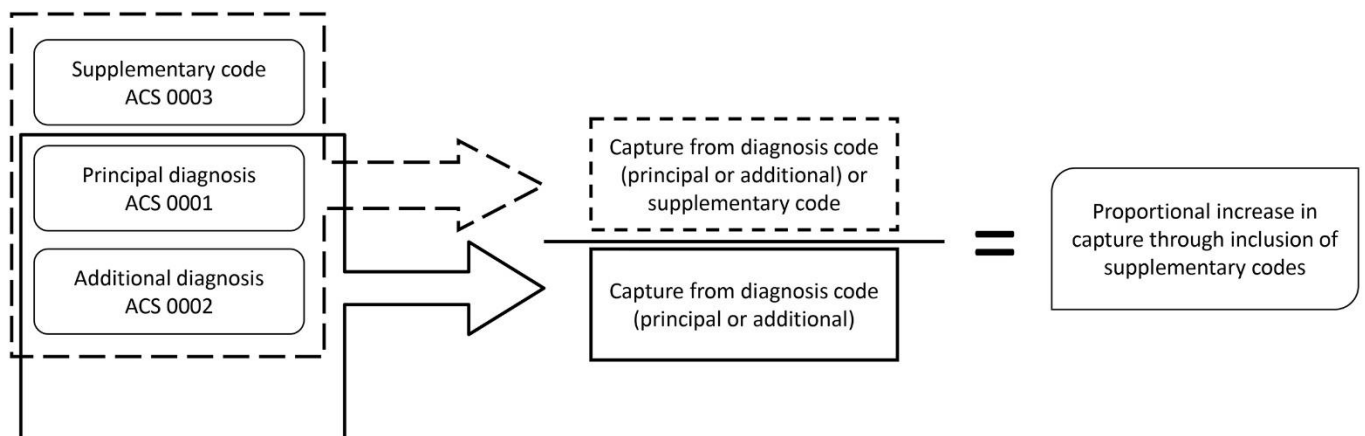
- examine the impact that the inclusion of supplementary chronic condition codes in linked and unlinked data analysis make on estimates of chronic conditions among the hospitalised population
- assess the consistency of chronic condition coding for an individual over time using linked data.

Summary of findings

Chronic condition capture in hospitalisations data

In the **unlinked** NHMD hospitalisation data (for the year 2019–20 only), the increase in chronic condition capture through the inclusion of supplementary codes was measured by dividing the number of **hospitalisations** that had a diagnosis code (principal or additional) or supplementary code for the relevant chronic condition, by the number of **hospitalisations** that only had the diagnosis code for the condition (Figure 6). Where a broad mapping to diagnosis codes was available, this was used for the results presented.

Figure 6 : Calculation of increase in capture through inclusion of supplementary codes



The chronic condition with the highest proportional increase in capture was chronic obstructive pulmonary disease. The number of hospitalisations selected with both diagnosis (principal and additional) and supplementary codes was 15.7-fold higher than when diagnosis (principal and additional) codes were used alone.

Other conditions with a high proportional increase in capture included:

- 13.0-fold higher for hypertension
- 12.2-fold higher for osteoporosis
- 12.4-fold higher for asthma.

The chronic condition with the lowest proportional increase in capture was chronic respiratory failure. The number of hospitalisations selected with the addition of the supplementary code was only 1.03-fold higher than when principal and additional diagnosis codes were used alone.

Other conditions with a lower proportional increase in capture included:

- 1.2-fold higher for tetraplegia, paraplegia, diplegia, monoplegia and hemiplegia due to any cause
- 1.3-fold higher for Cystic fibrosis
- 1.3-fold higher for multiple sclerosis.

It is important to note that conditions that are more likely to require treatment while hospitalised, such as the ones above, are less likely to fall outside the criteria for inclusion as an additional diagnosis when present.

In **linked** hospitalisation data from the NDLD, the increase in chronic condition capture through the inclusion of supplementary codes was measured by dividing the number of **people** with one or more hospitalisations with a diagnosis code (principal or additional) or supplementary code for the chronic condition, by the number of **people** with one or more hospitalisations that only had principal and additional diagnosis codes for the condition. People were selected based on hospitalisations for the 2-year period (2015–16 and 2016–17), and only people aged 40 and over were present in the data. Where a broad mapping to diagnosis codes was available, this was used for the results presented.

The condition with the highest proportional increase in capture was asthma. The number of people with hospitalisations captured with the addition of the supplementary code was 9.8-fold higher than when principal and additional diagnosis codes were used alone.

Other conditions with a high proportional increase in capture included:

- 6.5-fold higher for chronic obstructive pulmonary disease
- 6.3-fold higher for depression
- 5.5-fold higher for obesity.

The condition with the lowest proportional increase in capture was again chronic respiratory failure, where the number of people with hospitalisations selected with the addition of the supplementary code was 1.04-fold higher than when principal and additional diagnosis codes were used alone.

Other conditions with a low relative increase in capture included:

- 1.1-fold higher for tetraplegia, paraplegia, diplegia, monoplegia and hemiplegia, due to any cause
- 1.4-fold higher for ulcerative colitis.

Direct comparisons between the results from the linked and unlinked data sets are not within scope of this analysis due to different study populations.

Capture of pre-established chronic conditions with supplementary codes

The linked hospital data in the NDLD provides the opportunity to assess how well the supplementary codes in 2015–16 and 2016–17 hospitalisations data captured chronic conditions that had been identified in the patient's prior hospitalisations.

To determine how well supplementary codes captured pre-established chronic conditions that were identified in prior principal and additional diagnosis codes:

- Supplementary codes in hospitalisations from 2015–16 to 2016–17 were compared to the diagnosis codes of the patient's prior hospitalisation/s (details of look-back periods below).

Note, some in-scope chronic conditions identified at a prior hospitalisation may be transient and therefore not captured in subsequent hospitalisations (for example, depression). However, most of the 29 chronic conditions are long term and should be identified in subsequent hospitalisations.

A look-back period was applied to assess if a person had a prior hospitalisation with a directly mapped diagnosis captured as an additional or a principal diagnosis. This look-back period differed by year:

- 2012–13 to 2014–15 for the measurement hospitalisations selected in 2015–16
- 2012–13 to 2015–16 for the measurement hospitalisations selected in 2016–17.

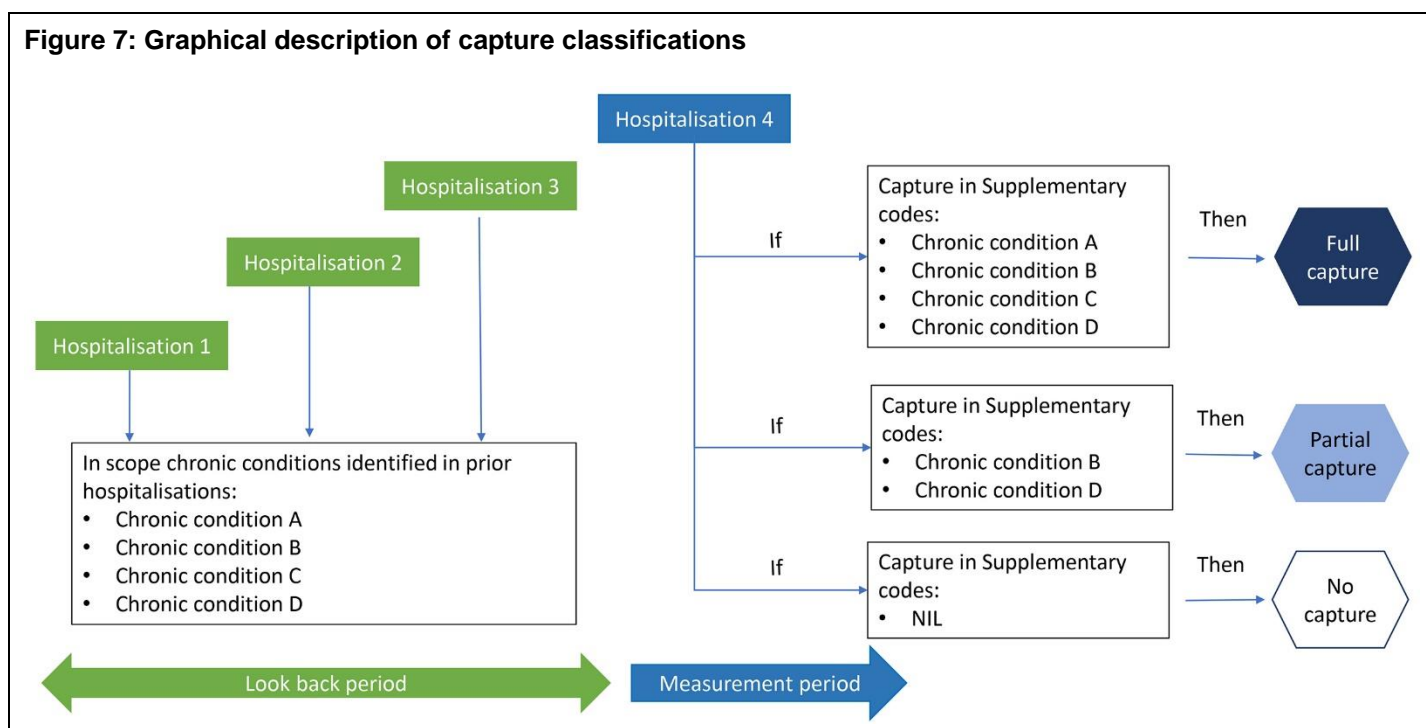
As the NDLD does not include date of admission or separation, diagnoses from hospitalisations in the same year were not able to be sequenced so were not included in this analysis.

In 2015–16 and 2016–17, 4.3 million hospitalisations were identified in the NDLD where the admitted patient had at least one pre-established chronic condition and were therefore in-scope to assess capture of conditions. These hospitalisations were used as the denominator for this measure and are referred to as the ‘measurement hospitalisations’ in this report.

For each measurement hospitalisation, the supplementary codes were assessed against all of the patient’s pre-established chronic condition/s (identified from prior hospitalisation/s) (Figure 7). The measurement hospitalisation was then classified as follows:

- (1) **‘Full capture’** – where supplementary codes were allocated for all pre-established chronic conditions.
- (2) **‘Partial capture’** – supplementary codes were allocated for some but not all pre-established chronic conditions
- (3) **‘No capture’** – none of the supplementary codes for the pre-established chronic conditions were allocated.

Figure 7: Graphical description of capture classifications



The majority (74.5%) of the measurement hospitalisations did not capture any of the patients’ pre-established chronic conditions in supplementary codes, 11.4% captured some, and 14.1% captured all (Table 3).

The capture of prior diagnoses as a corresponding supplementary code was higher for multi-day hospitalisations than same-day hospitalisations. Of same-day measurement hospitalisations, 12.3% captured some or all prior diagnoses in supplementary codes, compared to 52.1% of multi-day hospitalisations.

When restricted to multi-day hospitalisations only, the capture of some or all prior diagnoses in supplementary codes was:

- more likely in hospitalisations of patients who were older, with 58.2% of measurement hospitalisations of people aged 80 and older capturing some or all prior diagnoses in supplementary codes, compared to 37.6% of measurement hospitalisations of people aged 40–49
- similar between males and females, with 52.3% and 51.9% of measurement hospitalisations capturing some or all prior diagnoses in supplementary codes, respectively
- lower in more remote hospitals, with 53.7% of measurement hospitalisations in *Major cities* capturing some or all prior diagnoses in supplementary codes compared to 27.0% in *Very remote* areas.

Table 3: Capture of prior hospital diagnoses in supplementary codes by patient and hospital characteristics

	Capture of prior hospital diagnoses in supplementary codes		
	No capture %	Partial capture %	Full capture %
All hospitalisations of patients with prior relevant hospital diagnoses	74.5	11.4	14.1
Length of stay			
Same-day hospitalisation	87.7	5.4	6.9
Multi-day hospitalisation	47.9	23.4	28.7
Patient factors (restricted to multi-day admissions)			
Age group (years)			
40–49	62.4	13.5	24.1
50–59	55.8	18.3	25.9
60–69	50.9	21.8	27.4
70–79	45.8	25.3	28.9
80+	41.9	26.8	31.4
Sex			
Male	47.7	24.0	28.4
Female	48.1	22.7	29.1
Hospital factors (restricted to multi-day admissions)			
Hospital remoteness			
Major cities	46.4	23.9	29.8
Inner regional	50.4	22.6	27.0
Outer regional	54.6	21.2	24.2
Remote	58.6	19.4	21.9
Very remote	73.0	13.2	13.8

Note: National Dementia Linked Dataset is restricted to people aged 40 and older, and hospitalisations from NSW, Vic, Qld, ACT, Tas, SA.
Source: AIHW National Dementia Linked Dataset.

Capture of pre-existing conditions varied by the chronic condition type. Less than 1% of hospitalisations among people with a prior diagnosis (principal and/or additional) of chronic respiratory failure had the supplementary code of U83.5 assigned. In comparison, 51% of hospitalisations of people with a prior diagnosis (principal and/or additional) of cerebral palsy had the supplementary code of U80.4 assigned.

To determine how well supplementary codes captured pre-established chronic conditions that were identified in prior supplementary codes:

- Supplementary codes in hospitalisations in 2016–17 were compared to supplementary codes from the patient’s 2015–16 hospitalisation/s.

Capture of prior supplementary codes in subsequent hospitalisations varied by chronic condition. Conditions that were congenital and long term were more likely to be captured again. Less than 3% of hospitalisations, among people assigned a supplementary code of Chronic respiratory failure in the year prior, were again assigned a supplementary code of Chronic respiratory failure. In comparison, 53% had repeat coding where there was a prior supplementary code of Down’s syndrome.

Table 4: Summary of key results by chronic condition with supplementary code

Chronic condition with supplementary code	Increase in capture through inclusion of supplementary code Fold increase calculated as: Selection (n) with supplementary code / selection (n) with diagnosis codes only		Separation to persons ratio Hospitalisation with supplementary codes or mapped diagnosis ^(a)	% Hospitalisations (2016–17) that captured with a supplementary code the pre-established condition (identified in diagnosis from 2012–13 to 2015–16 hospitalisation)	% Hospitalisations (2016–17) that re-captured supplementary code that had been identified in prior hospitalisations (in 2015–16 hospitalisations)
	Unlinked hospitalisations, admission-based n (NHMD 2019–20)	Linked hospitalisation data, person-based n (NDLD 2015–16, 2016–17)	Linked hospitalisation (NDLD 2015–16, 2016–17)	% All hospitalisations (% multi-day hospitalisations only) (NDLD)	% All hospitalisations (% multi-day hospitalisations only) (NDLD)
Obesity (U78.1)	9.8	5.5	1.7	15.9 (35.1)	16.4 (35.9)
Cystic fibrosis (U78.2)	1.3	1.5	3.3	11.3 (27.7)	7.1 (10.2)
Dementia (including Alzheimer's disease) (U79.1)	2.3	1.7	2.0	36.0 (44.5)	38.9 (48.2)
Schizophrenia (U79.2)	2.0	2.0	2.5	29.2 (41.9)	31.7 (51.1)
Depression (U79.3)	4.8	6.3	2.0	21.6 (34.8)	28.0 (43.5)
Disorder of intellectual development (U79.4)	7.9	3.7	2.3	32.7 (48.1)	30.0 (48.6)
Parkinson's disease (U80.1)	2.7	2.0	2.8	48.6 (61.0)	46.6 (64.8)
Multiple sclerosis (U80.2)	1.3	1.6	4.6	40.4 (60.4)	38.3 (56.8)
Epilepsy (U80.3)	3.5	3.2	2.2	30.5 (45.0)	36.9 (54.9)
Cerebral palsy (U80.4)	3.1	3.2	2.5	51.2 (69.9)	47.3 (68.4)
Tetraplegia, paraplegia, diplegia, monoplegia and hemiplegia, due to any cause (U80.5)	1.2	1.1	2.1	3.9 (6.6)	15.9 (27.4)
Ischaemic heart disease (U82.1)	4.8	3.0	2.2	26.0 (52.4)	27.3 (56.4)
Chronic heart failure (U82.2)	2.0	1.5	2.2	13.8 (29.1)	19.6 (39.5)
Hypertension (U82.3)	13.0	5.1	2.1	23.0 (58.6)	34.2 (63.2)
Emphysema, without mention of chronic obstructive pulmonary disease (U83.1)	7.9	5.4	1.4	2.5 (3.2)	9.3 (6.6)
Chronic obstructive pulmonary disease (U83.2)	15.7	6.5	2.0	24.0 (31.6)	25.1 (37.5)

Asthma, without mention of chronic obstructive pulmonary disease (U83.3)	12.4	9.8	1.7	23.7 (32.4)	25.2 (36.3)
Bronchiectasis, without mention of cystic fibrosis (U83.4)	2.5	1.6	2.1	10.0 (13.4)	21.7 (22.7)
Chronic respiratory failure (U83.5)	1.03	1.04	1.5	0.2 (n.p.)	2.5 (n.p.)
Crohn's disease (U84.1)	1.3	1.5	3.0	23.3 (37.8)	30.1 (49.4)
Ulcerative colitis (U84.2)	1.4	1.4	1.9	11.3 (20.2)	19.8 (34.2)
Chronic liver failure (U84.3)	1.7	2.0	1.4	1.2 (1.3)	2.8 (3.9)
Rheumatoid arthritis (U86.1)	4.6	4.9	2.3	36.7 (56.2)	32.7 (49.2)
Arthritis and osteoarthritis (U86.2)	2.7	3.1	1.8	16.2 (25.4)	25.1 (38.7)
Systemic lupus erythematosus (U86.3)	3.7	3.4	2.1	8.2 (32.2)	19.4 (33.5)
Osteoporosis (U86.4)	12.2	7.7	2.0	24.4 (36.0)	28.7 (44.7)
Chronic kidney disease, stage 3–5 (U87.1)	1.8	1.5	3.8	6.4 (38.5)	11.0 (48.2)
Spina bifida (U88.1)	5.7	3.6	2.5	16.0 (59.8)	19.2 (57.6)
Down's syndrome (U88.2)	4.5	2.8	2.2	43.8 (71.3)	52.6 (77.4)

n.p. not available for publication

(a) broad mapping used where available.

Note: National Dementia Linked Dataset is restricted to people aged 40 and older, and hospitalisations from NSW, Vic, Qld, ACT, Tas, SA.

Sources: AIHW National Dementia Linked Dataset (NDLD), AIHW National Hospital Morbidity Database (NHMD).

Detailed results by supplementary code

Additional results for each of the supplementary codes are presented in appendices A1 to A29. Available in [related material](#).

A1: Additional results by supplementary code Arthritis and osteoarthritis (U86.2)

A2: Additional results by supplementary code Asthma, without mention of chronic obstructive pulmonary disease (U83.3)

A3: Additional results by supplementary code Bronchiectasis, without mention of cystic fibrosis (U83.4)

A4: Additional results by supplementary code Cerebral palsy (U80.4)

A5: Additional results by supplementary code Chronic heart failure (U82.2)

A6: Additional results by supplementary code Chronic kidney disease, stage 3–5 (U87.1)

A7: Additional results by supplementary code Chronic liver failure (U84.3)

A8: Additional results by supplementary code Chronic obstructive pulmonary disease (U83.2)

A9: Additional results by supplementary code Chronic respiratory failure (U83.5)

A10: Additional results by supplementary code Crohn's disease (U84.1)

A11: Additional results by supplementary code Cystic fibrosis (U78.2)

A12: Additional results by supplementary code Dementia (including Alzheimer's disease) (U79.1)

A13: Additional results by supplementary code Depression (U79.3)

A14: Additional results by supplementary code Disorder of intellectual development (U79.4)

A15: Additional results by supplementary code Down's syndrome (U88.2)

A16: Additional results by supplementary code Emphysema, without mention of chronic obstructive pulmonary disease (U83.1)

A17: Additional results by supplementary code Epilepsy (U80.3)

A18: Additional results by supplementary code Hypertension (U82.3)

A19: Additional results by supplementary code Ischaemic heart disease (U82.1)

A20: Additional results by supplementary code Multiple sclerosis (U80.2)

A21: Additional results by supplementary code Obesity (U78.1)

A22: Additional results by supplementary code Osteoporosis (U86.4)

A23: Additional results by supplementary code Parkinson's disease (U80.1)

A24: Additional results by supplementary code Rheumatoid arthritis (U86.1)

A25: Additional results by supplementary code Schizophrenia (U79.2)

A26: Additional results by supplementary code Spina bifida (U88.1)

A27: Additional results by supplementary code Systemic lupus erythematosus (U86.3)

A28: Additional results by supplementary code Tetraplegia, paraplegia, diplegia, monoplegia and hemiplegia, due to any cause (U80.5)

A29: Additional results by supplementary code Ulcerative colitis (U84.2)

Conclusion and recommendations

The introduction of the supplementary codes for chronic conditions in July 2015 into ICD-10-AM substantially increased the proportion of hospitalisations that were identified to have specific chronic conditions.

During the first 5 years since their implementation, more than 1 in 4 hospitalisations each year had a supplementary code. The allocation of supplementary codes increased with the age of patients, consistent with the increasing prevalence of many of the in-scope chronic conditions. Note that variations in coding context and the optional nature of the codes in the first 4 years may contribute to differences in the allocation of supplementary codes by length of stay, remoteness and hospital sector.

It is important to note that supplementary codes are intended to always be assigned where a chronic condition is documented by a clinician as part of the patient's current health status but does not meet the criteria for assignment as the principal or additional diagnosis. Supplementary codes are assigned independent of the reason for admission. This differentiates supplementary codes from other diagnoses fields and means that there are different opportunities and considerations for their use.

For many of these conditions, by design, the introduction impacted identification in the hospitals data based on additional diagnosis fields. This impact makes the introduction of supplementary codes an important consideration for the monitoring of chronic conditions in the hospitalised population. The scale of this impact varied greatly across the highly diverse 29 chronic conditions. For at least 10 out of the 29 conditions, the introduction of supplementary codes should be considered a break in time series for trends in additional diagnoses of conditions and this should be considered when presenting and interpreting trends for additional diagnosis data. These conditions include arthritis and osteoarthritis, cerebral palsy, chronic kidney disease (stage 3–5), dementia (including Alzheimer's disease), disorder of intellectual development, Down's syndrome, hypertension, multiple sclerosis, Parkinson's disease, and tetraplegia, paraplegia, diplegia, monoplegia and hemiplegia, due to any cause. Whether the observed impact represents a refinement in the coding of chronic conditions as additional diagnosis was not within the scope of this analysis

The relative increase in the capture of chronic conditions through inclusion of supplementary codes also varied greatly by condition. A very minimal increase in capture was seen for conditions such as chronic respiratory failure, which may rarely not meet the criteria as an additional diagnosis. While for conditions such as asthma, COPD, hypertension, obesity, and osteoporosis the capture in unlinked hospital data was more than 10-fold higher when supplementary codes were used for selection in addition to principal and additional diagnosis codes. This presents an opportunity for increased identification of these conditions which are prevalent in the Australian hospitalised population and most likely to fall outside the criteria for inclusion as an additional diagnosis.

Supplementary codes provide unique information about chronic conditions in the hospitalised population beyond the primary reason for being hospitalised. This is valuable for the measurement of multimorbidity in this population, and the evaluation and application of comorbidity indices applied to hospitalisation data. They also provide insights into the relationships between different health conditions, and hospital care being utilised by people living with specific chronic conditions. For example, the most common principal diagnosis for admissions with the supplementary codes of Depression (U79.3) and Schizophrenia (U79.2) was unspecified chest pain. While urinary tract infection was the most common principal diagnosis for admission with the supplementary codes for Dementia (including Alzheimer's

disease) (U79.1), Multiple sclerosis (U80.2), Spina bifida (U88.1) and Tetraplegia, paraplegia, diplegia, monoplegia and hemiplegia, due to any cause (U80.5). Within analysis of linked hospitalisations, supplementary codes can increase the identification or earlier identification of the cohort that have a condition. This is particularly beneficial for chronic conditions, such as dementia, that may not always require hospital care and, as such, would not be identified using only principal and additional diagnosis codes.

The influence of the underlying hospitalisation rates need to be considered in the measurement of chronic conditions using supplementary codes, particularly in unlinked hospitalisation data. The rate of admissions with a supplementary code in a population group is influenced by the underlying hospitalisation rate for that population and comparisons need to account for this unequal driver. This limitation can be partially moderated by using linked hospitalisations data and analysing at the person rather than separation level.

While supplementary codes considerably increase the capture of many chronic conditions in hospitalisation data compared to diagnosis codes alone, they may still underestimate the prevalence of these conditions in the hospitalised population. For example, only half of hospitalisations of people with a prior hospital diagnosis of cerebral palsy had the supplementary code of Cerebral palsy (U80.4) assigned, and this was the highest capture across the select chronic conditions. This again highlights the greater value of supplementary codes in analysis of linked hospitals data.

The supplementary codes for chronic conditions represent a significant change in time series when using hospitals data in population health reporting and this project provides evidence of the impact of chronic conditions to the health system.

Recommendations

- Incorporate the supplementary codes for chronic conditions in case definitions used for routine analyses using hospitals data.
 - Within AIHW, improve general understanding of the codes and their use.
 - Assess if there is a need to formally document the supplementary codes for chronic conditions within the metadata of the Admitted Patient Care National Minimum Data Set (APC NMDS).
 - Assess the impact of supplementary codes on performance indicators (for example, potentially preventable hospitalisations).
- Advocate for inclusion in admitted patient care data in linked data assets.
 - Where possible, increase reporting using linked person-based analyses.
- Continue time series impact reporting to assess changes with the implementation of ICD-10-AM Twelfth Edition (which commenced 1 July 2022).

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Glossary

Additional diagnosis: A condition or complaint either coexisting with the principal diagnosis or arising during the episode of admitted patient care, episode of residential care or attendance at a health-care establishment. METEOR identifier: 356590 (AIHW 2016b). The application of additional diagnosis in admitted patient care is guided by ACS 0002 (ACCD 2015b).

International Classification of Diseases (ICD): The World Health Organization's internationally accepted classification of diseases and related health conditions. The Twelfth Edition, Australian Modification (ICD-10-AM) is currently in use in Australian hospitals for admitted patients. Diagnosis, intervention and external cause data for 2019–20 was reported to the NHMD by all states and territories using the Eleventh Edition of International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification (ICD-10-AM) (ACCD 2019).

Principal diagnosis: The diagnosis established after study to be chiefly responsible for occasioning an episode of admitted patient care, an episode of residential care or an attendance at a health-care establishment. METEOR identifier: 269654 (AIHW 2016a). The application of principal diagnosis in admitted patient care is guided by ACS 0001 (ACCD 2015b).

Supplementary code: A supplementary code is assigned for chronic conditions that are part of the current health status on admission that do not meet criteria for inclusion as a principal or additional diagnosis on the patient's hospital record. The application of supplementary codes (u codes) in admitted patient care is guided by ACS 0003 (ACCD 2015b).

There is a discrete list of chronic conditions represented in the code range U78 to U88. These are:

U78.1 Obesity

U78.2 Cystic fibrosis

U79.1 Dementia (including Alzheimer's disease)

U79.2 Schizophrenia

U79.3 Depression

U79.4 Disorder of intellectual development
U80.1 Parkinson's disease
U80.2 Multiple sclerosis
U80.3 Epilepsy
U80.4 Cerebral palsy
U80.5 Tetraplegia, paraplegia, diplegia, monoplegia and hemiplegia, due to any cause
U82.1 Ischaemic heart disease
U82.2 Chronic heart failure
U82.3 Hypertension
U83.1 Emphysema, without mention of chronic obstructive pulmonary disease
U83.2 Chronic obstructive pulmonary disease
U83.3 Asthma, without mention of chronic obstructive pulmonary disease
U83.4 Bronchiectasis, without mention of cystic fibrosis
U83.5 Chronic respiratory failure
U84.1 Crohn's disease
U84.2 Ulcerative colitis
U84.3 Chronic liver failure
U86.1 Rheumatoid arthritis
U86.2 Arthritis and osteoarthritis
U86.3 Systemic lupus erythematosus
U86.4 Osteoporosis
U87.1 Chronic kidney disease, stage 3–5
U88.1 Spina bifida
U88.2 Down's syndrome

Abbreviations

ACS	Australian Coding Standard
APC	Admitted Patient Care
COPD	chronic obstructive pulmonary disease
ED	National Non-admitted Patient Emergency Department Care Database
ICD	International Classification of Diseases
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification
IHACPA	Independent Health and Aged Care Pricing Authority
MCD	Medicare Consumer Directory
NDLD	National Dementia Linked Dataset
NEC	not elsewhere classified
NHMD	National Hospital Morbidity Database
NMDS	National Minimum Data Set
NOS	not otherwise specified
PIC	Public Interest Certificate

Data sources

AIHW National Hospital Morbidity Database

The AIHW National Hospital Morbidity Database (NHMD) is a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals.

Reporting to the NHMD occurs at the end of a person's admitted episode of care (separation or hospitalisation) and is based on the clinical documentation for that hospitalisation.

The NHMD is based on the Admitted Patient Care National Minimum Data Set (APC NMDS). It records information on admitted patient care (hospitalisations) in essentially all hospitals in Australia, and includes demographic, administrative and length-of-stay data, as well as data on the diagnoses of the patients, the procedures they underwent in hospital and external causes of injury and poisoning.

The hospital separations data do not include episodes of non-admitted patient care given in outpatient clinics or emergency departments. Patients in these settings may be admitted subsequently, with the care provided to them as admitted patients being included in the NHMD.

The following care types were excluded when undertaking the analysis: 7.3 (newborn – unqualified days only), 9 (organ procurement – posthumous) and 10 (hospital boarder).

Further information about the NHMD can be found in [Admitted patient care NMDS 2019–20](#).

AIHW National Dementia Linked Dataset

The AIHW created the National Dementia Linked Dataset (NDLD) by linking the following data sets:

- Medicare Consumer Directory (MCD) – linkage of the MCD also allowed for the inclusion of the Pharmaceutical Benefits Scheme, which includes the Repatriation Pharmaceutical Benefits Scheme
- National Aged Care Data Clearinghouse, specifically the Home Care Packages Program, Aged Care Assessment Program and Aged Care Funding Instrument
- National Death Index
- Admitted Patient Care (APC)
- National Non-admitted Patient Emergency Department Care Database (ED).

The NDLD contains data from 6 of the 8 jurisdictions, with data from Western Australian and the Northern Territory not included. Name-based probabilistic linkage was used to link data sets. The linkage variables included full name, date of birth, sex and address (where available). People aged 40 and over as of 30 June 2018 were included.

The creation of the NDLD required the AIHW to seek and obtain the following:

- ethics approval through the AIHW Ethics Committee. Approval was received on 1 October 2019 (reference number: EO2019/4/1097).
- Public Interest Certificate (PIC) through the Department of Health Data Request Assessment Panel. PIC received on 15 January 2020.

- state and territory approvals for the use of APC and ED data. Approval from all jurisdictions was sought in January 2020. As of August 2020, approval was received from New South Wales, Tasmania and the Australian Capital Territory; conditional approval was received from Victoria, Queensland, South Australia and the Northern Territory; and Western Australia did not approve.

Only admitted patient care data and demographic information from Medicare data were accessed and used for this project.

The following additional data-cleaning steps were taken:

- Age groups used in the analysis were assigned based on age on 1 July 2016.
- Where an individual (as identified by unique ID) had more than one date of birth recorded:

If a person had 2 different dates of birth recorded, the rules below were applied:

1. If the difference between the 2 dates of birth was less than or equal to 2 years, then the earliest record was kept.
2. If the difference between the 2 dates of birth was greater than 2 years, then this person was excluded from the analyses.

If a person had 3 different dates of birth recorded, the following rules were applied:

1. If 2 out of 3 records for a person match exactly, then one of the matching records was kept.
2. If all 3 records have differing month of birth but 2 out of 3 records had the same year of birth, the earliest record out of the pair of records with the same year of birth was selected.
3. If none of the above conditions are met, then this person was excluded from the analyses.

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In 2015, a number of supplementary codes for chronic conditions were implemented in admitted patient care data in Australia. This report evaluates the use of the supplementary codes for the purpose of population health monitoring in Australia and provides evidence for including these codes in future analysis and linked data assets.

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