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Data update: Short-term health impacts of the 2019–20 Australian bushfires

Web report | Last updated: **12 Nov 2021** | Topic: Environment & health

About

This web report is an update to the 2020 report, Australian bushfires 2019–20: exploring the short-term health impacts. This report provides additional information on the short-term health impacts of the 2019–20 bushfires through the analysis of admitted patient hospitalisations, emergency department presentations and use of bushfire-specific mental health Medicare-subsidised services in Australia, as well as changes in the frequency of selected physical activities in the Australian Capital Territory.

Cat. no: PHE 293

Findings from this report:

- Increases in hospitalisations for burns in some areas coincided with fire activity
- There was an increase in mental health-related service use in some areas associated with fire activity
- Physical activity data for the ACT show a decrease in activities like riding and running when smoke pollution was high
- Hospitalisations and ED presentations for respiratory illness increased with poor air quality caused by bushfire smoke

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Summary

The bushfire season in 2019–20 saw fires sweep across Australia on a scale previously unrecorded. Thirty-three people lost their lives, more than 3,000 houses were destroyed, and millions of hectares of land burnt (Parliament of Australia 2020).

This is a data update to the report, Australian bushfires 2019–20: exploring the short-term health impacts. It includes additional information on the short-term health impacts of the 2019–20 bushfires through analysis of admitted patient hospitalisations, emergency department presentations beyond New South Wales, use of bushfire-specific mental health Medicare-subsidised services, and changes in selected physical activities.

There were increases in admitted patient hospitalisations and emergency department presentations for respiratory conditions, such as asthma and chronic obstructive pulmonary disease (COPD), associated with increased bushfire activity. Changes in hospitalisation rates for cardiovascular conditions, mental health conditions and burns, could be observed at specific times associated with bushfire activity in some locations, although further analysis is required to ascertain the extent to which bushfire and/or smoke were associated with increases in these conditions. Analysis of Medicare Benefits Schedule data also shows increases in mental health service use in some areas, coinciding with, or following, bushfire activity.

Data from physical activity tracking devices revealed a decrease in riding (bicycling), and running, walking, or hiking trips in the Australian Capital Territory, compared with the previous year, in association with air pollution from bushfires.

Understanding the immediate and short-term physical and mental health impacts of bushfires can help to ensure health services are sufficiently equipped to deal with them in any future bushfire event, as well as identifying areas that could benefit from further research.

References

Parliament of Australia 2020. 2019–20 bushfires—frequently asked questions: a quick guide - external site opens in new window. Canberra: Parliament of Australia. Viewed 10 March 2020.

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Introduction

As the effects of climate change become increasingly apparent, Australia is seeing an increase in the intensity and frequency of extreme fire weather, a trend that projections suggest will continue to rise (BoM & CSIRO 2018).

Prolonged drought and the hottest and driest year on record formed the backdrop for the 2019–20 bushfire season (BoM 2020). Fires started during the winter of 2019 and continued to burn until the beginning of March 2020, burning millions of hectares of land, resulting in:

- the death of 33 people as a direct result of the fires
- more than 3,000 houses destroyed
- hundreds of communities being threatened or displaced
- burning of the habitat of an estimate of almost 3 billion vertebrate animals
- billions of dollars in damage (Royal Commission into National Natural Disaster Arrangements 2020).

Particulate matter of diameter 2.5 micrometres or smaller (PM2.5) is associated with a range of health impacts when these particles are in high enough concentration (See Chapter 2 of Australian bushfires 2019–20: exploring the short-term health impacts for further information on air pollution and health). Arriagada and others (2020) found that, within their study area in eastern Australia, at least one monitoring station recorded a PM2.5 concentration exceeding the 95th percentile of historical daily mean values on 125 of the 133 days between 1 October 2019 and 10 February 2020. It should be noted that extreme heat often co-occurs with bushfire and has significant impacts on a range of health conditions and mortality.

During the first half of January, population-weighted PM2.5 levels in eastern Australia were substantially above the national air quality 24-hour PM2.5 standard of 25 micrograms per cubic metre (μg/m^3) of air, peaking at 98.5 μg/m^3 on 14 January 2020, which is more than 14 times the historical population weighted mean 24 hour PM2.5 value of 6.8μg/m^3 (Arriagada et al. 2020).

Bushfires and bushfire smoke are associated with a range of health conditions and health impacts, including loss of life. Public health is affected by bushfires through smoke pollution, impacts on water supplies and destruction of major infrastructure, such as roads and powerlines (Johnston 2009). The impacts of bushfire smoke are the most widespread. Johnston and colleagues (2020) estimated the smoke-related health costs of the 2019–20 bushfire season, due to premature deaths (all causes), hospital admissions for cardiovascular diseases and respiratory diseases, and emergency department attendances for asthma, to be $1.95 billion. For further information on the health impacts associated with bushfire and bushfire smoke pollution, see Australian bushfires 2019–20: exploring the short-term health impacts.

What is included in this report?

This report is an online update to the Australian Institute of Health and Welfare (AIHW) report released in November 2020, Australian bushfires 2019–20: exploring the short-term health impacts. The original report provided a detailed background and analysis of data relating to New South Wales Emergency Department presentations (preliminary data), pharmaceutical prescriptions and sales, general practitioner visits and use of bushfire-specific mental health Medicare Benefits Scheme items.

This update includes national data relating to admitted patient hospitalisations, emergency department presentations (all jurisdictions), use of Medicare-subsidised mental health services, and outdoor physical activity for the Australian Capital Territory based on activity tracking data. With the exception of some mental health data, all analyses cover the 2019–20 bushfire season (1 September 2019 to 29 February 2020 for the purposes of this report). For additional information on the geographical units of analysis used in this report, see Technical notes.

The AIHW holds perinatal health data within the National Perinatal Data Collection. At the time of writing, this data collection included data to the end of 2019. As the smoke exposure that occurred in the first quarter of 2020 was deemed critical in presenting a comprehensive picture of any effect of the 2019–20 bushfire season on perinatal outcomes, these are not presented in the current report. Analysis of perinatal data once 2020 data become available could provide further insight into the relationship between bushfire smoke exposure and perinatal outcomes.

References

Arriagada NB, Palmer AJ, Bowman DM, Morgan GG, Jalaludin BB, Johnston FH 2020. Unprecedented smoke-related health burden associated with the 2019–20 bushfires in eastern Australia. Medical Journal of Australia 213(6): 282–283.

BoM (Bureau of Meteorology) 2020. Annual climate statement 2019 - external site opens in new window. Melbourne: BoM. Viewed 5 March 2021.

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Johnston FH 2009. Bushfires and human health in a changing environment. Australian Family Physician 38(9).

Johnston FH, Borchers Arriagada N, Morgan GG, Jalaludin B, Palmer AJ, Williamson GJ, et al. 2020. Unprecedented health costs of smoke-related PM2.5 from the 2019–20 Australian megafires. Nature Sustainability 1–6.

Royal Commission into National Natural Disaster Arrangements 2020. Report - external site opens in new window. Canberra: Commonwealth of Australia. Viewed 10 March 2021.

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Admitted patients (hospitalisations)

Admitted patients are patients who undergo a public or private hospital's formal admission process to receive treatment and/or care. The types of care provided include surgical care, medical care, intensive care, newborn care, rehabilitation care, palliative care, and mental health care.

Data used in this section refer to the 2019–20 financial year, and the average of the 2014–15 to 2018–19 financial years. Data are sourced from the National Hospital Morbidity Database (NHMD), which is a compilation of episode level records from admitted patient morbidity data collection systems in Australian hospitals.

When considering numbers and rates reported in this section, it should be noted that variations in practices and policies may lead to variation among providers in the number of admissions for some conditions. Therefore, comparisons of hospitalisations across jurisdictions should be considered with caution. Additionally, while care has been taken when choosing periods for comparison, changes in International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM)/Australian Classification of Health Interventions (ACHI) classifications and the associated Australian Coding Standards may affect the comparability of the data over time. For more information on the NHMD, see Technical notes.

The number and rates of admissions, henceforth referred to as hospitalisations, for conditions related to air pollution and bushfire smoke are presented in the following section and include:

- Respiratory conditions
- Asthma
- Chronic obstructive pulmonary disease (COPD) with acute exacerbation
- Breathing difficulties (abnormalities of breathing)
- Heart, stroke, and vascular conditions
- Chest pain
- Mental health-related conditions
- Burns.

While not presented in this section, hospitalisations for dehydration are also included in the supplementary tables (tables S1 and S2).

Where possible, hospitalisations are presented by:

- state and territory
- Statistical Area Level 4 (SA4).

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Admitted patients (hospitalisations)

Because of the link between air pollution from bushfire smoke and respiratory conditions (see Australian bushfires 2019–20: exploring the short-term health impacts), hospitalisations with a principal diagnosis categorised as a respiratory condition (ICD-10-AM codes J00–J99) were analysed.

It should be noted that respiratory conditions, particularly in the earlier part of the bushfire season, may be largely caused or exacerbated by factors other than bushfire smoke (for example, pollen, dust storms, respiratory infections and random variation) which may vary from year to year.

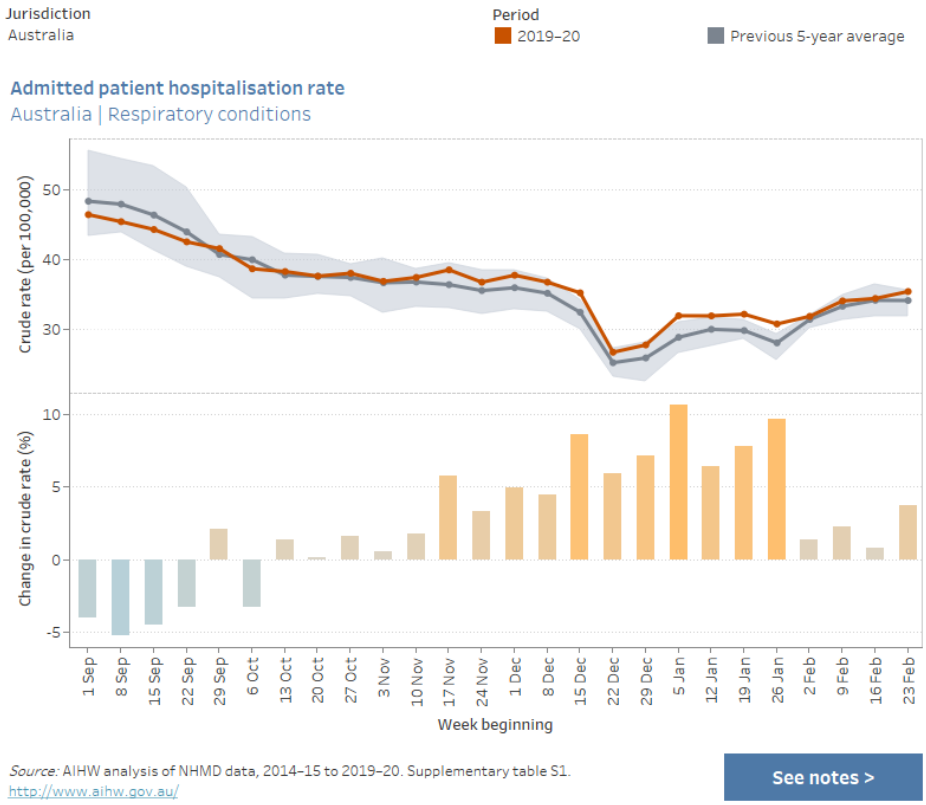
To explore changes in hospitalisations, data from each week in the 2019–20 bushfire season were compared with a 5-year average (2014–15 to 2018–19) of the same week. Increases in hospitalisation rates for respiratory conditions coincided with weeks with increased bushfire activity. This was largely driven by increases in more populous states (New South Wales, Victoria and Queensland) which sustained heavy impacts from bushfire.

Nationally, compared with the previous 5-year average, the hospitalisation rate for respiratory conditions was particularly high during January 2020. The largest increase in the hospitalisation rate was 11% in the week beginning 5 January 2020—32 per 100,000 persons (about 8,100 hospitalisations), compared with the previous 5-year average of 29 per 100,000 (an average of about 7,000 hospitalisations).

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S1).

Admitted patient hospitalisation rate, by jurisdiction, respiratory conditions (ICD-10-AM codes J00–J99), weeks in 2019–20 bushfire season relative to previous 5-year average

This combined chart shows the crude rate of admitted patient hospitalisations (per 100,000 persons) for respiratory conditions for the periods 2019–20 and the previous 5-year average, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous 5-year average, the hospitalisation rate for respiratory conditions was particularly high during January 2020. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in the hospitalisation rate for respiratory conditions coinciding with periods of significant fire activity or air pollution include:

- a 14% increase in the week beginning 5 January 2020 for Victorian residents—31 per 100,000 persons (about 2,000 hospitalisations), compared with an average of 27 per 100,000 in the previous 5-year period (an average of about 1,700 hospitalisations)
- a 20% increase in the week beginning 15 December 2019 for South Australian residents—41 per 100,000 persons (about 720 hospitalisations), compared with an average of 34 per 100,000 in the previous 5-year period (an average of about 590 hospitalisations)
- a 52% increase in the week beginning 5 January 2020 for Australian Capital Territory residents—32 per 100,000 persons (about 135 hospitalisations), compared with an average of 21 per 100,000 in the previous 5-year period (an average of 86 hospitalisations).

At the level of Statistical Area Level 4 (SA4), examples of large increases in the hospitalisation rate for respiratory conditions coinciding with periods of significant fire activity or air pollution include:

- a 67% increase in the week beginning 5 January 2020 for Sydney – Sutherland residents—34 per 100,000 persons (78 hospitalisations), compared with an average of 20 per 100,000 in the previous 5-year period (an average of 46 hospitalisations)
- a 64% increase in the week beginning 22 December 2019 for Bendigo residents—44 per 100,000 persons (72 hospitalisations), compared with an average of 27 per 100,000 in the previous 5-year period (an average of 42 hospitalisations)
- a 71% increase in the week beginning 17 November 2019 for Queensland – Outback residents—84 per 100,000 persons (69 hospitalisations), compared with an average of 49 per 100,000 in the previous 5-year period (an average of 41 hospitalisations).

For data by Statistical Area Level 4 (SA4), see Supplementary table S2.

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Admitted patients (hospitalisations)

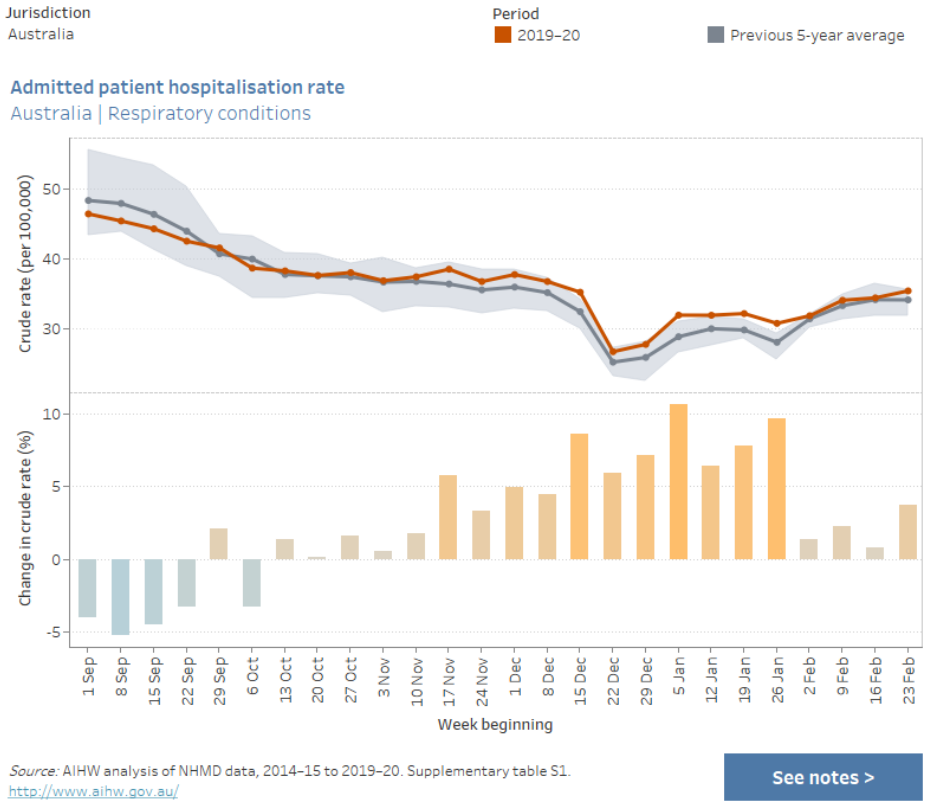
While asthma was included in the analysis of all respiratory conditions, hospitalisations with a principal diagnosis of asthma (ICD-10-AM codes J45—J46) were analysed separately, due to the known association between air pollution from bushfires and asthma (see Australian bushfires 2019–20: exploring the short-term health impacts).

Nationally, there were increases in the hospitalisation rate for asthma coinciding with increased bushfire activity during the 2019—20 bushfire season. The greatest increase was 36% in the week beginning 12 January 2020—2.4 per 100,000 persons (about 600 hospitalisations), compared with the previous 5-year average of 1.7 per 100,000 (an average of about 420 hospitalisations).

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S1).

Admitted patient hospitalisation rate, by jurisdiction, asthma (ICD-10-AM codes J45–J46), weeks in 2019–20 bushfire season relative to previous 5-year average

This combined chart shows the crude rate of admitted patient hospitalisations (per 100,000 persons) for asthma for the periods 2019–20 and the previous 5-year average, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous 5-year average, the greatest increase in the hospitalisation rate was 36% in the week beginning 12 January 2020. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in the hospitalisation rate for asthma coinciding with periods of significant fire activity or air pollution include:

- a 25% increase in the week beginning 8 December 2019 for New South Wales residents—3.1 per 100,000 persons (about 255 hospitalisations), compared with an average of 2.5 per 100,000 in the previous 5-year period (an average of about 195 hospitalisations). There was also a 25% increase in the rate of hospitalisations in the week beginning 5 January 2020
- a 95% increase in the week beginning 12 January 2020 for Victorian residents—3.4 per 100,000 persons (about 220 hospitalisations), compared with an average of 1.7 per 100,000 in the previous 5-year period (an average of about 105 hospitalisations)

- a 36% increase in the week beginning 10 November 2019 for Queensland residents—3.9 per 100,000 persons (about 200 hospitalisations), compared with an average of 2.9 per 100,000 in the previous 5-year period (an average of about 140 hospitalisations). This coincided with a period of thick smoke from fires in northern New South Wales, which covered south-east Queensland and triggered a public health warning to stay indoors (ABC News 2019).

Numbers of hospitalisations for asthma at the level of Statistical Area Level 4 (SA4) were generally small and should be considered with caution. However, some notable examples of increases in the hospitalisation rate, coinciding with periods of significant fire activity or air pollution include:

- a 75% increase in the week beginning 10 November 2019 for Newcastle and Lake Macquarie residents—5.3 per 100,000 persons (20 hospitalisations), compared with an average of 3.0 per 100,000 in the previous 5-year period (an average of 11 hospitalisations)
- about a 135% increase in the week beginning 12 January 2020 for Melbourne – West residents—4.4 per 100,000 persons (37 hospitalisations), compared with an average of 1.9 per 100,000 in the previous 5-year period (an average of 14 hospitalisations)
- a 94% increase in the week beginning 24 November 2019 for Ipswich residents—6.1 per 100,000 persons (22 hospitalisations), compared with an average of 3.1 per 100,000 in the previous 5-year period (an average of 10 hospitalisations).

For data by Statistical Area Level 4 (SA4), see Supplementary table S2.

References

ABC (Australian Broadcasting Corporation) News 2019. Queensland fire emergency leaves Brisbane's air quality worse than Beijing - external site opens in new window. Viewed 15 June 2020.

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Admitted patients (hospitalisations)

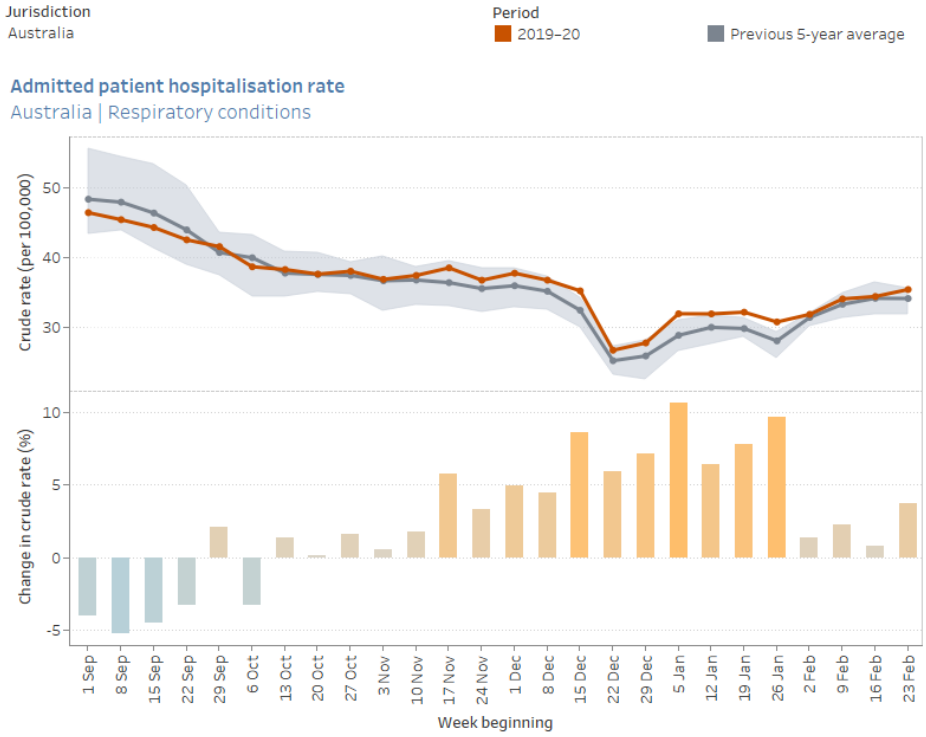
Chronic obstructive pulmonary disease with acute exacerbation, henceforth referred to as COPD, has been found to increase in association with air pollution from bushfire smoke (see Australian bushfires 2019–20: exploring the short-term health impacts); therefore, while COPD was included within all respiratory conditions, hospitalisations with a principal diagnosis of COPD with acute exacerbation (ICD-10-AM code J44.1) were also analysed separately. The current chapter presents the hospitalisation rate of COPD for all ages. While COPD can be reported in younger age groups, the diagnosis of the condition is more certain for those aged 45 and over.

Nationally, compared with the previous 5-year average, the hospitalisation rate for COPD increased in the period between the end of October 2019 and mid-February 2020. The greatest increases coincided with periods of bushfire activity. The largest increase was 30% in the week beginning 1 December 2019—2.0 per 100,000 persons (about 510 hospitalisations), compared with the previous 5-year average of 1.6 per 100,000 (an average of about 375 hospitalisations).

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S1).

Admitted patient hospitalisation rate, by jurisdiction, COPD (ICD-10-AM code J44.1), weeks in 2019–20 bushfire season relative to previous 5-year average

This combined chart shows the crude rate of admitted patient hospitalisations (per 100,000 persons) for Chronic obstructive pulmonary disease (COPD) with acute exacerbation for the periods 2019–20 and the previous 5-year average, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous 5-year average, the hospitalisation rate increased in the period between the end of October 2019 and mid-February 2020. There were also variations at the jurisdictional level.



Source: AIHW analysis of NHMD data, 2014–15 to 2019–20. Supplementary table S1.
http://www.aihw.gov.au/

See notes >

At the state and territory level, examples of large increases in the hospitalisation rate for COPD coinciding with periods of significant fire activity or air pollution include:

- a 57% increase in the week beginning 5 January 2020 for New South Wales residents—2.3 per 100,000 persons (about 185 hospitalisations), compared with an average of 1.4 per 100,000 in the previous 5-year period (an average of about 110 hospitalisations)
- a 50% increase in the week beginning 5 January 2020 for Victorian residents—2.0 per 100,000 persons (130 hospitalisations), compared with an average of 1.3 per 100,000 in the previous 5-year period (an average of 81 hospitalisations).

Because the numbers of COPD hospitalisations at the level of Statistical Area Level 4 (SA4) were generally small, data are not presented at this level.

For data by Statistical Area Level 4 (SA4), see Supplementary table S2.

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Admitted patients (hospitalisations)

Because of the association between air pollution from bushfires and respiratory conditions, hospitalisations with a principal diagnosis of abnormalities of breathing (ICD-10-AM codes R06.0–R06.8), henceforth referred to as breathing difficulties, were analysed.

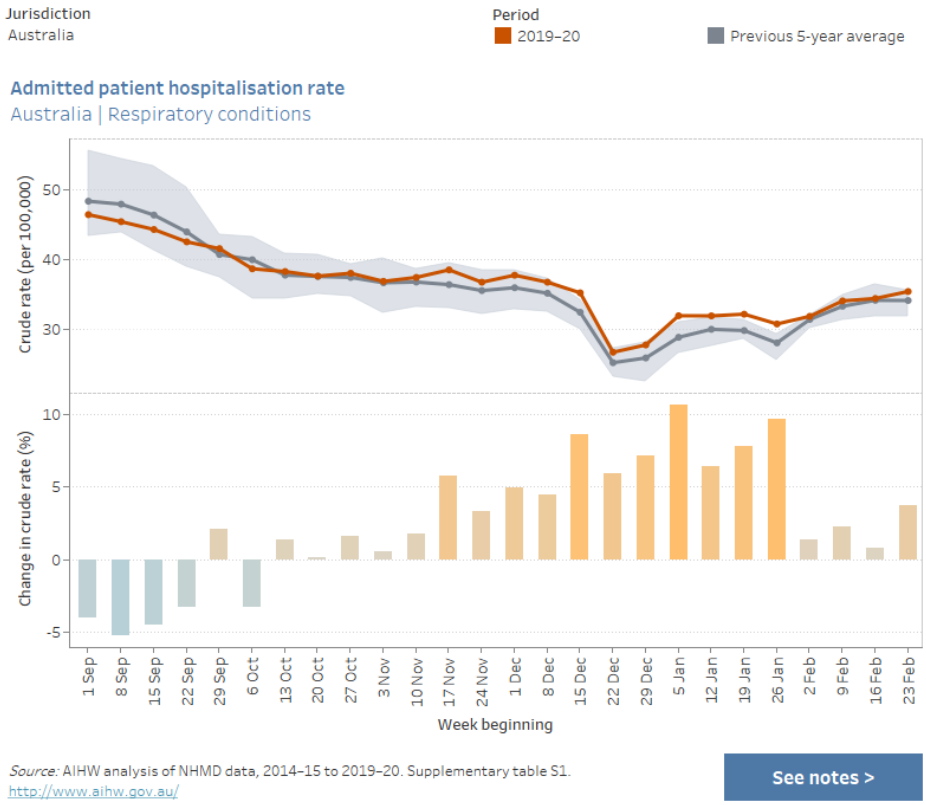
Analyses did not identify a consistent pattern in relation to impacts from bushfires and hospitalisations due to breathing difficulties.

Nationally, there were increases in the hospitalisation rate for breathing difficulties across each week of the 2019—20 bushfire season. The greatest increase during times of increased fires, was 41% in the week beginning 19 January 2020—3.5 per 100,000 persons (about 890 hospitalisations), compared with the previous 5-year average of 2.5 per 100,000 (an average of 610 hospitalisations).

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S1).

Admitted patient hospitalisation rate, by jurisdiction, breathing difficulties (ICD-10-AM codes R06.0–R06.8), weeks in 2019–20 bushfire season relative to previous 5-year average

This combined chart shows the crude rate of admitted patient hospitalisations (per 100,000 persons) for breathing difficulties for the periods 2019–20 and the previous 5-year average, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous 5-year average, there were increases in the hospitalisation rate across each week of the 2019—20 bushfire season. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in the hospitalisation rate for breathing difficulties coinciding with periods of significant fire activity or air pollution include:

- a 53% increase in the week beginning 19 January 2020 for Victorian residents—4.5 per 100,000 persons (about 295 hospitalisations), compared with an average of 2.9 per 100,000 in the previous 5-year period (an average of about 185 hospitalisations). Extremely high PM2.5 levels were recorded across the state in the week before (see Arriagada et al. 2020; supplementary material).

- a 99% increase in the week beginning 29 December 2019 for South Australian residents—2.1 per 100,000 persons (37 hospitalisations), compared with an average of 1.1 per 100,000 in the previous 5-year period (an average of 18 hospitalisations). This coincided with multiple new fires starting on Kangaroo Island, the Eyre Peninsula and the Lower South East (Government of South Australia 2020).

Because the numbers of hospitalisations for breathing difficulties at the level of Statistical Area Level 4 (SA4) were generally small, data are not presented at this level.

For data by Statistical Area Level 4 (SA4), see Supplementary table S2.

References

Arriagada NB, Palmer AJ, Bowman DM, Morgan GG, Jalaludin BB & Johnston FH 2020. Unprecedented smoke-related health burden associated with the 2019–20 bushfires in eastern Australia. Medical Journal of Australia 213(6): 282–3.

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Admitted patients (hospitalisations)

On this page

- Selected heart conditions
- Heart attack (acute myocardial infarction)
- Cerebrovascular conditions

While the evidence for an association between air pollution from bushfire smoke and heart, stroke and vascular conditions (also known as cardiovascular conditions, which includes events such as heart attack and stroke) is not as comprehensive as for respiratory conditions, several studies have found associations (see Australian bushfires 2019–20: exploring the short-term health impacts).

Analyses did not identify a consistent pattern in relation to impacts from bushfires and cardiovascular hospitalisations; however, there were examples of increases in hospitalisations for cardiovascular conditions coinciding with, or following, periods of poor air quality or fire activity. There were also some decreases in some jurisdictions and periods of the bushfire season, for particular conditions. The results suggest that further investigation is warranted regarding the extent to which these increases can be attributed to the effects of bushfire smoke pollution and whether there is a lag between exposure to air pollution and hospitalisation for cardiovascular conditions, as has been reported in the literature for some cardiovascular conditions (Walter et al. 2020). It should also be noted that other factors such as extreme heat (Loughnan et al. 2010), which often co-occurs with bushfire, may also lead to increases in hospitalisations.

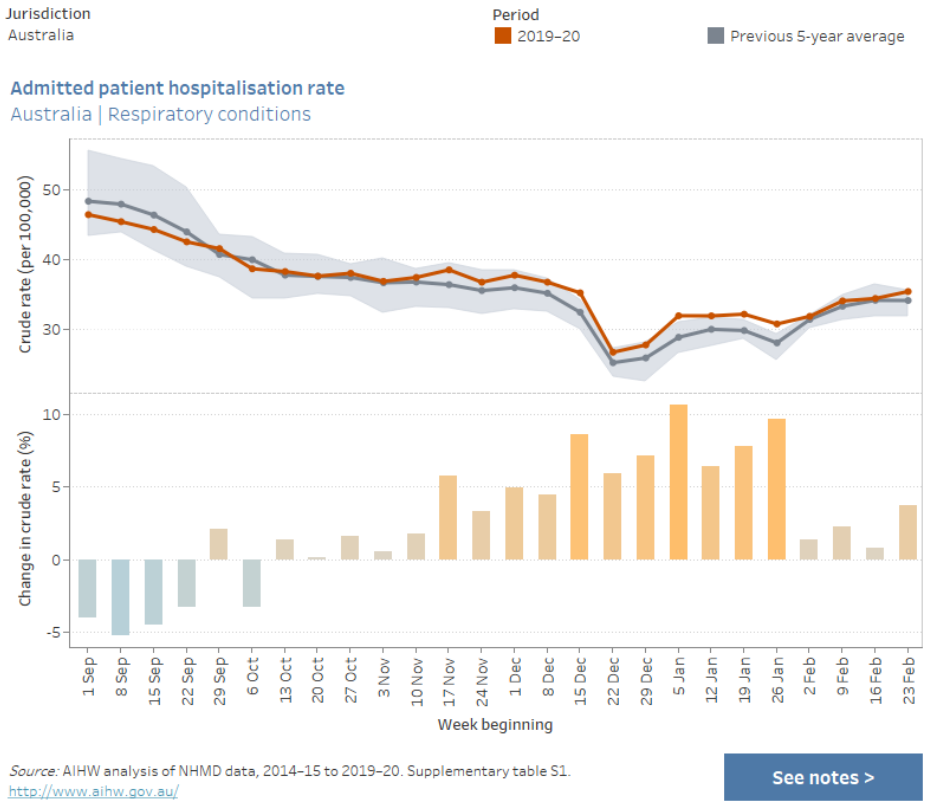
Selected heart conditions

Nationally, there were increases in the hospitalisation rate for selected heart conditions (ICD-10-AM codes I10–I15, I20–I25, I26–I28 and I30–I52), coinciding with increased bushfire activity during the 2019–20 bushfire season, particularly in January and February 2020. The greatest increase in the hospitalisation rate was 8.8% in the week beginning 19 January 2020—31 per 100,000 persons (about 7,900 hospitalisations), compared with the previous 5-year average of 29 per 100,000 (an average of about 6,900 hospitalisations).

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S1).

Admitted patient hospitalisation rate, by jurisdiction, selected heart conditions (ICD-10-AM codes I10–I15, I20–I25, I26–I28 and I30–I52), weeks in 2019–20 bushfire season relative to previous 5-year average

This combined chart shows the crude rate of admitted patient hospitalisations (per 100,000 persons) for selected heart conditions for the periods 2019–20 and the previous 5-year average, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, there were increases in the hospitalisation rate, coinciding with increased bushfire activity during the 2019–20 bushfire season, particularly in January and February 2020. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in the hospitalisation rate for selected heart conditions coinciding with periods of significant fire activity or air pollution include:

- a 7.6% increase in the week beginning 19 January 2020 for New South Wales residents—30 per 100,000 persons (about 2,400 hospitalisations), compared with an average of 28 per 100,000 in the previous 5-year period (an average of about 2,200 hospitalisations)
- an 11% increase in the week beginning 5 January 2020 for Victorian residents—26 per 100,000 persons (about 1,700 hospitalisations), compared with an average of 24 per 100,000 in the previous 5-year period (an average of about 1,500 hospitalisations)
- a 52% increase in the week beginning 26 January 2020 for Australian Capital Territory residents—29 per 100,000 persons (about 125 hospitalisations), compared with an average of 19 per 100,000 (an average of 77 hospitalisations).

At the level of Statistical Area Level 4 (SA4), examples of large increases in the hospitalisation rate for selected heart conditions coinciding with periods of significant fire activity or air pollution include:

- a 63% increase in the week beginning 5 January 2020 for Far West and Orana residents—49 per 100,000 persons (57 hospitalisations), compared with an average of 30 per 100,000 in the previous 5-year period (an average of 35 hospitalisations). Much of the state experienced high levels of air pollution from bushfires during this week
- a 59% increase in the week beginning 12 January 2020 (the week when Victoria experienced its worst air quality) for Bendigo residents—50 per 100,000 persons (81 hospitalisations), compared with an average of 31 per 100,000 in the previous 5-year period (an average of 49 hospitalisations).

Further investigation is required to determine whether these increases are likely to be caused primarily by air pollution or other factors, particularly heat, and whether there are interactions between these factors.

For data by Statistical Area Level 4 (SA4), see Supplementary table S2.

Heart attack (acute myocardial infarction)

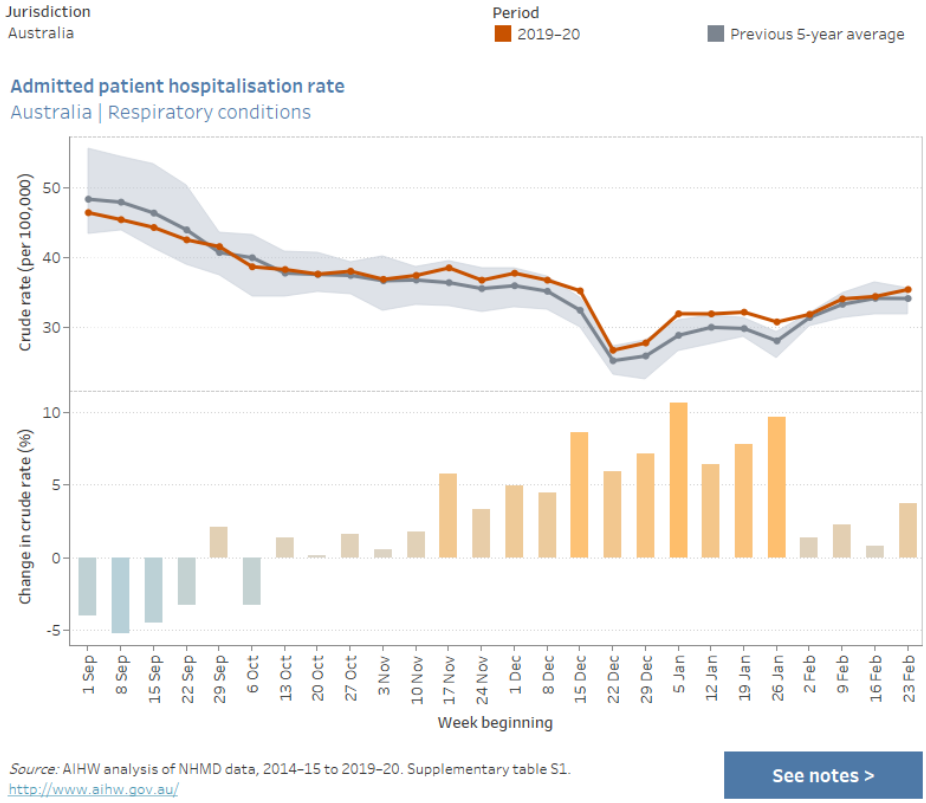
Among hospitalisations for heart conditions, hospitalisations for acute myocardial infarction (AMI; ICD-10-AM code I21), commonly known as heart attack, were also analysed separately as research has found specific associations with smoke pollution from bushfire (see Australian bushfires 2019–20: exploring the short-term health impacts). Note that hospitalisations for AMI are also included within selected heart conditions.

Nationally, there were increases in the hospitalisation rate for AMI coinciding with increased bushfire activity during the 2019–20 bushfire season. The greatest increase was 9.7% in the week beginning 19 January 2020—4.4 per 100,000 persons (about 1,100 hospitalisations), compared with the previous 5-year average of 4.0 per 100,000 (an average of 980 hospitalisations). The next greatest increase was 7.4% during the week beginning 5 January 2020.

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S1).

Admitted patient hospitalisation rate, by jurisdiction, AMI (ICD-10-AM code I21), weeks in 2019–20 bushfire season relative to previous 5-year average

This combined chart shows the crude rate of admitted patient hospitalisations (per 100,000 persons) for acute myocardial infarction for the periods 2019–20 and the previous 5-year average, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, there were increases in the hospitalisation rate, coinciding with increased bushfire activity during the 2019—20 bushfire season. The greatest increase was 9.7% in the week beginning 19 January 2020. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in the hospitalisation rate for AMI coinciding with periods of significant fire activity or air pollution include:

- a 20% increase in the week beginning 5 January 2020 for Victorian residents—4.3 per 100,000 persons (about 280 hospitalisations), compared with an average of 3.6 per 100,000 in the previous 5-year period (an average of 220 hospitalisations)
- a 45% increase in the week beginning 5 January 2020 for Western Australian residents—5.4 per 100,000 persons (about 140 hospitalisations), compared with an average of 3.7 per 100,000 in the previous 5-year period (an average of 95 hospitalisations).

Numbers of hospitalisations for AMI at the level of Statistical Area Level 4 (SA4) were generally small and should be considered with caution. However, examples of large increases in the hospitalisation rate for AMI coinciding with periods of significant fire activity or air pollution include:

- a 96% increase in the week beginning 1 December 2019 for Central Coast residents—12 per 100,000 persons (42 hospitalisations), compared with an average of 6.2 per 100,000 in the previous 5-year period (an average of 21 hospitalisations). An increase of about 115% also occurred in the week beginning 8 December 2019. The maximum hourly PM2.5 values during these weeks at Wyong, on the Central Coast of New South Wales were 359 $\mu g/m^3$ and 161 $\mu g/m^3$ respectively

- a 90% increase in the week beginning 5 January 2020 for Perth – North West residents—6.5 per 100,000 persons (37 hospitalisations), compared with an average of 3.4 per 100,000 in the previous 5-year period (an average of 19 hospitalisations). A similar increase also occurred in Perth – North East during this week. During this time, an emergency warning was in place as fires burned to the north of Perth, threatening a number of communities (ABC News 2020).

For data by Statistical Area Level 4 (SA4), see Supplementary table S2.

Cerebrovascular conditions

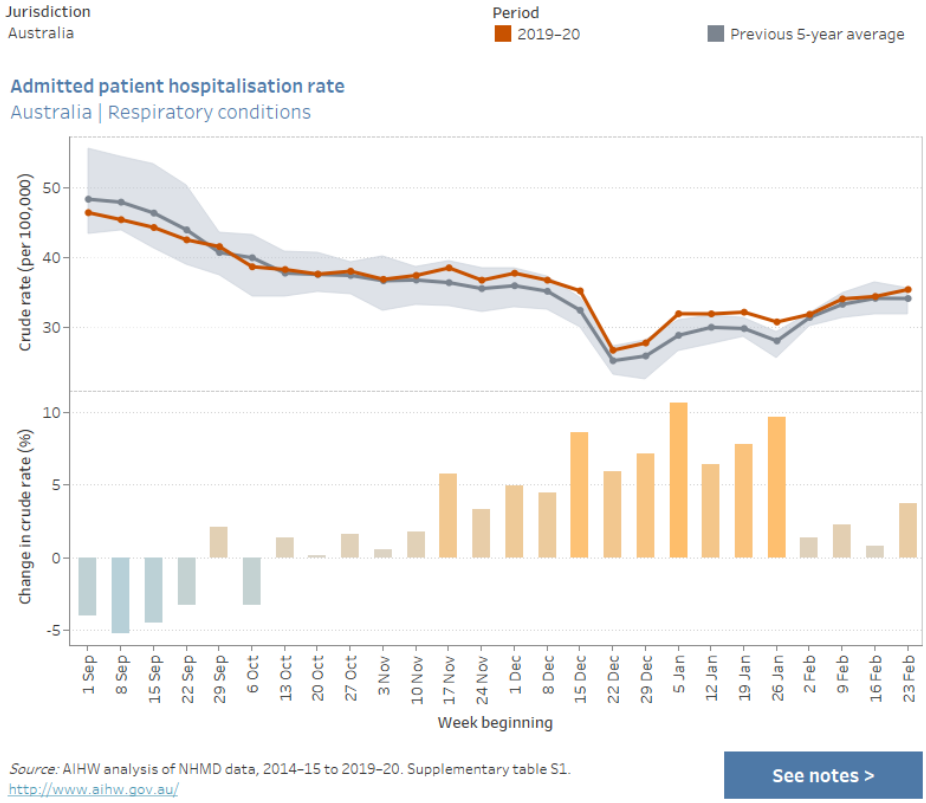
Some evidence suggests that exposure to bushfire smoke may increase the incidence of cerebrovascular conditions (ICD-10-AM codes I60–I69), including stroke (Edwards et al. 2018), therefore, hospitalisations for cerebrovascular conditions were analysed. There were large variations in the rate of hospitalisations for cerebrovascular conditions in the previous 5 years, and it was not possible to identify a consistent pattern between air quality and hospitalisations for cerebrovascular conditions. However, there did appear to be some notable increases in the hospitalisations rate coinciding with bushfire activity during the 2019–20 bushfire season in some jurisdictions.

Nationally, the largest increase in the hospitalisation rate was 16% in the week beginning 17 November 2019—6.5 per 100,000 persons (1,600 hospitalisations), compared with the previous 5-year average of 5.6 per 100,000 (an average of about 1,400 hospitalisations). A similar increase was observed in the week beginning 10 November 2019.

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S1).

Admitted patient hospitalisation rate, by jurisdiction, cerebrovascular conditions (ICD-10-AM codes I60–I69), weeks in 2019–20 bushfire season relative to previous 5-year average

This combined chart shows the crude rate of admitted patient hospitalisations (per 100,000 persons) for cerebrovascular conditions for the periods 2019–20 and the previous 5-year average, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared to the previous 5-year average, the largest increase in the hospitalisation rate was 16% in the week beginning 17 November 2019. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in hospitalisation rate for cerebrovascular conditions coinciding with periods of significant fire activity or air pollution include:

- an 8.8% increase in the week beginning 12 January 2020 for Victorian residents—4.7 per 100,000 persons (about 310 hospitalisations), compared with an average of 4.3 per 100,000 in the previous 5-year period (an average of 265 hospitalisations). However, there were also increases during times when air pollution was not particularly high (such as a 17% increase in Victoria in the week beginning 20 October 2019). This suggests that further analysis is needed to establish the extent to which increases in cerebrovascular hospitalisations can be attributed to the effects of bushfires (such as air pollution)
- a 34% increase in the week beginning 17 November 2019 for Queensland residents—8.4 per 100,000 persons (about 425 hospitalisations), compared with an average of 6.2 per 100,000 in the previous 5-year period (an average of about 305 hospitalisations). This coincided with a period of poor air quality in south-eastern Queensland around this time and the preceding days (ABC 2019; Arriagada et al. 2020; supplementary material).

Numbers of hospitalisations for cerebrovascular conditions at the level of Statistical Area Level 4 (SA4) were generally small and should be considered with caution. However, some notable examples of increases in the hospitalisation rate, coinciding with, or following periods of significant fire activity or air pollution include:

- an 85% increase in the week beginning 5 January 2020 for Newcastle and Lake Macquarie residents—12 per 100,000 persons (46 hospitalisations), compared with an average of 6.6 per 100,000 in the previous 5-year period (an average of 24 hospitalisations)
- an 83% increase in the week beginning 26 January 2020 for La Trobe – Gippsland residents—9.4 per 100,000 persons (27 hospitalisations), compared with an average of 5.1 per 100,000 in the previous 5-year period (an average of 14 hospitalisations).

For data by Statistical Area Level 4 (SA4), see Supplementary table S2.

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Admitted patients (hospitalisations)

Hospitalisations with a principal diagnosis of chest pain (ICD-10-AM codes R07.1, R07.3, and R07.4) were analysed.

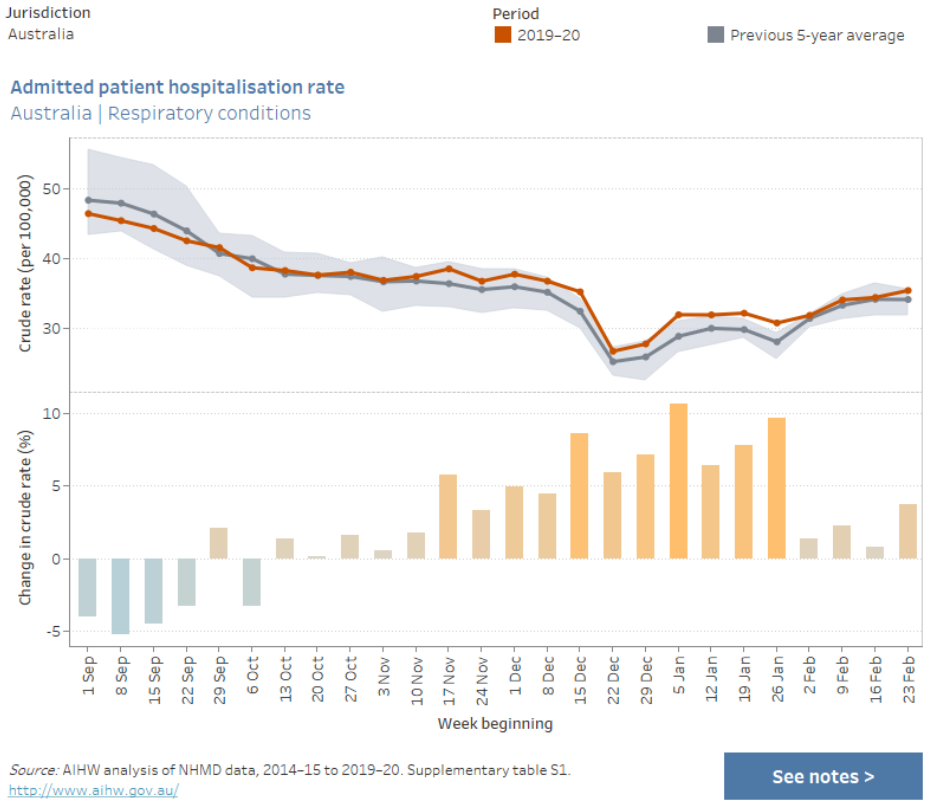
Analyses did not identify a consistent pattern in relation to impacts from bushfires and chest pain hospitalisations.

Nationally, there were increases in the hospitalisation rate for chest pain across most weeks during the 2019–20 bushfire season, particularly in the early season from mid-September to the end of October 2019.

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S1).

Admitted patient hospitalisation rate, by jurisdiction, chest pain (ICD-10-AM codes R07.1, R07.3, R07.4), weeks in 2019–20 bushfire season relative to previous 5-year average

This combined chart shows the crude rate of admitted patient hospitalisations (per 100,000 persons) for chest pain for the periods 2019–20 and the previous 5-year average, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, there were increases in the hospitalisation rate across most weeks during the 2019–20 bushfire season, particularly in the early season from mid-September to the end of October 2019. There were also variations at the jurisdictional level.



At the state and territory level, there were no consistent patterns between chest pain hospitalisations coinciding with periods of significant fire activity or air pollution. That is, New South Wales demonstrated lower chest pain hospitalisations each week during the 2019–20 bushfire season, compared with the average of the previous 5-year period, while Victoria and Queensland demonstrated higher chest pain hospitalisations each week during the same period.

Similarly, no consistent relationship between air quality from bushfires and chest pain hospitalisations was observed at the level of Statistical Area Level 4 (SA4).

For data by Statistical Area Level 4 (SA4), see Supplementary table S2.

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Admitted patients (hospitalisations)

The effects of bushfire are associated with mental health impacts (Gibbs et al. 2016; Laugharne et al. 2011). Consequently, some people's mental health care needs may require admission to hospital. Therefore, hospitalisations with a principal diagnosis for mental health-related conditions (ICD-10-AM codes F00–F99), were analysed.

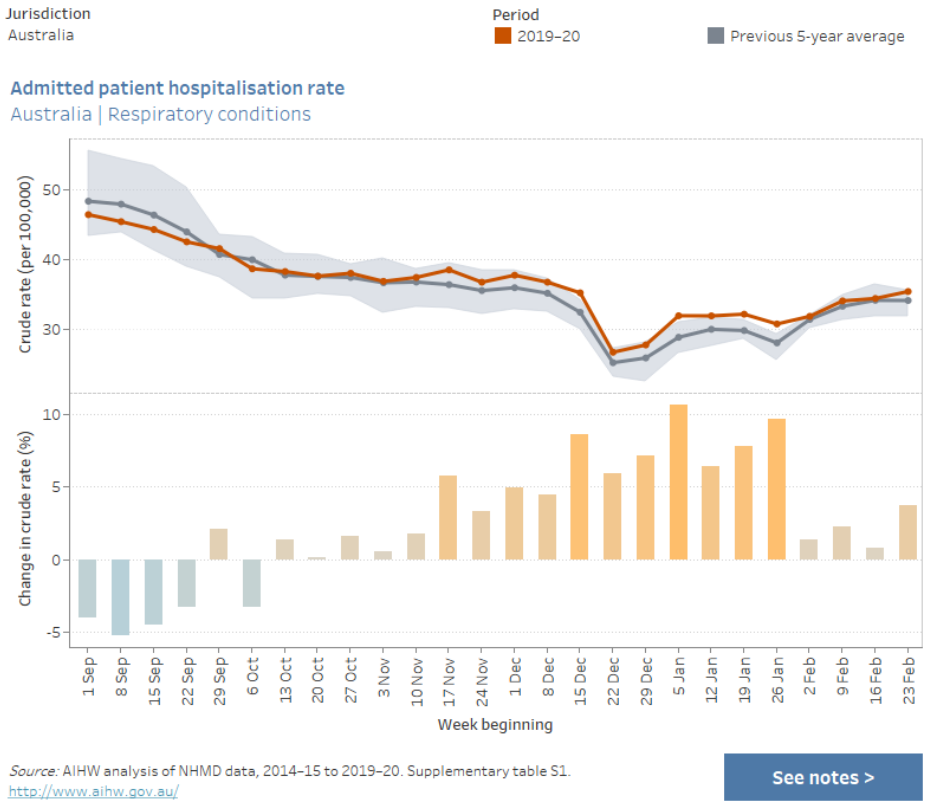
Nationally, the greatest increase in the hospitalisation rate was 17% in the week beginning 29 September 2019—38 per 100,000 persons (about 9,500 hospitalisations), compared with the previous 5-year average of 32 per 100,000 (an average of about 7,800 hospitalisations). However, it should be noted that it is difficult to ascertain the extent to which this increase was influenced by bushfires and bushfire smoke pollution or other factors.

Furthermore, there has been an increase in the mental health-related hospitalisation rate over time; for example, the national mental health-related conditions hospitalisation rate increased by an average of 3.2% per year between 2014–15 and 2018–19 (AIHW 2021; supplementary tables). Therefore, interpreting changes in rates relative to the previous 5-year average should be considered with caution.

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S1).

Admitted patient hospitalisation rate, by jurisdiction, mental health-related conditions (ICD-10-AM codes F00–F99), weeks in 2019–20 bushfire season relative to previous 5-year average

This combined chart shows the crude rate of admitted patient hospitalisations (per 100,000 persons) for mental health-related conditions for the periods 2019–20 and the previous 5-year average, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared to the previous 5-year average, the greatest increase in the hospitalisation rate was 17% in the week beginning 29 September 2019. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in the hospitalisation rate for mental health-related conditions coinciding with periods of significant fire activity or air pollution include:

- a 12% increase in the week beginning 5 January 2020 for New South Wales residents—34 per 100,000 persons (about 2,800 hospitalisations), compared with an average of 31 per 100,000 persons in the previous 5-year period (an average of about 2,400 hospitalisations)
- a 21% increase in the week beginning 24 November 2019 for Queensland residents—58 per 100,000 persons (about 2,900 hospitalisations), compared with an average of 48 per 100,000 in the previous 5-year period (an average of about 2,300 hospitalisations).

At the level of Statistical Area Level 4 (SA4), examples of large increases in the hospitalisation rate for mental health-related conditions coinciding with, or following, periods of significant fire activity or air pollution include:

- a 60% increase in the week beginning 5 January 2020 for Hunter Valley (excluding Newcastle) residents—40 per 100,000 persons (about 115 hospitalisations), compared with an average of 25 per 100,000 in the previous 5-year period (an average of 68 hospitalisations)
- a 111% increase in the week beginning 17 November 2019 for Townsville residents—70 per 100,000 persons (about 165 hospitalisations), compared with an average of 33 per 100,000 in the previous 5-year period (an average of 78 hospitalisations)
- a 57% increase in the week beginning 19 January 2020 for South Australia – South East residents—42 per 100,000 persons (82 hospitalisations), compared with an average of 27 per 100,000 in the previous 5-year period (an average of 51 hospitalisations).

For data by Statistical Area Level 4 (SA4), see Supplementary table S2.

References

AIHW (Australian Institute of Health and Welfare) 2021. Mental Health Services in Australia. Web report updated 18 May 2021. Viewed 13 July 2021.

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Laugharne J, Van de Watt G & Janca A 2011. After the fire: the mental health consequences of fire disasters. Current Opinions in Psychiatry 24(1):72–7.

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Admitted patients (hospitalisations)

Hospitalisations with a principal diagnosis categorised as burns (ICD-10-AM codes T20–T31) were analysed.

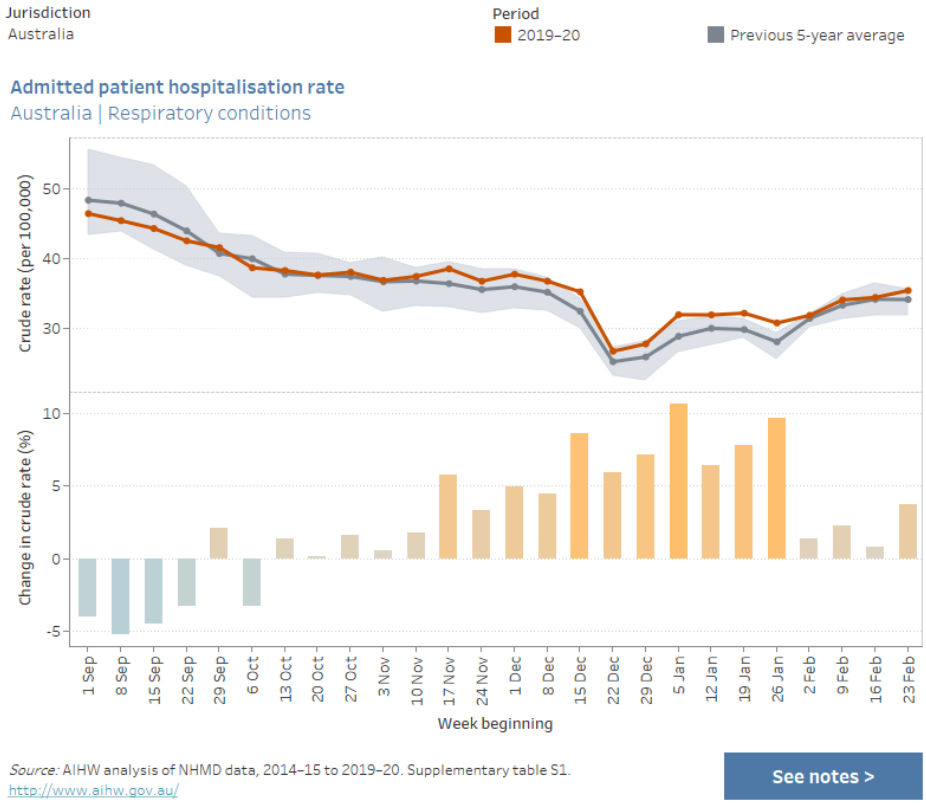
Overall, the rate of hospitalisations for burns in Australia is generally low. There were fluctuations in hospitalisation rates—likely due to small numbers—observed during the periods analysed. Therefore, the following results should be interpreted with caution.

Nationally, there were increases in the hospitalisation rate for burns coinciding with increased bushfire activity during the 2019—20 bushfire season. The greatest increase in the hospitalisation rate was 30% in the week beginning 15 December 2019—0.8 per 100,000 persons (about 210 hospitalisations), compared with the previous 5-year average of 0.6 per 100,000 (an average of 155 hospitalisations). The week beginning 29 December 2019 also saw a 13% increase in the rate of hospitalisations. The extent to which these hospitalisations were directly related to bushfire is unknown; however, this timing coincides with periods of intense fire activity.

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S1).

Admitted patient hospitalisation rate, by jurisdiction, burns (ICD-10-AM codes T20–T31), weeks in 2019–20 bushfire season relative to previous 5-year average

This combined chart shows the crude rate of admitted patient hospitalisations (per 100,000 persons) for burns for the periods 2019–20 and the previous 5-year average, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared to the previous 5-year average, the greatest increase in the hospitalisation rate was 30% in the week beginning 15 December 2019. There were also variations at the jurisdictional level.



At the state and territory level, there was a 160% increase in the week beginning 15 December 2019 for South Australian residents—1.9 per 100,000 persons (34 hospitalisations), compared with an average of 0.7 per 100,000 in the previous 5-year period (an average of 13 hospitalisations). During the same week, there was intense fire activity driven by extremely hot temperatures, strong winds and dry lightning strikes on 20 December 2020, with the Cudlee Creek fire (Adelaide Hills) and the Duncan and Menzies fires (Kangaroo Island) the most significant; 51 firefighter injuries resulted from the Cudlee Creek fire (Government of South Australia 2020).

Because the numbers of hospitalisations for burns at the level of Statistical Area Level 4 (SA4) were generally small, data are not presented at this level.

For data by Statistical Area Level 4 (SA4), see Supplementary table S2.

References

Government of South Australia 2020. Independent review into South Australia's 2019–20 bushfire season.

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Emergency department presentations

Emergency departments (EDs) are an essential component of Australia's health care system. Many of Australia's public hospitals have purpose-built EDs, staffed 24 hours a day, providing care for patients who require urgent medical, surgical or other attention. ED activity is measured by the number of presentations to the ED.

Data used in this section refer to the 2018–19 and 2019–20 financial years. Data are sourced from the National Non-admitted Patient Emergency Department Care Database (NNAPEDCD).

National standards exist for data on non-admitted patient emergency department services, however, there are some variations in how those services are defined and counted across states and territories and over time. Therefore, comparisons of ED presentations across jurisdictions, and across time should be considered with caution. For more information on the NNAPEDCD, see Technical notes.

The number and rates of presentations to public hospital EDs for conditions related to air pollution and bushfire smoke are presented in the following section and include:

- Respiratory conditions
- Asthma
- Chronic obstructive pulmonary disease (COPD) with acute exacerbation
- Breathing difficulties (abnormalities of breathing)
- Heart, stroke, and vascular conditions
- Chest pain
- Mental health-related conditions
- Burns.

While not presented in this section, ED presentations for dehydration are also included in the supplementary tables (tables S3 and S4).

Where possible, ED presentations are reported by:

- state and territory
- Statistical Area Level 4 (SA4).

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Emergency department presentations

Because of the link between air pollution from bushfire smoke, and respiratory conditions (see Australian bushfires 2019–20: exploring the short-term health impacts), presentations with a principal diagnosis categorised as a respiratory condition (ICD-10-AM codes J00–J99) were analysed.

It should be noted that respiratory conditions, particularly in the earlier part of the bushfire season, may be largely caused or exacerbated by factors other than bushfire smoke (for example, pollen, dust storms, or respiratory infections).

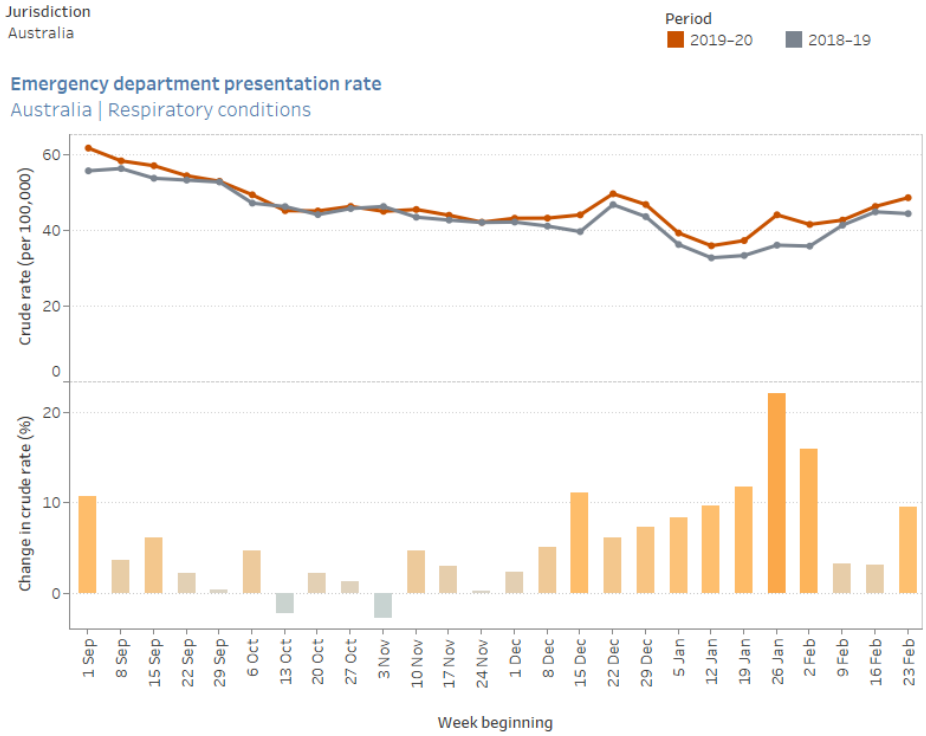
To explore changes in presentations, data from each week in the 2019–20 bushfire season were compared with the same week of the previous year (2018–19). Increases in presentation rates to emergency departments for respiratory conditions were generally higher from mid-November 2019 until the end of February 2020.

Nationally, the largest increase in the presentation rate was 22% in the week beginning 26 January 2020—44 per 100,000 persons (about 11,200 presentations), compared with 36 per 100,000 in the previous bushfire season (about 9,000 presentations). Part of this increase in presentations may have been influenced by the first confirmed case of COVID-19 on 25 January 2020 and associated warnings to self-monitor for respiratory symptoms (Department of Health 2020).

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S3).

Emergency department presentation rate, by jurisdiction, respiratory conditions (ICD-10-AM codes J00–J99), weeks in 2019–20 bushfire season relative to previous year

This combined chart shows the crude rate of emergency department presentations (per 100,000 persons) for respiratory conditions for the periods 2019–20 and 2018–19, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous year, the largest increase in the presentation rate was 22% in the week beginning 26 January 2020. There were also variations at the jurisdictional level.



Source: AIHW analysis of NNAPEDCD data, 2018–19 and 2019–20; Supplementary table S3.
http://www.aihw.gov.au/

See notes >

The Australian Capital Territory was an example in which there was a large increase in the presentation rate for respiratory conditions coinciding with periods of significant fire activity or air pollution. A 58% increase was observed in the week beginning 5 January 2020—50 per 100,000 persons (about 210 presentations), compared with 31 per 100,000 in the previous bushfire season (about 130 presentations).

At the level of Statistical Area Level 4 (SA4), examples of large increases in the presentation rate for respiratory conditions coinciding with periods of significant fire activity or air pollution include:

- increases ranging from 21% to 83% in the weeks between 15 December 2019 and 18 January 2020 for Riverina residents, compared with the previous bushfire season. Each of these weeks featured PM2.5 measurements rated as 'extremely poor' at the Wagga Wagga air quality monitoring station within this SA4.
- an 85% increase in the week beginning 5 January 2020 for Capital Region residents—about 105 per 100,000 persons (about 245 presentations), compared with 57 per 100,000 in the previous bushfire season (130 presentations). An increase of 55% was also observed in the week beginning 29 December 2019. This coincided with the intense bushfire activity in the area from Batemans Bay, New South Wales, in the north, down to Eden near the Victorian border.
- notable increases in the Australian Capital Territory that coincided with weeks of poor air quality due to bushfire smoke, particularly around the 2019–20 Christmas and New Year period.

For data by Statistical Area Level 4 (SA4), see Supplementary table S4.

References

Department of Health 2020. First confirmed case of novel coronavirus in Australia - external site opens in new window. Viewed 7 July 2021.

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Emergency department presentations

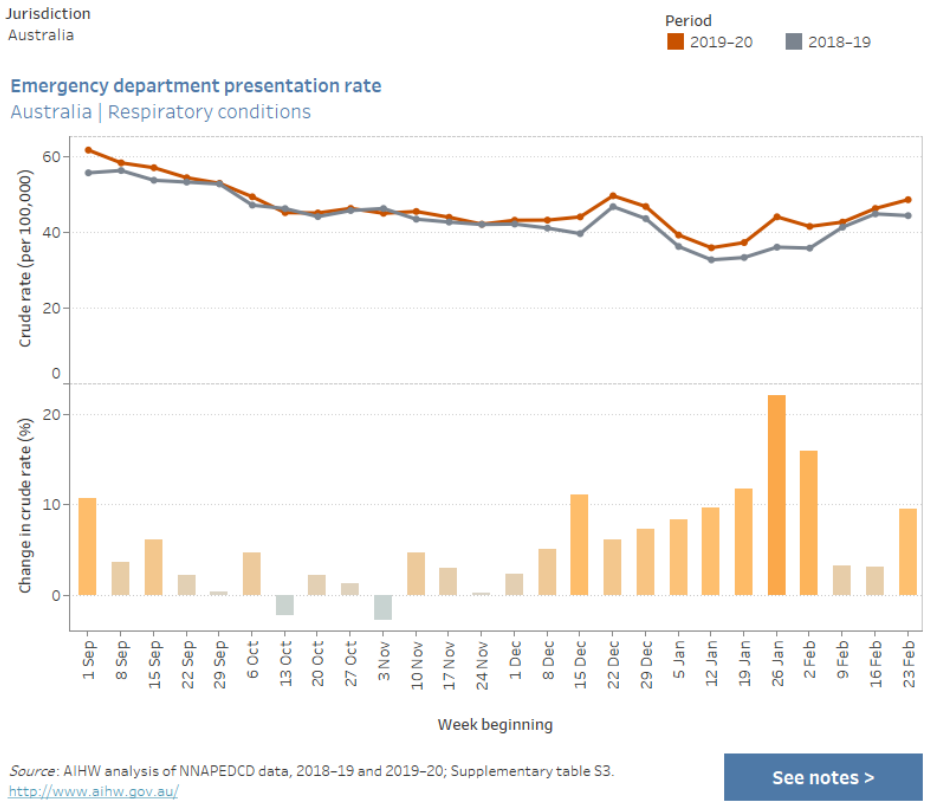
While asthma was included in the analysis of all respiratory conditions, emergency department presentations with a principal diagnosis of asthma (ICD-10-AM codes J45–J46) were also analysed separately due to the known association with air pollution from bushfires (see Australian bushfires 2019–20: exploring the short-term health impacts).

Nationally, the greatest increase in the asthma presentation rate was 44% in the week beginning 12 January 2020—4.7 per 100,000 persons (about 1,200 presentations), compared with 3.3 per 100,000 in the previous bushfire season (about 820 presentations). The week beginning 5 January 2020 saw a similar increase in the rate of presentations.

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S3).

Emergency department presentation rate, by jurisdiction, asthma (ICD-10-AM codes J45–J46), weeks in 2019–20 bushfire season relative to previous year

This combined chart shows the crude rate of emergency department presentations (per 100,000 persons) for asthma for the periods 2019–20 and 2018–19, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous year, the greatest increase in the presentation rate was 44% in the week beginning 12 January 2020. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in the presentation rate of asthma coinciding with periods of significant fire activity or air pollution include:

- a 54% increase in the week beginning 8 December 2019 for New South Wales residents—8.3 per 100,000 persons (about 670 presentations), compared with 5.4 per 100,000 in the previous bushfire season (about 425 presentations)
- an increase of around 125% in the week beginning 12 January 2020 for Victorian residents—7.4 per 100,000 persons (about 485 presentations), compared with 3.3 per 100,000 in the previous bushfire season (about 215 presentations)

- an increase of around 230% in the week beginning 29 December 2019 for Australian Capital Territory residents—13 per 100,000 persons (57 presentations), compared with 4.0 per 100,000 in the previous bushfire season (17 presentations).

At the level of Statistical Area Level 4 (SA4), examples of large increases in the presentation rate for asthma coinciding with periods of significant fire activity or air pollution include:

- an increase of around 300% in the week beginning 10 November 2019 for Mid North Coast residents—29 per 100,000 persons (65 presentations), compared with 7.3 per 100,000 (16 presentations) in the previous bushfire season. A similar increase was observed for the week beginning 17 November 2019. Each of these weeks coincided with extremely high PM2.5 measurements at the nearby Port Macquarie air quality monitoring station.
- an increase of around 135% in the week beginning 12 January 2020 for Latrobe-Gippsland residents—15 per 100,000 persons (43 presentations), compared with 6.4 per 100,000 in the previous bushfire season (18 presentations). This coincided with the time in which bushfires burned at emergency warning levels around the NSW and Victoria border.

For data by Statistical Area Level 4 (SA4), see Supplementary table S4.

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Emergency department presentations

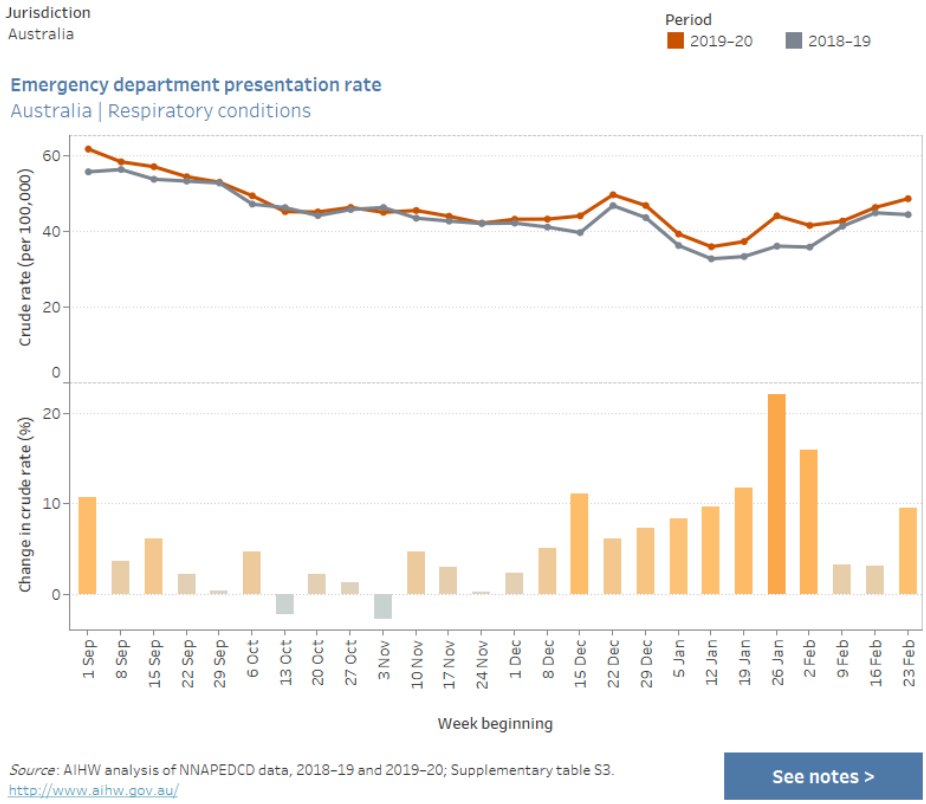
Chronic obstructive pulmonary disease with acute exacerbation, henceforth referred to as COPD, has been found to increase in association with air pollution from bushfire smoke (see Australian bushfires 2019–20: exploring the short-term health impacts); therefore, while COPD was included within all respiratory conditions, emergency department presentations with a principal diagnosis of COPD with acute exacerbation (ICD-10-AM code J44.1) were also analysed separately. The current chapter reports the presentation rate of COPD for all ages. While COPD can be reported in younger age groups, the diagnosis of the condition is more certain for those aged 45 and over.

Nationally, there were increases in presentations for COPD from 3 November 2019 to the end of February 2020. There was a large increase in the presentation rate of 31% in the week beginning 12 January 2020—1.4 per 100,000 persons (about 365 presentations), compared with 1.1 per 100,000 in the previous bushfire season (about 275 presentations).

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S3).

Emergency department presentation rate, by jurisdiction, COPD (ICD-10-AM code J44.1), weeks in 2019–20 bushfire season relative to previous year

This combined chart shows the crude rate of emergency department presentations (per 100,000 persons) for Chronic obstructive pulmonary disease (COPD) with acute exacerbation for the periods 2019–20 and 2018–19, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous year, there were increases in the presentation rate from 3 November 2019 to the end of February 2020. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in the presentation rate for COPD coinciding with periods of significant fire activity or air pollution included:

- a 21% to 65% increase in the weeks beginning 1 December 2019 to 8 February 2020 for New South Wales residents. The highest increase was 65% in the week beginning 12 January 2020—2.3 per 100,000 persons (about 185 presentations), compared with 1.4 per 100,000 in the previous bushfire season (about 110 presentations)
- a 29% increase in the week beginning 10 November 2019 for Queensland residents—2.3 per 100,000 persons (115 presentations), compared with 1.8 per 100,000 (88 presentations). This increase corresponded to a week in which Queensland experienced particularly high levels of air pollution from bushfire smoke.

Because the numbers of COPD ED presentations at the level of Statistical Area Level 4 (SA4) were generally small, data are not presented at this level.

For data by Statistical Area Level 4 (SA4), see Supplementary table S4.

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Emergency department presentations

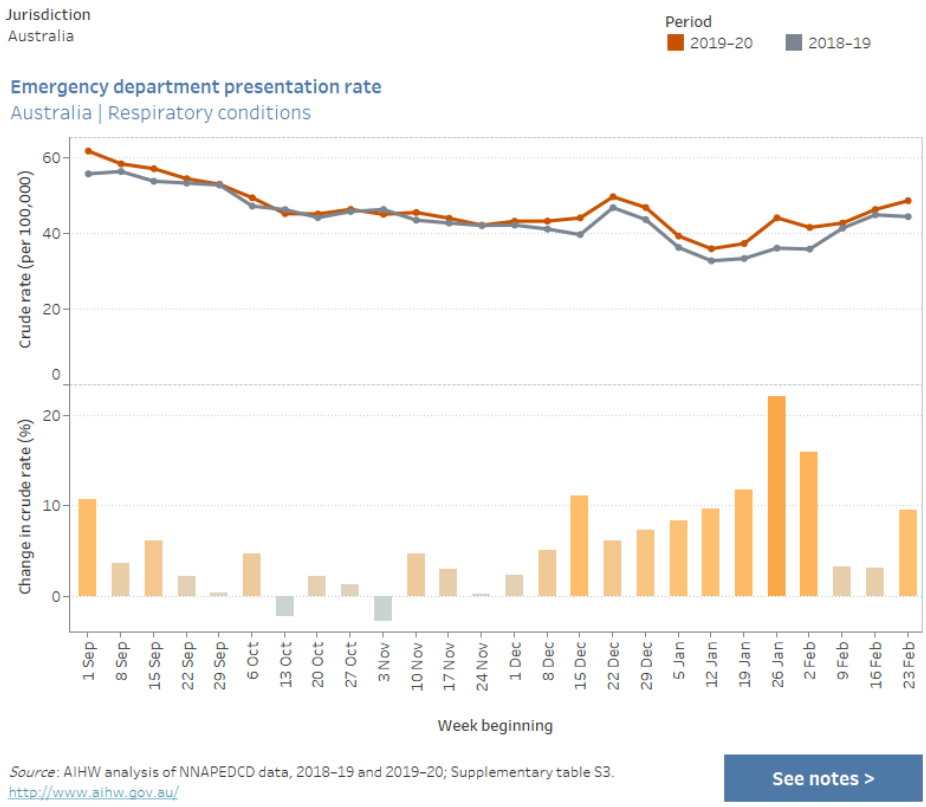
Emergency department presentations with a principal diagnosis relating to abnormalities of breathing (R06.0–R06.8), henceforth referred to as breathing difficulties, were analysed due to the association between bushfire smoke pollution and respiratory symptoms (see Australian bushfires 2019–20: exploring the short-term health impacts).

Nationally, there were increases in presentations for breathing difficulties throughout most of the 2019–20 bushfire season, with the largest increases occurring between the week beginning 5 January 2020 and the week beginning 19 January 2020. The largest increase in presentation rate was 21% in the week beginning 19 January 2020—6.8 per 100,000 persons (about 1,700 presentations), compared with 5.6 per 100,000 in the previous bushfire season (about 1,400 presentations).

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S3).

Emergency department presentation rate, by jurisdiction, breathing difficulties (ICD-10-AM code R06.0–R06.8), weeks in 2019–20 bushfire season relative to previous year

This combined chart shows the crude rate of emergency department presentations (per 100,000 persons) for breathing difficulties for the periods 2019–20 and 2018–19, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous year, there were increases in the presentation rate throughout most of the 2019–20 bushfire season, with the largest increases occurring between the week beginning 5 January 2020 and the week beginning 19 January 2020. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in the presentation rate for breathing difficulties coinciding with periods of significant fire activity or air pollution included:

- a 60% increase in the week beginning 12 January 2020 for Victorian residents—7.0 per 100,000 persons (460 presentations), compared with 4.4 per 100,000 in the previous bushfire season (about 280 presentations). A similar increase was observed in the week beginning 5 January 2020

- around a 155% increase in the week beginning 5 January 2020 for Australian Capital Territory residents—8.4 per 100,000 persons (36 presentations), compared with 3.3 per 100,000 in the previous bushfire season (14 presentations).

Numbers of presentations for breathing difficulties at the level of Statistical Area Level 4 (SA4) were generally small and should be considered with caution. However, some notable examples of increases include:

- an increase of around 155% in the week beginning 5 January 2020 for Capital Region residents—13 per 100,000 persons (31 presentations), compared with 5.3 per 100,000 (12 presentations). The week before this recorded around a 120% increase, with the presentation rate reaching 20 per 100,000 (47 presentations) compared with 9.2 per 100,00 (21 presentations)
- a 79% increase in the week beginning 3 November 2019 for Perth-South West residents—11 per 100,000 persons (49 presentations), compared with 6.3 per 100,000 in the previous bushfire season (27 presentations). There were increases of 37%, 26% and 31% during the remaining weeks of November 2019. This corresponded to a time when bushfires burned at an *Emergency warning* level.

For data by Statistical Area Level 4 (SA4), see Supplementary table S4.

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Emergency department presentations

On this page

- Selected heart conditions
- Heart attack (acute myocardial infarction)
- Cerebrovascular conditions

While the evidence for an association between air pollution from bushfire smoke and cardiovascular conditions (which include conditions such as heart attack and stroke) is not as comprehensive as for respiratory conditions, several studies have found associations (see Australian bushfires 2019–20: exploring the short-term health impacts). It should also be noted that other factors such as extreme heat (Loughnan et al. 2010), which often co-occurs with bushfire, may also lead to increases in ED presentations.

There was no consistent pattern identified between air quality and heart, stroke and vascular conditions in the analysis of ED presentation data for this data update, however the data suggest that further examination of this relationship, particularly with respect to the cumulative effects of prolonged exposure to bushfire smoke, would be of interest.

Selected heart conditions

Nationally, the presentations for selected heart conditions (ICD-10-AM codes I10–I15, I20–I25, I26–I28 and I30–I52) during the 2019–20 bushfire season were generally lower than in the previous year. However, there was an increase of 7.0% in the presentation rate in the week beginning 19 January 2020–18 per 100,000 persons (about 4,600 presentations), compared with 17 per 100,000 in the previous bushfire season (about 4,300 presentations).

During this week, in all jurisdictions except Queensland, there were increases in the presentation rate for selected heart conditions. The smallest and largest increases were:

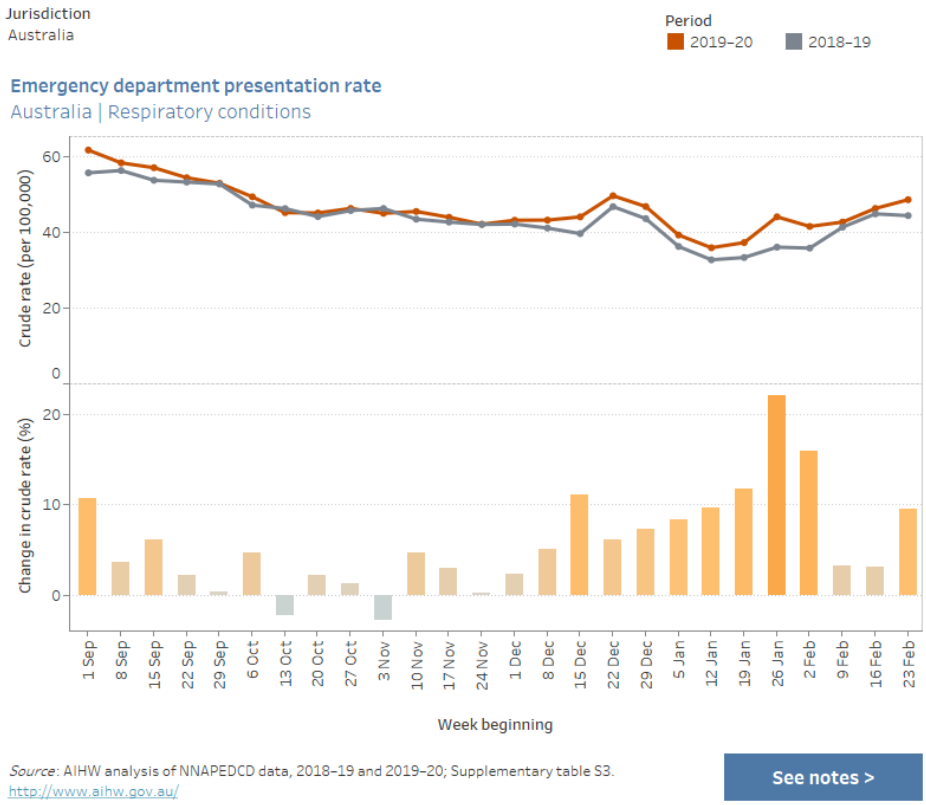
- a 5.9% increase for New South Wales residents—18 per 100,000 persons (about 1,400 presentations), compared with 17 per 100,000 in the previous bushfire season (about 1,300 presentations)
- a 45% increase for Australian Capital Territory residents—18 per 100,000 persons (75 presentations), compared with 12 per 100,000 in the previous bushfire season (51 presentations).

The results should be interpreted with caution as lower rates of presentation were also observed during the 2019–20 bushfire season (for example, during November and December in New South Wales). It is important to consider that other factors or natural variation in the data may contribute to changes in presentation rates from year to year. In addition, differences in policies or the way presentations are coded between jurisdictions may affect the data.

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S3).

Emergency department presentation rate, by jurisdiction, selected heart conditions (ICD-10-AM codes I10–I15, I20–I25, I26–I28 and I30–I52), weeks in 2019–20 bushfire season relative to previous year

This combined chart shows the crude rate of emergency department presentations (per 100,000 persons) for selected heart conditions for the periods 2019–20 and 2018–19, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous year, the presentation rate was lower during most weeks. However, there was an increase of 7% in the week beginning 19 January 2020. There were also variations at the jurisdictional level.



At the level of Statistical Area Level 4 (SA4), examples of large increases in the presentation rate for selected heart conditions in the week beginning 19 January 2020, while based on relatively small numbers, include:

- about a 110% increase for Adelaide – Central and Hills residents—10 per 100,000 persons (32 presentations), compared with 5.0 per 100,000 (15 presentations) in the previous bushfire season
- a 90% increase for Sydney – Sutherland residents—20 per 100,000 persons (46 presentations), compared with 11 per 100,000 (24 presentations) in the previous bushfire season.

For data by Statistical Area Level 4 (SA4), see Supplementary table S4.

Heart attack (acute myocardial infarction)

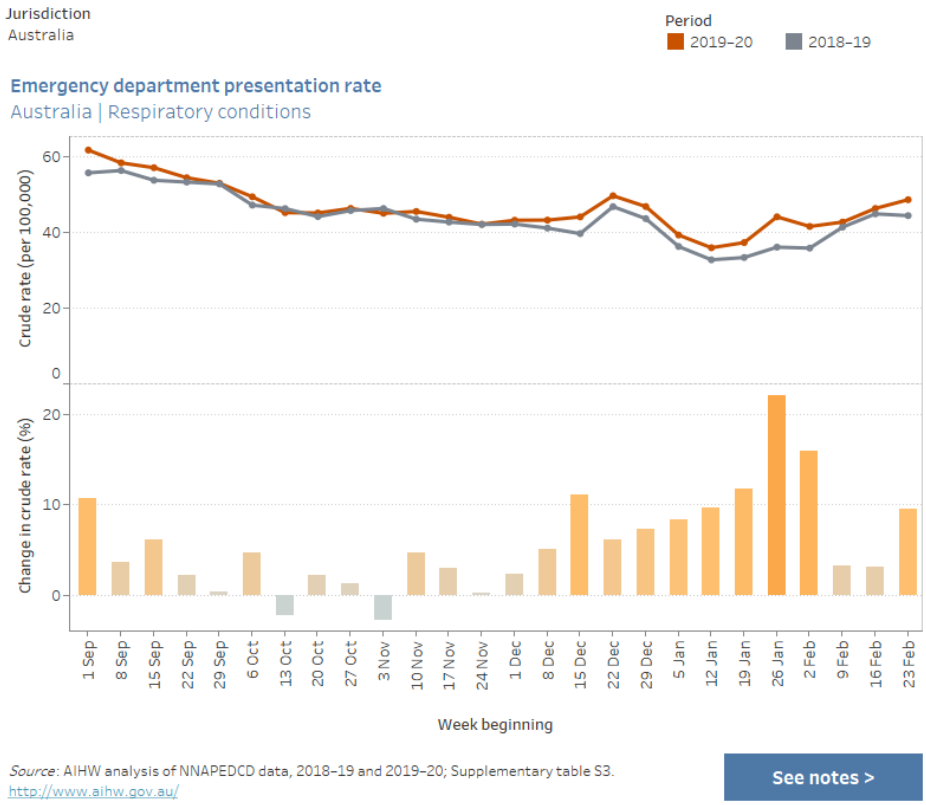
Among presentations for heart conditions, presentations for acute myocardial infarction (AMI; ICD-10-AM code I21), commonly known as heart attack, were also analysed separately as research has found specific associations with smoke pollution from bushfire (see Australian bushfires 2019–20: exploring the short-term health impacts). Note that presentations for AMI are also included within selected heart conditions.

Nationally, increases in emergency department presentations for AMI occurred primarily during a number of weeks in January and February 2020. For example, there was a 13% increase in the presentation rate in the week beginning 5 January 2020—2.8 per 100,000 persons (about 700 presentations), compared with 2.5 per 100,000 in the previous bushfire season (about 610 presentations). A similar increase was observed in the week beginning 19 January 2020.

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S3).

Emergency department presentation rate, by jurisdiction, AMI (ICD-10-AM code I21), weeks in 2019–20 bushfire season relative to previous year

This combined chart shows the crude rate of emergency department presentations (per 100,000 persons) for acute myocardial infarction for the periods 2019–20 and 2018–19, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous year, increases in the presentation rate occurred primarily during a number of weeks in January and February 2020. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in the presentation rate for AMI coinciding with periods of significant fire activity or air pollution included:

- a 21% increase in the week beginning 2 February 2020 for New South Wales residents—2.8 per 100,000 persons (about 225 presentations), compared with 2.3 per 100,000 in the previous bushfire season (185 presentations). In general, there were increases in emergency department presentations for AMI for most weeks from the beginning of September to the middle of November 2019 and between 22 December 2019 and 15 February 2020. However, there were also decreases in the rate at times when air pollution levels from bushfire smoke were high (mid-November to mid-December), so it was difficult to identify a clear relationship between exposure and presentations
- an 18% increase in the week beginning 5 January 2020 for Victorian residents—2.5 per 100,000 persons (about 160 presentations), compared with 2.1 per 100,000 in the previous bushfire season (about 135 presentations). A 39% increase was observed in the week beginning 2 February 2020, however the relatively lower rate in the year before appears to have influenced the rate increase, so part of the rate increase may be due to natural variation in the data.

Because the numbers of AMI presentations at the level of Statistical Area Level 4 (SA4) were generally small, data are not presented at this level.

For data by Statistical Area Level 4 (SA4), see Supplementary table S4.

Cerebrovascular conditions

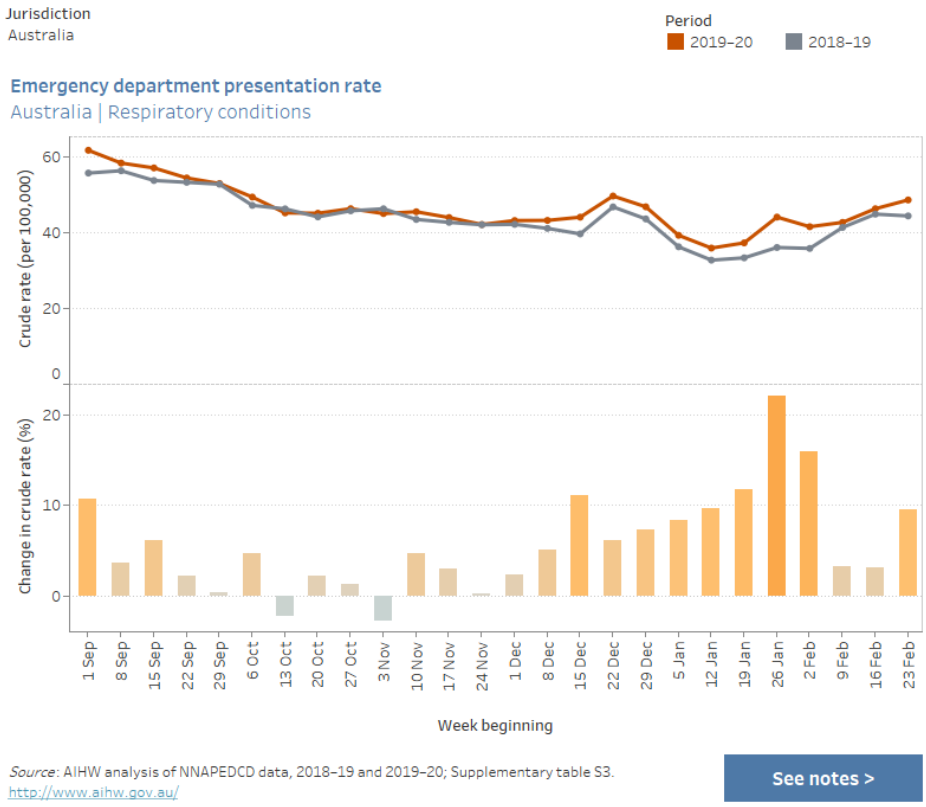
There is some evidence to suggest that exposure to bushfire smoke may increase the incidence of cerebrovascular conditions (ICD-10-AM codes I60–I69), including stroke (Edwards et al. 2018), therefore, presentations for cerebrovascular conditions were analysed.

Nationally, there were increases in presentations for cerebrovascular conditions during all of January and February 2020, compared with the previous bushfire season. There was an increase in the presentation rate of 8.1% in the week beginning 19 January 2020—3.4 per 100,000 persons (about 850 presentations), compared with 3.1 per 100,000 in the previous bushfire season (about 780 presentations). A similar increase was observed in the week beginning 29 December 2019. There were also increases earlier in the season coinciding with, or following times when air pollution from bushfires was elevated (Arriagada et al. 2020; supplementary material).

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S3).

Emergency department presentation rate, by jurisdiction, cerebrovascular conditions (ICD-10-AM codes I60–I69), weeks in 2019–20 bushfire season relative to previous year

This combined chart shows the crude rate of emergency department presentations (per 100,000 persons) for cerebrovascular conditions for the periods 2019–20 and 2018–19, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous year, the presentation rate increased during all of January and February 2020. There were also variations at the jurisdictional level.



At the state and territory level, examples of large increases in the presentation rate of cerebrovascular conditions coinciding with periods of significant fire activity or air pollution included:

- a 14% increase in the week beginning 27 October 2019 for New South Wales residents—3.8 per 100,000 persons (about 310 presentations), compared with 3.3 per 100,000 in the previous bushfire season (about 265 presentations). A 12% increase was observed in the week beginning 3 November 2019.
- an 18% increase in the week beginning 10 November 2019 for Queensland residents—3.0 per 100,000 persons (about 155 presentations), compared with 2.5 per 100,000 in the previous bushfire season (about 125 presentations). A 23% increase was observed in the week beginning 24 November 2019.

Because the numbers of cerebrovascular condition presentations at the level of Statistical Area Level 4 (SA4) were generally small, data are not presented at this level.

For data by Statistical Area Level 4 (SA4), see Supplementary table S4.

References

Arriagada NB, Palmer AJ, Bowman DM, Morgan GG, Jalaludin BB & Johnston FH 2020. Unprecedented smoke-related health burden associated with the 2019–20 bushfires in eastern Australia. Medical Journal of Australia 213(6): 282–3.

Edwards LJ, Williamson G, Williams SA, Veitch MGK, Salimi F & Johnston FH 2018. Did fine particulate matter from the Summer 2016 landscape fires in Tasmania increase emergency ambulance dispatches? A case crossover analysis. Fire 1(2):1–11.

Loughnan ME, Nicholls N & Tapper NJ 2010. When the heat is on: threshold temperatures for AMI admissions to hospital in Melbourne Australia. Applied Geography 30(1):63–9.

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Emergency department presentations

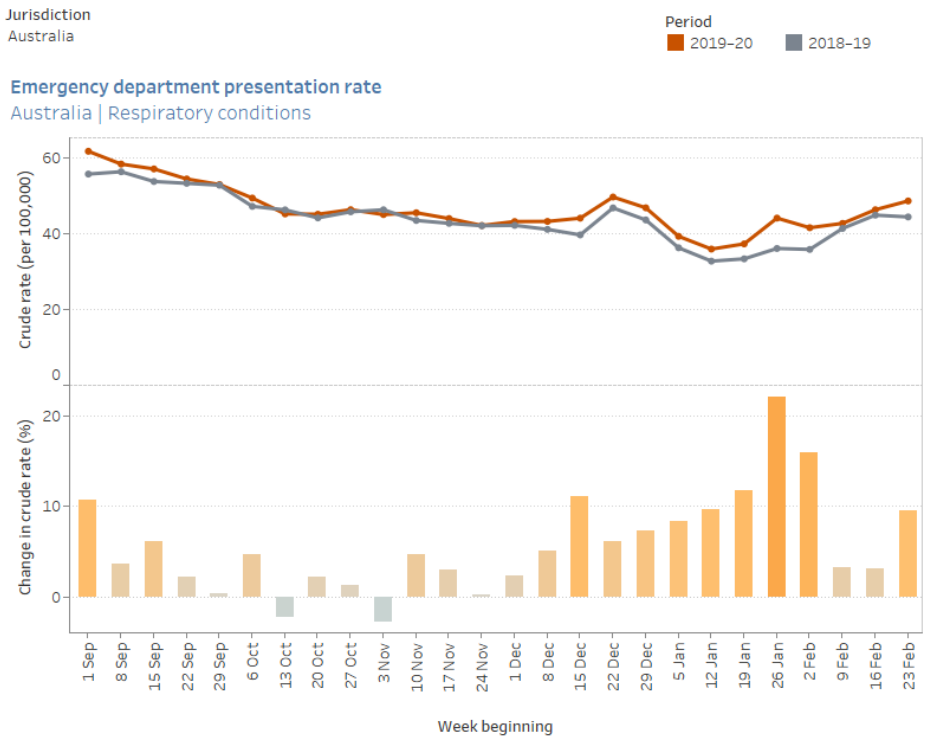
Emergency department presentations with a principal diagnosis of chest pain (ICD-10-AM codes R07.1, R07.3, and R07.4) were analysed.

Nationally, there were increases in the presentation rate for chest pain across most weeks during the 2019–20 bushfire season, particularly in the early season from mid-September to the end of October 2019, and then from mid-January to early-February.

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S3).

Emergency department presentation rate, by jurisdiction, chest pain (ICD-10-AM code R07.1, R07.3, R07.4), weeks in 2019–20 bushfire season relative to previous year

This combined chart shows the crude rate of emergency department presentations (per 100,000 persons) for chest pain for the periods 2019–20 and 2018–19, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous year, there were increases in the presentation rate across most weeks during the 2019–20 bushfire season, particularly in the early season from mid-September to the end of October 2019, and then from mid-January to early-February 2020. There were also variations at the jurisdictional level.



Source: AIHW analysis of NNAPEDCD data, 2018–19 and 2019–20; Supplementary table S3.
http://www.aihw.gov.au/

See notes >

At the state and territory level, there were no consistent patterns between chest pain presentations coinciding with periods of significant fire activity or air pollution.

Similarly, no consistent patterns between air quality from bushfires and chest pain presentations were observed at the level of Statistical Area Level 4 (SA4).

For data by Statistical Area Level 4 (SA4), see Supplementary table S4.

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Emergency department presentations

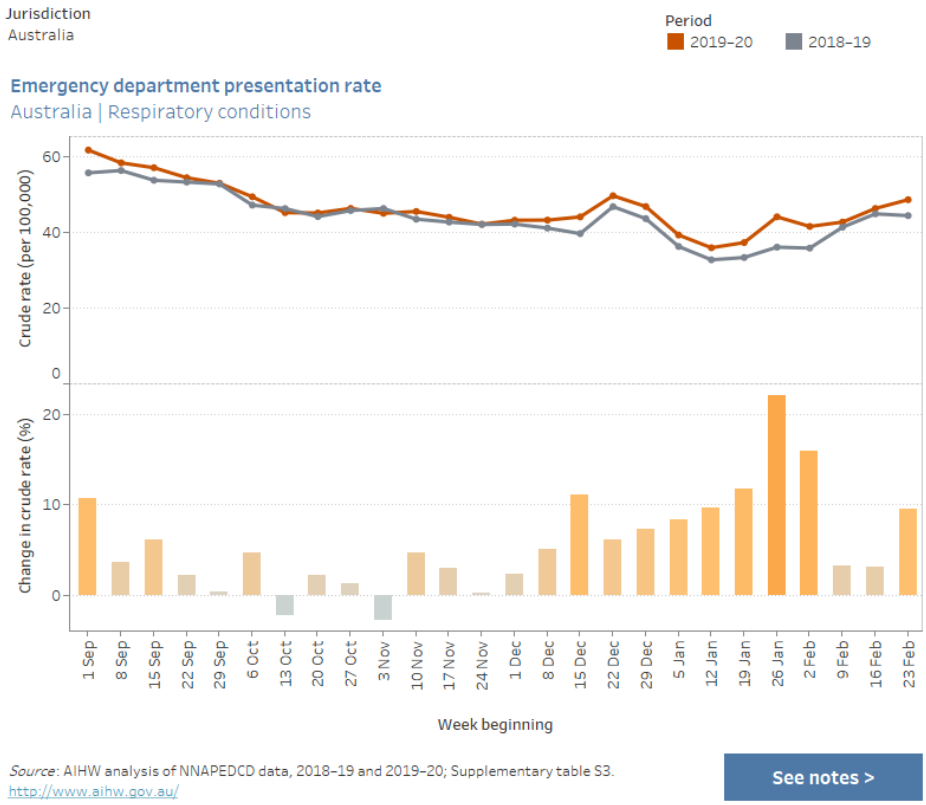
The effects of bushfire are associated with mental health impacts (Gibbs et al. 2016; Laugharne et al. 2011). Consequently, some people's mental health care needs may require presentation to an emergency department. Therefore, presentations with a principal diagnosis for mental health-related conditions (ICD-10-AM codes F00–F99), were analysed.

Nationally, the presentation rate for mental health-related conditions was generally higher for most weeks throughout the 2019–20 bushfire season, compared with the previous bushfire season. It is not clear to what extent this increase was related to the effects of the bushfires or to other factors.

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S3).

Emergency department presentation rate, by jurisdiction, mental health-related conditions (ICD-10-AM codes F00–F99), weeks in 2019–20 bushfire season relative to previous year

This combined chart shows the crude rate of emergency department presentations (per 100,000 persons) for mental health-related conditions for the periods 2019–20 and 2018–19, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous year, the presentation rate was generally higher for most weeks throughout the 2019–20 bushfire season. There were also variations at the jurisdictional level.



The presentation rates for mental health-related conditions varied across states and territories. Most states and territories generally had higher rates throughout the 2019–20 bushfire season compared with the previous bushfire season, particularly in weeks of, or surrounding, when bushfires were burning (although the interaction with other factors such as COVID–19 and damaging storms might have affected increases). Examples of increases in the presentation rate for mental health-related conditions included:

- a 35% increase in the week beginning 26 January 2020 for Australian Capital Territory residents—24 per 100,000 persons (about 105 presentations), compared with 18 per 100,000 in the previous bushfire season (75 presentations)

- a 22% increase in the week beginning 9 February 2020 for South Australian residents—32 per 100,000 persons (about 560 presentations), compared with 26 per 100,000 in the previous bushfire season (450 presentations)
- a 21% increase in the week beginning 5 January 2020 for Queensland residents—27 per 100,000 persons (about 1,400 presentations), compared with 22 per 100,000 in the previous bushfire season (about 1,100 presentations).

Conversely, presentation rates for mental health-related conditions among New South Wales residents were generally lower across the 2019–20 bushfire season. However, there were regional variations.

At the level of Statistical Area Level 4 (SA4), examples of increases in the presentation rate for mental health-related conditions coinciding with periods of significant fire activity or air pollution include:

- a 60% increase in the week beginning 29 December 2019 for Capital Region residents—73 per 100,000 persons (about 170 presentations), compared with 46 per 100,000 in the previous bushfire season (about 105 presentations). Bushfire had an impact on large parts of this SA4 for an extended period, particularly during December 2019 and January 2020
- about a 120% increase in the week beginning 19 January 2020 in presentation rates for South Australia–South East residents—33 per 100,000 persons (64 presentations), compared with 15 per 100,000 in the previous bushfire season (29 presentations). This SA4 included Kangaroo Island, much of which was burnt by bushfire.

For data by Statistical Area Level 4 (SA4), see Supplementary table S4.

References

Gibbs L, Bryant R, Harms L, Forbes D, Block K, Gallagher HC et al. 2016. Beyond bushfires: community resilience and recovery: final report. Melbourne: University of Melbourne.

Laugharne J, Van de Watt G & Janca A 2011. After the fire: the mental health consequences of fire disasters. Current Opinions in Psychiatry 24(1):72–7.

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Emergency department presentations

Presentations to an emergency department with a principal diagnosis categorised as burns (ICD-10-AM codes T20–T31) were analysed.

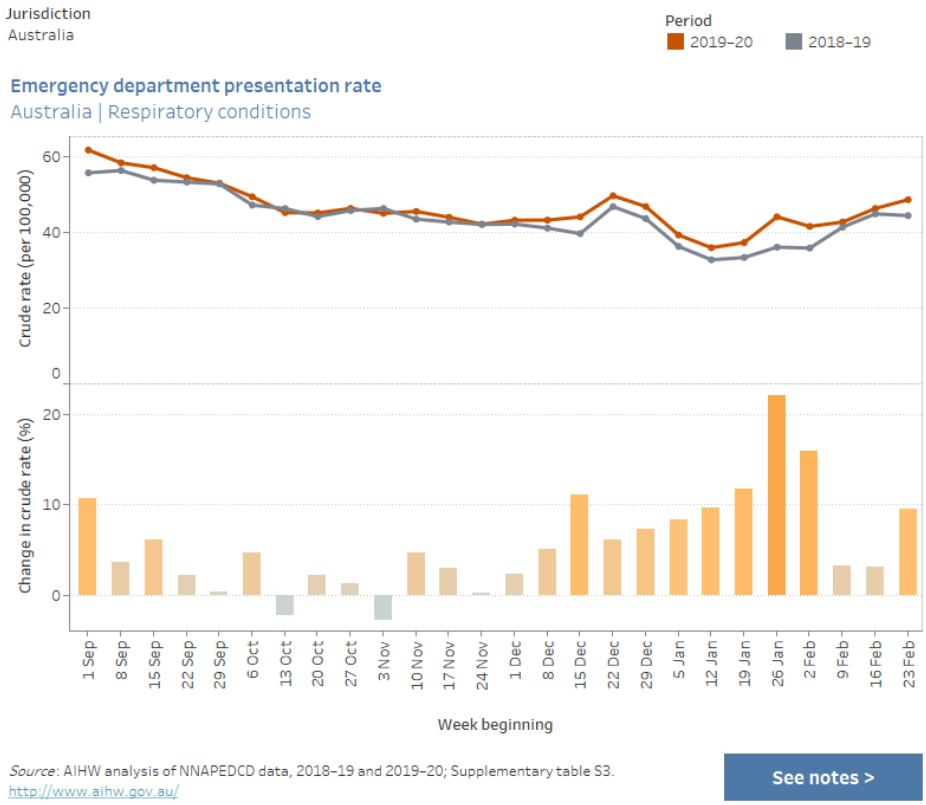
Overall, the presentation rate for burns in Australia is generally low. Fluctuations in presentation rates—likely due to small numbers—were observed during the periods analysed. Therefore, the following results should be interpreted with caution.

Nationally, presentation rates for burns was generally lower each week during the 2019–20 bushfire season, compared with the previous bushfire season. However, there was a 10% increase in the week beginning 24 November 2019—3.1 per 100,000 persons (about 800 presentations), compared with 2.8 per 100,000 in the previous bushfire season (about 710 presentations).

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S3).

Emergency department presentation rate, by jurisdiction, burns (ICD-10-AM codes T20–T31), weeks in 2019–20 bushfire season relative to previous year

This combined chart shows the crude rate of emergency department presentations (per 100,000 persons) for burns for the periods 2019–20 and 2018–19, and the percentage change in crude rate between the two periods. Data are presented by jurisdiction and by week, for the period 1 September to 29 February/1 March, which correspond to the bushfire season. The chart shows that nationally, compared with the previous year, the presentation rate was generally lower each week during the 2019–20 bushfire season. There were also variations at the jurisdictional level.



At the state and territory level, examples of increases in the rate of presentations for burns coinciding with periods of significant fire activity or air pollution included:

- a 90% increase in the week beginning 26 January 2020 for Australian Capital Territory residents—6.3 per 100,000 persons (27 presentations), compared with 3.3 per 100,000 in the previous bushfire season (14 presentations). This period coincided with an increased intensity of the Orroral Valley fire in the Australian Capital Territory

- a 54% increase in the week beginning 15 December 2019 for South Australian residents—5.2 per 100,000 persons (92 presentations), compared with 3.4 per 100,000 in the previous bushfire season (59 presentations). This coincided with a time when dozens of fires burned in the state in catastrophic conditions.

Because the numbers of burns presentations at the level of Statistical Area Level 4 (SA4) were generally small, data are not presented at this level.

For data by Statistical Area Level 4 (SA4), see Supplementary table S4.

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Medicare-subsidised mental health services

The mental health impacts of bushfires on individuals and communities are varied, and often long-term (Black Dog Institute 2020).

Data from the 2011–12 Victoria Population Health Survey showed that:

- 1 in 5 adults (22%) who were affected by the 2009 Black Saturday bushfires showed signs of depression or anxiety
- 1 in 10 (9.3%) accessed counselling or specialist mental health services (Department of Health & Human Services 2016).

In addition to admitted patient (hospitalisations) and emergency department presentations for mental health-related conditions mentioned elsewhere in this report, the short-term impacts of the 2019–20 bushfires (and beyond) can be informed through analysis of claims made through the Medicare Benefits Schedule (MBS). The MBS is a listing of services that qualify for a benefit under the Health Insurance Act 1973. The associated MBS claims data comprise information on MBS services claimed through Medicare. These include visits to a general practitioner (GP) or to certain specialists and allied health professionals, and hospital visits by a private patient in a public or private hospital. For more information on the MBS, see Technical notes.

Data used in this section refer to the Medicare-subsidised mental health-specific services provided by psychiatrists, GPs, psychologists and other allied health professionals. These data relate only to mental health services that are claimed under specific mental health care MBS item numbers (AIHW 2021); therefore, services provided by practitioners who do not claim items under MBS mental health items are not captured in these data. A complete list of the item numbers included can be found in Supplementary table S9.

MBS claims made during the 2019–20 bushfire season (1 September 2019 to 29 February 2020), and the average of the 2014–15 to 2018–19 bushfire seasons, are presented by Statistical Area Level 4 (SA4) for all Medicare-subsidised mental health services. The claims data show variability over the period analysed, and should be interpreted with caution.

At the level of Statistical Area Level 4 (SA4), there were generally increases in the total rate of claims for all Medicare-subsidised mental health services in the 2019–20 bushfire season compared with the previous 5-year average. For all data by Statistical Area Level 4 (SA4), see Supplementary table S6.

It is important to note that these data provide a snapshot of a particular point in time and longitudinal data could show further trends in mental health impacts over time.

References

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Black Dog Institute 2020. Mental Health Interventions Following Disasters - external site opens in new window. New South Wales: Black Dog Institute. Viewed 19 July 2021.

Department of Health and Human Services 2016. The health and wellbeing of Victorian adults affected by the bushfires in 2009—fact sheet. Victoria: Department of Health & Human Services. Viewed 19 July 2021.

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Medicare-subsidised mental health services

In response to the 2019–20 bushfires, the Australian Government introduced a number of additional Medicare Benefits Schedule (MBS) subsidised mental health items in January 2020 for Australians whose mental health was adversely affected by a bushfire that occurred in the 2019–20 financial year (for details on these items, see Technical notes). The new services are provided by eligible psychologists, GPs and medical practitioners, social workers, and occupational therapists. Patients are not required to have a diagnosed mental health condition, GP mental health treatment plan, or referral before requesting these additional services.

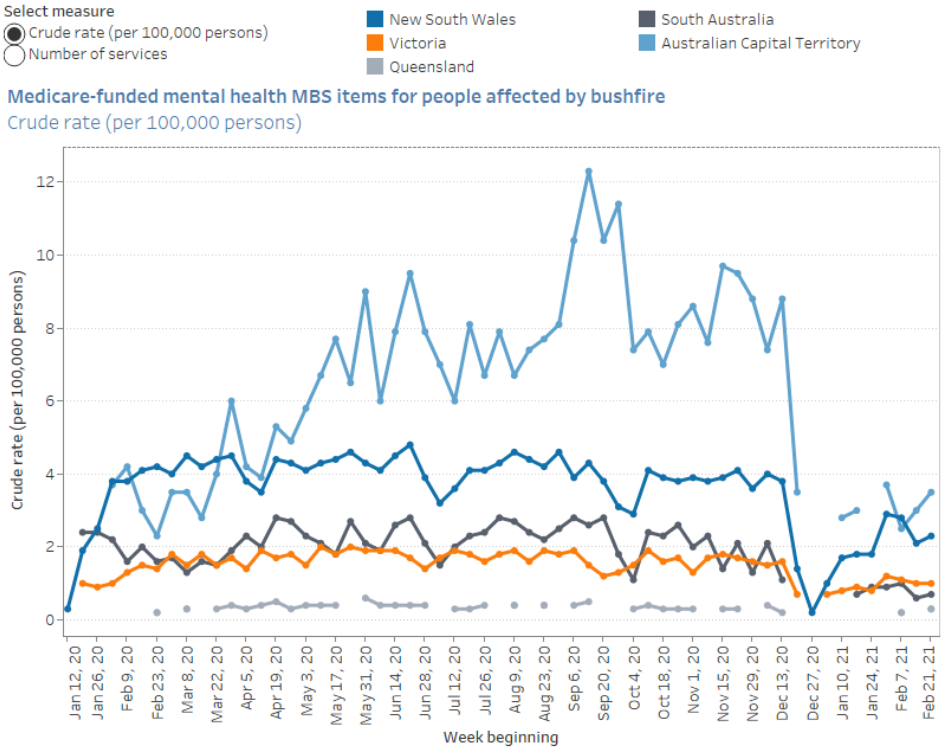
Data used in this section refer to the MBS claims made during the week beginning 12 January 2020 to the week beginning 28 February 2021 (that is, to the end of the 2020–21 bushfire season). These data relate only to bushfire-specific mental health services that are claimed under a subset of mental health care MBS item numbers.

Use of the bushfire-specific mental health items increased rapidly in the weeks following their introduction. Nationally, the highest number of services claimed were between April and June 2020, averaging around 500–600 services per week (with a peak of about 620 services claimed in the week beginning 21 June 2020). By the end of February 2021, the use of the bushfire-specific mental health items had returned to around half to one-third of the level of service use seen in the middle of 2020, following the typical reduction in number of services around the Christmas/New Year period.

To explore national data and data for states and territories, see interactive data visualisations below (for data tables see Supplementary table S5).

Use of Medicare-funded mental health MBS items for people affected by bushfire, by jurisdiction, 12 January 2020 to 6 March 2021

This chart shows the number of Medicare-funded mental health MBS items claimed for people affected by bushfire and the crude rate of these claims (per 100,000 persons) for the periods 12 January 2020 to 27 February 2021. Data are presented by jurisdiction and by week. While New South Wales had the most services claimed over the period, the crude rate of services claimed was highest for the Australian Capital Territory in many of the weeks in this period.



Source: AIHW analysis of Services Australia MBS Statistics.
http://www.aihw.gov.au

See notes >

The highest volume of services was claimed in New South Wales where between 300 and 400 services were claimed in most weeks between February and September 2020. When examining overall rates, the Australian Capital Territory had the highest rate of claims per capita for many of the weeks analysed.

In addition to the specific bushfire response mental health MBS items, MBS-subsidised mental health treatment may also have been provided to those affected by the bushfires through existing MBS mental health items. Similarly, MBS items for mental health treatment that were introduced for people affected by the COVID-19 pandemic may also have been utilised. Therefore, the actual number of mental health MBS services delivered to people affected by the bushfires may be higher than the numbers presented here.

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Outdoor physical activity (Australian Capital Territory)

The current section reports on the change in selected outdoor physical activity recorded within the Australian Capital Territory between the 2019–20 bushfire season, and the corresponding weeks in the previous year (i.e. 2018–19), based on activity tracking data. It should be noted that activity tracking data may not give a comprehensive picture of the impact of bushfire smoke pollution on outdoor activity, as people can exercise without actively tracking and uploading their sessions. Additionally, during times of bushfire smoke, people might have performed more of their physical activity sessions indoors.

The information presented in this section are based on AIHW analysis of aggregated and de-identified data provided by Strava, through their Strava Metro - external site opens in new window platform. Strava technology enables users to track, upload and share physical activity trips, such as rides (bicycling) or runs, via a smartphone app or GPS-enabled hardware. Worldwide, Strava has over 85 million users and there are 40 million activities are uploaded to Strava each week. This data forms the basis for the Strava Metro platform which allows partner organisations to analyse aggregated and de-identified data, usually for the purposes of improving active transport infrastructure. This data only includes recorded sessions from users who have made their uploads public, and excludes those whose activities are set to private or choose to opt-out of their activity being used for research purposes. For more information on Strava Metro, see Technical notes.

From the beginning of September 2019, until mid-December 2019, there was a general increase in the number of trips recorded by runners, walkers, or hikers, and riders, in comparison to the same weeks in the previous year. However, trips within the Australian Capital Territory, recorded by Strava users, generally decreased between mid-December 2019 and the end of January 2020. The greatest decreases in the number of trips recorded was:

- 64% in the week beginning 30 December 2019 for runners, walkers, or hikers, compared with the same week in the previous year
- 68% in the week beginning 30 December 2019 for riders, compared with the same week in the previous year.

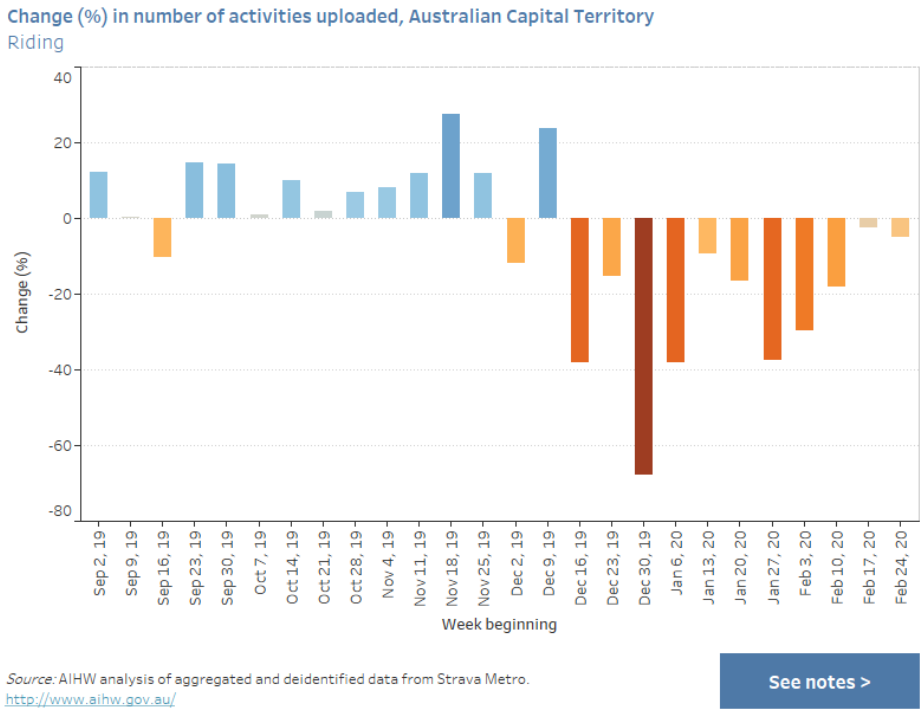
This decrease corresponded with the increased air pollution from the 2019–20 bushfires.

To explore data by activity type, see the interactive data visualisation below (for data tables see Supplementary table S7).

Change (%) in the number of trips uploaded by Strava users, by week and activity type, Australian Capital Territory, 2019–20 bushfire season relative to the previous year

This chart shows the percentage change in riding and running, walking or hiking activities uploaded by Strava users in the Australian Capital Territory for the periods 2019–20 and 2018–19. Data are presented by activity type, and by week roughly in alignment with the bushfire season. The chart shows that, compared with the previous year, trips within the Australian Capital Territory, recorded by Strava users, generally decreased between mid-December 2019 and the end of January 2020. This decrease corresponded with the increased air pollution from the 2019–20 bushfires.

Activity type
- (●) Riding
- ( ) Running/walking/hiking



Source: AIHW analysis of aggregated and deidentified data from Strava Metro.
http://www.aihw.gov.au/

See notes >

It should be noted that the change (%) in the number of recorded trips doesn't account for changes in the number of Strava users, or other seasonal effects that may have occurred between the 2 periods, and should be considered with caution.

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Technical notes

On this page

- The bushfire season
- Crude rates (rates)
- Statistical Area Level 4 (SA4)
- National Hospital Morbidity Database
- National Non-admitted Patient Emergency Department Care Database
- Medicare Benefits Schedule (MBS) data
- Outdoor activity (Strava) data—Australian Capital Territory

The bushfire season

For comparability, data for this report were limited to a selected period, which varied slightly to accommodate leap years. For analyses related to admitted patient hospitalisations, emergency department presentations, and the Medical Benefits Schedule (MBS; all mental health items analysis only), this period was from 1 September to 1 March (for non-leap years: 2014–15, 2016–17, 2017–18 and 2018–19) and 1 September to 29 February (for leap years: 2015–16 and 2019–20). This period is referred to in reporting as the 'bushfire season'.

Counts and rates were organised by week, grouped into 7-day periods beginning on 1 September for all years analysed. The comparison period for admitted patient hospitalisations and all Medicare-subsidised mental health services was the average of the previous 5 years (2014–15 to 2018–19). For emergency department presentations, the comparison period was the previous year (2018–19) for reasons of comparability, as the Emergency Department ICD-10-AM Principal Diagnosis Short List - external site opens in new window was implemented from 2018–19.

Strava Metro data were grouped by weeks, with Monday as the first day. The 2019–20 bushfire period for these purposes was from 2 September 2019 to 1 March 2020, with the previous year (3 September 2018 to 3 March 2019), used for comparison.

For MBS bushfire-specific mental health items, week groupings started after the introduction of the items and there was no comparison period.

See Supplementary table S8 for a complete list of the weeks used in this report.

Crude rates (rates)

A crude rate, referred to as rate in this report, is defined as the number of events over a specified period (for example, a year or week) divided by the total population at risk of the event. It is then often multiplied by a set number to be expressed as a rate per standard unit of population (for example, number of hospitalisations per 100,000 persons) or as a percentage by multiplying the rate by 100.

The Australian Bureau of Statistics (ABS) Estimate Resident Population (ERP) for the end of the previous year's reporting period was used as the denominators when calculating rates for admitted patient hospitalisations and emergency department presentations. For example, the population at 30 June 2018 was used to create rates for the 2018–19 period. Therefore, populations used in denominators reflect the population at the beginning of each reporting period. For bushfire-specific mental health Medicare Benefits Schedule (MBS) data, the ERP at the end of the quarter in which a given week occurred was used to calculate rates.

Statistical Area Level 4 (SA4)

Where possible, counts and rates have been reported by Statistical Area Level 4 (SA4), based on the ABS 2016 Australian Statistical Geography Standard (ASGS). A total of 88 SA4s are presented in this report, which excludes non-geographic codes and *Other territories*. A populated SA4 has around 100,000 to 300,000 people; metropolitan SA4s tend to have larger populations of around 300,000 to 500,000 people. In interpreting the results, note that where data are described at the state or territory level, the data include areas that were affected by fire or smoke as well as unaffected areas; this influences results at the state or territory level. Therefore, interpretation of data at the state or territory level is complemented by analysis at the SA4 regional level, to provide added detail in relation to short-term health effects of the 2019–20 bushfires. Many of the examples provided in this report are focused on jurisdictions most affected by bushfires and smoke: New South Wales, Victoria and the Australian Capital Territory.

National Hospital Morbidity Database

This section includes information relevant to interpretation of the National Hospital Morbidity Database (NHMD). Further information on the NHMD is available at <https://www.aihw.gov.au/reports-data/myhospitals/content/about-the-data> and a complete data quality statement is available online at <https://meteor.aihw.gov.au/content/index.phtml/itemId/181162 - external site opens in new window>.

The NHMD is a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals.

The data supplied are based on the National Minimum Data Set (NMDS) for Admitted Patient Care and include 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 purpose of the NMDS for Admitted Patient Care is to collect information about care provided to admitted patients in Australian hospitals. The scope of the NMDS is episodes of care for admitted patients in all public and private acute and psychiatric hospitals, free-standing day hospital facilities, and alcohol and drug treatment centres in Australia. Hospitals operated by the Australian Defence Force, corrections authorities and in Australia's off-shore territories are not in scope but some are included.

See the methodology section below for things to consider when interpreting these data.

Methodology

Data were grouped into 26, 7-day 'bushfire weeks' for each year of data, beginning on 1 September for all years and ending at 1 March for non-leap years and 29 February for leap years (See Supplementary table S8 for dates included in each week where comparisons were made). The dates reflect the date of admission of each episode of care.

Counts and crude rates based on principal diagnosis (see Table 1 below for groupings) were produced by bushfire week, state, and Statistical Local Area 4 (SA4).

Counts represent the number of hospitalisations for each reference week, reported by ICD-10-AM code aggregated into 1 of 11 condition groups (see coding details below).

Crude rate refers to number of hospitalisations per 100,000 persons. Rates for the 2019–20 bushfire season were calculated using the number of hospitalisations by bushfire week, state, and SA4 and condition group, divided by the estimated resident population at 30 June 2019 (see Crude rates (rates) above).

Crude rate for the previous 5-year average (per 100,000): Rate for the previous 5-year average was calculated as a weighted average of the crude rates for the years 2014–15 to 2018–19, to account for population change. Rates are expressed as hospitalisations per 100,000 persons.

Rate change (%) refers to the percentage change in the 2019–20 crude rate relative to the previous 5-year average crude rate.

The conditions (and associated ICD-10-AM codes) in Table 1 below were selected for inclusion based on existing literature on the health impacts of bushfires and bushfire smoke pollution.

Table 1: ICD-10-AM codes included in NHMD analyses

Condition	ICD-10-AM code(s)
Respiratory conditions	J00–J99
Asthma	J45–J46
Chronic obstructive pulmonary disease (COPD) with acute exacerbation	J44.1
Selected heart conditions	I10–I15, I20–I28, I30–I52
Cerebrovascular disease	I60–I69
Heart attack (Acute myocardial infarction)	I21
Mental health	F00–F99
Breathing abnormalities	R06.0–R06.8
Chest pain	R07.1, R07.3, R07.4
Dehydration	E86
Burns	T20–T31

ICD-10-AM codes for the above were included for all years of analyses as follows: 2014–15 (8th edition); 2015–16 and 2016–17 (9th edition); 2017–18 and 2018–19 (10th edition); 2019–20 (11th edition).

Records with missing sex and age were included in the analysis. The data exclude hospitalisations with a care type of hospital boarder, post humous organ procurement, and newborns with unqualified days only. Additionally, data exclude hospitalisations in Western Australia with a contracted patient status of 'Inter-hospital contracted patient to private sector hospital', to adjust for separations recorded on both sides of contractual care arrangements.

Analysis by geography

Geography is based on the patients' state of usual residence, or area of usual residence—SA4, and not the jurisdiction or SA4 of the hospital at which the patient was admitted.

Reporting of results

In line with AIHW policy on reporting to manage confidentiality and reliability, as well as data management protocols for this dataset, where counts for diagnosis in a given week in a given jurisdiction or SA4 were less than 10, crude rates were not produced; where counts were 5 or lower for a particular disaggregation, both the counts and rates were suppressed. Secondary suppression was also applied throughout in the event that a suppressed cell could be identified from a higher level aggregation. Rates based on small numerators (particularly counts of less than 20) can be subject to volatility, and should be interpreted with caution.

Limitations and data considerations

The comparability of the coded diagnosis, intervention and external cause data can be affected by variations in the quality of the coding, and the numbers of diagnoses and/or interventions reported. Comparability can also be influenced by state-specific coding standards.

When considering numbers and rates in this report, it should be noted that variations in practices and policies may lead to variation among providers in the number of admissions for some conditions. Therefore, comparisons of hospitalisations across jurisdictions should be considered with caution Additionally, while care has been taken when choosing periods for comparison, changes in ICD-10-AM/ACHI classifications and the associated Australian Coding Standards may affect the comparability of the data over time.

Data based on the state or territory of residence should be interpreted with caution because of potential cross-border flows of patients.

National Non-admitted Patient Emergency Department Care Database

This section presents information on the emergency department data used in this report, and their limitations. The data quality statement and detailed data specifications for the National Non-admitted Patient Emergency Department Care Database (NNAPEDCD) is available online at <www.aihw.gov.au/about-our-data/our-data-collections/national-hospitals-data-collection - external site opens in new window>.

The data supplied by state and territory health authorities for the Non-admitted Patient Emergency Department Care (NAPEDC) National Minimum Data Set/National Best Endeavours Data Set (NMDS/NBEDS) were used by the AIHW to assemble the NNAPEDCD. The data cover waiting times and other characteristics of presentations to public hospital emergency departments.

The NNAPEDCD provides information on the care provided (including waiting times for care) for non-admitted patients registered for care in public hospital emergency departments that have:

- a purposely designed and equipped area with designated assessment, treatment, and resuscitation areas
- the ability to provide resuscitation, stabilisation, and initial management of all emergencies
- availability of medical staff in the hospital 24 hours a day
- designated emergency department nursing staff 24 hours per day 7 days per week, and a designated emergency nursing unit manager.

See the methodology section below for things to consider when interpreting these data.

Methodology

Data were grouped into 26, 7-day ' bushfire weeks' for each year of data, beginning on 1 September for all years and ending at 1 March for non-leap years and 29 February for leap years (See Supplementary table S8) for dates included in each week where comparisons were made. The dates reflect the date of presentation of each episode of care.

Counts and crude rates based on principal diagnosis (see Table 2 below for groupings) were produced by bushfire week, state, and Statistical Local Area 4 (SA4).

Counts represent the number of presentations for each reference week, reported by ICD-10-AM code aggregated into 1 of 11 condition groups (see coding details below).

Crude rate refers to number of presentations per 100,000 persons. Rates for the 2019–20 bushfire season were calculated using the number of presentations by bushfire week, state, and SA4 and condition group, divided by the estimated resident population at 30 June 2019 (see Crude rates (rates) above). Rates are expressed as presentations per 100,000 persons.

Rates for the 2018–19 bushfire season were calculated using the same methodology but with the estimated resident population at 30 June 2018 as the denominator.

Rate change (%) refers to the percentage change in the 2019–20 crude rate relative to the previous 2018–19 bushfire season crude rate.

The conditions (and associated ICD-10-AM codes) in Table 2 below were selected for inclusion based on existing literature on the health impacts of bushfires and bushfire smoke.

Table 2: ICD-10-AM codes included in NNAPEDCD analyses

Condition	ICD-10-AM code(s)
Respiratory conditions	J00–J99
Asthma	J45–J46
Chronic obstructive pulmonary disease (COPD) with acute exacerbation	J44.1
Selected heart conditions	I10–I15, I20–I28, I30–I52
Cerebrovascular disease	I60–I69
Heart attack (Acute myocardial infarction)	I21
Mental health	F00–F99
Breathing abnormalities	R06.0–R06.8
Chest pain	R07.1, R07.3, R07.4
Dehydration	E86
Burns	T20–T31

ICD-10-AM codes for the above were included for all years as follows: 2018–19 (10th edition short list); 2019–20 (11th edition short list)—comparisons with the 5 previous years were not made for data from the NNAPEDCD due to concerns about comparability of the data before the introduction of the short list.

Analysis by geography

Geography is based on the patients' state of usual residence, or area of usual residence—SA4, and not the jurisdiction or SA4 of the emergency department at which the patient presented.

Reporting of results

In line with AIHW policy on reporting to manage confidentiality and reliability as well as data management protocols for this dataset, where counts for a diagnosis on a given week in a given jurisdiction or SA4 were less than 10, crude rates were not produced; where counts were 5 or lower for a particular disaggregation, both the counts and rates were suppressed. Secondary suppression was also applied throughout in the event that a suppressed cell could be identified from a higher level aggregation. Rates based on small numerators (particularly counts of less than 20) can be subject to volatility, and should be interpreted with caution.

Limitations and data considerations

A general concern with data from emergency departments is that diagnoses are not coded by qualified clinical coders, as they are for admitted patient care. Emergency department diagnoses data are coded at point of care by medical, nursing or clerical personnel.

Although the NNAPEDCD is a valuable source of information on emergency department care, the data have limitations. For example, sick or injured people who do not present to emergency departments are not included. Persons who present to an emergency department more than once in a reference year are counted on each occasion. Because the scope of the collection is limited to emergency departments that meet nationally agreed criteria, most of the data provided to the NNAPEDCD relate to emergency department care provided to people living in *Major cities*. The NNAPEDCD may not include emergency presentations to hospitals that have emergency departments that are not in scope for the Non-admitted Patient Emergency Department Care (NAPEDC) National Minimum Data Set (NMDS)/National Best Endeavours Data Set (NBEDS).

States and territories are primarily responsible for the quality of the data they provide. However, the AIHW undertakes extensive validations on receipt of data. Potential errors are queried with jurisdictions, and corrections and resubmissions may be made in response to these edit queries. The AIHW does not adjust data to account for possible data errors or missing values, except where stated.

Although there are national standards for data on non-admitted patient emergency department services, the way those services are defined and counted varies across states and territories, and over time. Therefore, comparisons of ED presentations across jurisdictions, and across time should be considered with caution.

For more detailed information on the data, see <https://www.aihw.gov.au/reports-data/myhospitals/content/about-the-data>.

Medicare Benefits Schedule (MBS) data

The MBS data presented relate to services provided on a fee-for-service basis for which MBS benefits were paid. The date is determined from the date the service was provided rather than the date the service was processed by Medicare.

Services Australia collects data on the activity of all persons making claims through the Medicare Benefits Scheme and provides this information to the Department of Health (Services Australia 2020). Information collected includes the type of service provided (MBS item number) and the benefit paid by Medicare for the service. The item numbers and benefits paid by Medicare are based on the Medicare benefits schedule book (Department of Health 2021). Services that are not included in the MBS are not included in the data.

See Supplementary tables S5 and S9 for a list of the MBS items used in the analyses. Further information on mental health-specific MBS items may be found at <https://www.aihw.gov.au/reports/mental-health-services/mental-health-services-in-australia/report-contents/medicare-subsidised-mental-health-specific-services/data-source-and-key-concepts#references>.

All Medicare-subsidised mental health conditions analysis

Notes on the analysis of all Medicare-subsidised mental health conditions are included below:

- MBS items included in the analysis are listed in Table S9 of the Supplementary tables.
- Crude rate (per 100,000) refers to number of services per 100,000 persons.
- For the analysis of bushfire-specific mental health items (Supplementary table S5), the population used to calculate the crude rate was the estimated resident population as at the end of the quarter in which the relevant week occurred, or the most recent available for services in 2021 (31 December 2020).
- For SA4 analysis (Supplementary table S6), the previous 5-year average crude rate was calculated as the weighted average crude rate over the 5-year period (that is total services / total population in that SA4).
- Comparison weeks were based on the same dates in the year over the previous 5 years, going back to 2014 (ensuring the period didn't run into 2020).
- The population used for the calculation of rates for the SA4 analysis was the estimated resident population at 30 June of the corresponding financial year in which the week occurred. For example, the population used for calculating comparison rates for the week 1 September to 7 September 2018 was the ERP at 30 June 2019.
- An adjustment was made for the week containing the date of 29 February 2020—comparison weeks for all years except 2016 have an additional day added onto the end of the week to provide a 7 day time period.
- The last week of the period ends on March 1 for 2014–15, 2016–17, 2017–18 and 2018–19, and on February 29 for 2015–16, and 2019–20, to account for the leap year.
- Medicare services were allocated to SA4 based on the patient's enrolment postcode at the date of processing.
- Analysis of MBS mental health items was by date of service.
- Data for *Other territories* were excluded.

Further information on MBS data: see Medicare statistics—Services Australia - external site opens in new window.

Bushfire-specific mental health Medicare-subsidised service use

Notes on the analysis of bushfire-specific mental health MBS items are included below:

- On 10 January 2020, bushfire MBS mental health items were announced.
- From 17 January 2020, bushfire MBS mental health items were available to people whose mental health was adversely affected by a bushfire in the 2019–20 financial year. Therefore, counts and rates for the week beginning 12 January 2020 include 17–18 January 2020 only.

- MBS item numbers for claims by people whose mental health was affected by a bushfire in the 2019–20 financial year include services provided by:
  - GPs: 894, 896, 898, 2121, 2150, 2196, 91283, 91285, 91286, 91287, 91371, 91372, 91721, 91723, 91725, 91727, 91729, 91731
  - clinical psychologists: 91000, 91001, 91005, 91010, 91011, 91015
  - registered psychologists: 91100, 91101, 91105, 91110, 91111, 91115
  - social workers and occupational therapists: 91125, 91126, 91130, 91135, 91136, 91140, 91150, 91151, 91155, 91160, 91161, 91165.
- On 13 March 2020, new temporary COVID-19 MBS mental health telehealth items were introduced.
- From 20 April 2020, allied health service providers were no longer required to bulk-bill COVID-19 MBS mental health telehealth items. GPs and other medical professionals must bulk bill for Commonwealth concession card holders, children under 16 years old and patients who are more vulnerable to COVID-19.
- On 2 August 2020, 10 additional Medicare psychological therapy sessions were made available to people subjected to further restrictions in areas affected by the second wave of the COVID-19 pandemic. This was available from 7 August 2020 to 31 March 2021.
- From 9 April 2020 to 30 June 2022, the 10 additional individual psychological therapy sessions were made available to all patients eligible under the existing MBS Better Access initiative.
- On 10 December 2020 eligibility requirements for the Better Access initiative were expanded to allow aged care residents to access up to 20 subsidised individual psychological services each calendar year.
- The reporting period for these items is 12 January 2020–6 March 2021.
- Medicare services are allocated to SA4 based on the patient's enrolment postcode at the date of processing.
- Analysis of MBS mental health items is by date of service.
- Counts of small numbers of services (less than 6) have not been presented for reasons of privacy and confidentiality.
- Crude rates are presented per 100,000 persons.
- Rates based on less than 10 services have not been reported for reasons of data reliability. Rates based on small numbers of services (particularly less than 20) should be interpreted with caution.

For further information on MBS data: see Medicare statistics—Services Australia - external site opens in new window.

Outdoor activity (Strava) data—Australian Capital Territory

This report presents information based on AIHW analysis of aggregated and de-identified data provided by Strava, through their Strava Metro platform. Strava is a platform that enables users to track, upload and share activities (trips) such as riding (bicycling), running, walking, or hiking, via a smartphone app or GPS-enabled hardware. Worldwide, Strava has over 85 million users and there are 40 million activities are uploaded to Strava each week. This data forms the basis for the Strava Metro platform, which allows partner organisations to analyse the data, usually for the purposes of improving active transport infrastructure. Strava Metro data includes activities from users that has been shared publicly and does not include activities shared privately or activities from people who have opted out of Strava Metro.

Strava granted the AIHW access to data for the Australian Capital Territory via the Strava Metro dashboard. In order to compare Strava user activity during the 2019–20 bushfire season with activity in the previous year, the proportional difference in total trips uploaded by Strava users for weeks in the period 2 September 2019–1 March 2020, relative to weeks in the previous period, 3 September 2018–3 March 2019 was calculated. It should be noted that activity tracking data may not give a comprehensive picture of the impact of bushfire smoke pollution on outdoor activity, as people can exercise without actively tracking and uploading their sessions. Additionally, during times of bushfire smoke, people might have performed more of their physical activity sessions indoors.

Additionally, the change (%) in the number of recorded trips doesn't account for changes in the number of Strava users, or other seasonal effects such as air quality, temperature, or rainfall that may have occurred between the 2 periods, and should be considered with caution. It is also possible that some users may have left the Australian Capital Territory to avoid smoke pollution or have been affected by road closures during the height of the 2019–20 bushfire season.

Week groupings on the Strava Metro dashboard are based on weeks starting on a Monday rather than aligned according to date. Therefore, comparison weeks were aligned based on the week in the previous year which had the closest date to the week of interest.

References

Department of Health 2021. Medicare Benefits Schedule book - external site opens in new window. Viewed 21 August 2021.

Services Australia 2020. Education guide—Better Access to mental health care for eligible health professionals - external site opens in new window. Viewed 21 August 2021.

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Data

Data tables: Short-term health impacts of the 2019–20 Australian bushfires – data update

Data
XLS 6.3Mb

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Related material

Resources

Australian bushfires 2019–20: exploring the short-term health impacts

Resource

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