

health

The health impacts of the January 2014 heatwave in Victoria

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Contents

List of figures	v
List of tables	v
Acknowledgements	vi
Executive summary	1
Introduction	3
Background	5
Methods	7
Data sources	7
Definitions	8
Data analysis	9
Results	11
Extreme heat in Victoria	11
Victorian public hospital emergency department presentations	12
Ambulance Victoria emergency dispatches	17
National Home Doctor Service after-hours consultations	18
NURSE-ON-CALL heat-related telephone calls	19
Deaths reported to the Coroners Court of Victoria	20
Death admissions to the Victorian Institute of Forensic Medicine	21
Total deaths	22
Appendix I: Weather forecast districts by heat health temperature threshold, weather station and local government area, Victoria	24
Appendix II: People affected by heat	26
References	28

List of figures

Figure 1: Heat health temperature thresholds (mean temperatures) for weather forecast districts in Victoria	5
Figure 2: Mean temperatures during extreme heat events in Melbourne, 26 January–1 February 2009 and 12–18 January 2014	12
Figure 3: Total public hospital emergency department presentations, 12–18 January 2014	13
Figure 4: Total public hospital emergency department presentations by older age group, 12–18 January 2014	14
Figure 5: Total public hospital emergency department presentations, by triage category, 12–18 January 2014	15
Figure 6: Deaths in, and prior to arrival at public hospital emergency departments, by age group, 12–18 January 2014	15
Figure 7: Public hospital emergency department presentations, by disease type, 12–18 January 2014	16
Figure 8: Public hospital emergency department heat-related presentations, 12–18 January 2014	17
Figure 9: Total Ambulance Victoria metropolitan emergency dispatches, January 2013 & 2014	18
Figure 10: National Home Doctor Service heat-related consultations (rate per 1,000 consultations), 12–18 January 2014	19
Figure 11: NURSE-ON-CALL heat-related telephone calls, 12–18 January 2014	20
Figure 12: NURSE-ON-CALL heat-related telephone calls, by topic (as a percentage of all heat-related calls), 12–18 January 2014	20
Figure 13: Deaths reported to the Coroners Court of Victoria, 12–18 January 2014	21
Figure 14: Death admissions to the Victorian Institute of Forensic Medicine, 4 January–3 February, 2013 & 2014	21
Figure 15: Total deaths in Victoria, 12–18 January 2014	22

List of tables

Table 1: Daily temperatures during extreme heat events in Melbourne, 26 January–1 February 2009 and 12–18 January 2014	11
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Executive summary

The heatwave which affected south eastern Australia between 14 and 17 January 2014 was similar, in terms of intensity and duration, to heatwaves recorded in January 2009, January 1939 and January 1908 (Bureau of Meteorology 2014). Although maximum temperatures for the January 2014 heatwave were slightly lower than those observed during these earlier heatwaves, mean temperatures were high and the heat lasted for a longer time, with Victoria actually experiencing the hottest four-day period on record. Maximum temperatures were 12°C or more above average for much of Victoria, with parts of the state recording temperatures of 45°C or more on three consecutive days during the heatwave, and Melbourne experiencing temperatures in excess of 41°C each day between 14 and 17 January 2014.

The health impacts of the heatwave have been assessed in this report by examining the following health service use and deaths data:

- Victorian public hospital emergency department presentations
- Ambulance Victoria emergency dispatches
- National Home Doctor Service after-hours locum doctor consultations
- Telephone calls to the NURSE-ON-CALL service
- Deaths reported to the Coroners Court of Victoria
- Death admissions to the Victorian Institute of Forensic Medicine
- Death registrations at the Victorian Registry of Births, Deaths and Marriages.

The health service use and deaths data for the week of the heatwave, 12–18 January 2014, has been compared to what would have been expected, based on data from previous years.

The key findings in this report include the following:

Victorian public hospital emergency department presentations

Total presentations

- There was a seven per cent increase in (all cause) public hospital emergency department presentations during the week of the January 2014 heatwave, with a 23 per cent increase observed for Victorians aged 75 years or more. This compares to a 37 per cent increase for Victorians aged 75 years or more in the 2009 heatwave.
- There was an increase in the number of presentations requiring more urgent attention during the week of the heatwave and a decrease in the number of presentations triaged as non-urgent cases.
- There were 63 people who died prior to arrival at a hospital emergency department during the week of the heatwave, and a further 27 died within an emergency department.

Heat-related presentations

- There were 621 heat-related presentations during the week of the heatwave, higher than the 105 expected, representing a five-fold increase.
- Forty per cent of heat-related presentations were for people aged 75 years or more.

Ambulance Victoria emergency dispatches

Total emergency dispatches

- There was a 25 per cent increase in the Ambulance Victoria emergency caseload in the metropolitan region during the heatwave (14–17 January). This compares to a 46 per cent increase in metropolitan emergency dispatches during the three days of the heatwave in 2009.
- The number of emergency dispatches peaked on the last two days of extreme heat (16–17 January), however, the number of emergency incidents continued to be high for a few days following the heatwave.

Code 1 dispatches

- Code 1 dispatches increased by 44 per cent in the metropolitan region, from an average of 587 per day for the period 1–13 January, prior to the heatwave, to an average of 847 per day during the heatwave (14–17 January).

Priority '0' dispatches

- The Priority '0' caseload in the metropolitan region increased from an average of 29 dispatches per day for the period 1–13 January, to an average of 57 dispatches per day during the heatwave (14–17 January), representing a 97 per cent increase.

National Home Doctor Service after-hours consultations

Total consultations

- There was a 56 per cent increase in after-hours doctor consultations during the week of the heatwave.

Heat-related consultations

- There was a three-fold increase in consultations with a heat-related diagnosis during the week of the heatwave.

NURSE-ON-CALL heat-related telephone calls

- There was a three-fold increase in heat-related calls to the service during the week of the heatwave.
- Sixty per cent of all heat-related calls to the service were about heat exposure or heat injury; a further 23 per cent were about sunburn and 17 per cent were about dehydration.
- Almost a third (30 per cent) of all heat-related calls to the service during the week of the heatwave were identified as being about children, while around 12 per cent were from people aged 65 years or more.

Deaths reported to the Coroners Court of Victoria

- There were 228 deaths reported to the Coroners Court of Victoria for investigation during the week of the heatwave, which was more than double the number expected (105).

Death admissions to the Victorian Institute of Forensic Medicine

- Although admissions peaked on the last day of the heatwave, admission numbers continued to be high for a few days following the heatwave.

Total deaths

- There were 858 deaths, with 691 expected during the week of the heatwave.
- This represents an estimated 167 excess deaths and corresponds to a 24 per cent increase in mortality.
- This compares to an estimated 374 excess deaths, or a 62 per cent increase in total all-cause mortality, in the 2009 heatwave. This is despite the fact that the 2014 heatwave was a four day period of prolonged heat, compared to a three day period in 2009.
- We believe that the continued implementation of Victoria's heatwave plan (2011) has contributed to the decrease in estimated excess mortality observed in 2014.

Introduction

Heatwaves are brief periods of extreme heat that vary in intensity and duration. These periods of extreme heat are an important issue in public health because they can result in considerable harm. The January 2009 heatwave was associated with increased morbidity and mortality, highlighting the risk, and the vulnerability of Victorians to extreme heat (Department of Human Services 2009).

This report assesses some of the health impacts from the extreme heat experienced in Victoria between 14 and 17 January 2014. During this four-day period, Victoria experienced one of the longest, intense heatwaves on record, with many new records set for the state (Bureau of Meteorology 2014). Although maximum temperatures were not as high as those experienced during the January 2009 heatwave, mean temperatures were high and the heat lasted for a longer period.

The health data presented in this report have been obtained from a number of sources, based upon relevance, quality, completeness and availability. Each of the data items presented provides insights into the collective health impacts of extreme heat in Victoria.

Background

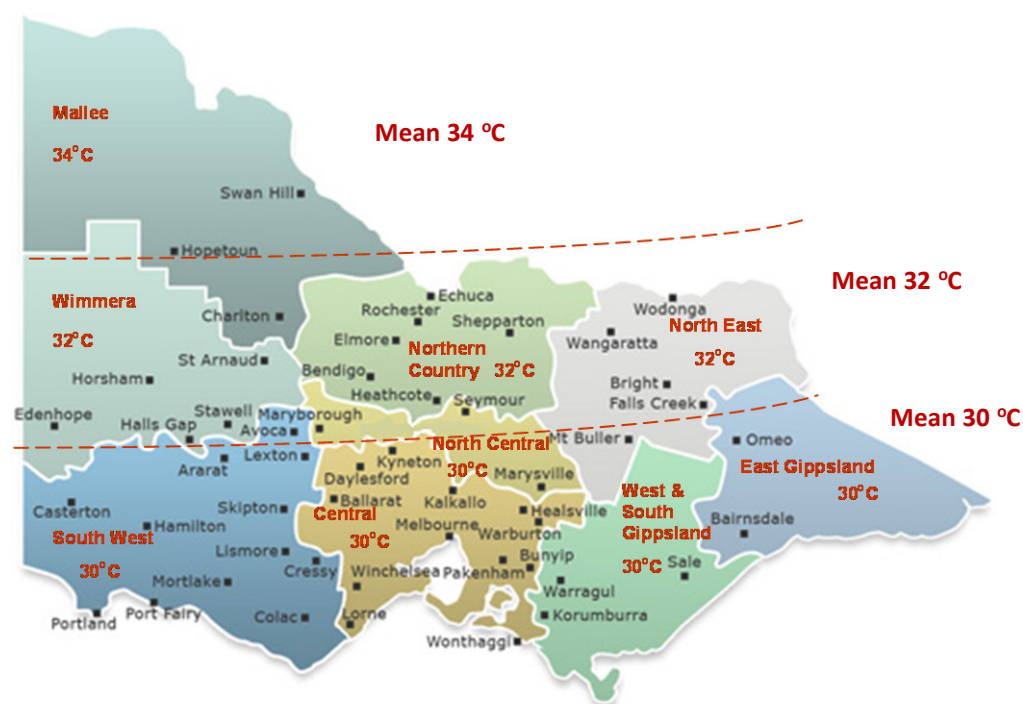
Heatwaves are brief periods of unusually high temperatures that can result in considerable harm. These periods of extreme heat vary in intensity and duration between geographic areas and may also vary in intensity and duration at different times of the year. Increases in temperature and more frequent periods of extreme heat have been forecast for Victoria into the future (Intergovernmental Panel on Climate Change 2014). They are an important issue in public health because of the risk they pose to human health.

There is no single, internationally accepted definition of a heatwave, or period of extreme heat, but the Department of Health has developed a definition based on the lower limit above which heat-related illness and mortality increase. This lower temperature limit is described as a 'heat health temperature threshold' in Victoria.

Following the January 2009 heatwave, the department developed a *Heatwave plan for Victoria* (Department of Health 2011a), a coordinated and integrated response to heatwaves in Victoria. The plan provides a clear understanding of the actions and systems in place to support at-risk groups in the community and includes information about the health impacts of heat and how to stay healthy in the heat.

The department operates a heat health alert system each summer, monitoring forecast temperatures around the state by weather forecast district (Figure 1 and Appendix I). Heat health temperature thresholds for Victoria differ by weather forecast district, with higher thresholds established in northern areas, reflecting the higher temperatures experienced in these areas. When a heatwave is forecast, and heat health temperature thresholds are expected to be exceeded, the department issues heat health alerts to notify departmental program areas, hospitals, local government, agency partners and health and community service providers of forecast conditions. The alerts advise recipients to monitor local conditions and respond in accord with their heatwave plans.

Figure 1: Heat health temperature thresholds (mean temperatures) for weather forecast districts in Victoria



Source: Image adapted from the Country Fire Authority's 'Find your fire district' map <<http://www.cfa.vic.gov.au/warnings-restrictions/find-your-fire-district/>>.

The department also operates a heat health information surveillance system each summer to monitor the human health impacts of extreme heat (Department of Health 2011b). The surveillance system operates between 1 November and 31 March each year. The department obtains actual temperature data, along with health service activity and mortality data in order to track health service use and deaths in relation to temperature. The information is used to assist in assessing public health risk from extreme heat.

Although extreme heat is a generic health stressor and can affect anyone in the community, studies have shown that certain groups are more vulnerable to the effects of heat than others (Department of Health 2011a; 2011b; World Health Organisation 2008) (Appendix II). Older people, for example, are more vulnerable, largely because of an impaired physiological response to heat and higher prevalence of chronic conditions involving the cardiovascular, respiratory, renal and endocrine systems. As a group, they are likely to have lower levels of cardiovascular fitness, which is necessary for thermoregulation, and be on medication that may impair their response to the heat. They are also more likely to suffer impaired mobility, visual impairment, varying degrees of cognitive decline and waning social connectedness, which can reduce their capacity to protect themselves from the effects of extreme heat (Department of Health 2013).

Both mortality and morbidity have been shown to increase in Victoria during extreme heat events (Department of Human Services 2009). Health services experience higher than normal demand during heatwaves, with increases in heat-related conditions, and a greater health burden born by vulnerable groups. The insights gained from analysis of past heatwaves and their health impacts continues to assist in the formation of plans and strategies to respond, as well as assisting in developing and improving the resilience of Victorians to extreme heat.

Methods

Data sources

Ambulance Victoria – total emergency, Code 1 and Priority ‘0’ dispatches

Ambulance Victoria provides daily de-identified information about emergency ambulance responses to the department between November and March each year. The ambulance data presented in this report include total emergency dispatches, as well as Code 1 dispatches—time critical cases with a lights and sirens ambulance response, which are a subset of all emergency incidents. The report also includes Priority ‘0’ incidents—emergency ambulance responses to cardiac cases, which are a subset of Code 1 incidents.

National Home Doctor Service – total and heat-related consultations

The National Home Doctor Service provides after-hours medical care in the Melbourne metropolitan, Geelong and Mornington Peninsula areas of the state. Patients seeking care from their GP when a practice is closed are directed to contact the service for a doctor to make a home visit. The notes from each home visit by a locum are recorded on a database and made available to the patient’s usual doctor. De-identified daily counts of locum consultations are obtained by the department for heat health surveillance purposes each day during summer from the service database using keywords for heat-related diagnoses. This report includes analysis of total after-hours locum consultations and analysis of records that include a heat-related diagnosis.

NURSE-ON-CALL – heat-related telephone calls

The NURSE-ON-CALL service is a telephone service that provides immediate, expert health advice from a registered nurse, 24-hours a day, seven days a week. The details of telephone calls to the service are collected, including the symptoms or health concern prompting each call. The service is operated by Medibank Health Solutions in Victoria on behalf of the Department, and provides de-identified call data to the department each day during summer for heat health surveillance purposes. This report includes an analysis of telephone call records from around the state, which included a reference to a heat-related condition.

Victorian Emergency Minimum Dataset – total and heat-related presentations

The Victorian Emergency Minimum Dataset is a data collection containing de-identified administrative and clinical information on presentations to public hospital emergency departments in Victoria. De-identified daily counts of total and heat-related presentations are extracted for heat health surveillance purposes during summer. Heat-related presentations included in the analyses in this report include those records containing an ICD-10-AM code ‘E86’, ‘L55–L56’ and ‘T67’. This includes people who are diagnosed in a Victorian public hospital emergency department with volume depletion or dehydration, sunburn, sunstroke, heat exhaustion, heat syncope, heat cramp, heat stroke, heat fatigue or heat oedema. This report includes analysis of both total emergency department presentations and heat-related emergency department presentations from public hospitals in Victoria.

Deaths reported to the Coroners Court of Victoria – total deaths

Certain deaths are required by law to be reported to the Coroners Court of Victoria. This includes deaths that are unexpected, or appear to have resulted directly or indirectly from accident or injury; where the identity of a person is not known, or where a medical practitioner has been unable to provide a death certificate. De-identified daily counts of deaths reported to the Coroners Court of Victoria are forwarded to the department for heat health surveillance purposes during summer. Deaths reported to the Coroners Court of Victoria come from all around Victoria and the data may include records for

persons who normally reside in other states or territories, or overseas. These people are included in the analyses as they have died within the state and are assumed to have been exposed to the heat.

Victorian Institute of Forensic Medicine – death admissions

The Victorian Institute of Forensic Medicine became an important part of the heat health surveillance system in January 2014. De-identified daily counts of death admissions to the Institute for forensic investigation are forwarded to the department for heat health surveillance purposes. The number of death admissions that occurred during the week of the heatwave has been included in this report. These admissions are a subset of deaths reported to the Coroners Court of Victoria.

Victorian Registry of Births, Deaths and Marriages – total deaths

Victorian mortality data are collated by the Victorian Registry of Births, Deaths and Marriages. Death certificates are required to be completed by a registered medical practitioner within 48 hours of a death and then forwarded to the Registry. De-identified daily counts of registered deaths (by date of death) are forwarded to the department for heat health surveillance purposes during summer each year. This report includes an estimate of excess deaths and the total number of deaths that occurred during the week of the heatwave. These figures are based on death registrations from the Registry and unregistered deaths reported to the Coroners Court of Victoria, as at 30 June 2014.

Bureau of Meteorology – 24-hour minimum and maximum temperatures

The Bureau of Meteorology provides a range of climatic statistics for Victoria on its website (see www.bom.gov.au), including 24-hour minimum and maximum temperatures from weather stations around the state. Temperature information is obtained daily between November and March each year for surveillance purposes from key weather stations from around Victoria. The analysis in this report includes actual temperature data (as opposed to forecast temperature data) from the Melbourne Regional Station (station number 086071).

Definitions

Heatwave

A heatwave is a period of unusually hot weather, or extreme heat that may vary in intensity and duration between locations, and may vary in intensity and duration at different times of the year. The department has a technical definition for a heatwave based on the minimum temperature (heat health temperature threshold) that is likely to impact on the health of the community.

Heat health temperature threshold

A heat health temperature threshold is the lower temperature limit above which there is likely to be an impact on human health. There are three heat health temperature thresholds that apply to three broad geographical bands or zones, running horizontally from east to west across Victoria (Figure 1). The highest threshold (mean 34°C) applies to the northernmost (warmest) area of Victoria and the lowest threshold (mean 30°C) applies to the more southern (coolest) area of the state.

Weather forecast district

Temperature is monitored by weather forecast district in Victoria each summer. With the exception of the North East, these districts are based on geographical zones with similar, consistent weather patterns and temperatures. Weather forecast districts can be defined by local government area boundaries (Appendix 1).

Mean temperature

Daily maximum and minimum temperature data were obtained from the Bureau of Meteorology

(www.bom.gov.au). Mean temperature was calculated from the daily maximum temperature and the following overnight temperature, which is the minimum for the following day.

Mean temperature = (daily maximum + following overnight minimum)/2.

Confidence intervals

The 95 per cent confidence interval (95% CI) indicates a 95 per cent probability that the true value of a number is contained within the interval. So, the confidence interval is the likely range of the true value for a number. Some of the figures in the report include 95% CIs.

Statistical significance

The only trends and patterns in the data that are discussed in this report are statistically significant trends and patterns. Statistical significance provides an indication of how likely a result is due to chance. It does not infer clinical significance, the relative importance of a particular finding, or the actual magnitude of difference between values.

Significant differences between values in this report were deemed to exist if the confidence intervals of respective values did not overlap. If there was no statistically significant difference between two values (that is, the 95 per cent confidence intervals overlapped), they were either not discussed in the text or were described as being 'similar'.

Data analysis

Most of the data used in the analysis to produce this report are preliminary data which have not been finalised. Although the data is adequate for the purposes of assessing the health impacts of the extreme heat, it may not be complete for the period of interest, contain duplicate records or it may contain other minor errors. Therefore, the results presented in this report should be regarded as preliminary and subject to amendment following data finalisation. Any changes to the data following finalisation are expected to be minor changes and are not expected to impact on patterns and trends, or the direction of an effect in the analysis. Note that the finalisation of some of the data sourced for this report can take several years.

In this report, actual levels of daily health service use and mortality have been compared with expected levels of service use and mortality in Victoria. Information about health service use is used as an indicator of morbidity (ill health).

The total number of deaths and excess cited in this report are based on the deaths that occurred during the week of the heatwave. They include deaths that were registered with the Victorian Registry of Births, Deaths and Marriages as at 30 June 2014, and deaths reported to the Coroners Court of Victoria that were unregistered as at 30 June 2014. The data are subject to change following finalisation, but incorporate all known deaths during the week of the heatwave in Victoria, at the time of writing.

The number of excess deaths has been derived by subtracting the number of expected deaths from the estimate for total deaths. Expected deaths are a daily average that was derived from pooled deaths data from previous years.

All analyses were conducted using Stata statistical software version 12.1 (StataCorp, College Station, Texas, USA).

Results

Extreme heat in Victoria

Between 14 and 17 January 2014 southeast Australia experienced an extreme heat event. The heat affected a large geographical area, including Victoria, Tasmania, southern New South Wales—away from the coast, and the southern half of South Australia (Bureau of Meteorology 2014). It ranked alongside similar heatwaves recorded in January 2009, January 1939 and January 1908. Although maximum temperatures for the January 2014 heatwave were slightly lower than those observed during these earlier heatwaves, the extreme heat lasted for a longer period over many areas that were affected, including Adelaide and Melbourne. Mean temperatures in Melbourne were higher than those experienced during the heatwave in 2009 for three of the four days during the heatwave in 2014.

Victoria experienced the hottest four-day period on record, with the highest maximum and mean temperatures ever observed between 14 and 17 January 2014. Maximum temperatures across much of Victoria were 12°C or more above average during this four-day period, with temperatures reaching 45°C on three days in some parts of the state. In Melbourne, maximum temperatures were 41°C or more and the city experienced two nights with minimum temperatures of 27°C or more, between 14 and 17 January (Table 1). Temperatures peaked in Victoria on 14 January 2014, at 46.5°C in Charlton, in the North West.

The January 2009 heatwave was characterised by maximum temperatures 12–15°C above average, for most of Victoria. The heat peaked at 45.8°C at Avalon Airport on 29 January and again at Charlton on 31 January 2009. Between 28–30 January 2009, Melbourne experienced three days with maximum temperatures above 43°C—a record for the city in terms of the number of consecutive days with temperatures above 43°C.

Table 1 and Figure 2 show that there were three days of extreme heat (mean temperature $\geq 30^\circ\text{C}$) in Melbourne at the end of January 2009, compared with four days in mid-January 2014. The extreme heat in Melbourne lasted for longer, and overnight minimum temperatures were generally higher in 2014, but maximum temperatures were lower than those experienced in 2009.

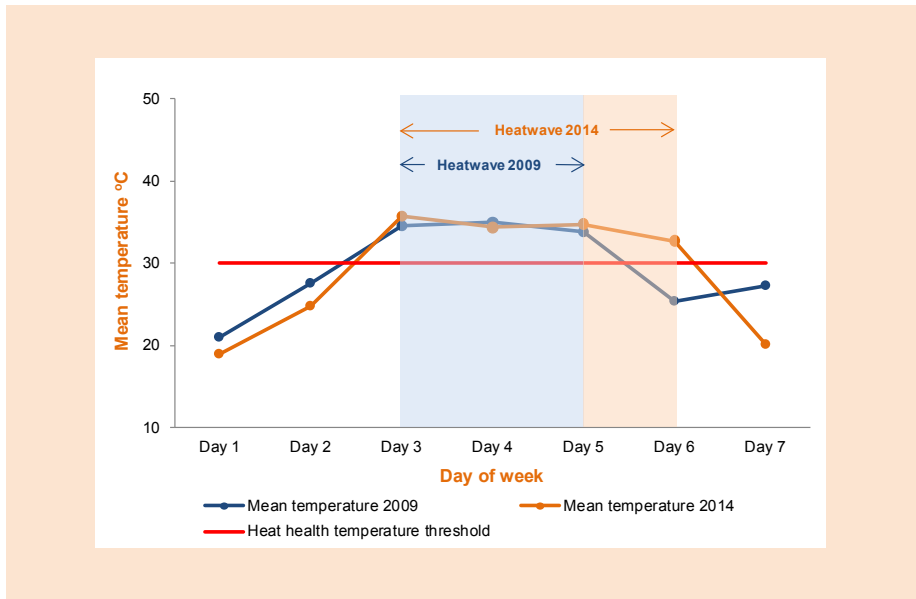
Table 1: Daily temperatures during extreme heat events in Melbourne, 26 January–1 February 2009 and 12–18 January 2014

	Extreme heat event 2009			Extreme heat event 2014		
	Maximum 2009	Minimum 2009	Mean 2009	Maximum 2014	Minimum 2014	Mean 2014
Day 1	25.5	14.4	21.1	22.8	16.5	19.0
Day 2	36.4	16.6	27.6	31.1	15.2	24.7
Day 3	43.4	18.8	34.6	42.8	18.3	35.7
Day 4	44.3	25.7	35.0	41.7	28.6	34.4
Day 5	45.1	25.7	33.8	43.9	27.0	34.8
Day 6	30.5	22.5	25.4	43.9	25.6	32.7
Day 7	33.8	20.3	27.3	24.0	21.5	20.1

Data source: Bureau of Meteorology, Melbourne Regional Station #086071.

The figures in red in the table denote mean temperatures above the heat health temperature threshold for Melbourne (mean $\geq 30^\circ\text{C}$).

Figure 2: Mean temperatures during extreme heat events in Melbourne, 26 January–1 February 2009 and 12–18 January 2014



Data source: Bureau of Meteorology, Melbourne Regional Station #086071. The heat health temperature threshold for Melbourne is mean 30°C.

Victorian public hospital emergency department presentations

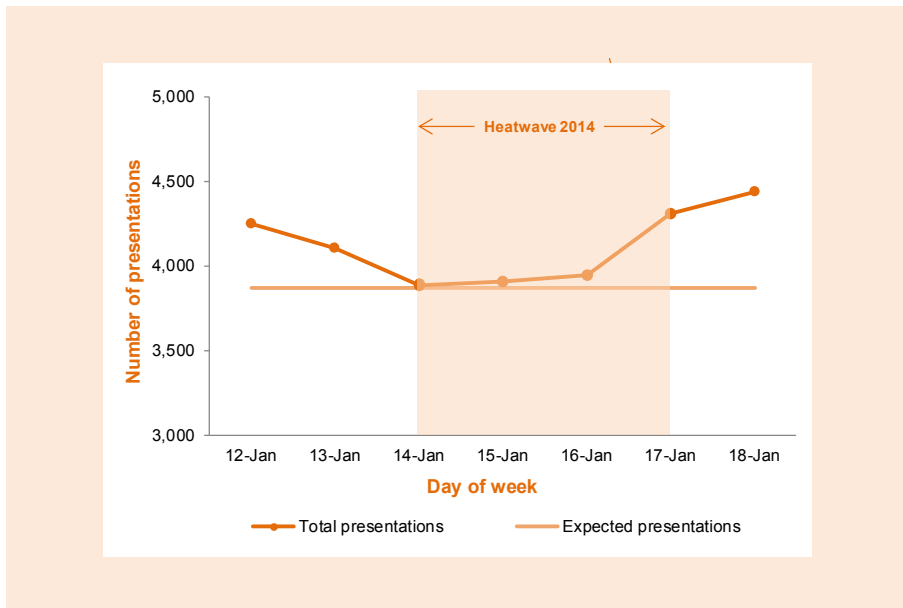
Total presentations

Victorian public hospital emergency department presentation data were collated for the week 12–18 January 2014 and compared with the expected number of presentations (average for the same seven-day period during the previous three years).

Figure 3 presents the total (all cause) number of emergency department presentations recorded each day during the week of the heatwave. The figure shows that total presentations peaked on the day following the final day of extreme heat. The figure also includes the expected number of presentations, derived from presentation data from previous years.

Between 12–18 January there was a seven per cent increase in emergency department presentations at Victorian public hospitals. There were 28,838 presentations observed, a similar number to the 27,086 presentations expected for that week.

Figure 3: Total public hospital emergency department presentations, 12–18 January 2014



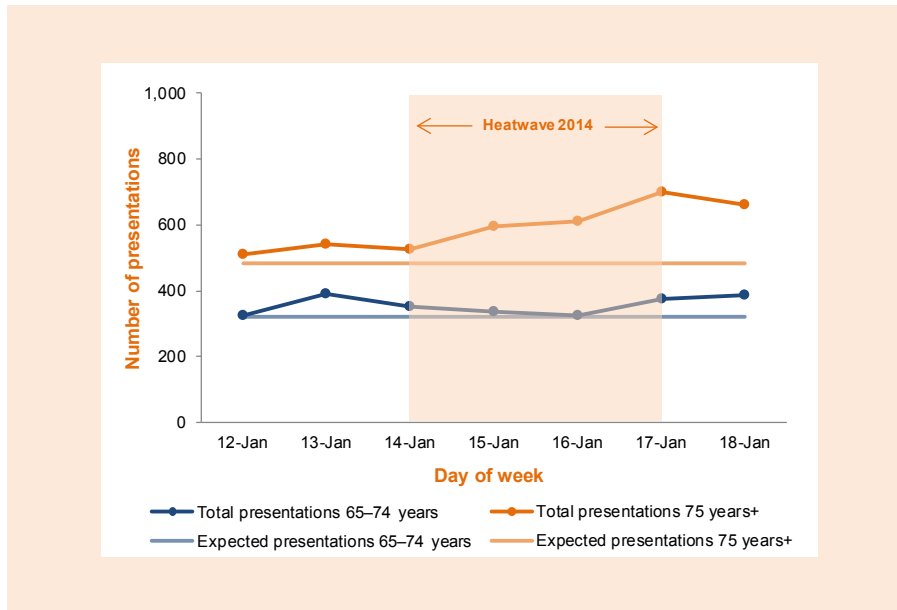
Data source: Emergency Department Information Systems, Department of Health.

The expected number of presentations in the figure is a daily average that was derived from pooled data for 12–18 January 2011–2013.

Older people may be more vulnerable to the effects of extreme heat than younger people (Department of Health 2011a). They are more likely to have poor cardiovascular fitness, essential for regulation of body temperature and they are more likely to be taking medications that interfere with the way the body reacts to heat. Previous studies in Victoria have shown that they are more likely to experience a greater share of the health burden during a heatwave (Department of Human Services 2009; Department of Health 2011b).

Figure 4 shows the number of emergency department presentations for older Victorians that occurred each day during the week of the heatwave. Overall, there was a 23 per cent increase in presentations for older people aged 75 years or more (4,143 presentations observed, higher than the 3,373 presentations expected) during the week of the heatwave, higher than the 10 per cent increase for people aged 65–74 years (2,483 presentations observed, similar to the 2,254 presentations expected). In 2009, there was a 37 per cent increase in emergency department presentations in those aged 75 years or older.

Figure 4: Total public hospital emergency department presentations by older age group, 12–18 January 2014



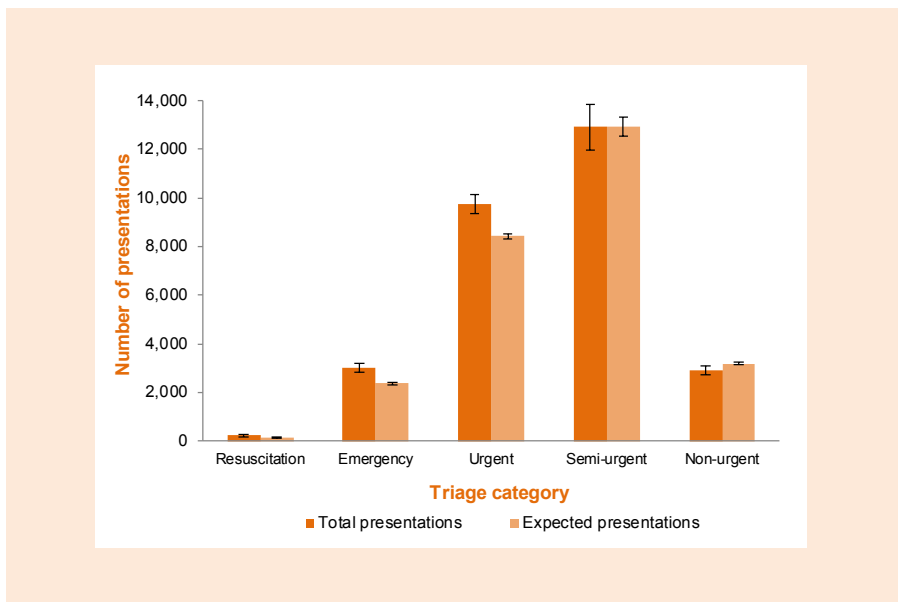
Data source: Emergency Department Information Systems, Department of Health.

The expected number of presentations in the figure for 65–74 years and 75 years+ are daily averages that were derived from pooled data for 12–18 January 2011–2013.

The severity of presentations provides further insights into the health impacts of the heatwave (Figure 5). Emergency department presentations are triaged to six categories (resuscitation, emergency, urgent, semi-urgent, non-urgent and dead on arrival), depending upon how urgently a patient requires medical attention. During the week of the heatwave, there were increases in the number of presentations triaged as resuscitation, emergency and urgent cases, as well as a decrease in the number of presentations triaged as non-urgent cases.

There was a 60 per cent increase in the number of patients requiring immediate resuscitation during the week of the heatwave, compared with the average for the same week during the previous three years (224 presentations observed, higher than the 140 presentations expected). Emergency presentations increased by 27 per cent (2,999 presentations observed, higher than the 2,362 presentations expected) and urgent presentations increased by 16 per cent (9,759 presentations observed, higher than the 8,431 presentations expected). There was a 10 per cent decrease in non-urgent presentations (2,888 presentations observed, lower than the 3,191 presentations expected) and the number of semi-urgent presentations (12,905) was similar to the average number for the week 12–18 January 2011–2013 (12,927).

Figure 5: Total public hospital emergency department presentations, by triage category, 12–18 January 2014

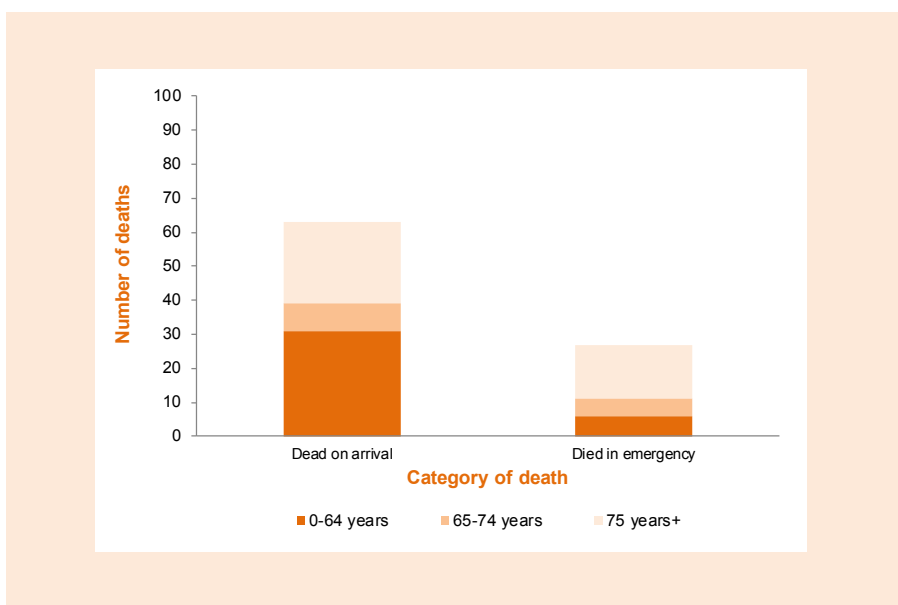


Data source: Emergency Department Information Systems, Department of Health. The expected number of presentations in the figure are daily averages that were derived from pooled data for 12–18 January 2011–2013.

During the week of the heatwave, there were 63 people who died prior to arrival at a Victorian public hospital emergency department (Figure 6). A further 27 people died within a hospital emergency department.

Almost half (45 per cent) of all people who died in, or prior to arrival at an emergency department were aged 75 years or more.

Figure 6: Deaths in, and prior to arrival at public hospital emergency departments, by age group, 12–18 January 2014



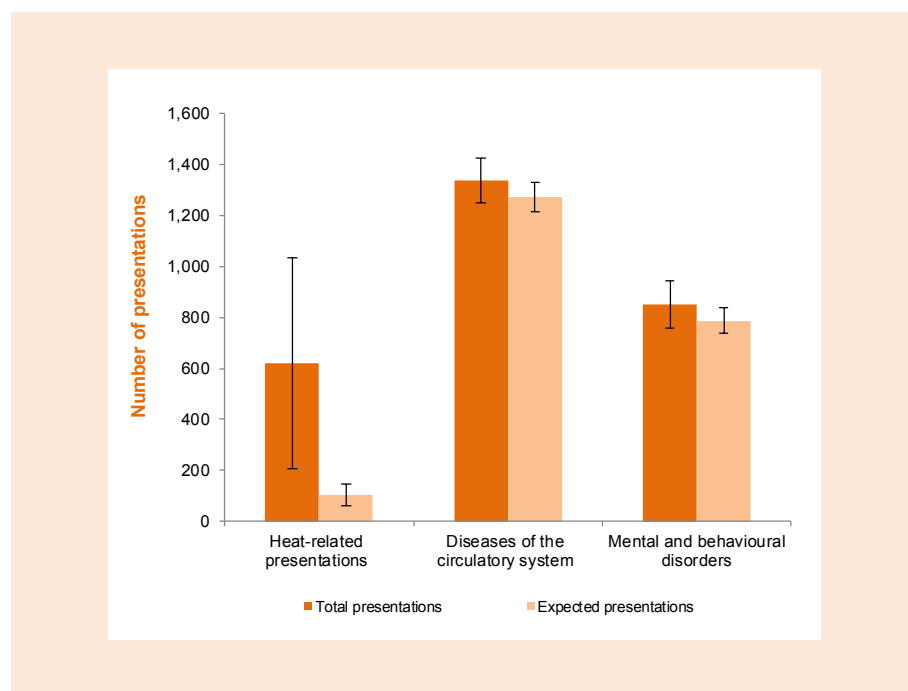
Data source: Emergency Department Information Systems, Department of Health.

Heat-related presentations

There were 621 heat-related presentations to emergency departments during the week of the January 2014 heatwave, higher than the number expected (105), representing a five-fold increase in heat-related presentations (Figure 7). There were 328 (53 per cent) presentations for dehydration, 140 (23 per cent) for heat stroke, 118 (19 per cent) for heat syncope and 35 (6 per cent) presentations for sunburn. Forty per cent of those who presented with a heat-related condition were aged 75 years or more.

The number of presentations to emergency departments for diseases of the circulatory system during the week of the heatwave (1,337) was similar to the number of presentations that were expected (1,272). The number of presentations for mental and behavioural disorders (850) was also similar to the number expected (786).

Figure 7: Public hospital emergency department presentations, by disease type, 12–18 January 2014



Data source: Emergency Department Information Systems, Department of Health.

Diseases of the circulatory system include presentations with an ICD-10-AM code in the range I00–I99.

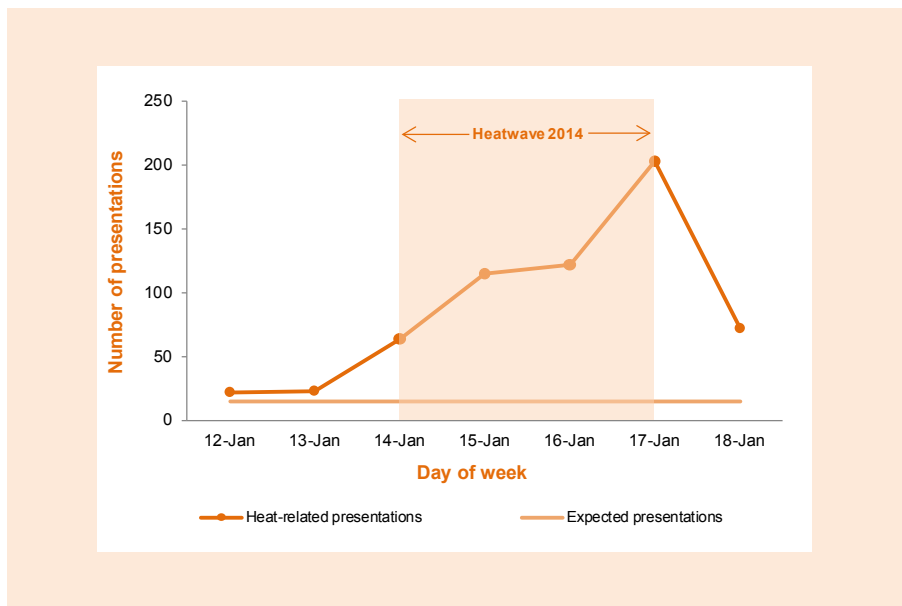
Mental and behavioural disorders include presentations with an ICD-10-AM code in the range F00–F99.

Heat-related presentations include presentations with an ICD-10-AM code with one of the following: E86 (volume depletion/dehydration), L55–56 (sunburn/other skin changes due to UV) and T67 (heat stroke/sunstroke/heat syncope/heat cramp/heat exhaustion/heat fatigue/heat oedema etc.).

The expected number of presentations in the figure are daily averages that were derived from pooled data for 12–18 January 2011–2013.

Figure 8 shows the number of heat-related presentations to emergency departments each day during the week of the heatwave. The figure shows that heat-related presentations peaked on the last day of the heatwave (17 January), when maximum temperatures peaked in Melbourne (Table 1).

Figure 8: Public hospital emergency department heat-related presentations, 12–18 January 2014



Data source: Emergency Department Information Systems, Department of Health.

Heat-related presentations include presentations with an ICD-10-AM code with at least one of the following: E86 (volume depletion/dehydration), L55–56 (sunburn/other skin changes due to UV) and T67 (heat stroke/sunstroke/heat syncope/heat cramp/heat exhaustion/heat fatigue/heat oedema etc.).

The expected number of (heat-related) presentations in the figure is a daily average that was derived from pooled data for 12–18 January 2011–2013.

Ambulance Victoria emergency dispatches

Ambulance Victoria provides medical care and transport for Victorians in both emergency and non-emergency situations. During the heatwave (14–17 January), there was an increase in the emergency caseload in the metropolitan region, with less of an impact experienced in rural regions of the state.

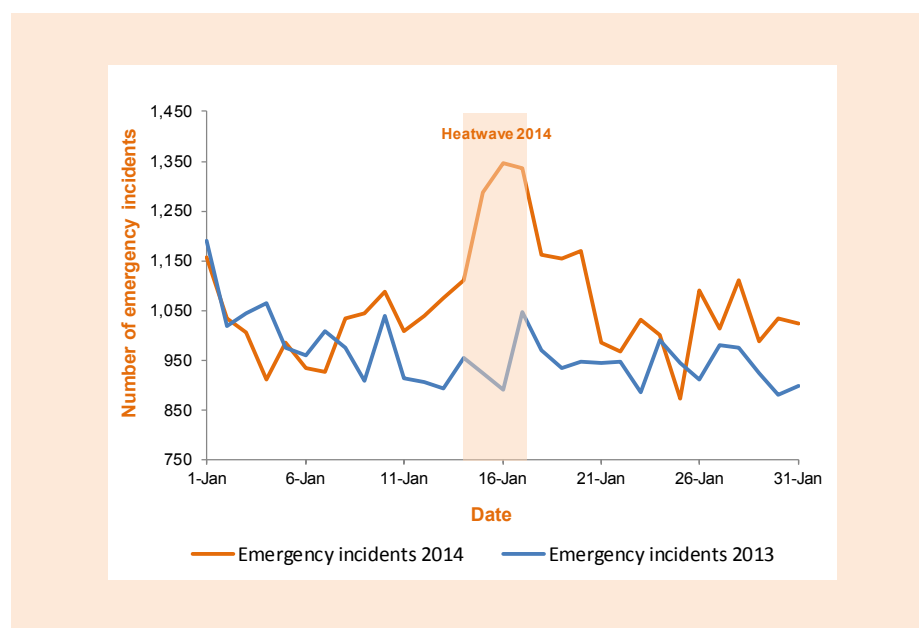
Total emergency dispatches

Figure 9 shows the number of emergency dispatches in the metropolitan region each day during January 2014, compared with January 2013. The figure shows a higher number of emergency dispatches during the days of the heatwave in 2014, compared with the same period in 2013.

There was an average of 1,271 emergency dispatches per day during the heatwave (14–17 January 2014) in the metropolitan region, which represents an increase of 25 per cent on the period prior to the heatwave (1–13 January), when there was an average of 1,019 dispatches per day. In 2009, there was a 46 per cent increase in emergency dispatches in the metropolitan region in the three days of the heatwave.

Although the number of emergency dispatches peaked on 16 and 17 January (1,347 and 1,336 incidents, respectively), the last two days of extreme heat, the number of emergency dispatches continued to be high for a few days following the heatwave (Figure 9).

Figure 9: Total Ambulance Victoria metropolitan emergency dispatches, January 2013 & 2014



Data source: Ambulance Victoria.

Code 1 dispatches

A Code 1 dispatch is a time critical case with a lights and sirens ambulance response. Code 1 dispatches increased in the metropolitan region, from an average of 587 per day for the period 1–13 January, prior to the heatwave, to an average of 847 per day during the heatwave (14–17 January), representing an increase of 44 per cent. The peak occurred on 16 January, with 940 Code 1 dispatches, which was sixty per cent higher than the period 1–13 January, prior to the heatwave.

Priority ‘0’ dispatches

A Priority ‘0’ dispatch is an emergency ambulance response to a cardiac case. The Priority ‘0’ caseload in the metropolitan region increased from an average of 29 dispatches per day for the period 1–13 January, to an average of 57 dispatches per day during the heatwave (14–17 January), representing a 97 per cent increase. The number of Priority ‘0’ dispatches peaked on the last day of the extreme heat (17 January) with 90 Priority ‘0’ dispatches, representing a 210 per cent increase on the period 1–13 January.

National Home Doctor Service after-hours consultations

The data obtained from the service includes both the total number of locum general practitioner consultations with patients that occurred during the week of the heatwave, as well as the number of consultations with a heat-related diagnosis.

Total consultations

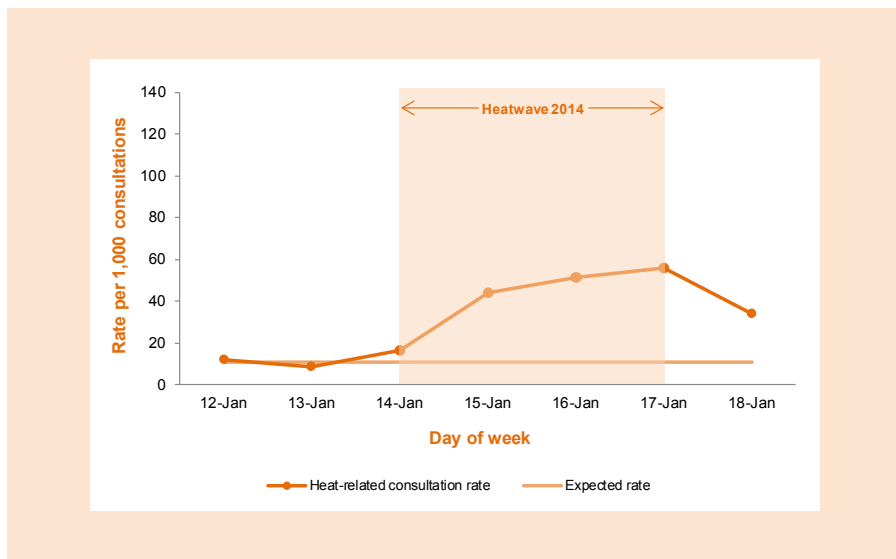
The service recorded 3,687 locum consultations for the period 12–18 January, higher than the 2,365 consultations expected, representing an increase of 56 per cent.

Heat-related consultations

The service also recorded a three-fold increase in consultations with a heat-related diagnosis during the week of the heatwave, with 112 consultations observed, higher than the 26 consultations expected.

Figure 10 shows after-hours locum consultations with a heat-related diagnosis, expressed as a daily rate per 1,000 consultations, for the week of the heatwave. The figure shows that the rate peaked on the last day of the heatwave (17 January).

Figure 10: National Home Doctor Service heat-related consultations (rate per 1,000 consultations), 12–18 January 2014



Data source: National Home Doctor Service.

The expected (heat-related consultation) rate in the figure is a daily average that was derived from pooled data for 12–18 January 2011–2013.

NURSE-ON-CALL heat-related telephone calls

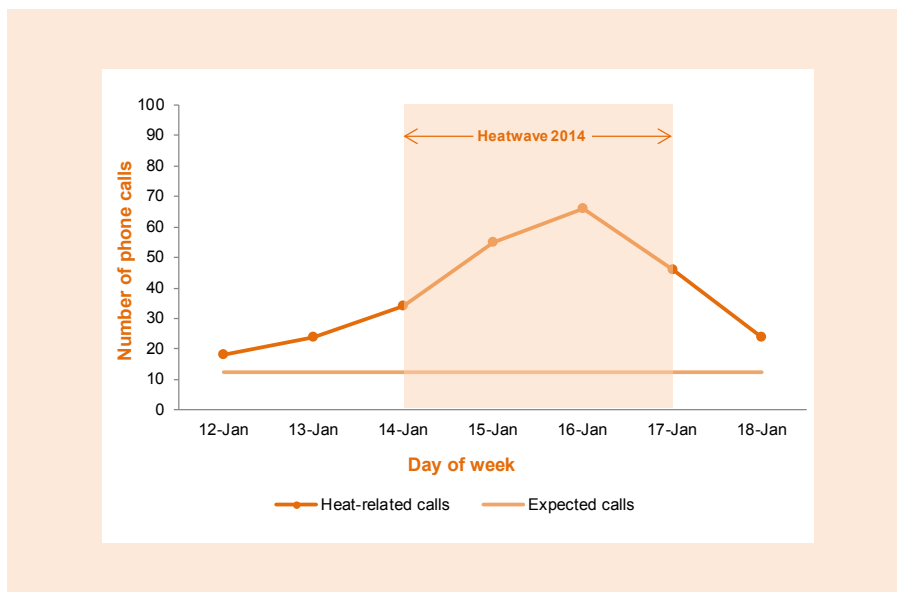
The NURSE-ON-CALL service is a 24-hour service providing health advice to Victorians by telephone from a registered nurse. Basic information about each call is collected, including the reason for the call. The data presented in this section includes calls to the service for heat exposure or heat injury, sunburn and dehydration.

Between 12–18 January, there were 267 heat-related telephone calls to the NURSE-ON-CALL service, higher than the number expected (87), representing a three-fold increase in heat-related calls (Figure 11). However, heat-related calls comprise a relatively small component of calls, accounting for less than two per cent of all calls to the service in January 2014.

Figure 12 shows that 60 per cent of heat-related calls to the service during the week of the heatwave were about heat exposure or heat injury; a further 23 per cent were about sunburn and 17 per cent were about dehydration.

Almost a third (30 per cent) of heat-related calls during the heatwave were identified as calls about children. About 12 per cent of heat-related calls were from people aged 65 years or more.

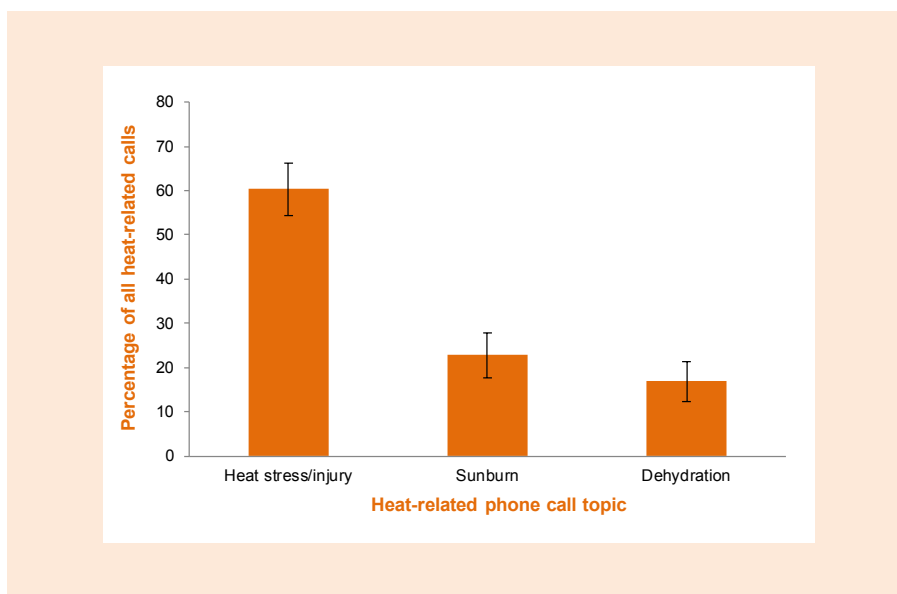
Figure 11: NURSE-ON-CALL heat-related telephone calls, 12–18 January 2014



Data source: Medibank Health Solutions.

The number of expected (heat-related) calls in the figure is a daily average that was derived from pooled data for January 2010–2013.

Figure 12: NURSE-ON-CALL heat-related telephone calls, by topic (as a percentage of all heat-related calls), 12–18 January 2014



Data source: Medibank Health Solutions.

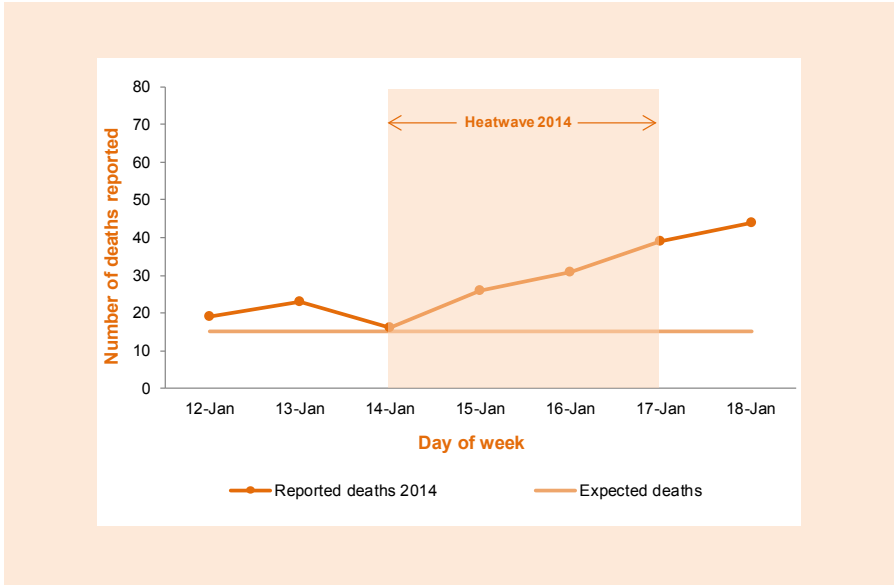
Deaths reported to the Coroners Court of Victoria

Each death in Victoria that is reported to the Coroners Court of Victoria is investigated to determine the underlying cause of death. The information presented in this section includes deaths reported to the Coroners Court of Victoria during the week of the heatwave.

There were 228 deaths reported to the Coroners Court of Victoria for investigation during the week of the heatwave, which was more than double the number expected (105), based on the average for the same

week over the previous three years. The number of deaths reported to the Coroners Court of Victoria peaked on 18 January (Figure 13), the day after the final day of extreme heat in Victoria.

Figure 13: Deaths reported to the Coroners Court of Victoria, 12–18 January 2014



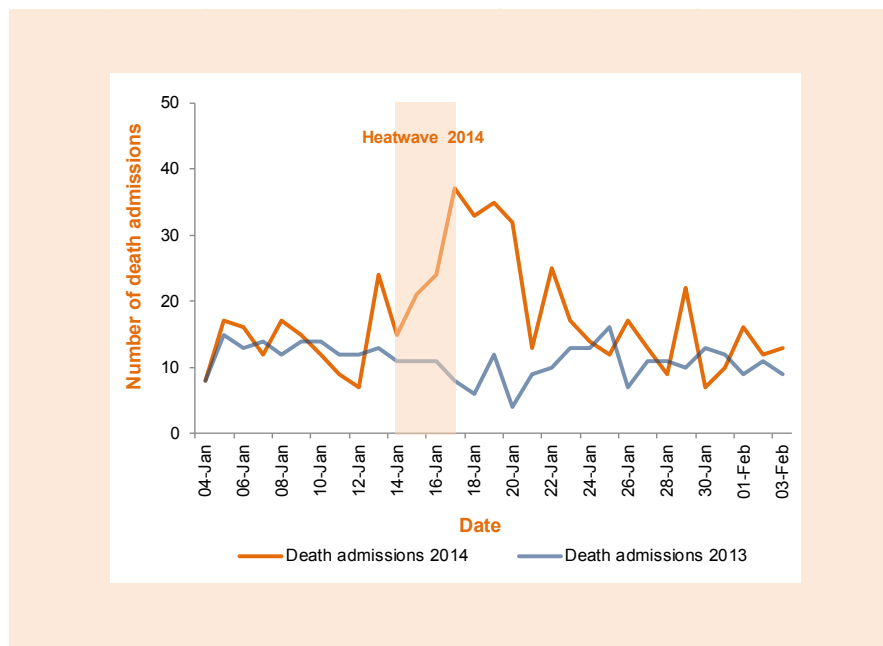
Data source: Coroners Court of Victoria.
The number of expected deaths in the figure is a daily average that was derived from pooled data for 12–18 January 2011–2013.

Death admissions to the Victorian Institute of Forensic Medicine

The Victorian Institute of Forensic Medicine provided de-identified information on death admissions to the Institute for forensic investigation during January and early February 2014. The Institute also provided information about admissions for the same period in 2013 for comparative purposes. These admissions are a subset of deaths reported to the Coroners Court of Victoria.

Figure 14 shows daily admissions during January and early February 2014, compared with the same period in 2013. Although admissions peaked on the last day of the heatwave in 2014 (17 January), the number of death admissions continued to be high for a few days following the heatwave. The figure clearly shows a higher number of admissions during the days of the heatwave in 2014, compared with the same period in 2013.

Figure 14: Death admissions to the Victorian Institute of Forensic Medicine, 4 January–3 February, 2013 & 2014



Data source: Victorian Institute of Forensic Medicine.

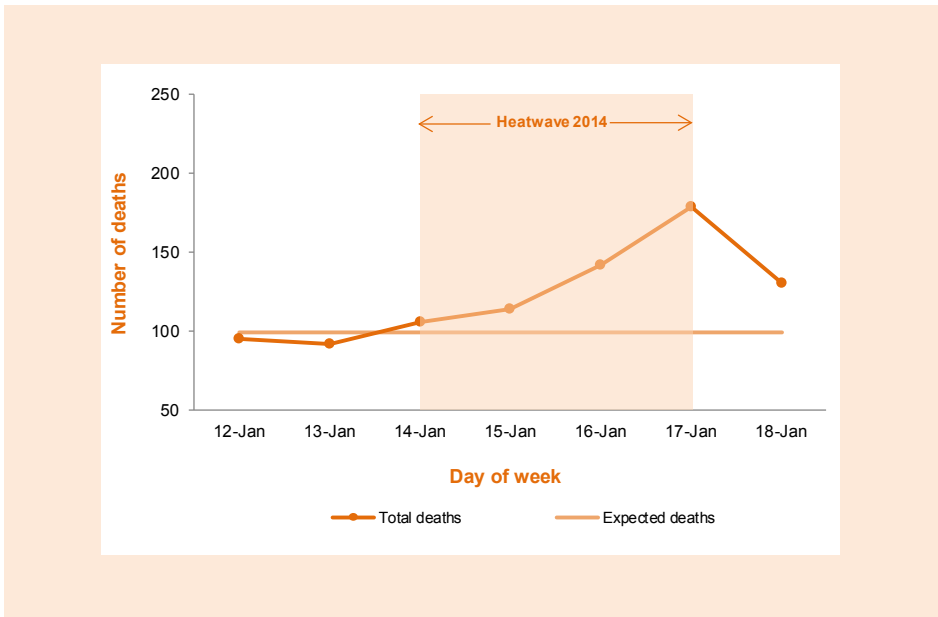
Total deaths

Deaths data from the Victorian Registry of Births, Deaths and Marriages include data from the Victorian Institute of Forensic Medicine and the Coroners Court of Victoria. Death registrations from the Registry and deaths reported to the Coroners Court of Victoria that were unregistered as at 30 June 2014, are presented in this section. Together, these data provide the best estimate available of the total number of deaths for the period of interest. The Australian Bureau of Statistics prepare and release final mortality and cause of death information, but this is not yet available.

Figure 15 shows that the total number of deaths increased daily, peaking on the last day of the heatwave, before decreasing following the extreme heat. The deaths data indicate that there were 858 deaths, with 691 expected, during the week of the heatwave. This represents an estimated 167 excess deaths and corresponds to a 24 per cent increase in the number of deaths during the week of the heatwave.

This compares to 374 estimated excess deaths, or a 62 per cent increase in total all-cause mortality, in 2009.

Figure 15: Total deaths in Victoria, 12–18 January 2014



Data sources: Victorian Registry of Births, Deaths & Marriage, Coroners Court of Victoria.
 The number of deaths for the week 12–18 January 2014 are based on registered deaths with the Registry of Births, Deaths & Marriages, as at 30 June 2014 and unregistered deaths reported to the Coroners Court of Victoria, as at 30 June 2014.
 The expected number of deaths is a daily average that was derived from pooled data for 12–18 January 2012–2013.

Appendix I: Weather forecast districts by heat health temperature threshold, weather station and local government area, Victoria

Weather forecast district	Heat health temperature threshold	Weather station sites	Local government area	
Mallee	Mean 34°C	Mildura	Buloke Shire Gannawarra Shire Yarriambiack (north of Galaquil East & Galaquil West Road)	Mildura Rural City Swan Hill Rural City
Wimmera	Mean 32°C	Horsham	Horsham Rural City Northern Grampians Shire Yarriambiack (south of Galaquil East & Galaquil West Road)	Hindmarsh Shire West Wimmera Shire
South West	Mean 30°C	Hamilton	Ararat Rural City Southern Grampians Shire Pyrenees Shire Corangamite Shire	Glenelg Shire Moyne Shire Colac Otway Shire Warrambol City
Northern Country	Mean 32°C	Bendigo Shepparton	Campaspe Shire Greater Bendigo City Greater Shepparton City	Loddon Shire Moirā Shire Strathbogie Shire
North Central	Mean 30°C	Seymour	Central Goldfields Shire Lake Mountain Alpine Resort (Unincorporated) Mitchell Shire	Mount Alexander Shire Murrindindi Shire
North East	Mean 32°C	Wodonga	Benalla Rural City Mansfield Shire Falls Creek Alpine Resort (Unincorporated) Mount Buller Alpine Resort (Unincorporated) Mount Hotham Alpine Resort (Unincorporated) Mount Stirling Alpine Resort (Unincorporated)	Alpine Shire Indigo Shire Towong Shire Wangaratta Rural City Wodonga City
East Gippsland	Mean 30°C	Bairnsdale	East Gippsland Shire	
West & South Gippsland	Mean 30°C	Sale	Baw Baw Shire Latrobe City Mount Baw Baw Alpine Resort (Unincorporated)	South Gippsland Shire Wellington Shire
Central	Mean 30°C	Melbourne Ballarat Geelong	Ballarat City Banyule City Bass Coast Shire Bayside City Boroondara City Brimbank City Cardinia Shire Casey City Darebin City Frankston City French Island (Unincorporated) Glen Eira City Golden Plains Shire Greater Dandenong City	Greater Geelong City Hepburn Shire Hobsons Bay City Hume City Kingston City Knox City Macedon Ranges Shire Manningham City Maribyrnong City Maroondah City Melbourne City Melton Shire Monash City Moonee Valley City Moorabool Shire Moreland City Mornington Peninsula Nillumbik Shire Port Phillip Shire Queenscliffe Borough Stonnington City Surf Coast Shire Whitehorse City Whittlesea City Wyndham City Yarra City Yarra Ranges

Appendix II: People affected by heat

Heatwaves can affect anybody. The following population groups may be susceptible to heat-related illness:

- people aged over 65 years, especially those living alone
- people who have a medical condition such as heart disease, high blood pressure, diabetes, cancer or kidney disease
- people taking medications that may affect the way the body reacts to heat such as
 - allergy medicines (antihistamines)
 - some blood pressure and heart medicines (beta-blockers and vasoconstrictors)
 - seizure medicines (anticonvulsants)
 - thyroid medications (thyroxine)
 - water pills (diuretics)
- people who have a mental illness, particularly those on medication (antidepressants or antipsychotics)
- people with problematic alcohol or other drug use such as amphetamines
- people with an illness or infection that causes dehydration or fever
- people with cognitive impairment who may not be able to identify or communicate their discomfort or need for water
- people who have trouble moving around (such as those who are bed bound or in wheelchairs)
- people who are overweight or obese
- pregnant women, breastfeeding mothers, babies and young children
- people who work in hot environments or are physically active outdoors (such as gardeners and labourers)
- people with health conditions that impair sweating including people with heart disease, dehydration, extremes of age, skin disorders (including sunburn, prickly heat and extensive scarring from burns), congenital impairment of sweating, cystic fibrosis, quadriplegia and scleroderma
- people who are unable to acclimatise
- homeless people
- people who are dehydrated
- people of low socioeconomic status
- people who live alone or are socially isolated
- people with low cardiovascular fitness
- non-English speaking people who may not be able to understand heatwave announcements or who have reduced access to appropriate health or support services

(Department of Health 2011a).

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